Utilization maps

Title	Utilization maps
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Project TRANSENERGY

Transboundary Geothermal Energy Resources of Slovenia, Austria, Hungary and Slovakia

Work package WP3 Utilization aspects

3.2.3. Utilization maps

Index

1. Introduction

Overview of geothermal energy utilization, which is the main output of the work package 3.2, comprises an overview of thermal water users in the Transenergy project area. Work package actions started with construction of the Database of users in work package 3.2.1, in which all active and potential users in the project area were identified, and their basic organization information gathered. The research continued through work package 3.2.2 Database of current and potential utilization parameters. Herewith additional site-specific data on actual properties of geothermal wells, exploited aquifers, thermal water use, and waste water management were compiled and compared between the countries. The data were updated in 2011 and interpreted in details within the final report "Database of users and database of current and potential utilization parameters" and are available as web-application on http://akvamarin.geo-zs.si/users/. Additionally, the graphical presentation of the collected data is the subject of the presented work package 3.2.3 Utilization maps, and this report.

2. Information presented on the Utilization maps

An overview of current geothermal energy utilization in the Transenergy project area was achieved gradually, with 213 geothermal energy users and 401 thermal boreholes included in the survey at the end. At first, collection of harmonized information on actual utilization in the four project countries was performed in 2010 and updated at the end of 2011. The activities continued by establishing the database of relevant users and their utilization data as the activities continued in 2011. The database was developed using MS SQL Server 2008 R2 software solution and is stored on the server at Geological Survey of Slovenia.

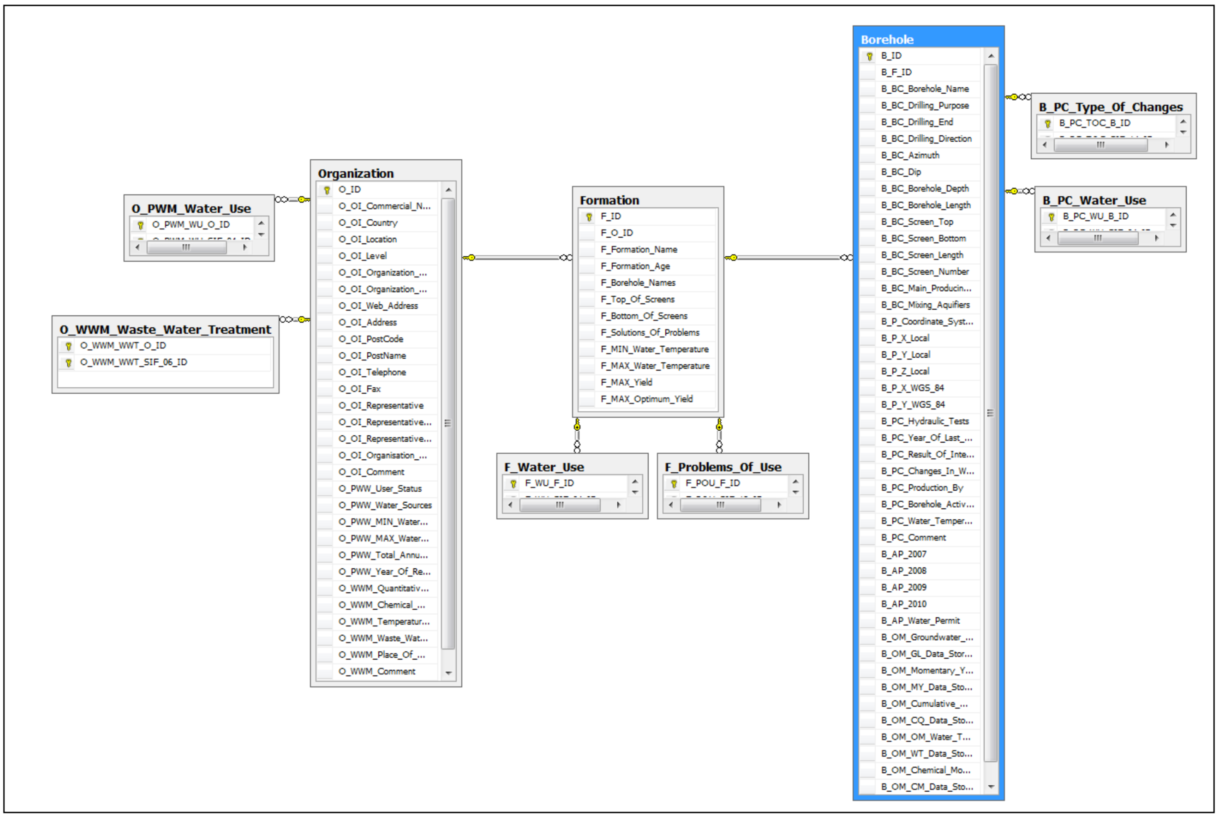
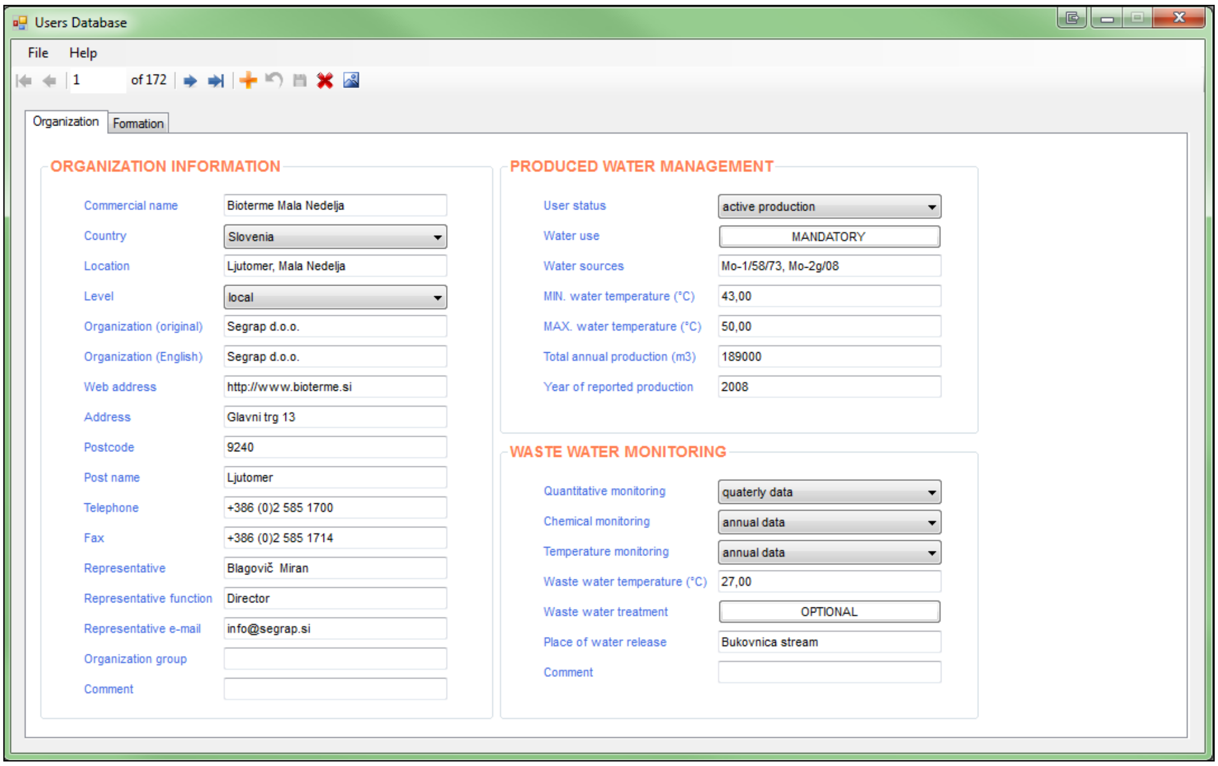


Figure 1 : The database structure

One database of a multi-level approach was established (Fig. 1) into which the 1st level organization-specific data were included as compiled for the Database of users, and the 2nd level borehole-specific information was input also as compiled for the Database of current and potential utilization parameters.

A user client (Fig. 2) was developed using Visual Studio 2008 SDK and C# programming language, which allows an easy data access, new records adding, editing and deleting for users station inside the Geological Survey of Slovenia as well as via remote login. For the remote login new SQL user accounts for the project partners were created. The access is established through the TCP/IP protocol, port 1433.



ORGANIZATION INFORMATION

Commercial name	Bioterme Mala Nedelja
Country	Slovenia
Location	Ljutomer, Mala Nedelja
Level	local
Organization (original)	Segrap d.o.o.
Organization (English)	Segrap d.o.o.
Web address	http://www.bioterme.si
Address	Glavni trg 13
Postcode	9240
Post name	Ljutomer
Telephone	+386 (0)2 585 1700
Fax	+386 (0)2 585 1714
Representative	Blagovič Miran
Representative function	Director
Representative e-mail	info@segrap.si
Organization group	
Comment	

PRODUCED WATER MANAGEMENT

User status	active production
Water use	MANDATORY
Water sources	Mo-1/58/73, Mo-2g/08
MIN. water temperature (°C)	43,00
MAX. water temperature (°C)	50,00
Total annual production (m3)	189000
Year of reported production	2008

WASTE WATER MONITORING

Quantitative monitoring	quaterly data
Chemical monitoring	annual data
Temperature monitoring	annual data
Waste water temperature (°C)	27,00
Waste water treatment	OPTIONAL
Place of water release	Bukovnica stream
Comment	

Figure 2 : Project partners' level client of the database

At final stage the **website database application** (Fig. 3) available on http://akvamarin.geo-zs.si/users/ was developed showing some of the most important data from the expert database. By choosing the country and its user organization detailed information on geothermal energy utilization is shown on an organization level.

Statistical interpretation of numerous collected data is given in the final **report "Database of users and database of current and potential utilization parameters"**, available on http://transenergy-eu.geologie.ac.at/index.html, section results. Users' locations (Fig. 4) can be distinguished by using the Google maps link given at the individual user on the website database.

Country: Austria

Users: Asia Resort Linsberg Betriebs. GmbH

ORGANIZATION INFORMATION:

Commercial name	Therme Linsberg Asia
Country	Austria
Location	Bad Erlach
Level	local
Organization (Original)	Asia Resort Linsberg Betriebs. GmbH
Organization (English)	Asia Resort Linsberg Betriebs. GmbH
Web address	Click to view
Address	Thermenplatz 1
Postcode	2822
Post name	Bad Erlach
Telephone	+43 (0)2627 480 00
Fax	+43 (0)2627 48000 50
Organization group	
Comment	
Google Maps	Click to view

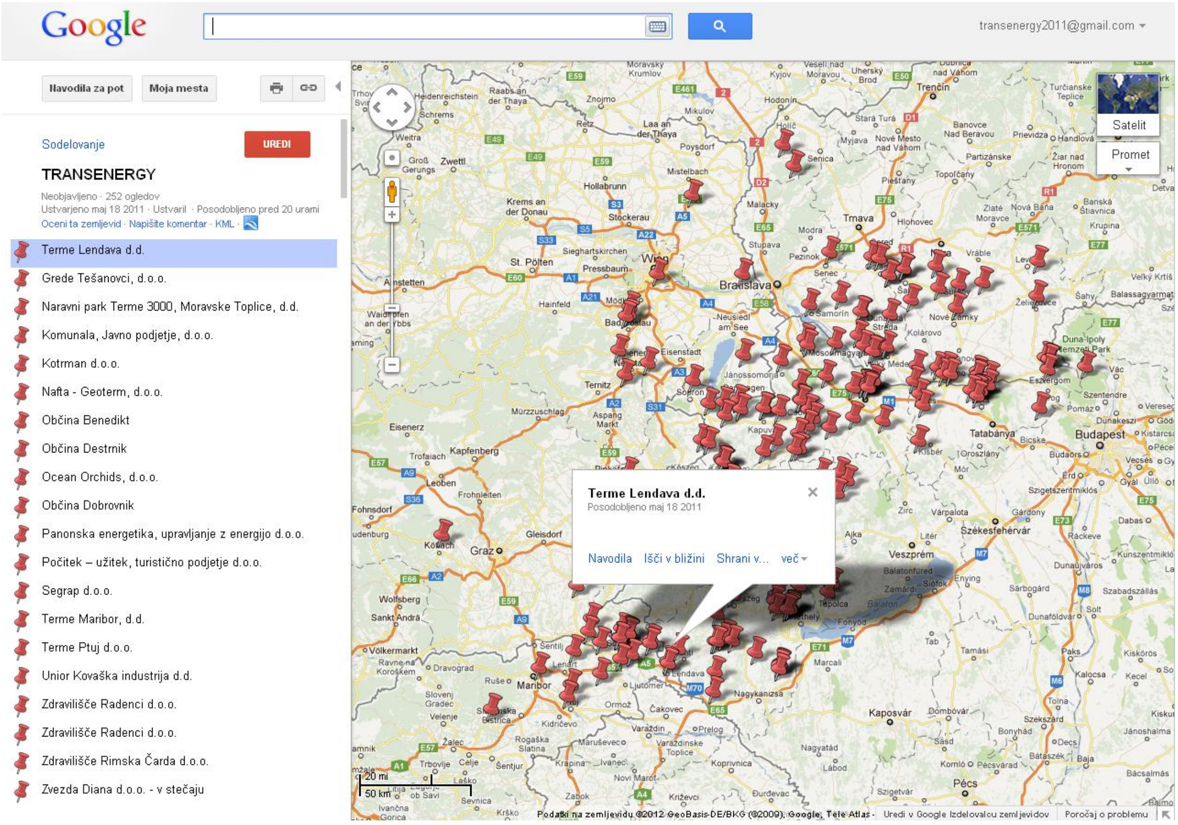
PRODUCED WATER MANAGEMENT:

User status	active production
Water use	bathing and swimming (including balneology)
Water sources	Linsberg TH1b
MIN. water temp. (°C)	26,60
MAX. water temp. (°C)	31,30

WASTE WATER MONITORING:

Quantitative monitoring	no data
Chemical monitoring	no data
Temperature monitoring	no data
Waste water temp. (°C)	
Waste water treatment	seepage purifying plant
Place of water release	channel Bad Erlach
Comment	

Figure 3 : Information on the website database



Sodelovanje UREDI

TRANSENERGY

Neobjavljeno · 252 ogledov

Ustvarjeno maj 18 2011 · Ustvaril · Posodobljeno pred 20 urami

Oceni ta zemljevid · Napišite komentar · KML ·

- Terme Lendava d.d.
- Grede Tešanovci, d.o.o.
- Naravni park Terme 3000, Moravske Toplice, d.d.
- Komunala, Javno podjetje, d.o.o.
- Kotrman d.o.o.
- Nafta - Geoterm, d.o.o.
- Občina Benedikt
- Občina Destrnik
- Ocean Orchids, d.o.o.
- Občina Dobrovnik
- Panonska energetika, upravljanje z energijo d.o.o.
- Počitek – užitek, turistično podjetje d.o.o.
- Segrap d.o.o.
- Terme Maribor, d.d.
- Terme Ptuj d.o.o.
- Unior Kovaška industrija d.d.
- Zdravilišče Radenci d.o.o.
- Zdravilišče Radenci d.o.o.
- Zdravilišče Rimska Čarda d.o.o.
- Zvezda Diana d.o.o. - v stečaju

Terme Lendava d.d.

Posodobljeno maj 18 2011

Navodila Išči v bližini Shrani v... več

Figure 4 : Location tool with 213 geothermal energy users (Transenergy project area)

We tried to make the data as clear and simple as possible to be understandable to all addressed stakeholders as well as other interested public. Furthermore, graphical data are widely applicable and will be easily used for further project activities. Therefore, we elaborated twelve **Utilization maps** on which the most relevant utilization information is presented. These core outputs enable fast spatial orientation and clear presentation of the most important and interesting utilization information. Their detailed interpretation was already done in the previously mentioned report on the database available as pdf on the website, but major outputs are highlighted in this report also.

We are aware that due to large density of geothermal energy users and thermal water sources, the presented data are hardly distinguishable or readable in some areas. Interactive maps with zoom in / zoom out tool may solve this inconvenience, but this approach was not foreseen when planning the project activities. **Site specific and detailed information on an individual user can now be acquired by simultaneous use of the website database, utilization maps and this report, and the database report.**

3. Utilization maps concept

Utilization maps should enable clear, fast and simple distinction between different utilization concepts and success of their employment. Each map presents the whole Transenergy project area. Therefore, the background information is evident and simple. It supports fast orientation and keeps an emphasis on the presented utilization data. Based on compiled information in the Database of users, it became evident that not all countries have comparable and quality information on actual thermal water use. This resulted in the need for identification of available quality information on thermal water use for all 4 project countries. Only presentation of meaningful, good and distinctive data can give some supplementary information on thermal water use with which transboundary different practices will be evaluated.

1) Cartographical concept

Utilization maps are created using ArcMap software (© ESRI) and as final results exported into the raster format JPEG. The maps are designed for A3 paper size.

Each utilization map contains the following information (Fig. 5):

- Title of the map
- Project logo and financial initiatives logos
- Project partners' logos
- Date of elaboration
- Authors
- Persons responsible for digital cartography
- References of the spatial data
- Graphical scale and north
- Delineation of the Transenergy project area
- State boundaries
- Topography, rivers and main cities
- Corresponding graphical utilization data taken from the database.

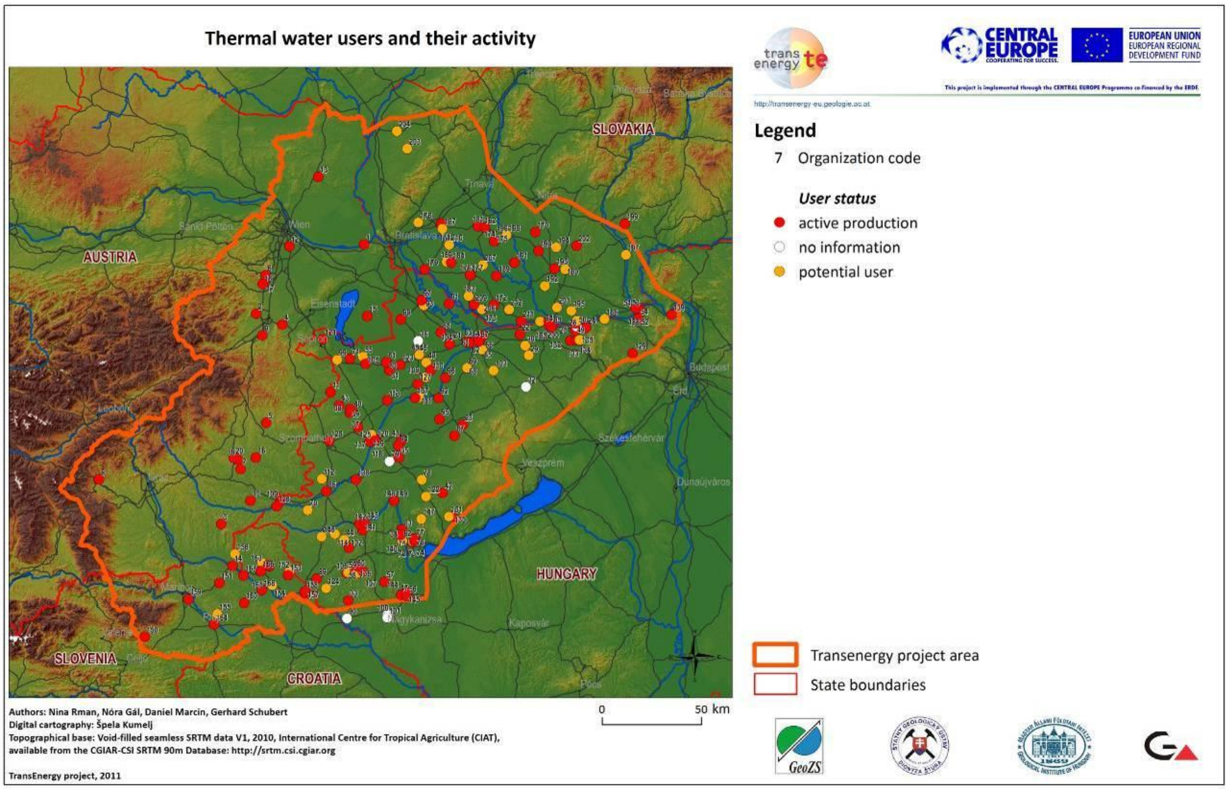


Figure 5 : Graphical concept of the Utilization maps

2) Presented information

In the project proposal four maps were planned, however, twelve are elaborated to achieve broader topics presentation. In the first five data are characteristic for an individual thermal water organization (actual or potential user). In the following 7 maps data are borehole-specific which causes rather dense distribution of presented points. The two lists (Enclosure 1 and 2), one of thermal water users (organizations or companies) and other of their thermal boreholes, contain individual codes as used on the maps. They are enclosed to this report and should be used simultaneously with the maps. Details on each map are presented in the following text.

a) Thermal water users and their activity

The first map shows location and type of user organizations. Distinction between active and potential thermal water users is presented. The organizations are listed in Enclosure 1.

This enables identification of highly exploited areas as well as future areas of possible overexploitation. Moreover, areas for possible additional geothermal development without too much stress on existent users can be identified.

The map **Thermal water users and their activity** shows the following data (Fig. 6):

1) Location of one of the user's water source (circle on the map)
2) Original organization name (full name in Enclosure 1)
3) Organization web address (full name in Enclosure 1)
4) Water sources names (full list in Enclosure 1)
5) User's activity (coloured points)

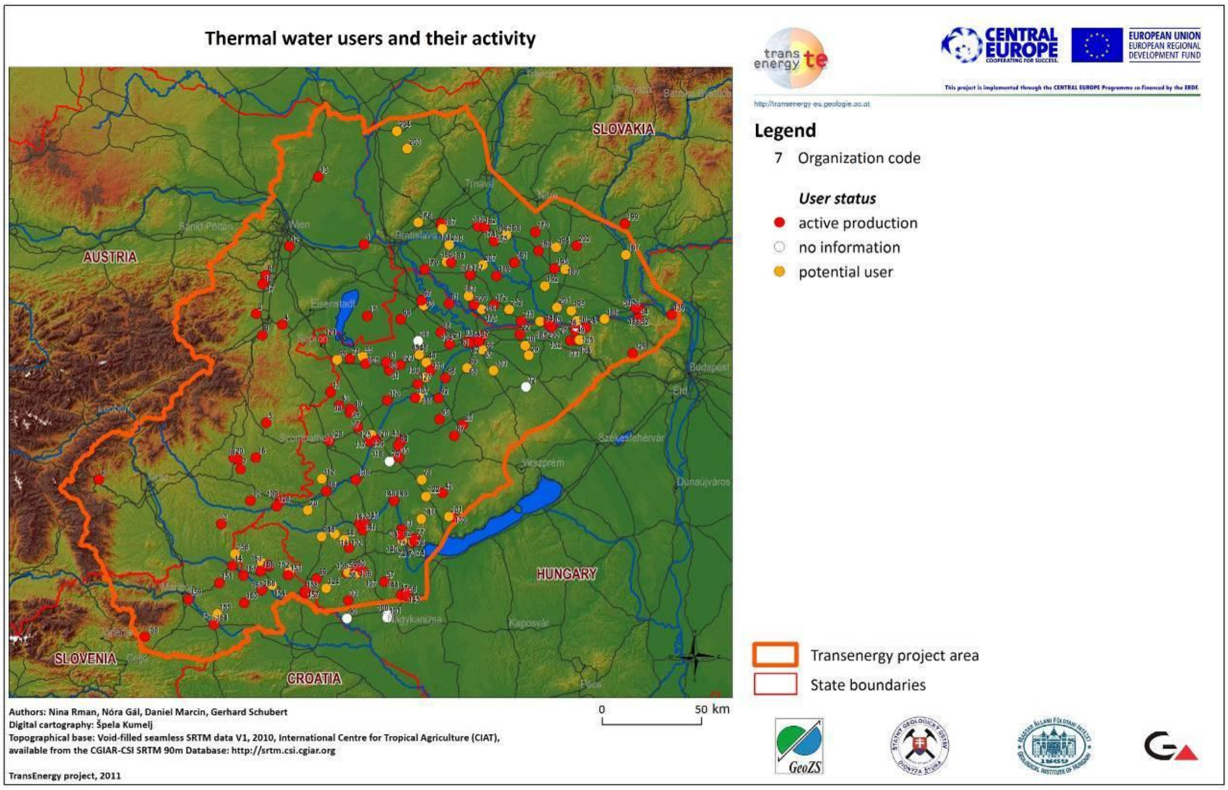


Figure 6 : Thermal water users and their activity map

There are **213 geothermal energy users** indentified in the Transenergy project area whose details are given in Enclosure 1. It is evident from Fig. 6 that Austria is the least densely exploited and Hungary the most exploited. Austrians reported only active users (20), while others also potential users with currently inactive wells. In Slovenia 5 of 20 users are potential, in Slovakia 21 of 44, while in Hungary 39 of 129. Users are positioned mainly in the flatlands of the Pannonian Basin and are **not evenly distributed**. Near highlands areas with no exploitation are indicated. These may represent potential areas for future geothermal development, but other geoscientific parameters need to be considered also. Near the state borders between Slovenia, Austria and Hungary, Hungary and Austria, and Hungary and Slovakia **areas with possible transboundary effects are perceived**. Some of them will be modelled in details as they represent pilot areas for geological, hydrogeological and geothermal modelling in WP5 actions. Additional detailed interpretation of the presented data is available on pages 11 to 12 and 23 to 25 in the final report "Database of users and database of current and potential utilization parameters".

b) Thermal water utilization and maximum outflow temperature

The second map presents types of thermal water usage on organization-specific level. Criteria and classification types are the same as already described in pull-down menu options in the database report. The 3rd and the 4th map show only users which have applied two utilization types (bathing and swimming and space or water heating). The reported maximum outflow temperature is also given to additionally enlighten the decision on why the reported type of use prevails.

Herewith, comparison between the countries shows in which areas which type of use prevails, as well as what can be done to more efficiently exploit thermal water. It also gives some data to potential investors on what to expect from new geothermal wells if drilled in already used aquifers.

The map **Thermal water utilization and maximum outflow temperature** shows the following data (Fig. 7):

1) Location of one of the user's water source (circle on the map)
2) Organization number (Fig. 6 and Enclosure 1)
3) Water use type (numbers on the map, multiple choices)
4) Borehole maximum outflow temperature (coloured points)

Fig. 7 shows that of all 26 theoretically identified utilization types only **17 uses** are reported in the project area (indicated by bold letters in the legend). The most abundant use in all four project countries is thermal water use for **bathing and swimming (including balneology)**, reported at more than 100 users (Fig. 8). This type of use is quite equally distributed in the project area.

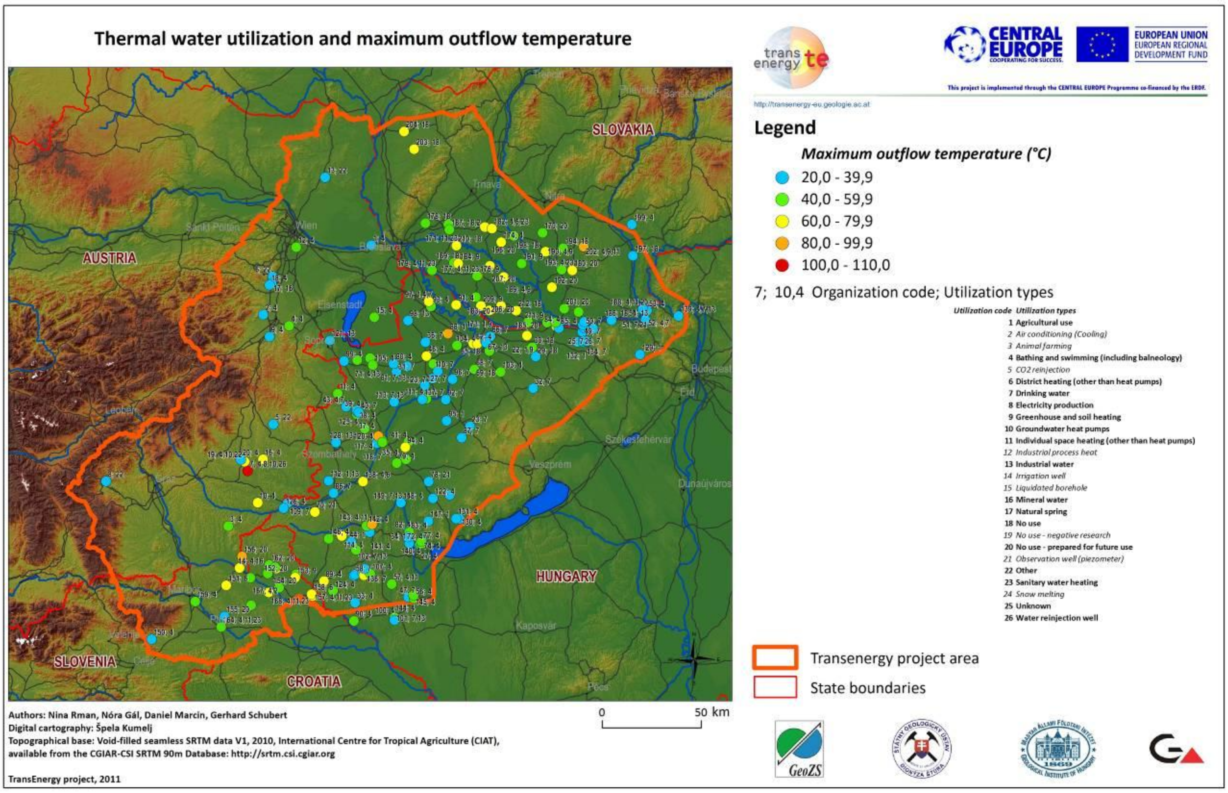


Figure 7 : Thermal water utilization and maximum outflow temperature map

It is followed by more than 30 Hungarian users that use thermal water as a **drinking water resource**. There are also more than 20 users which use it in industry and agriculture. This is a consequence of **different national definitions of the term 'thermal water'**. In this project thermal water is defined as water with outflow temperature of 20°C or higher, while in Hungary this limit is set at 30°C. In other countries, district, space and sanitary water **heating** are most often applied beside bathing and swimming (Fig. 9). It is interesting that this type of utilization is reported to be applied mostly in the Slovenian and Slovakian spa resorts, while it is very rarely noticed in Austria and Hungary. In Austria two uses of groundwater heat pumps are known (Waltersdorf, Blumau), but this is not noticed as a heating utilization in the project database and on these maps.

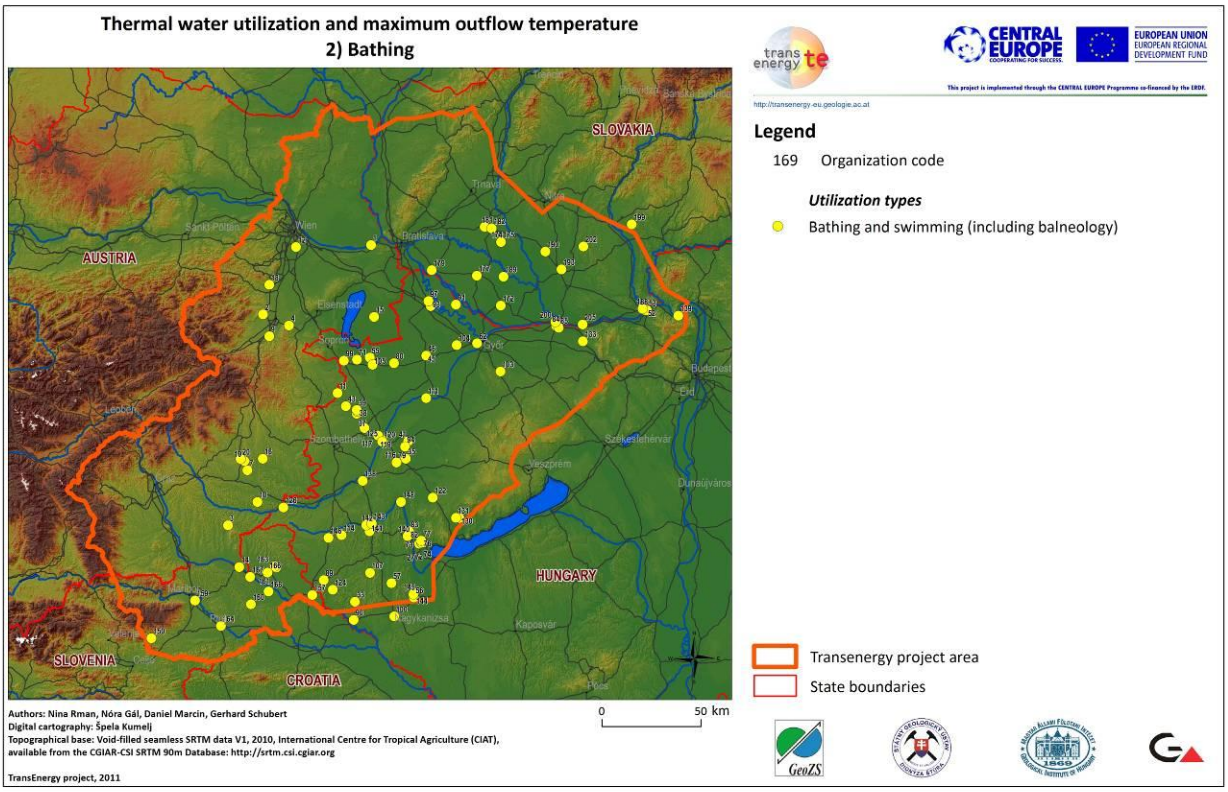


Figure 8: Thermal water utilization map with locations of users who use water for bathing and swimming

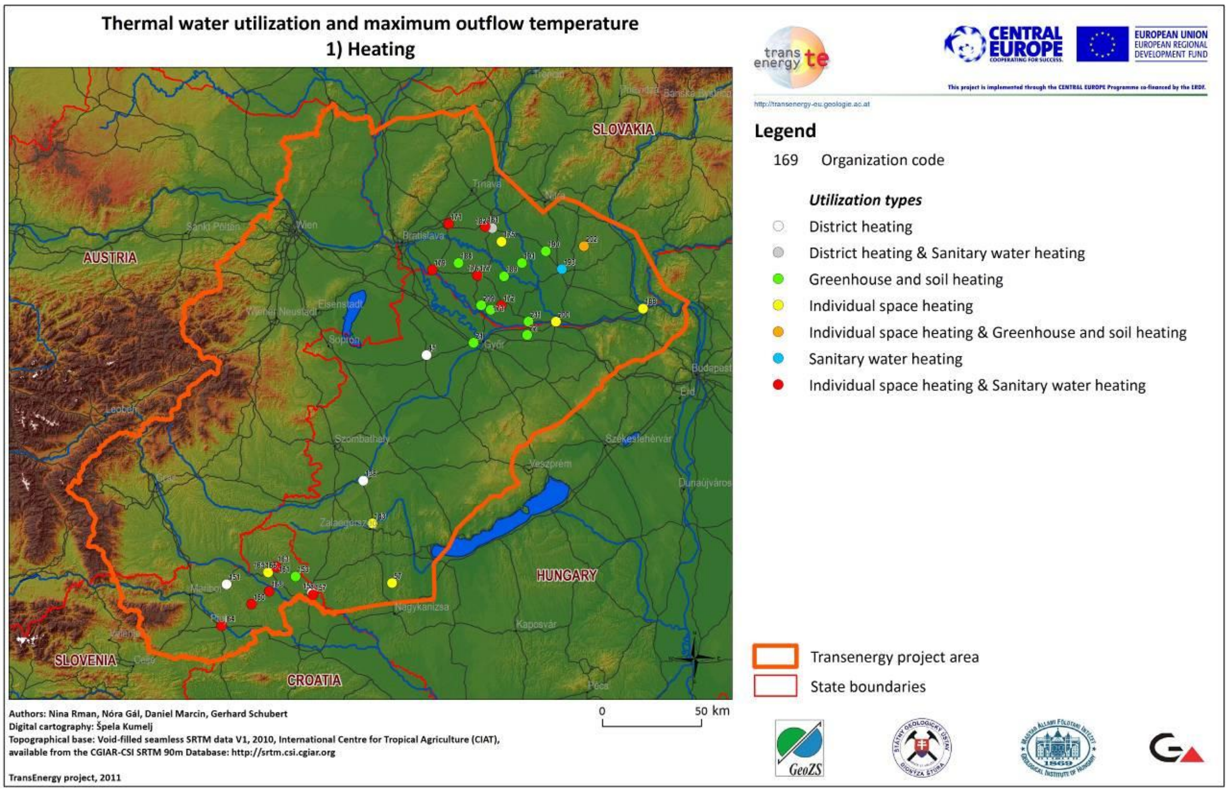


Figure 9 : Thermal water utilization map with locations of users who use water for space / water heating

Electricity production and high temperature groundwater heat pumps are reported only in Austria, while **reinjection** continuously operates in Austria and periodically in Slovakia and Slovenia. In Austria and Hungary most users produce water with temperature below 40°C (blue points on the Fig.7). In Austria it is used mainly for bathing and swimming, while in Hungary for drinking. **Most spa resorts (in all 4 countries) produce thermal water below 60°C**, while water with higher temperatures is used for different types of heating, but rather often the source is not yet exploited. **The highest temperature is reported at Blumau** (AT) where geothermal electricity is produced. Detailed interpretation of the presented data is available on pages 13 to 14 and 30 to 31 in the final report "Database of users and database of current and potential utilization parameters".

c) Thermal waste water management

Annual produced amount of thermal water is rather high and most of the used water is still released to surface waters instead of reinjected into the aquifers. Therefore, map on waste water management gives organization-specific information on where waste water is released to and its temperature. It is not shown precisely to which stream the water is released as only few data is reported, but only indicated by the point shape how the water is treated before being emitted.

This enables discussion on some environmental aspects of thermal water use and discharges between the countries. Also locations with reinjection are shown and can serve as additional information where it is already proved being possible to be conducted.

The map **Thermal waste water management** shows the following data (Fig 10):

1) Location of one of the user's water source (point on the map)
2) Organization number (Fig. 6 and Enclosure 1)
3) Waste water management (different shapes of the point)
4) Waste water temperature (coloured points)

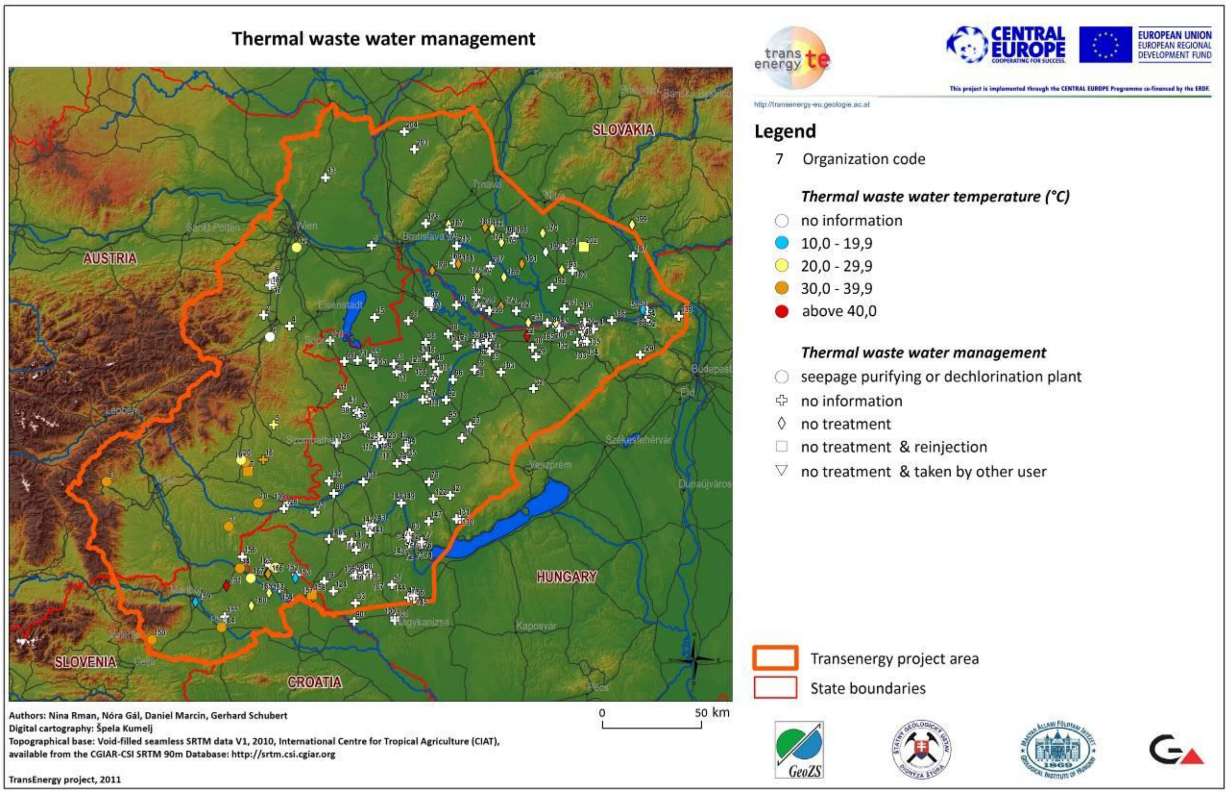


Figure 10 : Thermal waste water management map

Despite performed field inspection and interviews with users, there are quite some for which no information on waste water management is available (Fig. 10). This category (**no information**) is applied also at inactive wells. In **Hungary** it is known that most waste water **is released to surface water flows**, sometimes through a cooling lake. A small part of waste water in Hungary is released to public sewage systems, if the water is used for drinking purpose. Most outflow is between **20 to 30°C**. In **Slovakia** most waste water **is not treated** before its emission into surface streams and can reach temperature up to **40°C**. The category "**no treatment & reinjection**" stands for users were part of the water is emitted to the environment without any treatment (except for cooling in cooling lakes), and part of it is reinjected into the aquifer. Periodical **reinjection** is applied in the Mesozoic carbonates in Podhájska (SK) and Upper Miocene sands in Lendava (SI). In **Austria seepage purifying or dechlorination plants** are often applied, but emitted temperatures are still up to **40°C** (reinjection not included). Constant **reinjection** of water with temperature 49 to 90°C into the Paleozoic carbonate aquifer is applied in Blumau (AT), but the rest of waste water is emitted to the environment. In **Slovenia** some purifying plants are applied, but more often **no treatment** is applied. The lowest annual waste water temperature reported there is approx. **15°C**, but also the highest approx. **45°C**. Rather good chemical waste water management is applied in Austria, but the emitted water temperature is rather high there. Other countries show poorer chemical waste water treatment, but water temperatures are lower. As they often exceed 20°C we can conclude that the proper cooling is not widely applied. Additional interpretation of the presented data is available on pages 15 to 18 in the final report "Database of users and database of current and potential utilization parameters".

d) Thermal boreholes exploitation characteristics

Basic hydrogeological data on borehole-specific level is given by this map. It shows for each well, whether it is active (producing) or inactive, which is its main producing geothermal aquifer, and how it produces thermal water when it is active (pumping or natural outflow).

This map enables direct comparison of exploited geothermal aquifers in project countries, identification of the most densely exploited areas, also on a transboundary level, as well as fast identification of aquifers pressure conditions by the reported production type.

The map **Thermal boreholes exploitation characteristic** shows the following data (Fig. 11):

1) Location of each borehole (point on the map)
2) Borehole number (numbers on the map, full name in Enclosure 2)
3) Borehole activity (different shapes of the point)
4) Exploited geothermal aquifer (numbers on the map, full name in legend)
5) Type of water production (coloured points)

With the project Transenergy we identified **401 boreholes** than (can) produce thermal water (Fig. 11). 64% of them are situated in Hungary, 12% in Austria, 15% in Slovakia and 9% in Slovenia. These wells **produce over 31 million m^3 of thermal water per year**, **excluding the Austrian part** for which no production information is available. Interpretation of the annual production data with all connected problems are discussed in details on pages 15 and 24 to 29 in the final report "Database of users and database of current and potential utilization parameters".

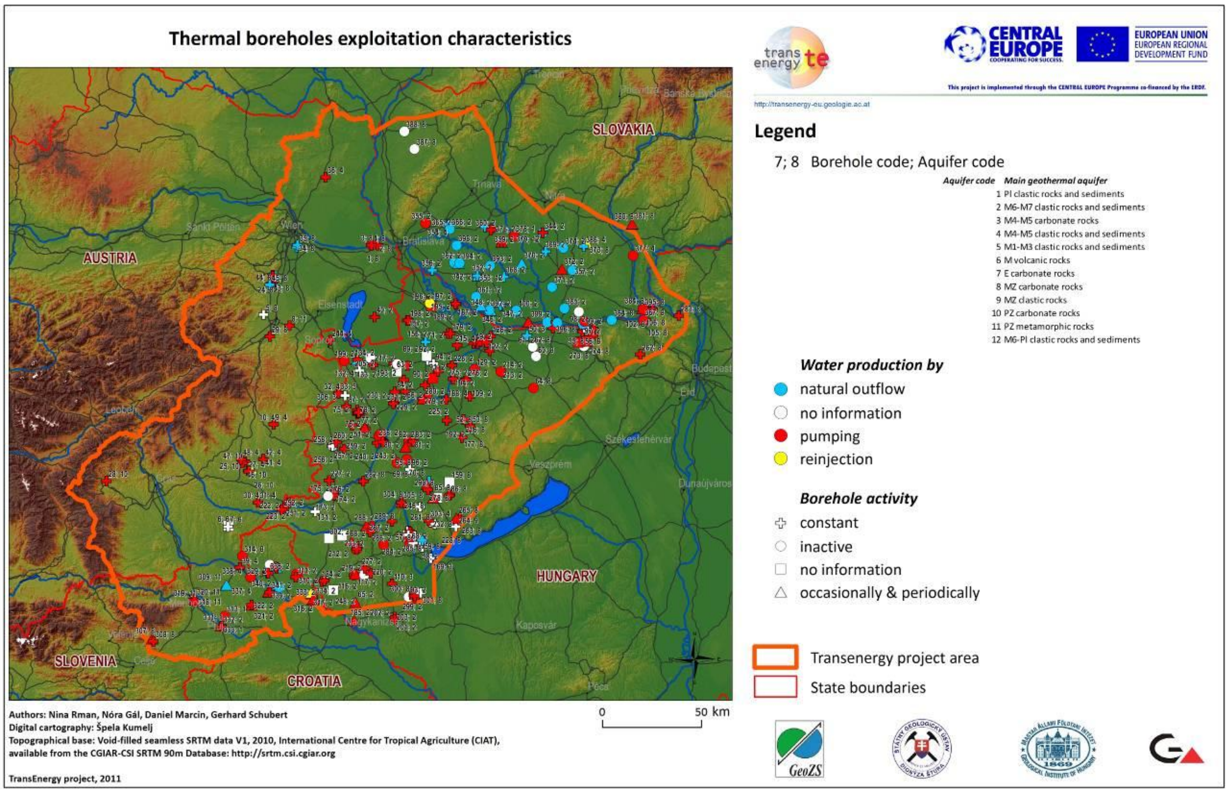


Figure 11 : Thermal boreholes exploitation characteristics map

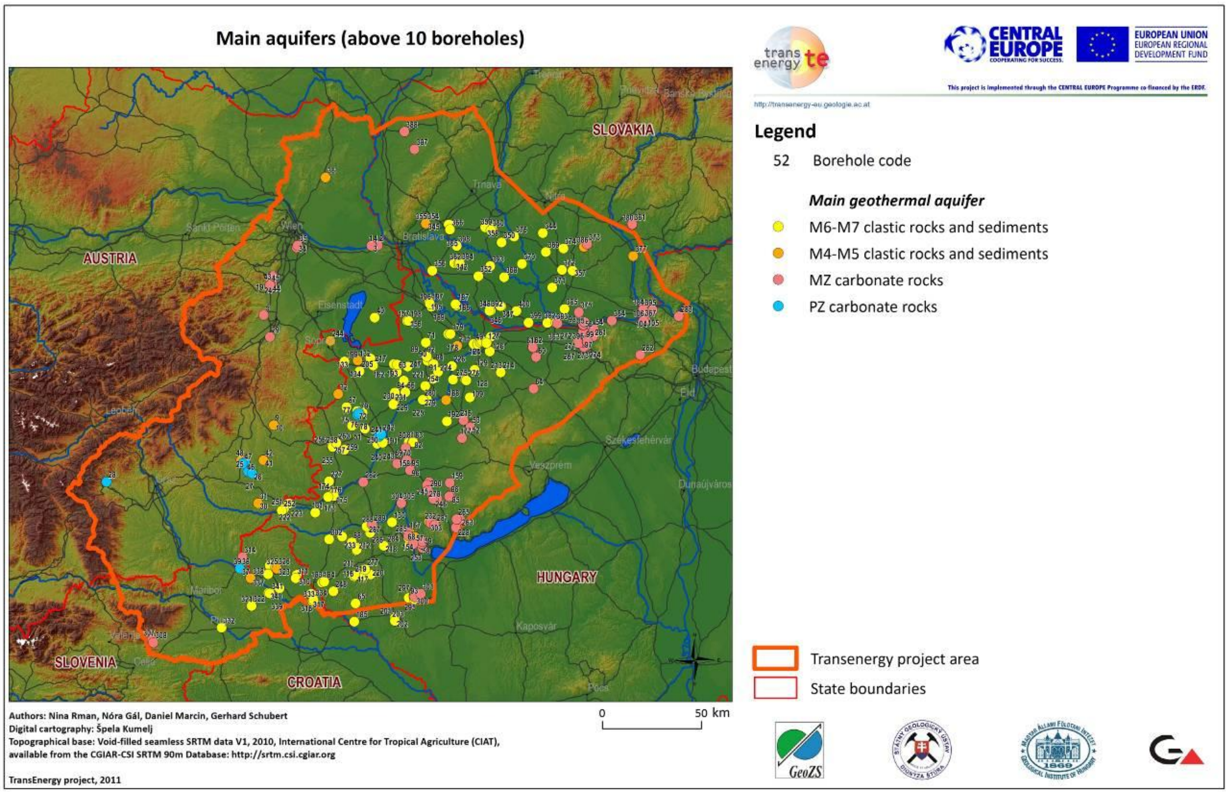
All reported Austrian boreholes are active (Fig. 11), while 20% of all boreholes are inactive in total. In **Austria** and **Hungary** most of the water is produced by **pumping**, while in **Slovakia** the aquifers are still artesian and **natural outflow** occurs. In **Slovenia** only few wells are artesian, therefore, pumps are widely used for production. Again, **4 reinjection boreholes** are identified, but reinjection in **Hungary is not applied** as the well was unsuccessful.

In the **aquifer code legend** the abbreviations for some stratigraphic time periods are used. As harmonizing the reported lithostratigraphical units was very difficult (there was more than 290 different formation aquifers reported), only major groups were delineated, not necessarily describing the actually existing hydraulically connected and transboundary aquifers. This will have to be further investigated in future. For our purpose (showing which aquifers are exploited) it was enough that units with similar lithostratigraphy were pointed out. The abbreviations denote the following (**Central Parathetys stratigraphy** was used):

- PZ : Paleozoic
- MZ : Mesozoic
- E : Eocene
- M : Miocene
- M1-M3 : Lower Miocene (Eggenburgian, Ottnangian, Karpatian)
- M4-M5 : Middle Miocene (Badenian, Sarmatian)
- M6-M7 : Upper Miocene (Pannonian, Pontian)
- Pl : Pliocene.

Due to the large number of presented boreholes, the borehole and aquifer codes are rather hardly readable. However, as already noticed in the previous report, **the Pannonian and Pontian (M6-M7) – Upper Miocene clastic rocks and sediments aquifers** are widely exploited and captured mainly in the flatlands (basin area) in NE Slovenia, W Hungary and

SW Slovakia (Fig. 12). **The Mesozoic (MZ) carbonate rocks aquifers** are also densely exploited, but the boreholes are positioned in topographically higher area, on the eastern margin of the Central and the Southern Alps in Slovenia and Austria, and north of the Balaton lake – west of the Bakony hills in Hungary. Almost the same number of boreholes is distributed between the **Middle Miocene clastic aquifers** and **Paleozoic carbonate aquifers**. Further details are available on pages 19 to 28 in the final report "Database of users and database of current and potential utilization parameters".



Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

Figure 12 : Map of the most exploited geothermal aquifers which are captured by more than 10 boreholes

e) Changes in exploitation of geothermal aquifers

Additional hydrogeological data on exploited aquifers are given on this map. Unfortunately, it is rather common that multiple aquifers are exploited in the same well, which can cause inter-flow in well and between the aquifers. This is important for interpretation of changes in wells.

These data help to identify already highly exploited geothermal aquifers and locations of the most affected areas. Therewith, transboundary effects can be studied in the future, proper geothermal development plans prepared and possible (future) problematical areas identified.

The map **Changes in exploitation of geothermal aquifers** shows the following data (Fig. 13):

1) Location of each borehole (point on the map)
2) Borehole number (numbers on the map from Fig. 11 and Enclosure 2)
3) Exploited geothermal aquifer (numbers on the map, full name in legend)
4) Screened aquifers (different shapes of the point)
5) Changes in well operation (coloured points)

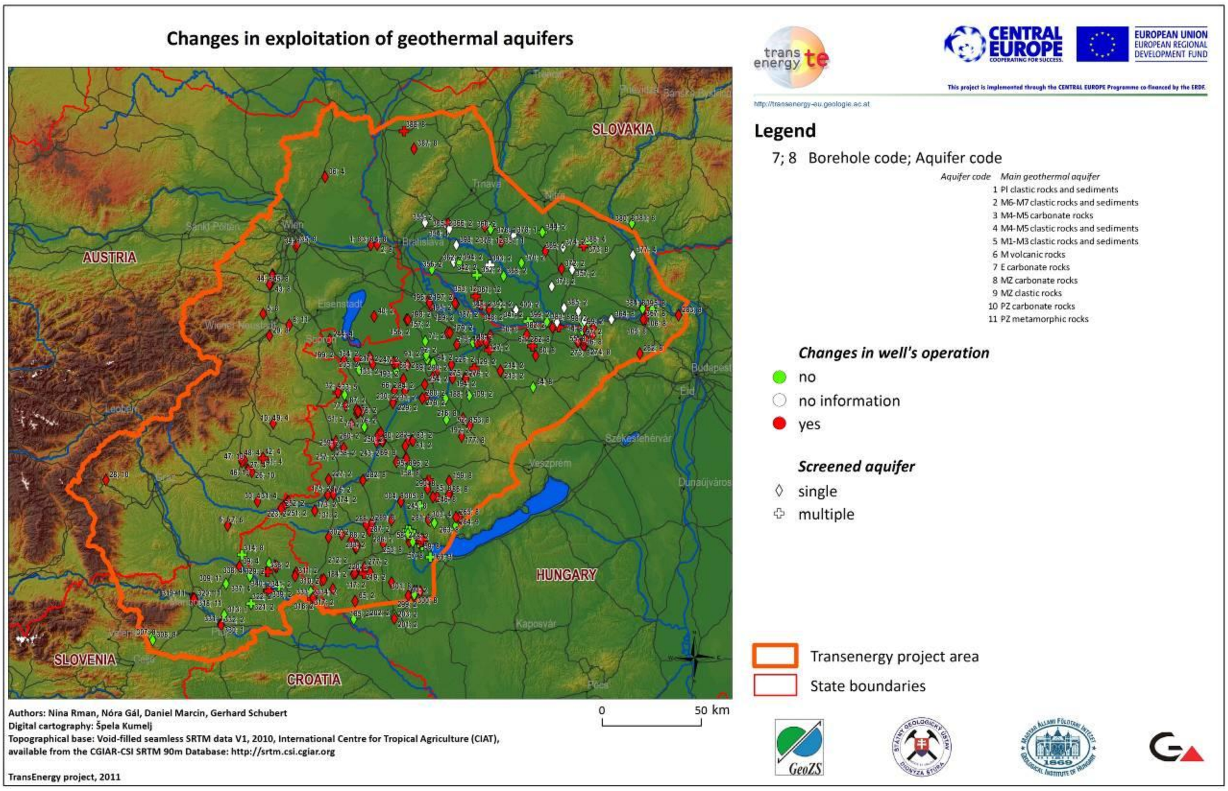


Figure 13 : Changes in exploitation of geothermal aquifers map

A comparison between the amounts of screened aquifers in a borehole (Fig. 13) indicates that **multiple aquifers are screened in 64 boreholes** in total. This is not only a management problem since it is in a conflict with the Water Framework Directive incentives, but can also cause hydrological difficulties as free water flow between different water-bearing layers in a single well is possible. **303** of 401 wells do already show **hydrodynamic changes due to/during operation**. Detailed interpretation of the presented data is available on pages 28 to 29 in the final report "Database of users and database of current and potential utilization parameters".

f) Operational monitoring on thermal boreholes

The main tool for evaluating the status of geothermal aquifers is a proper monitoring, which gives quality and quantity data on produced thermal water properties. In the first phase, a comparison between the project countries focused on the following questions: if there is a monitoring at each borehole, which type of monitoring exists, and whether it records the measured data. This information is collected for all boreholes, active and inactive ones. Due to the complexity of information we decided to make not only one joint map, but four separate ones for each monitored parameter individually. These maps are numbered from 1 to 4 and give information on type of the existing monitoring (quantity, chemistry, temperature, water level) and its data storage. Herewith, fast but clear overview of the existing (historical) data is exposed. So it becomes evident where and which data can be used for the analyses of transboundary aquifers.

Maps on **Operational monitoring on thermal boreholes (**monitoring of active and inactive wells) show the following data:

1) Location of each borehole (cross on the map)
2) Borehole number (numbers on the map from Fig. 11 and Enclosure 2)

3) Interval of data recording and data storage (coloured cross)

The four maps show different monitoring types evident from the subtitle:
1) Groundwater level/aquifer pressure (Fig. 14)
2) Cumulative quantity (Fig. 15)
3) Water temperature (Fig. 16)
4) Water chemistry (Fig. 17).

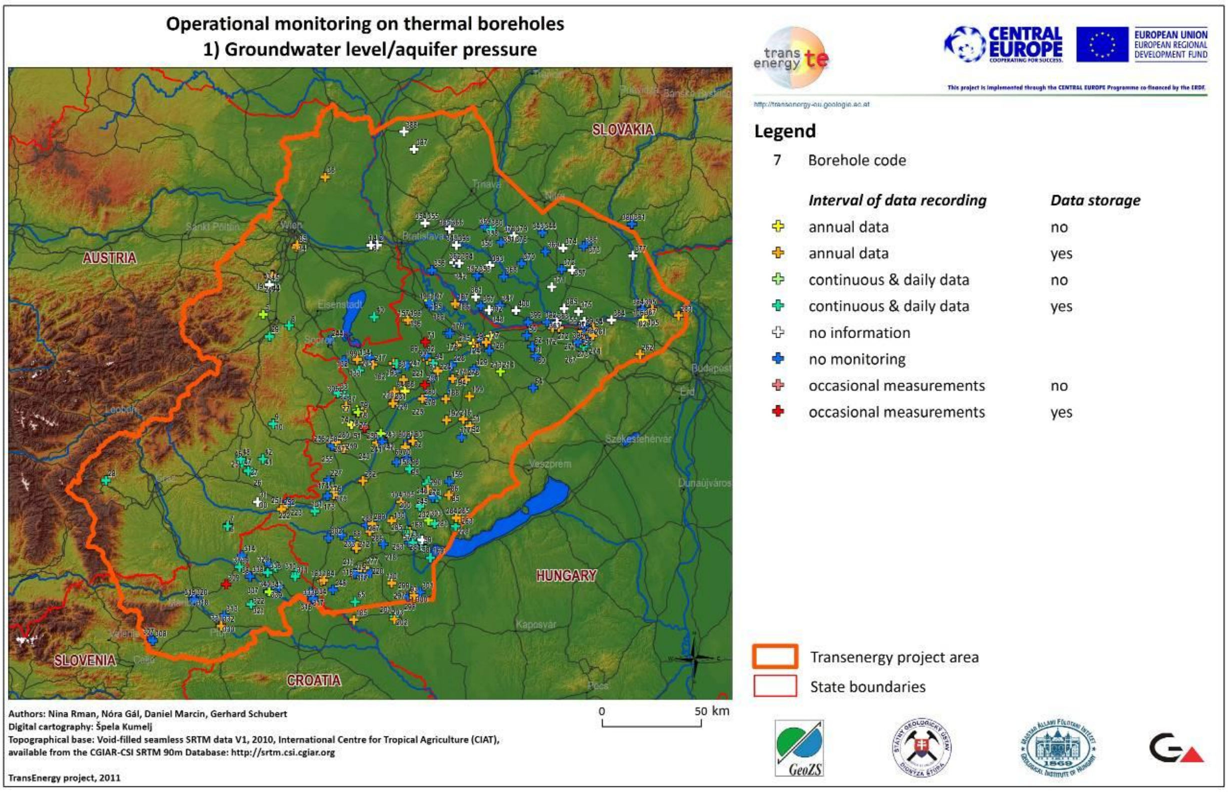


Figure 14 : Operational monitoring on thermal boreholes 1) Groundwater level/aquifer pressure map

Figure 14 indicates that **the difference** on the applied groundwater level/aquifer pressure monitoring is evident between the 4 project countries. In **Austria** and **Slovenia** many boreholes have **continuous** monitoring applied, whereas in others at least **annual** measurements are performed. In **Slovakia no monitoring** is reported and this is unfortunately true also for some Slovenian and Hungarian wells. However, **Hungary** has a well established monitoring network of the representative wells for which **annual** readings are available.

Monitoring **results** (measurements) are always stored by /available at **each user** itself in all 4 project countries, while the **reporting process differs** between the countries. These reports are given to the following authorities: in Austria always to regional authorities, in Slovenia sometimes to the National Environmental Agency or the Geological Survey, in Slovakia always to the Inspectorate of Spas and Springs for thermal curative waters and sometimes to the Slovak Hydrometeorological Institute for geothermal waters to energetic use or wellness. In Hungary, the Geological Institute of Hungary (MÁFI) has an independent national water level monitoring system, while users report their data to different Regional Environmental and Water Directorates. Beside, the water level is monitored also in monitoring wells owned by the regional directorates and the Environmental and Water Management Research Centre (VITUKI). All the data from Regional Water Directorates is sent to the Water and Environmental Protection Directorate (VKKI).

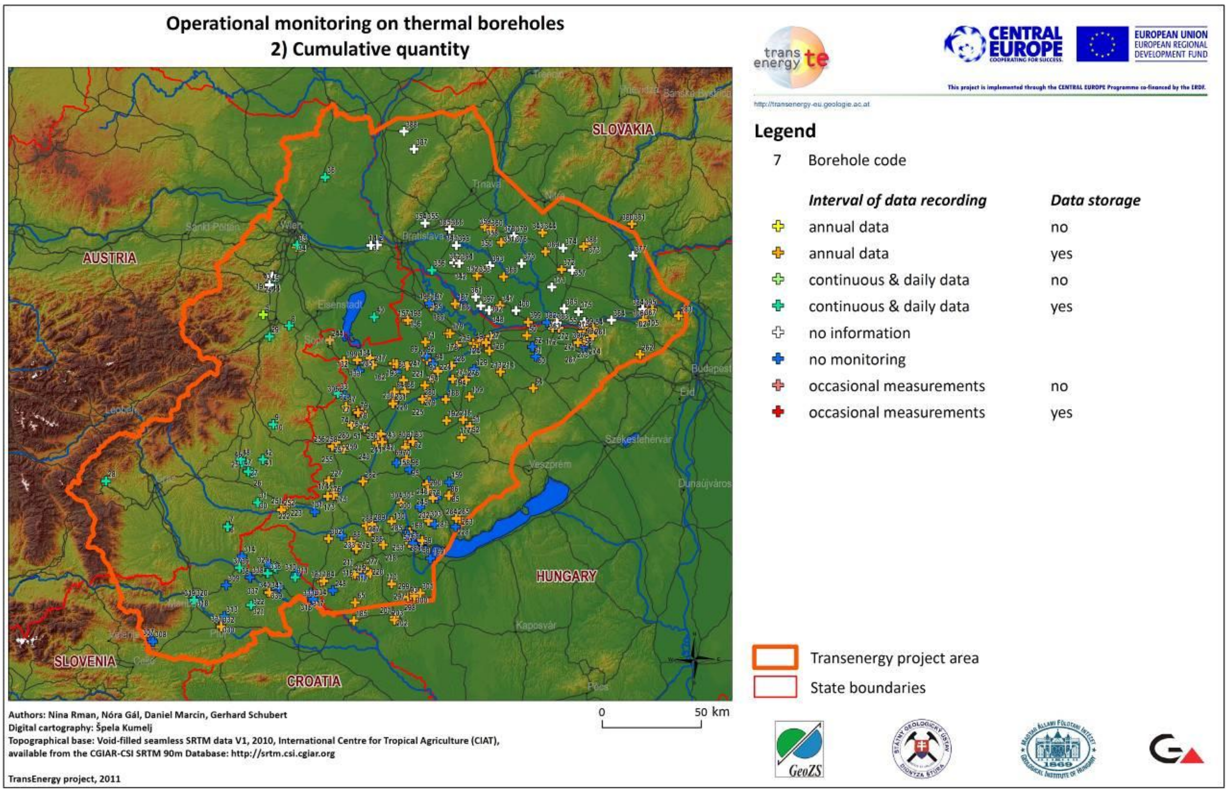


Figure 15 : Operational monitoring on thermal boreholes 2) Cumulative quantity map

The map on cumulative quantity shows distinctions in production management between the countries. It is evident (Fig. 15) that the **annual** thermal water extraction rates are available for **Slovakia** and **Hungary** with only few boreholes without this information reported. Inactive wells obviously do not have cumulative quantity monitoring applied which can be also seen on this figure. On the opposite, in **Austria** and **Slovenia continuous** (mostly daily) production monitoring prevails, however, in the latter the extraction is often **not monitored** also.

Production monitoring **results** are always stored by /available at **each user** itself in all 4 project countries, while the **reporting process differs** between the countries. The reports are given to the following authorities: in Austria always to regional authorities, in Slovenia sometimes to the National Environmental Agency or the Geological Survey, in Slovakia always to the Slovak Hydrometeorological Institute. In Hungary, users report their cumulative quantity data to different Regional Environmental and Water Directorates. All the data from Regional Water Directorates is sent to the Water and Environmental Protection Directorate (VKKI).

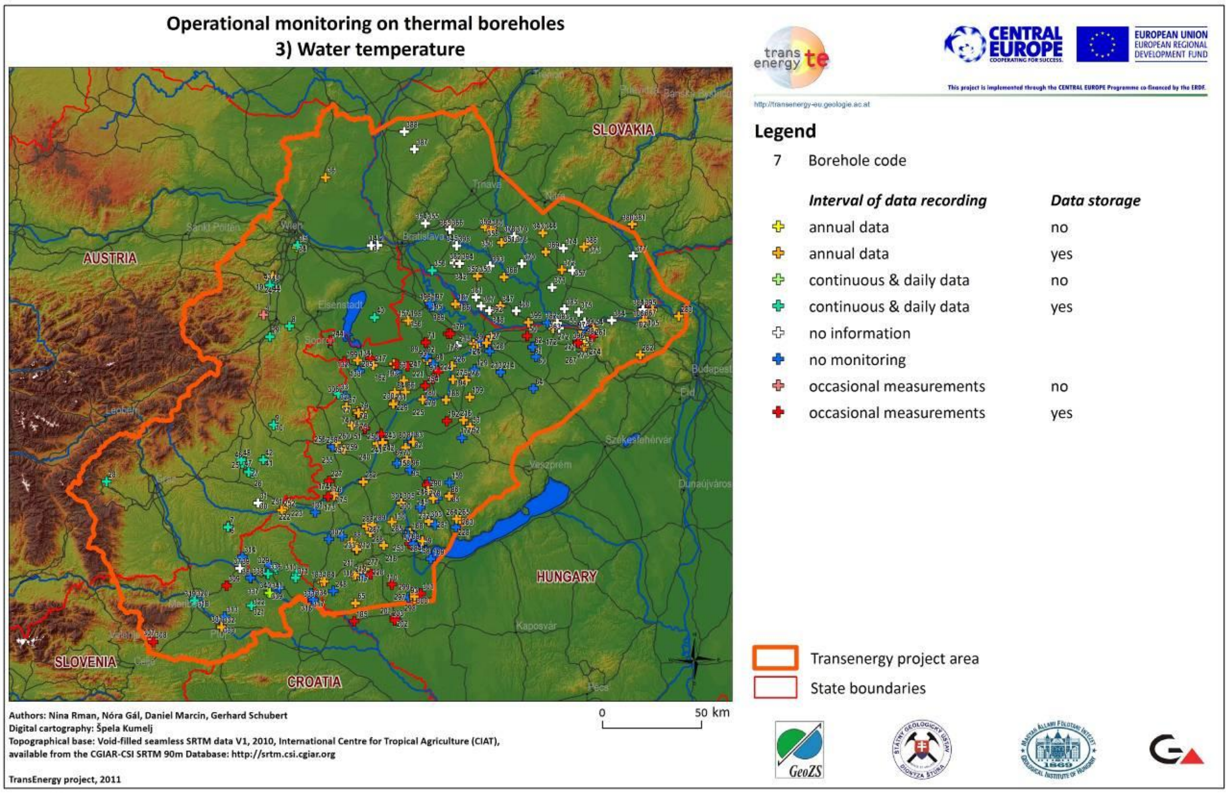


Figure 16 : Operational monitoring on thermal boreholes 3) Water temperature map

In some **Austrian** and **Slovene** boreholes outflow temperatures are **constantly** monitored (Fig. 16), but in **Slovenia** it is also common that **no** temperature **monitoring** is applied. In **Slovakia** and **Hungary annual** measurements are prevalent, while in the latter **occasional** measurements are also reported.

Temperature monitoring **results** are always stored by /available at **each user** itself in all 4 project countries, while the **reporting process differs** between the countries. The reports are given to the following authorities: in Austria always to regional authorities, in Slovenia sometimes to the National Environmental Agency or the Geological Survey, in Slovakia always to the Slovak Hydrometeorological Institute, while in Hungary it is observed together with produced quantities and reported to the Regional Environmental and Water Directorates.

It is interesting that in **Austria** (Fig. 17) the electric conductivity of thermal water is often **continuously** monitored. The most important geochemical parameters are usually analysed annually, while detailed chemical analysis are done every 5 years. In **Hungary annual** sampling is well established, and on many other wells occasional analyses are performed. In **Slovakia** and **Slovenia** non-systematic **occasional** analysis are usually done, despite the fact that chemistry should be checked annually as demanded in granted water permits.

Chemical monitoring **results** are always stored by /available at **each user** itself in all 4 project countries, while the **reporting process differs** between the countries. The reports are given to the following authorities: in Austria always to regional authorities, in Slovenia sometimes to the Geological Survey, in Slovakia always to the Inspectorate of Spas and Springs for thermal curative waters and sometimes to the District Environmental Office for geothermal waters to energetic use or wellness. The water chemistry in Hungary is monitored and controlled by the Regional Inspectorate for Environmental Protection, Nature Conservation and Water Managements, as regional authorities. The data are collected by the Environmental and Water

Management Research Centre (VITUKI). Eventually, all data is stored in the national database of the Central Directorate for Water Management and Environmental Protection (VKKI).

Joint and detailed interpretation of the presented data is available on pages 31 to 35 in the final report "Database of users and database of current and potential utilization parameters".

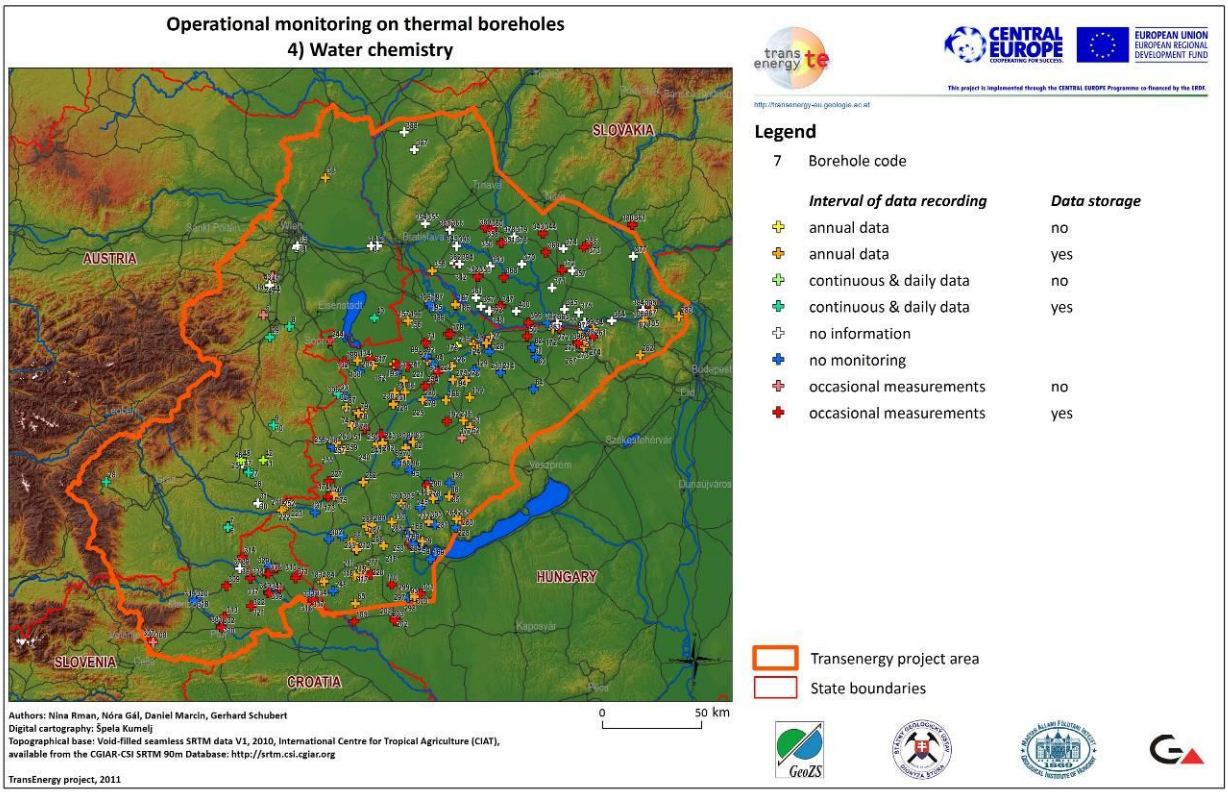


Figure 17 : Operational monitoring on thermal boreholes 4) Water chemistry map

4. Conclusions

The activities accomplished in the WP 3.1 "Screening of users' needs" and WP 3.2 "Overview of geothermal energy utilization" clearly show that the thermal water users' and utilization data are rather heterogeneous between Austria, Hungary, Slovakia and Slovenia. Moreover, their availability, quantity and quality often differ between individual users in the countries also. From this it can be concluded that **the geothermal energy use / thermal water extraction is not regulated and/or controlled effectively neither at national nor at the transboundary level, as different practices are applied**.

- The utilization maps show that 213 geothermal energy users identified in the Transenergy project area are not evenly spatially distributed, and some densely exploited areas, especially near the state borders, are noticed. There are some inactive boreholes identified near the state borders.
- These users exploit thermal water on 17 different ways, of which bathing and swimming (incl. balneology) is the most abundant in all 4 countries. Drinking water use is applied mainly in Hungary, while space and water heating in Slovenia and Slovakia.
- In Austria and Hungary water with rather low temperature is captured, frequently below 40°C, while in Slovenia and Slovakia outflow temperatures often reach temperatures between 60 and 80°C.
- Thermal water is abstracted mainly by pumping. Only in Slovakia natural outflow prevails. Hydrodynamic changes in geothermal aquifers due to thermal water exploitation have been noticed in 303 wells from all 4 project countries.
- The most exploited aquifers are of the Upper Miocene and Mesozoic age. The Mesozoic carbonates are exploited in the NW and SE project area, while the Upper Miocene sands and sandstones in the central project area.
- Multiple aquifers are screened in 64 boreholes in all 4 countries.
- Monitoring practices differ between the countries as well as their application. In Austria continuous monitoring prevails. In Slovakia groundwater level monitoring is not established, and cumulative quantity and temperature are annually monitored, while water chemistry is controlled only occasionally. This frequency of chemical analyses is also observed in Slovenia. The monitoring is not uniformed there as at some boreholes groundwater level, temperature and cumulative quantity are constantly observed, while at others no monitoring is applied. Very good monitoring network is established in Hungary, where the parameters are controlled annually in the representative wells, while in other wells occasional measurements are mostly reported.
- Rather good chemical waste thermal water management is applied only in Austria. The waste water temperatures are (too) high everywhere, often much above 20°C. The observed waste water management practices indicate that the thermal and chemical pollution of surface waters are widely present and not prevented in the project area.

With the presented activities a valuable evaluation of the state of geothermal aquifers exploitation and different utilization schemes in 2011 has been made. **Specific and detailed information on an individual user can now be acquired by each interested stakeholder himself. The way of using the website database, database report and utilization maps simultaneously is described in this report.**

This work is upgraded by the activities performed in the WP 3.3 Legal aspects of transboundary groundwater management. When the activities suggested for attaining systematic thermal water utilization information are actually applied in future, a collection of harmonized data will be enabled. With its interpretation the presented methodology can be used for attaining much improved comparison of the geothermal energy utilization between different countries.

5. References

Rman, N. et al. 2011: Database of users and database of current and potential utilization parameters. Final report. GeoZS, ŠGUDŠ, GBA, MAFI, 36 pages. (available at 30.5.2011 on http://transenergy-eu.geologie.ac.at/index.html)

Website database of users and database of current and potential utilization parameters application. (available at 30.5.2011 on http://akvamarin.geo-zs.si/users/)

Rman, N., Lapanje, A., Prestor, J. 2011: Water Concession Principles for Geothermal Aquifers in the Mura-Zala Basin, NE Slovenia. Water Resour Manage DOI 10.1007/s11269-011-9855-5

Attachments

1. Thermal water users and their activity map
2. Thermal water utilization and maximum outflow temperature map
3. Thermal water utilization map 1) Heating
4. Thermal water utilization map 2) Bathing
5. Thermal waste water management map
6. Thermal boreholes exploitation characteristics map
7. Main geothermal aquifers (captured with more than 10 boreholes)
8. Changes in exploitation of geothermal aquifers map
9. Operational monitoring on thermal boreholes 1) Groundwater level/aquifer pressure map
10. Operational monitoring on thermal boreholes 2) Cumulative quantity map
11. Operational monitoring on thermal boreholes 3) Water temperature map
12. Operational monitoring on thermal boreholes 4) Water chemistry map
13. Enclosure 1: Legend of organizations
14. Enclosure 2: Legend of boreholes

Thermal water users and their activity

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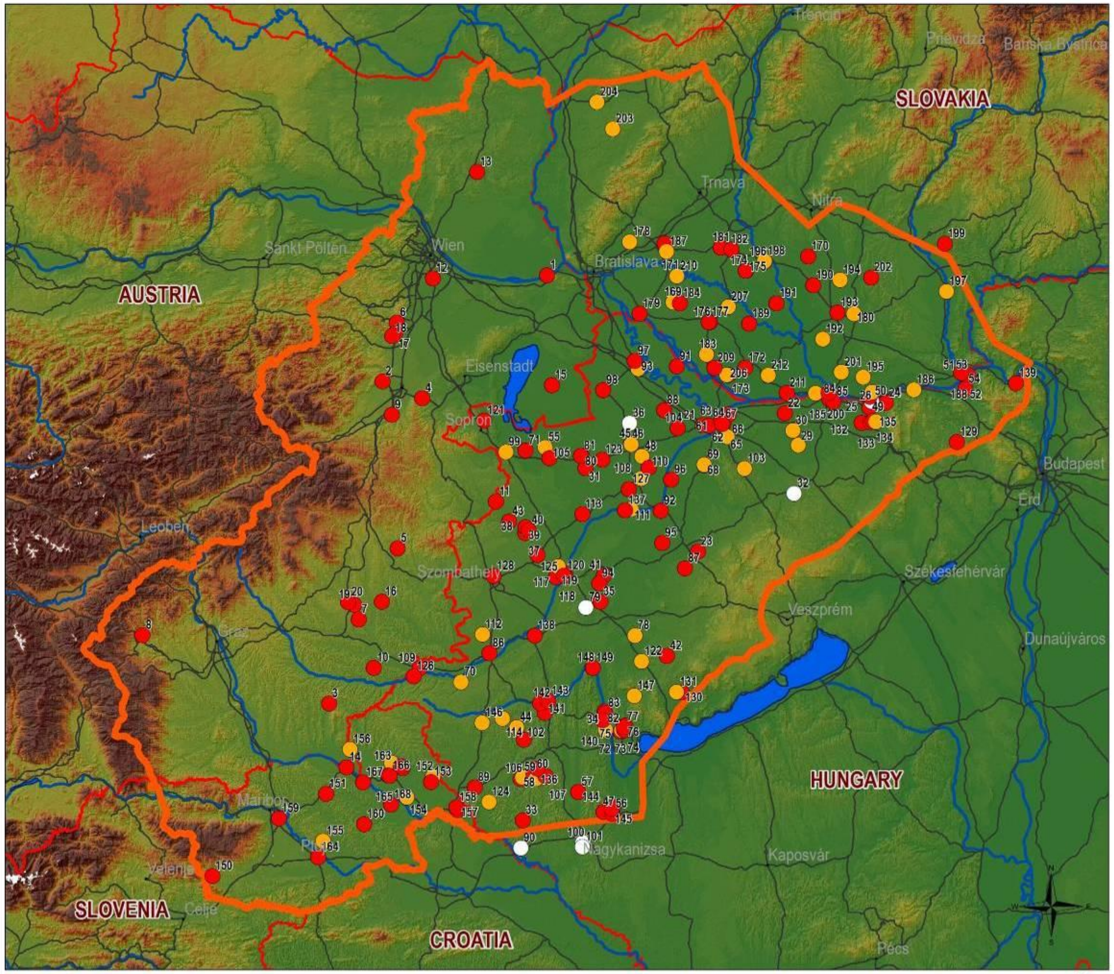
http://transenergy-eu.geologie.ac.at



Legend

7 Organization code

User status

- ● active production
- ○ no information
- ● potential user

▭ Transenergy project area

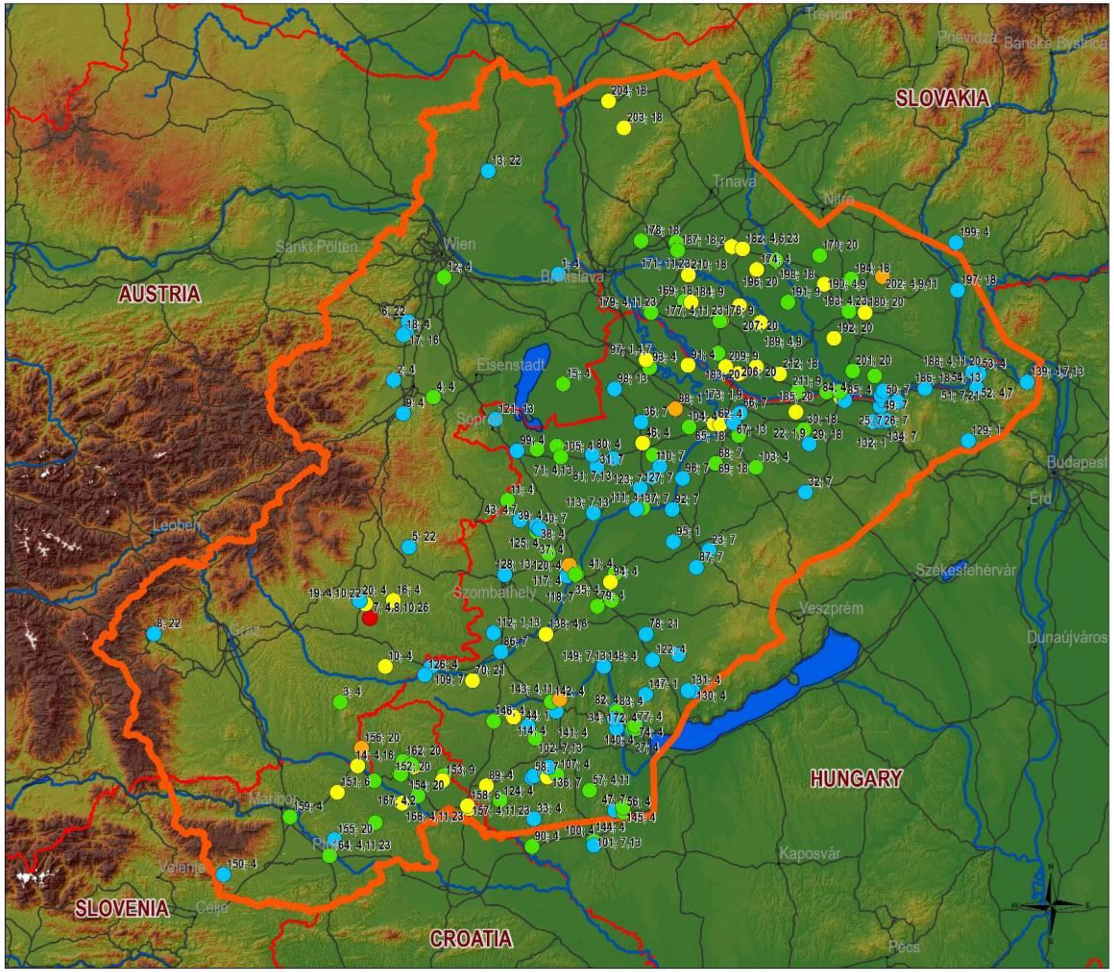
▭ State boundaries

0 50 km

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

Thermal water utilization and maximum outflow temperature



0 50 km

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

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Legend

Maximum outflow temperature (°C)

- 🔵 20,0 - 39,9
- 🟢 40,0 - 59,9
- 🟡 60,0 - 79,9
- 🟠 80,0 - 99,9
- 🔴 100,0 - 110,0

7; 10,4 Organization code; Utilization types

Utilization code	*Utilization types*
1	Agricultural use
2	*Air conditioning (Cooling)*
3	*Animal farming*
4	Bathing and swimming (including balneology)
5	*CO2 reinjection*
6	District heating (other than heat pumps)
7	Drinking water
8	Electricity production
9	Greenhouse and soil heating
10	Groundwater heat pumps
11	Individual space heating (other than heat pumps)
12	*Industrial process heat*
13	Industrial water
14	*Irrigation well*
15	*Liquidated borehole*
16	Mineral water
17	Natural spring
18	No use
19	*No use - negative research*
20	No use - prepared for future use
21	*Observation well (piezometer)*
22	Other
23	Sanitary water heating
24	*Snow melting*
25	Unknown
26	Water reinjection well

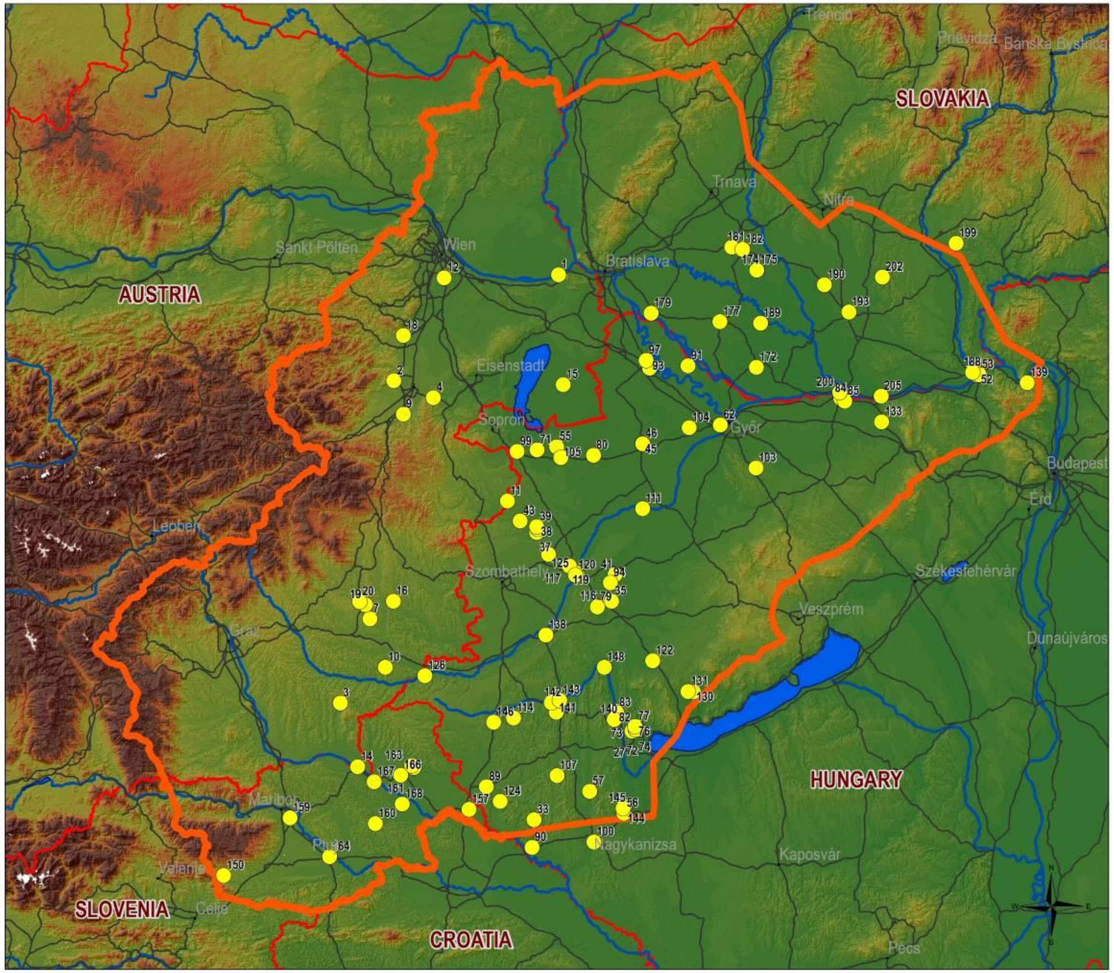
🟧 Transenergy project area

🟥 State boundaries

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

Thermal water utilization and maximum outflow temperature
2) Bathing



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Legend

169	Organization code

Utilization types

●	Bathing and swimming (including balneology)
▭	Transenergy project area
▭	State boundaries

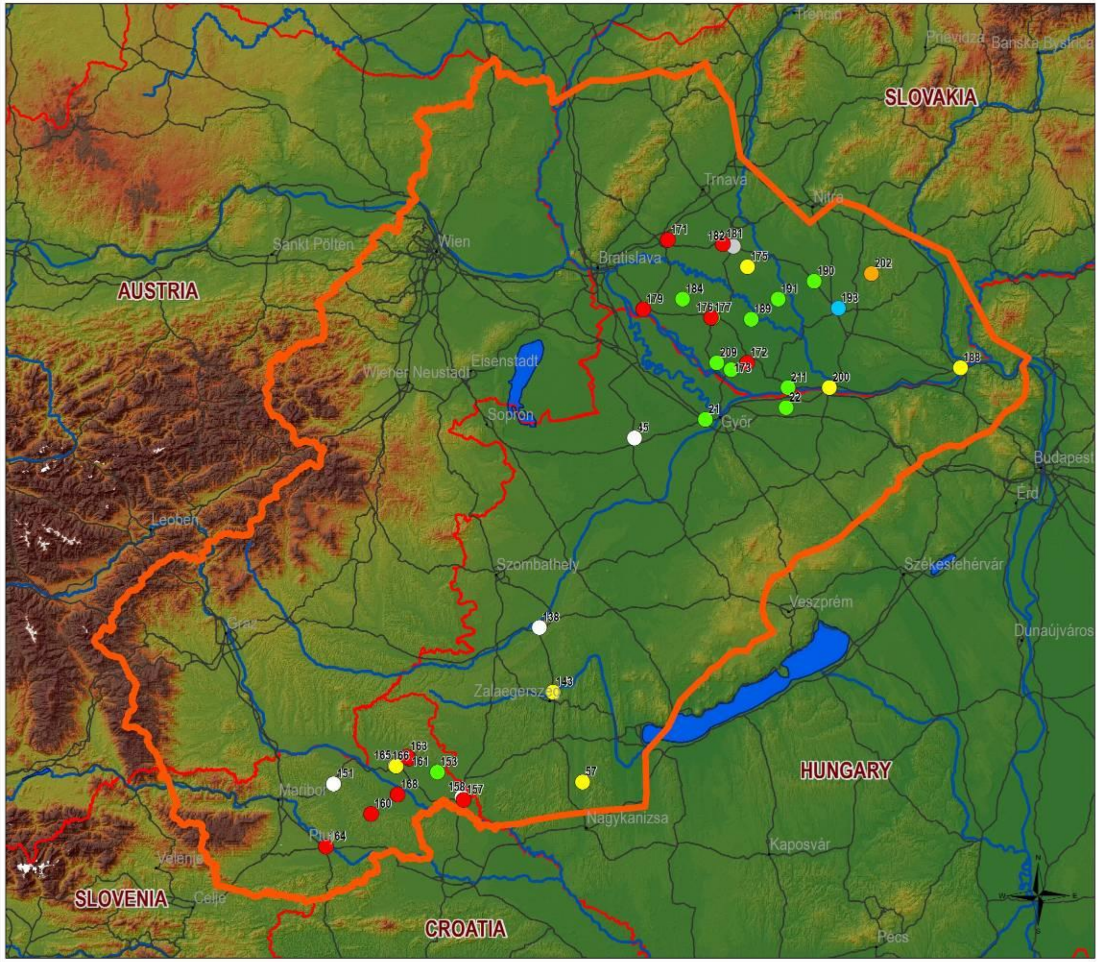
0 50 km

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

GeoZS

Thermal water utilization and maximum outflow temperature
1) Heating



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

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

Legend

169 Organization code

Utilization types

○ District heating

● District heating & Sanitary water heating

🟢 Greenhouse and soil heating

🟡 Individual space heating

🟠 Individual space heating & Greenhouse and soil heating

🔵 Sanitary water heating

🔴 Individual space heating & Sanitary water heating

▭ Transenergy project area

▭ State boundaries

0 50 km

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

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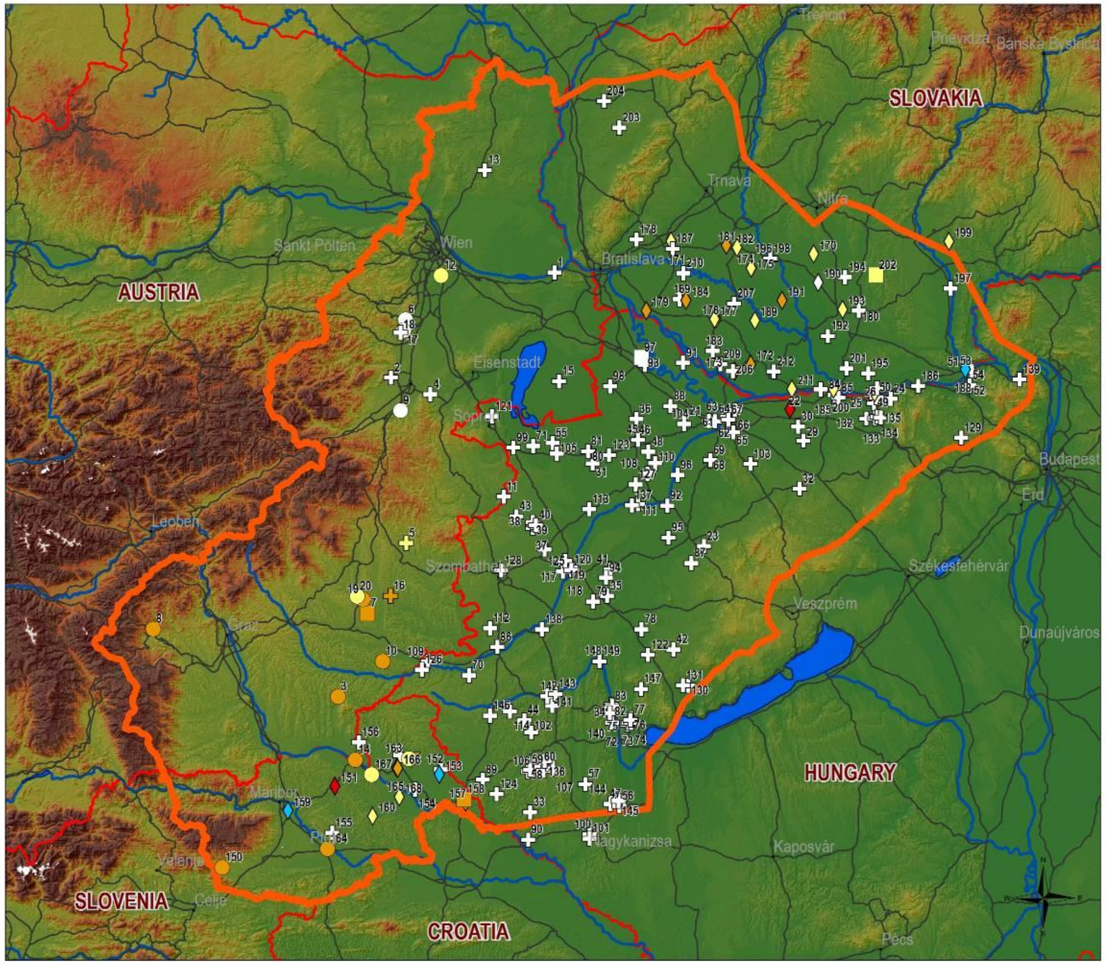
Thermal waste water management



0 50 km

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert

Digital cartography: Špela Kumelj

Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

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Legend

7 Organization code

Thermal waste water temperature (°C)

- ○ no information
- ● 10,0 - 19,9
- ● 20,0 - 29,9
- ● 30,0 - 39,9
- ● above 40,0

Thermal waste water management

- ○ seepage purifying or dechlorination plant
- ✚ no information
- ◊ no treatment
- □ no treatment & reinjection
- ▽ no treatment & taken by other user

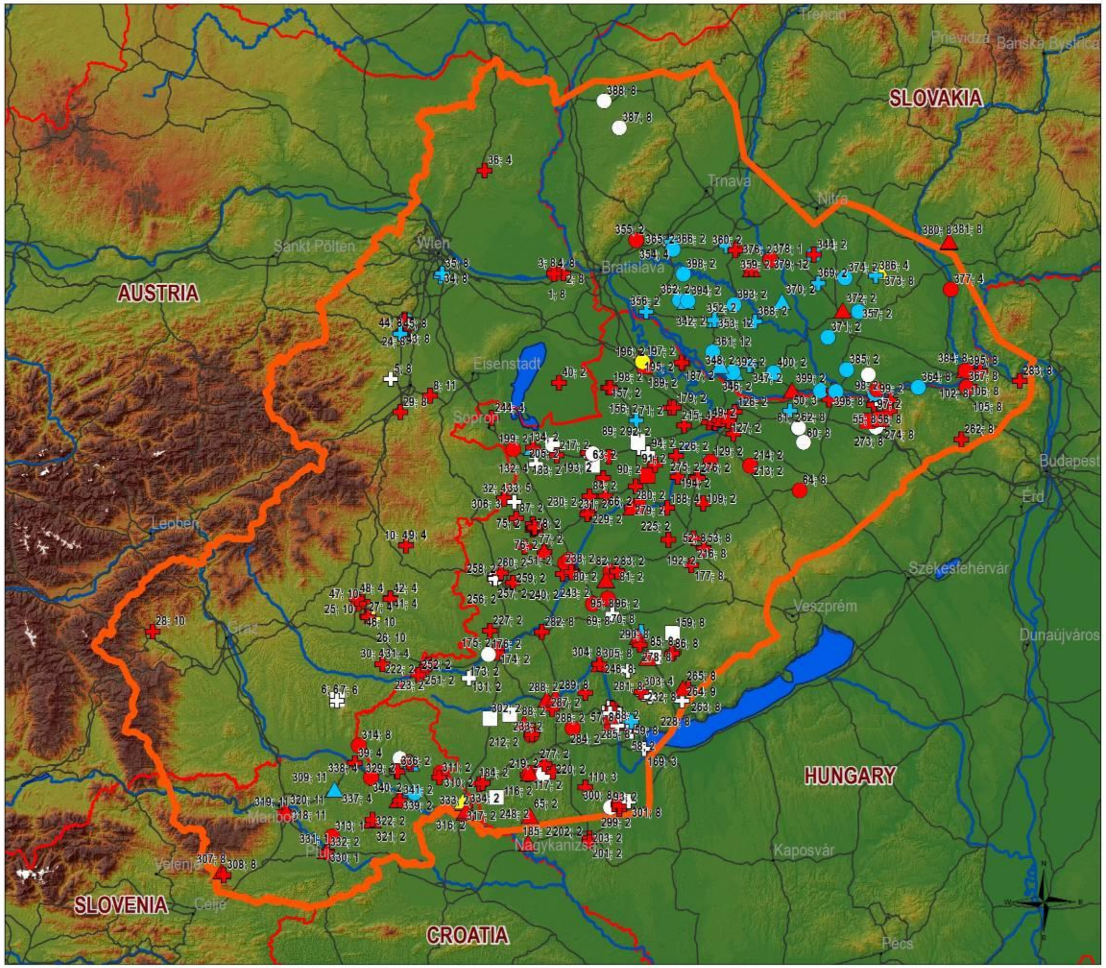
- ▭ Transenergy project area
- ▭ State boundaries

GeoZS

ŠTÁTNY GEOLOGICKÝ ÚSTAV DIONÝZA ŠTÚRA

MAGYAR ÁLLAMI FÖLDTANI INTÉZET 1869 GEOLOGICAL INSTITUTE OF HUNGARY

Thermal boreholes exploitation characteristics



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

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EUROPEAN REGIONAL DEVELOPMENT FUND

Legend

7; 8 Borehole code; Aquifer code

Aquifer code	*Main geothermal aquifer*
1	Pl clastic rocks and sediments
2	M6-M7 clastic rocks and sediments
3	M4-M5 carbonate rocks
4	M4-M5 clastic rocks and sediments
5	M1-M3 clastic rocks and sediments
6	M volcanic rocks
7	E carbonate rocks
8	MZ carbonate rocks
9	MZ clastic rocks
10	PZ carbonate rocks
11	PZ metamorphic rocks
12	M6-Pl clastic rocks and sediments

Water production by

- ● natural outflow
- ○ no information
- ● pumping
- ● reinjection

Borehole activity

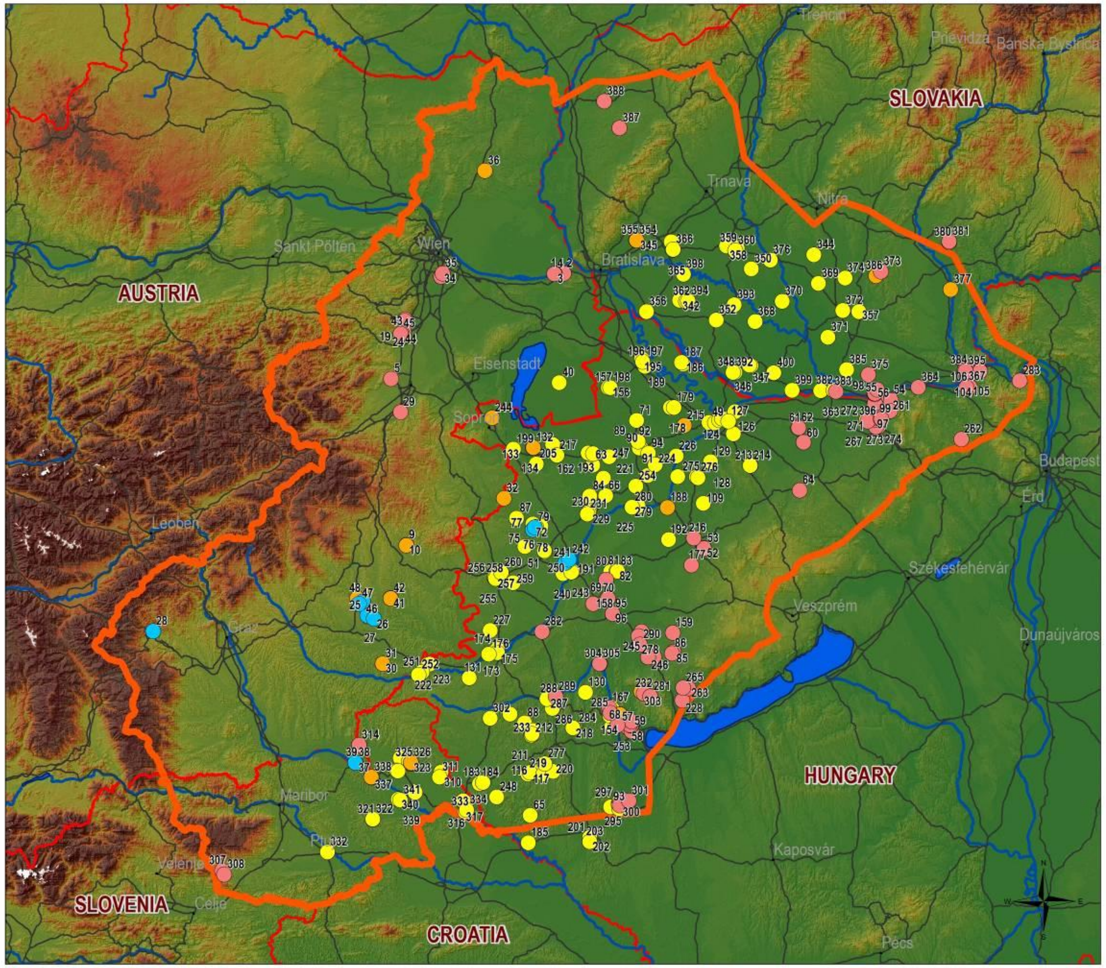
- ✚ constant
- ○ inactive
- □ no information
- △ occasionally & periodically

- 🟧 Transenergy project area
- 🟥 State boundaries

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

Main aquifers (above 10 boreholes)



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

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Legend

52 Borehole code

Main geothermal aquifer

- 🟡 M6-M7 clastic rocks and sediments
- 🟠 M4-M5 clastic rocks and sediments
- ● MZ carbonate rocks
- 🔵 PZ carbonate rocks

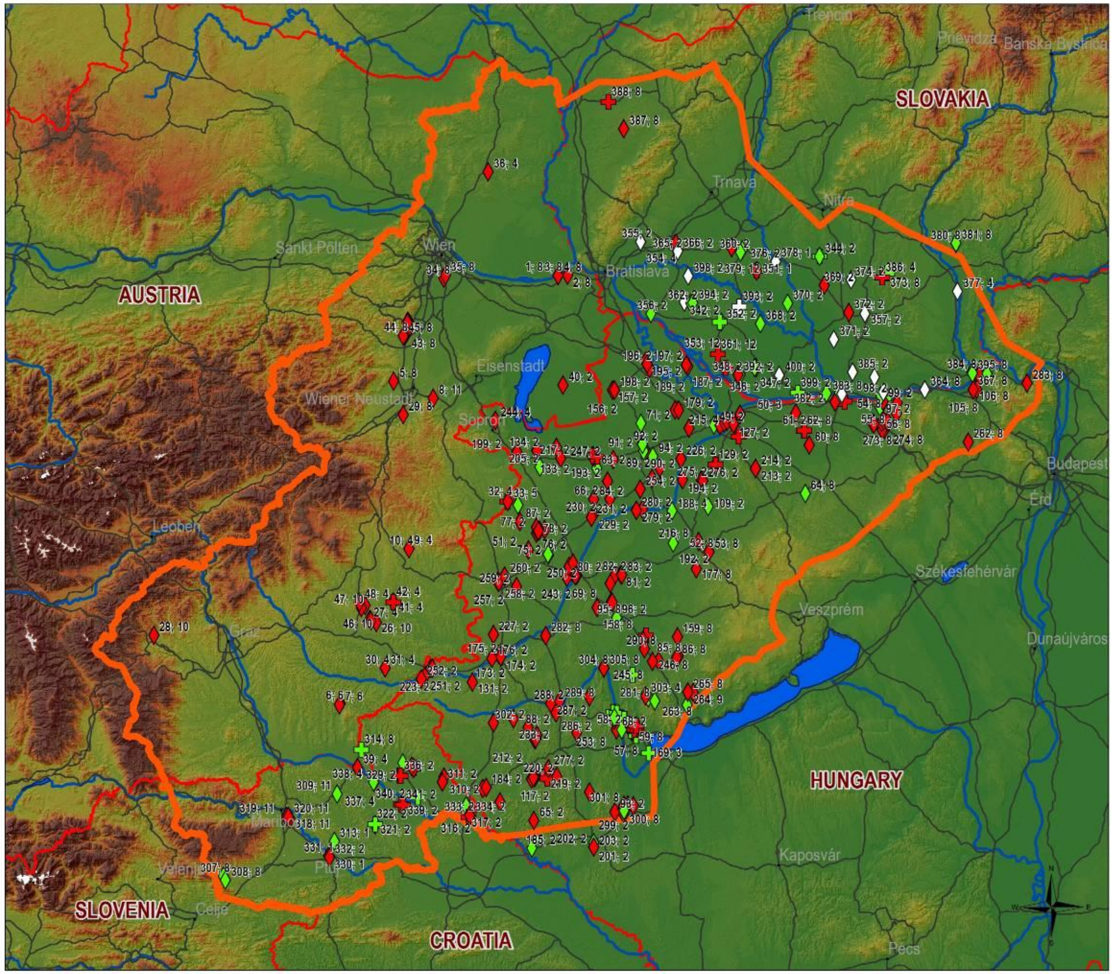
- ▭ Transenergy project area
- ▭ State boundaries

0 50 km

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

Changes in exploitation of geothermal aquifers



0 50 km

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

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

Legend

7; 8 Borehole code; Aquifer code

Aquifer code	Main geothermal aquifer
1	Pl clastic rocks and sediments
2	M6-M7 clastic rocks and sediments
3	M4-M5 carbonate rocks
4	M4-M5 clastic rocks and sediments
5	M1-M3 clastic rocks and sediments
6	M volcanic rocks
7	E carbonate rocks
8	MZ carbonate rocks
9	MZ clastic rocks
10	PZ carbonate rocks
11	PZ metamorphic rocks

Changes in well's operation

- 🟢 no
- ○ no information
- 🔴 yes

Screened aquifer

- ◊ single
- ✣ multiple

- 🟧 Transenergy project area
- 🟥 State boundaries

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

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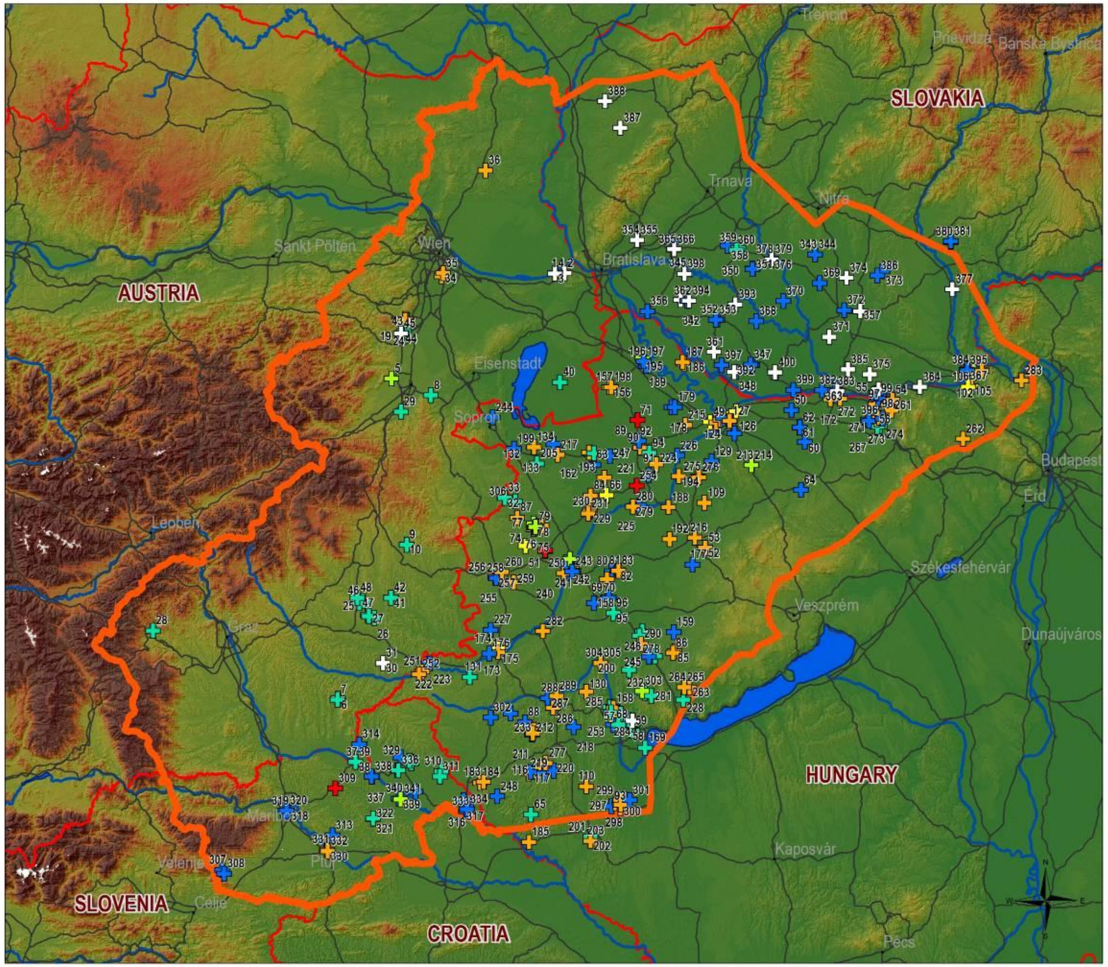
Operational monitoring on thermal boreholes
1) Groundwater level/aquifer pressure



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

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Legend

7 Borehole code

	Interval of data recording	Data storage
✚	annual data	no
✚	annual data	yes
✚	continuous & daily data	no
✚	continuous & daily data	yes
✚	no information	
✚	no monitoring	
✚	occasional measurements	no
✚	occasional measurements	yes

▭ Transenergy project area

▭ State boundaries

0 50 km

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

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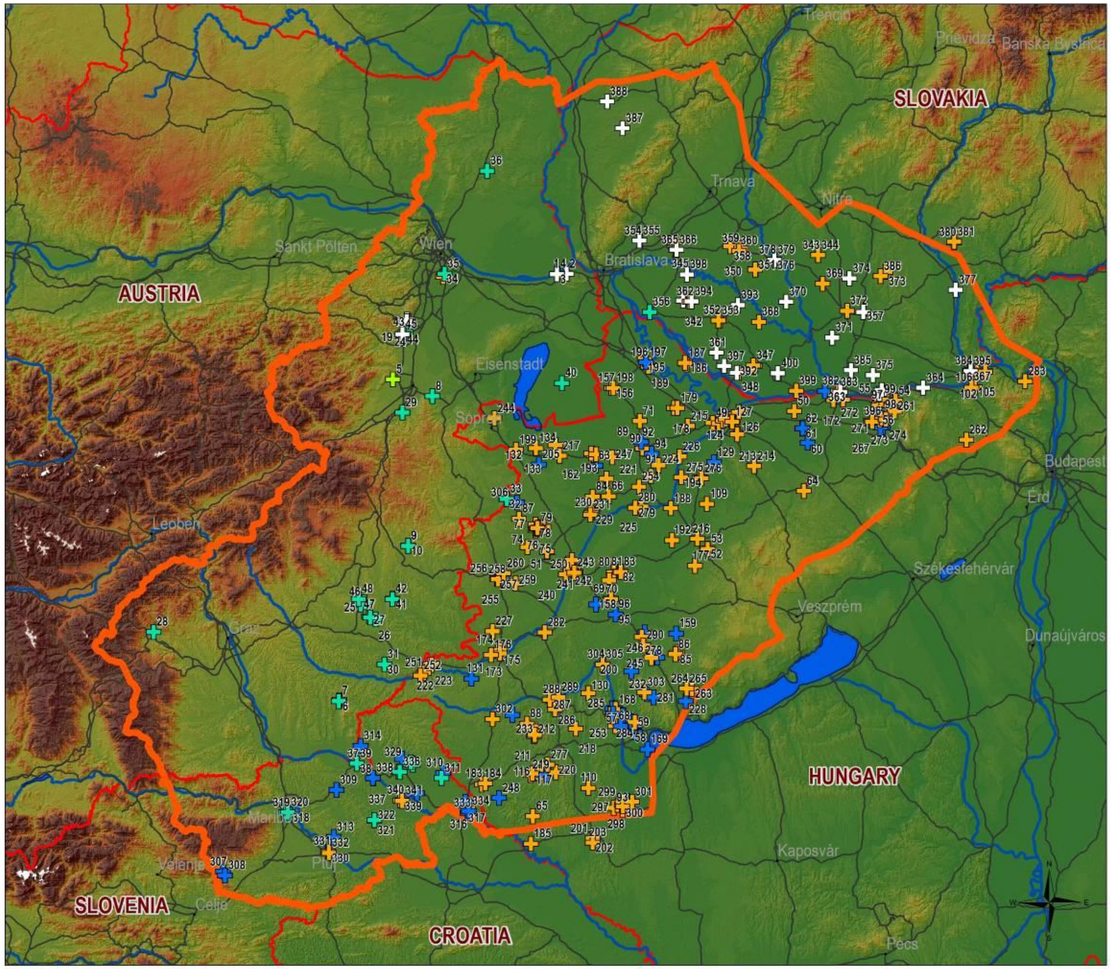
Operational monitoring on thermal boreholes
2) Cumulative quantity



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Legend

7 Borehole code

	Interval of data recording	Data storage
✚	annual data	no
✚	annual data	yes
✚	continuous & daily data	no
✚	continuous & daily data	yes
✚	no information	
✚	no monitoring	
✚	occasional measurements	no
✚	occasional measurements	yes

□ Transenergy project area

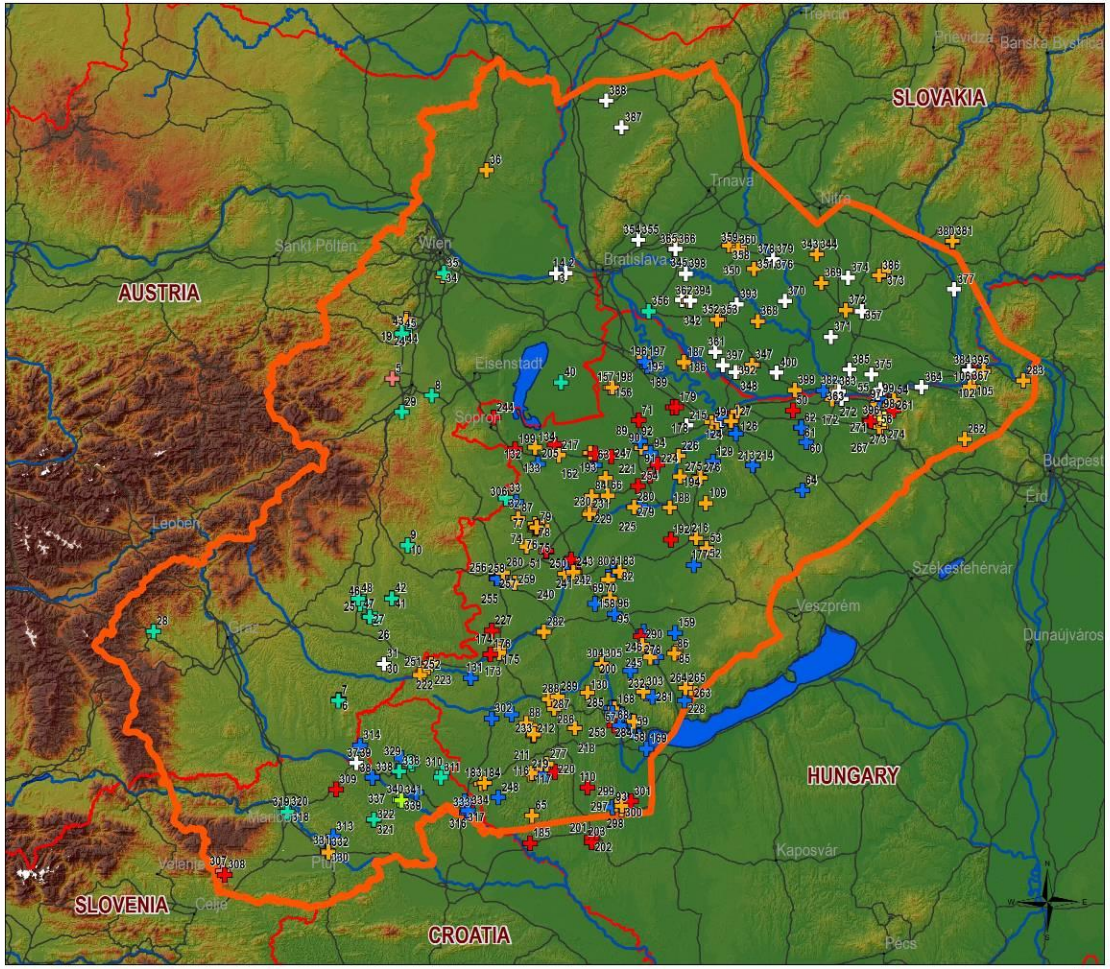
□ State boundaries

0 50 km

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

Operational monitoring on thermal boreholes
3) Water temperature



0 50 km

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Legend

7	Borehole code

	Interval of data recording	*Data storage*
✚	annual data	no
✚	annual data	yes
✚	continuous & daily data	no
✚	continuous & daily data	yes
✛	no information	
✚	no monitoring	
✚	occasional measurements	no
✚	occasional measurements	yes

▢ Transenergy project area

▢ State boundaries

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

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GeoZS

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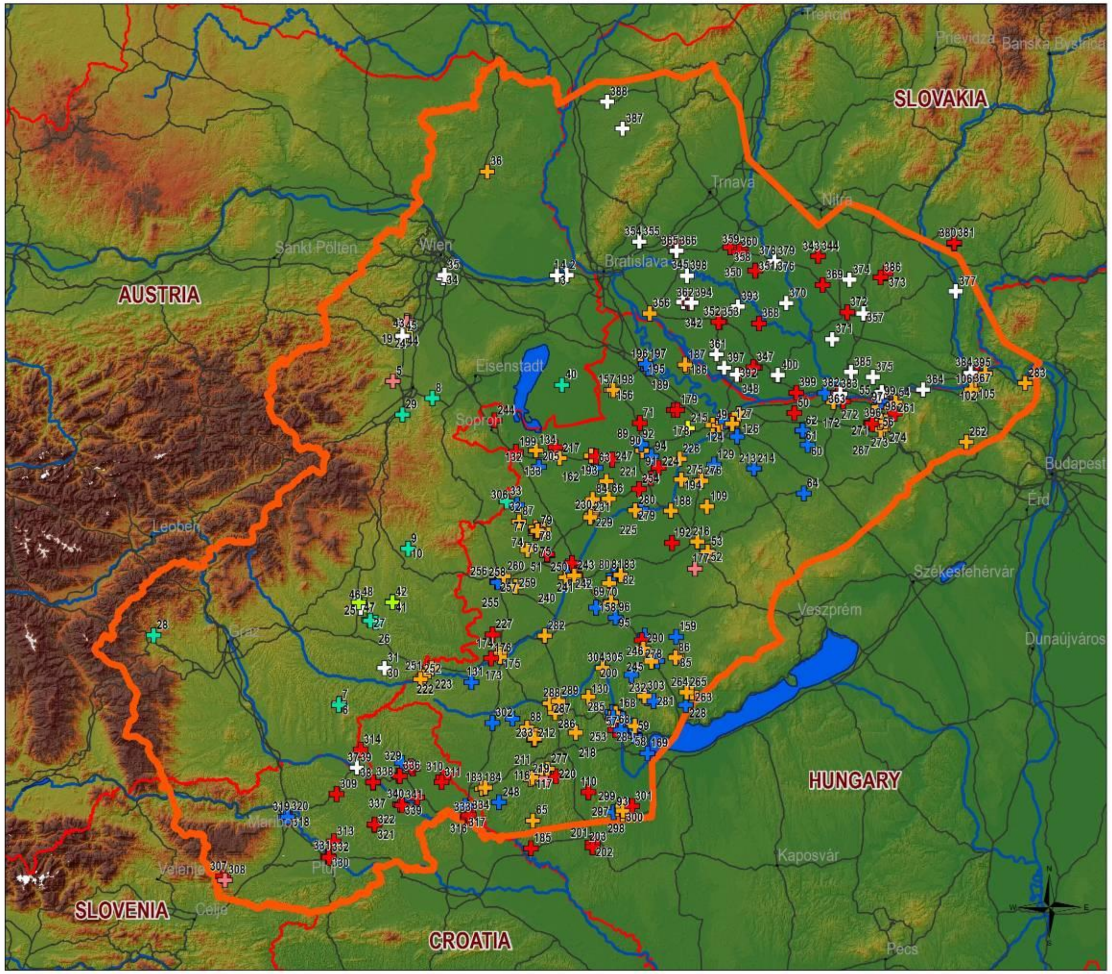
Operational monitoring on thermal boreholes
4) Water chemistry



0 50 km

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

Legend

7 Borehole code

	Interval of data recording	*Data storage*
✚	annual data	no
✚	annual data	yes
✚	continuous & daily data	no
✚	continuous & daily data	yes
✚	no information	
✚	no monitoring	
✚	occasional measurements	no
✚	occasional measurements	yes

▭ Transenergy project area

▭ State boundaries

Authors: Nina Rman, Nóra Gál, Daniel Marcin, Gerhard Schubert
Digital cartography: Špela Kumelj
Topographical base: Void-filled seamless SRTM data V1, 2010, International Centre for Tropical Agriculture (CIAT), available from the CGIAR-CSI SRTM 90m Database: http://srtm.csi.cgiar.org

TransEnergy project, 2011

GeoZS

Enclosure 1

Legend of Organizations

LEGEND OF ORGANIZATIONS

Organization code	Country	Organization name	Web Address	Water Sources
1	AT	Therme Carnuntum	www.therme-carnuntum.at	Bad Deutsch-Altenburg Direktionsbrunnen, Kurhausbrunnen, Schlossbrunnen, Kaiserbad
2	AT	Kristalltherme Bad Fischau	www.kristalltherme.at	Bad Fischau,Quelle Herrenbad und Quelle hinter Damenbad
3	AT	Life medicine Heilbad & Spa	www.lifemedicineresort.com	Bad Gleichenberg Mariannenquelle, Bad Gleichenberg TH 1
4	AT	Heiltherme Bad Sauerbrunn	www.heilbad-sauerbrunn.at/heilbad-sauerbrunn/index.php	Bad Sauerbrunn TH 1
5	AT	Gemeinde Bad Tatzmannsdorf	www.kuren.at	Bad Tatzmannsdorf TH1, TH3
6	AT	Stadtgemeinde Baden	www.baden.at	Baden Bohrung I, Bohrung II, Engelsbad, Franzensbadquelle, Frauenbadquelle, Josefsquelle, Karolinenquelle, Leopoldsquelle, Mariazellerhofquelle, Marienquelle, Peregriniquelle, Peterhofquelle, Römerquelle, Sauerhofquelle
7	AT	Rogner Bad Blumau	www.blumau.com	Blumau 1/1a, Blumau 2, Blumau 3
8	AT	Gemeinde Köflach	www.koeflach.at	Köflach Th 1
9	AT	Therme Linsberg Asia	www.linsbergasia.at	Linsberg TH1b
10	AT	Loipersdorf	www.therme.at	Loipersdorf 1 (Binderberg), Loipersdorf 2 (Lautenberg 1)
11	AT	Sonnentherme Lutzmannsburg	www.sonnentherme.com	Lutzmannsburg Therm 1, TH 2
12	AT	Therme Wien Oberlaa	www.therme-wien.at	Oberlaa TH I, TH II
13	AT	Marktgemeinde Pirawarth	www.badpirawarth.at	Pirawarth Thermal 1
14	AT	Gemeinde Bad Radkersburg	www.badradkersburg.at	Radkersburger Stadtquelle, Radkersburg 2, Radkersburg Sicherheitsbohrung 3a

LEGEND OF ORGANIZATIONS

Organization code	Country	Organization name	Web Address	Water Sources
15	AT	St. Martins Therme & Lodge	www.stmartins.at	Seewinkel Th 1
16	AT	Reiter`s Resort Stegersbach	www.dietherme.com	Stegersbach Therm 1, TH 2
17	AT	Vöslauer Mineralwasser AG	www.vöslauer.com	Vöslau 6/1, Vöslau 7
18	AT	Thermalbad Vöslau	www.thermalbad-voeslau.at	Vöslau Ursprungsquellen
19	AT	Heiltherme Bad Waltersdorf	www.heiltherme.at	Waltersdorf 1, Waltersdorf 2a
20	AT	H2O Hotel-Therme-Resort	www.hoteltherme.at	Waltersdorf 4
21	HU	Kommunális Szolgáltató	www.komszol.hu	Abda K-12
22	HU	Ácsi Termálkertészet		Ács K-67
23	HU	Pápai Vízmű	www.papaivizmu.hu	Adásztevel K-10, Adásztevel K-11, Gecse K-6, Vág K-22
24	HU	Hilltop	www.hilltop.hu	Almásneszmély K-10
25	HU	Dunaalmás Falugazda	www.maviz.org	Almásneszmély K-4
26	HU	ÉDV Zrt.	www.edvrt.hu	Tata K-28/a, Almásneszmély K-9, Esztergom K-107, Esztergom K-108
27	HU	Kolping Hotel	www.kolping.hotel.hu	Alsópáhok B-7
28	HU	NYUDUVIZIG Megfigyelőkutak	www.nyuduvizig.hu	Alsópáhok K-4, Alsópáhok K-6, Csepreg K-13, Duka K-3, Hévíz K-19, Hévíz K-30, Kehidakustány K-4, Keszthely K-19, Nemesbük K-1, Nemesbük K-3, Szentgyörgyvár K-2, Várvölgy K-4
29	HU	Bábolna Zrt		Bábolna K-47
30	HU	Bábolna Termálfürdő		Bábolna K-52, Bábolna K-53
31	HU	Pannon-Víz	www.pannon-viz.hu	Beled B-13, Cirák B-3, Csorna K-60/A, Csorna K-61, Jánossomorja B-81, Jánossomorja K-107, Mihályi K-11, Rábaújfalu K-7, Tét B-12, Tét B-13, Babót K-6,

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Organization code	Country	Organization name	Web Address	Water Sources
				Egyed B-1
32	HU	Bakonyszombathely karsztkút		Bakonyszombathely K-9
33	HU	Bázakerettye	www.bazakerettye.hu	Bázakerettye K-1
34	HU	Bókaháza termálkút		Bókaháza K-1
35	HU	Borgáta Termálfürdő	www.borgatathermal.hu	Borgáta K-2, Borgáta K-6
36	HU	Bősárkány közkút		Bősárkány K-1/A
37	HU	Büki Gyógyfürdő	www.bukfurdo.hu	Bük K-4, Bük K-10, Bük K-16, Bük K-20, Bük K-38
38	HU	Medi-Aqua Kft.kút	www.mediaqua.hu	Bük K-19
39	HU	RDS Birdland	www.euhotelcenter.hu	Bük K-22
40	HU	Bük és Térsége Vízmű	www.bukvizmu.hu	Bő K-1, Bük K-24, Acsád K-3
41	HU	Vulkán Fürdő	www.celldomolk.hu	Celldömölk K-43, Celldömölk K-45, Celldömölk K-46, Celldömölk K-60
42	HU	DRV vízmű kutak	www.drv.hu	Csabrendek K-9, Csabrendek K-10, Hévíz B-1, Káptalanfa K-1
43	HU	Vasivíz	www.vasiviz.hu	Csepreg K-8, Körmend B-17, Körmend K-27, Körmend K-63, Répcelak K-16, Szombathely B-11, Szombathely B-46/A, Szombathely B-47/B, Szombathely B-108, Szombathely K-43/C, Szentgotthárd K-41/A
44	HU	PÁL-FI		Csonkahegyhát K-1
45	HU	Csorna Termálfürdő		Csorna K-47
46	HU	Meta-Trade Kft. Kút		Csorna K-69
47	HU	Délzalai Víz	www.dzviz.hu	Zalakaros K-7, Zalakaros K-12, Csurgó-12/A
48	HU	MÁFI Megfigyelőkutak	www.mafi.hu	Dőr-1, Duka-1, Nagylózs-1, Raposka-HgN84, Rezi K-4, Zalacsány Zcs-1, Zsira-1

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Organization code	Country	Organization name	Web Address	Water Sources
49	HU	Tatai MG Zrt.		Szomód K-5, Dunaalmás K-12
50	HU	Dunaalmás Polgármesteri Hivatal	polgarmesterhivatal.dunaalmás.hu	Dunaalmás K-15
51	HU	ÉDUVIZIG Megfigyelőkutak	www.edukovizig.hu	Esztergom B-46, Tata B-47, Tata B-48
52	HU	Szent István Fürdő		Esztergom B-5
53	HU	Aquasziget	www.aquasziget.hu	Esztergom B-86
54	HU	Grante	www.grante.hu	Esztergom K-87, Esztergom K-88
55	HU	DORI Hotel kút	www.dorihotel.hu	Fertőd K-44
56	HU	Zalakarosi Castrum	www.castrum-group.hu	Galambok K-7
57	HU	Gelse termálkút		Gelse K-5
58	HU	Zalavíz	www.zalaviz.hu	Gutorfölde B-5, Gutorfölde B-4, Gyűrűs K-1, Nagylengyel K-9, Pölöske K-8
59	HU	Agrana Juice		Gutorfölde K-9, Gutorfölde K-10
60	HU	EON	www.eon-foldgaz-storage.hu	Gutorfölde K-6, Gutorfölde K-7, Gutorfölde K-8
61	HU	Textilplusz 97 Kft.	www.viszfrottir.hu	Győr B-12/A
62	HU	Rába Quelle	www.gyortermal.hu	Győr B-60, Győr B-81, Győr B-148
63	HU	Győri Szeszgyár	www.gyoriszesz.hu	Győr B-181
64	HU	PANNON-FLAX	www.pannon-flax.hu	Győr B-87/a
65	HU	Győr termálkutak		Győr K-107, Győr K-109
66	HU	MH Légvédelmi	www.raketaezred.hu/	Győr K-139
67	HU	GRABOPLAST	www.kszgysz.hu/grabo.htm	Győr K-80/A
68	HU	Győri Plast Kf.t Kútja	www.gyoriplast.com/	Győrszemere K-5
69	HU	VIKUV telep termálkút	www.vikuv.hu	Győrszemere K-7
70	HU	Hegyhátszentmárton termálkút	www.hegyhatszentmarton.hu	Hegyhátszentmárton K-1

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Organization code	Country	Organization name	Web Address	Water Sources
71	HU	SÁ-RA	www.saratermal.hu	Hegykő B-5/A, Hegykő B-9, Hegykő K-20
72	HU	Hunguest Hotel Helios	www.hotelhelios.hunguesthotels.com	Hévíz K-10, Hévíz K-11/A, Hévíz B-12, Hévíz B-18, Hévíz B-23
73	HU	Hévíz Gyógyfürdő	www.spaheviz.hu	Héviz spring, Hévíz B-7, Hévíz B-8, Hévíz B-14, Hévíz B-28, Hévíz B-32
74	HU	Thermal Hotel Aqua	www.budapesthotelreservation.hu/hotels/thermal_hotel_aqua.HU.php	Hévíz B-15
75	HU	Hotel Carbona	www.carbona.hu	Hévíz K-33, Hévíz K-17/A
76	HU	Hunguest Hotel Panoráma kút	www.hotelhelios.hunguesthotels.com	Hévíz K-10, Hévíz K-11/A, Hévíz B-12, Hévíz B-18, Hévíz B-23
77	HU	Hotel Aquamarin	www.hotelaquamarin.hu	Hévíz B-4/A
78	HU	KDTVIZIG Megfigyelőkutak	www.kdtvizig.hu	Hosztót K-1, Sümeg B-1
79	HU	LA-MI		Káld K-9
80	HU	Flóra Gyógyfürdő	www.floragyogyfurdo.hu	Kapuvár K-61, Kapuvár K-71, Kapuvár K-84
81	HU	Kapuvári Húsipari	www.kapuvarihusrt.hu	Kapuvár B-77
82	HU	Kustányi Thermal		Kehidakustány K-10
83	HU	Kehida Thermál		Kehidakustány K-8, Kehidakustány K-11, Kehidakustány K-12
84	HU	Komthermal	www.komthermal.hu	Komárom K-21, Komárom B-62
85	HU	Komárom Termál kút		Komárom K-109
86	HU	Körmend Szakiskola	www.rendeszkepzo-kormend.hu	Körmend K-19
87	HU	Kup laktanya		Kup K-3
88	HU	Zeiler Hungária Termelő		Lébénymiklós B-28, B-40
89	HU	Városi Gyógyfürdő	www.lenti.hu	Lenti K-12, K-21, K-23, B-33, B-34

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Organization code	Country	Organization name	Web Address	Water Sources
90	HU	Letenye strand	www.letenye.hu/termalfurdo.html	Letenye K-59
91	HU	Lipóti Termál	www.gyogyturizmus.hu	Lipót K-7, Lipót K-10
92	HU	Bakonykarszt Zrt.	www.bakonykarsztrt.hu	Ukk K-4/A, Zalagyömörő K-4, Marcaltő K-4
93	HU	Máriakálnok Termál		Máriakálnok K-32
94	HU	Mesteri Termál	www.lipotfurdo.hu	Mesteri K-8, Mesteri K-3/a
95	HU	Pápai-Ser	www.papaihus.hu	Mezőlak K-12
96	HU	MÁRVÍZ		Mórichida K-20
97	HU	Flexum-Termál		Mosonmagyaróvár B-123, Mosonmagyaróvár K-136, Mosonmagyaróvár K-136.
98	HU	Multicikória		Mosonszentjános B-1
99	HU	Széchenyi Forrás		Nagycenk K-11
100	HU	Nagykanizsa strand	www.kanizsauszoda.hu/	Nagykanizsa B-62
101	HU	Nagykanizsa Sörgyár		Nagykanizsa K-85, Nagykanizsa K-86
102	HU	Ormándlaki Vízmű		Ormándlak B-23, Ormándlak B-24, Ormándlak K-25, Ormándlak K-26, Ormándlak K-27
103	HU	Pannonhalma Polgármesteri Hivatal	www.pannonhalma.hu	Pannonhalma K-6, Pannonhalma K-12
104	HU	Pápai Várkert Gyógyfürdő	www.varkertfurdo.hu	Pápa K-18/a, Pápa K-35
105	HU	Petőháza Strand		Petőháza B-11
106	HU	Pusztaederics közkút	www.pusztaederics.hu/onkormanyzat.html	Pusztaederics B-1
107	HU	Eurowild Termálfürdő	www.eurowild.hu	Pusztaszentlászló K-2
108	HU	Rábacsanak közkút		Rábacsanak K-16
109	HU	Szombathelyi Tangazdaság (tönkrement cég)		Rábafüzes K-5, Rábafüzes K-4

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Organization code	Country	Organization name	Web Address	Water Sources
110	HU	Rábapordány közkút		Rábapordány B-2/a
111	HU	Széchenyi Kastélyszálló	www.szechenyikastelyszallo.hu	Rábasebes K-12
112	HU	Agrorádóc		Rádóckölked K-3
113	HU	Pannontej Répcelak	www.pannontej.hu	Répcelak B-17, Répcelak B-7
114	HU	Salomvár termálkút		Salomvár K-2
115	HU	Sága Foods		Sárvár B-17, Sárvár B-27, Sárvár B-51
116	HU	Sárvári Gyógyfürdő	www.sarvarfurdo.hu	Sárvár B-7, Sárvár B-35
117	HU	Danubius Hotel	www.danubiushotels.hu/hu/szallodak/magyarorszag/sarvar/danubius_health_spa_resort_sarvar	Sárvár B-44
118	HU	Sárvár-Víz		Sárvár K-19/a
119	HU	Termálkristály	www.termalkristaly.hu	Sárvár K-23, Sárvár K-36
120	HU	SPIRIT Hotel	www.spirithotel.hu	Sárvár K-53
121	HU	SOP-VIN	www.loverpince.hu	Sopron K-44
122	HU	Sümeg Strandfürdő		Sümeg B-8
123	HU	Szárföld közkút		Szárföld K-2
124	HU	Szécsisziget strand kút		Szécsisziget K-2
125	HU	K és B Medi Galen		Szeleste K-5, Szeleste K-7
126	HU	Gotthárd-Therm	www.termalpark.hu	Szentgotthárd B-44
127	HU	Szil közkút		Szil B-3
128	HU	MÁV	www.mvj.hu	Szombathely K-71
129	HU	Somodori Növénytermesztő		Szomor K-3
130	HU	Hotel Pelion	www.hunguesthotels.hu/hu/hotel/t	Tapolca B-28

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LEGEND OF ORGANIZATIONS

Organization code	Country	Organization name	Web Address	Water Sources
			apolca/hunguest_hotel_pelion/	
131	HU	Tapolca Termálstrand		Tapolca K-15/A, Tapolca K-16
132	HU	Bábolna Nemzeti Ménesbirtok Kft.	menesbirtok@babolnamenes.hu	Tata K-31, Tata K-39
133	HU	Tata VIZIPARK		Tata K-34
134	HU	Klima-Vill		Tata K-35
135	HU	Mirelta	www.mirelta.hu	Tata K-61, Tata K-63
136	HU	Zalakerámia	www.zalakeramia.hu	Tófej K-5
137	HU	Vág közkút		Vág B-17
138	HU	Vasi Triász		Vasvár K-10
139	HU	Termal Hotel Visegrád	www.thv.hu	Visegrád K-7
140	HU	Inter Thermál	www.wellnesskastely.hu	Zalacsány B-2
141	HU	Strandfürdő és Fedett Uszoda	www.strandkft.hu	Zalaegerszeg B-21
142	HU	Aquaplus Gébárti Strand	www.aquazala.hu	Zalaegerszeg K-193, Zalaegerszeg K-249
143	HU	Aquaplus Kft. Pózvai Kórház	www.aquazala.hu	Zalaegerszeg K-286
144	HU	Gránit Gyógyfürdő	www.bad-zalakaros.hu	Zalakaros K-5, Zalakaros K-6, Zalakaros K-8, Zalakaros K-11, Zalakaros K-14, Zalakaros K-15 Zalakaros K-16, Zalakomár K-11
145	HU	Hotel Karos Spa	www.karos-spa.hu	Zalakaros K-18
146	HU	Zalaquelle		Zalalövő K-11
147	HU	Vindornyamenti MTSz Ujmajor		Zalaszántó K-1
148	HU	Szentgróthi Inter Thermál és Fürdő	www.zalatermalvolgye.hu	Zalaszentgrót K-37
149	HU	Coca-Cola HBC Magyarország	www.cocacola.hu	Zalaszentgrót K-72
150	SI	Terme Zreče	www.terme-zrece.eu	B-2/85, B-3/88

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Organization code	Country	Organization name	Web Address	Water Sources
151	SI	Občina Benedikt	www.benedikt.si	Be-2/04
152	SI	Občina Dobrovnik	www.dobrovnik.si	Do-1/67
153	SI	Ocean Orchids	www.oceanorchids.si	Do-3g/05
154	SI	Sončni vrt		Fi-14/57
155	SI	Občina Destrnik	www.destrnik.si	Jan-1/04
156	SI	Kotrman	www.nivo.si	Kor-1gα/08
157	SI	Terme Lendava	www.terme-lendava.si	Pt-20/49, Pt-74/50, Le-1g/97
158	SI	Nafta Geoterm	www.nafta-geoterm.si	Le-2g/94, Le-3g/08
159	SI	Terme Maribor	www.termemb.si	Mb-1/90, Mb-2/91, Mb-4/91
160	SI	Bioterme Mala Nedelja	www.bioterme.si	Mo-1/58/73, Mo-2g/08
161	SI	Terme 3000	www.terme3000.si	Mt-1/60, Mt-4/74, Mt-5/82, Mt-6/82, Mt-7/93
162	SI	Rimska Čarda		Mt-2/61
163	SI	Terme Sončni park Vivat	www.vivat.si/	Mt-8g/06
164	SI	Terme Ptuj	www.terme-ptuj.si	P-1/73, P-2/88, P-3/05
165	SI	Komunala Murska Sobota	www.komunalams.si	Sob-1/87
166	SI	Zvezda Diana	www.hotel-diana.si	Sob-2/88
167	SI	Zdravilišče Radenci	www.zdravilisce-radenci.si	T-4/88, T-5/03
168	SI	Terme Banovci	www.terme-banovci.si	Ve-1/57, Ve-2/57, Ve-3/91
169	SK	Obec Lehnice	www.obeclehnice.sk/	BL-1
170	SK	Thermal Kesov	www.thermalkesov.sk	BPK-1, BPK-2
171	SK	Aquathermal Senec	www.aquathermal.sk	BS-1
172	SK	Termál	www.thermalcorvinus.sk	Č-1, Č-2
173	SK	Medzičiližie	www.infoma.sk/firma-kontakt-	ČR-1

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Organization code	Country	Organization name	Web Address	Water Sources
			cinnost.php?category=220&firma=25965	
174	SK	Obec Diakovce	www.vodnesvety.sk/kupalisko-diakovce	Di-1
175	SK	Obec Horné Saliby	www.hornesaliby.sk	Di-2, Di-3
176	SK	McCarter TRADE	www.mccarter.sk	DS-1
177	SK	Thermalpark DS	www.thermalpark.sk	DS-2
178	SK	Obec Chorvátsky Grob	www.chorvatskygrob.sk/	FGB-1, FGB-1A
179	SK	Merkator	www.liecebnecentrum.sk	FGČ-1
180	SK	Obec Dvory nad Žitavou	www.dvory.sk	FGDŽ-1
181	SK	Termálne kúpalisko Vincov Les	www.vincovles.com	FGG-1
182	SK	Galantaterm	www.galantaterm.sk	FGG-2, FGG-3
183	SK	Obec Gabčikovo	www.gabcikovo.sk	FGGa-1
184	SK	Poľnohospodárske družstvo Horná Potôň	katalog.centrum.sk/polnohospodarske-druzstvo-v-hornej-potoni/3ef62d597d61dc8b5bfdf299cff988dc.html	FGHP-1, VHP-12-R
185	SK	Flower	www.flowersro.sk/index.htm	FGK-1
186	SK	Obec Kravany nad Dunajom	www.kravany.ou.sk	FGKr-1
187	SK	Obec Kráľová pri Senci	www.kralovaprisenci.sk	FGS-1, FGS-1A
188	SK	Vadaš	www.vadas.sk	OPKS, FGŠ-1, VŠ-1
189	SK	AGROTOP Topoľníky	www.123dopyt.sk/dodavatele/firma/B2M-AX20d2/agrotop-topolniky-a-s	FGT-1
190	SK	Obec Tvrdošovce	www.vodnesvety.sk/kupalisko-	FGTv-1

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LEGEND OF ORGANIZATIONS				
Organization code	**Country**	**Organization name**	**Web Address**	**Water Sources**
			tvrdosovce/674?task=view	
191	SK	Obec Vlčany	www.obecvlcany.sk	FGV-1
192	SK	Obec Nesvady	www.nesvady.sk	GN-1
193	SK	Mesto Nové Zámky	www.kupaliskonz.sk	GNZ-1
194	SK	Mesto Šurany	www.surany.sk	GŠM-1
195	SK	Obec Marcelová	www.marcelova.sk	GTM-1
196	SK	MeT Šaľa	www.metsala.sk	GTŠ-1
197	SK	Mesto Želiezovce	www.azet.sk/firma/pobocka/.../odbor-ekonomiky-mu-zeliezovce_1/	HGŽ-1
198	SK	Mesto Šaľa	www.sala.sk	HTŠ-2, HTŠ-3
199	SK	Margita - Ilona	www.margita-ilona.sk	HVB-1, HVB-2A
200	SK	VIATOR	www.komarnohotel.sk	M-2, M-3
201	SK	Obec Svätý Peter	www.svatypeter.eu	PGT-11
202	SK	Termálne kúpalisko Podhájska	www.obecpodhajska.sk	Po-1, GRP-1
203	SK	Obec Lakšárska Nová Ves	www.laksarskanovaves.sk	RGL-1
204	SK	Mesto Šaštín - Stráže	www.msu-sastinstraze.sk	RGL-2
205	SK	Kúpele Patince	www.obecpatince.sk	SB-1, SB-2, SB-3
206	SK	Obec Čiližská Radvaň	www.csilizradvany.sk	VČR-16
207	SK	Obec Dunajský Klátov	www.dunajskyklatov.sk	VDK-15
208	SK	Obec Virt	www.azet.sk/firma/79811/obecny-urad-virt/	VŠE
209	SK	Blumen Bt. Slovakia	www.skfirmy.com/blumen-bt-slovakia-s-r-o.html	VTP-11
210	SK	Obec Zlaté Klasy	www.zlateklasy.sk	VZK-10

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Organization code	Country	Organization name	Web Address	Water Sources
211	SK	4 Fruit	www.4fruit.sk	VZO-13
212	SK	Obec Zemianska Olča	www.zemianskaolca.ocu.sk	VZO-14
213	SI	Grede Tešanovci		Waste water from Terme 3000

Enclosure 2

Legend of boreholes

LEGEND OF BOREHOLES			
Borehole code	**Borehole name**	**Country**	**Organization code**
1	Bad Deutsch-Altenburg Direktionsbrunnen	AT	1
2	Bad Deutsch-Altenburg Kaiserbad	AT	1
3	Bad Deutsch-Altenburg Kurhausbrunnen	AT	1
4	Bad Deutsch-Altenburg Schlossbrunnen	AT	1
5	Bad Fischau,Quelle Herrenbad und Quelle hinter Damenbad	AT	2
6	Bad Gleichenberg Mariannenquelle	AT	3
7	Bad Gleichenberg TH 1	AT	3
8	Bad Sauerbrunn TH 1	AT	4
9	Bad Tatzmannsdorf TH1	AT	5
10	Bad Tatzmannsdorf TH3	AT	5
11	Baden Bohrung 1	AT	6
12	Baden Bohrung 2	AT	6
13	Baden Engelsbad	AT	6
14	Baden Franzensbadquelle	AT	6
15	Baden Frauenbadquelle	AT	6
16	Baden Josefsquelle	AT	6
17	Baden Karolinenquelle	AT	6
18	Baden Leopoldsquelle	AT	6
19	Baden Mariazellerhofquelle	AT	6
20	Baden Marienquelle	AT	6
21	Baden Peregriniquelle	AT	6
22	Baden Peterhofquelle	AT	6
23	Baden Römerquelle	AT	6
24	Baden Sauerhofquelle	AT	6
25	Blumau 1/1a	AT	7
26	Blumau 2	AT	7
27	Blumau 3	AT	7
28	Köflach Th 1	AT	8
29	Linsberg TH1b	AT	9
30	Loipersdorf 1 (Binderberg 1)	AT	10
31	Loipersdorf 2 (Lautenberg 1)	AT	10
32	Lutzmannsburg TH2	AT	11
33	Lutzmannsburg Therm 1	AT	11
34	Oberlaa TH I	AT	12
35	Oberlaa TH II	AT	12
36	Pirawarth Thermal 1	AT	13

LEGEND OF BOREHOLES

Borehole code	Borehole name	Country	Organization code
37	Radkersburg 2	AT	14
38	Radkersburg Sicherheitsbohrung 3a	AT	14
39	Radkersburger Stadtquelle	AT	14
40	Seewinkel Th 1	AT	15
41	Stegersbach TH2	AT	16
42	Stegersbach Therm 1	AT	16
43	Vöslau 6/1	AT	17
44	Vöslau 7	AT	17
45	Vöslau Ursprungsquellen	AT	18
46	Waltersdorf 1	AT	19
47	Waltersdorf 2a	AT	19
48	Waltersdorf 4	AT	20
49	Abda K-12	HU	21
50	Ács K-67	HU	22
51	Acsád K-3	HU	40
52	Adásztevel K-10	HU	23
53	Adásztevel K-11	HU	23
54	Almásneszmély K-10	HU	24
55	Almásneszmély K-4	HU	25
56	Almásneszmély K-9	HU	26
57	Alsópáhok B-7	HU	27
58	Alsópáhok K-4	HU	28
59	Alsópáhok K-6	HU	28
60	Bábolna K-47	HU	29
61	Bábolna K-52	HU	30
62	Bábolna K-53	HU	30
63	Babót K-6	HU	31
64	Bakonyszombathely K-9	HU	32
65	Bázakerettye K-1	HU	33
66	Beled B-13	HU	31
67	Bő K-1	HU	40
68	Bókaháza K-1	HU	34
69	Borgáta K-2	HU	35
70	Borgáta K-6	HU	35
71	Bősárkány B-1/A	HU	36
72	Bük K-10	HU	37
73	Bük K-16	HU	37
74	Bük K-19	HU	38

LEGEND OF BOREHOLES			
Borehole code	**Borehole name**	**Countr y**	**Organization code**
75	Bük K-20	HU	37
76	Bük K-22	HU	39
77	Bük K-24	HU	40
78	Bük K-38	HU	37
79	Bük K-4	HU	37
80	Celldömölk K-43	HU	41
81	Celldömölk K-45	HU	41
82	Celldömölk K-46	HU	41
83	Celldömölk K-60	HU	41
84	Cirák B-3	HU	31
85	Csabrendek K-10	HU	42
86	Csabrendek K-9	HU	42
87	Csepreg K-8	HU	43
88	Csonkahegyhát K-1	HU	44
89	Csorna K-47	HU	45
90	Csorna K-60/a	HU	31
91	Csorna K-61	HU	31
92	Csorna K-69	HU	46
93	Csurgó B-12/A	HU	47
94	Dőr-1	HU	48
95	Duka K-3	HU	28
96	Duka-1	HU	48
97	Dunaalmás K-12	HU	49
98	Dunaalmás K-15	HU	50
99	Egyed B-1	HU	31
100	Esztergom B-46	HU	51
101	Esztergom B-5	HU	52
102	Esztergom B-86	HU	53
103	Esztergom K-107	HU	26
104	Esztergom K-108	HU	26
105	Esztergom K-87	HU	54
106	Esztergom K-88	HU	54
107	Fertőd K-44	HU	55
108	Galambok K-7	HU	56
109	Gecse K-6	HU	23
110	Gelse K-5	HU	57
111	Gutorfölde B-4	HU	58
112	Gutorfölde B-5	HU	58

LEGEND OF BOREHOLES			
Borehole code	**Borehole name**	**Country**	**Organization code**
113	Gutorfölde K-10	HU	59
114	Gutorfölde K-6	HU	60
115	Gutorfölde K-7	HU	60
116	Gutorfölde K-8	HU	60
117	Gutorfölde K-9	HU	59
118	Győr B-12/A	HU	61
119	Győr B-148	HU	62
120	Győr B-181	HU	63
121	Győr B-60	HU	62
122	Győr B-81	HU	62
123	Győr B-87/a	HU	64
124	Győr K-107	HU	65
125	Győr K-109	HU	65
126	Győr K-139	HU	66
127	Győr K-80/A	HU	67
128	Győrszemere K-5	HU	68
129	Győrszemere K-7	HU	69
130	Gyűrűs K-1	HU	58
131	Hegyhátszentmárton K-1	HU	70
132	Hegykő B-5/A	HU	71
133	Hegykő B-9	HU	71
134	Hegykő K-20	HU	71
135	Hévíz B-1	HU	42
136	Hévíz B-12	HU	72
137	Hévíz B-14	HU	73
138	Hévíz B-15	HU	74
139	Hévíz B-17/A	HU	75
140	Hévíz B-18	HU	72
141	Hévíz B-23	HU	76
142	Hévíz B-23	HU	72
143	Hévíz B-28	HU	73
144	Hévíz B-32	HU	73
145	Hévíz B-4/A	HU	77
146	Hévíz B-7	HU	73
147	Hévíz B-8	HU	73
148	Hévíz B-9	HU	72
149	Hévíz K-10	HU	72
150	Hévíz K-11/A	HU	72

LEGEND OF BOREHOLES			
Borehole code	**Borehole name**	**Country**	**Organization code**
151	Hévíz K-19	HU	28
152	Hévíz K-30	HU	28
153	Hévíz K-33	HU	75
154	Hévíz spring	HU	73
155	Hosztót K-1	HU	78
156	Jánossomorja B-81	HU	31
157	Jánossomorja K-107	HU	31
158	Káld K-9	HU	79
159	Káptalanfa K-1	HU	42
160	Kapuvár K-61	HU	80
161	Kapuvár K-71	HU	80
162	Kapuvár K-77	HU	81
163	Kapuvár K-84	HU	80
164	Kehidakustány K-10	HU	82
165	Kehidakustány K-11	HU	83
166	Kehidakustány K-12	HU	83
167	Kehidakustány K-4	HU	28
168	Kehidakustány K-8	HU	83
169	Keszthely K-19	HU	28
170	Komárom B-62	HU	84
171	Komárom K-109	HU	85
172	Komárom K-21	HU	84
173	Körmend B-17	HU	43
174	Körmend K-19	HU	86
175	Körmend K-27	HU	43
176	Körmend K-63	HU	43
177	Kup K-3	HU	87
178	Lébénymiklós B-28	HU	88
179	Lébénymiklós B-40	HU	88
180	Lenti B-33	HU	89
181	Lenti B-34	HU	89
182	Lenti K-12	HU	89
183	Lenti K-21	HU	89
184	Lenti K-23	HU	89
185	Letenye K-59	HU	90
186	Lipót K-10	HU	91
187	Lipót K-7	HU	91
188	Marcaltő K-4	HU	92

LEGEND OF BOREHOLES			
Borehole code	**Borehole name**	**Country**	**Organization code**
189	Máriakálnok K-32	HU	93
190	Mesteri K-3/a	HU	94
191	Mesteri K-8	HU	94
192	Mezőlak K-12	HU	95
193	Mihályi K-11	HU	31
194	Mórichida K-20	HU	96
195	Mosonmagyaróvár B-123	HU	97
196	Mosonmagyaróvár K-136	HU	97
197	Mosonmagyaróvár K136.	HU	97
198	Mosonszentjános B-1	HU	98
199	Nagycenk K-11	HU	99
200	Nagygörbő	HU	48
201	Nagykanizsa B-62	HU	100
202	Nagykanizsa K-85	HU	101
203	Nagykanizsa K-86	HU	101
204	Nagylengyel K-9	HU	58
205	Nagylózs-1	HU	48
206	Nemesbük K-1	HU	28
207	Nemesbük K-3	HU	28
208	Ormándlak B-23	HU	102
209	Ormándlak B-24	HU	102
210	Ormándlak K-25	HU	102
211	Ormándlak K-26	HU	102
212	Ormándlak K-27	HU	102
213	Pannonhalma K-12	HU	103
214	Pannonhalma K-6	HU	103
215	Pápa K-18/a	HU	104
216	Pápa K-35	HU	104
217	Petőháza B-11	HU	105
218	Pölöske K-8	HU	58
219	Pusztaederics B-1	HU	106
220	Pusztaszentlászló K- 2	HU	107
221	Rábacsanak K-16	HU	108
222	Rábafüzes K-4	HU	109
223	Rábafüzes K-5	HU	109
224	Rábapordány B-2/a	HU	110
225	Rábasebes K-12	HU	111
226	Rábaújfalu K-7	HU	31

LEGEND OF BOREHOLES

Borehole code	Borehole name	Country	Organization code
227	Rádóckölked K-3	HU	112
228	Raposka-HgN84	HU	48
229	Répcelak B-17	HU	113
230	Répcelak B-7	HU	113
231	Répcelak K-16	HU	43
232	Rezi K-4	HU	48
233	Salomvár K-2	HU	114
234	Sárvár B-17	HU	115
235	Sárvár B-27	HU	115
236	Sárvár B-35	HU	116
237	Sárvár B-44	HU	117
238	Sárvár B-51	HU	115
239	Sárvár B-7	HU	116
240	Sárvár K-19/a	HU	118
241	Sárvár K-23	HU	119
242	Sárvár K-36	HU	119
243	Sárvár K-53	HU	120
244	Sopron K-44	HU	121
245	Sümeg B-1	HU	78
246	Sümeg B-8	HU	122
247	Szárföld K-2	HU	123
248	Szécsisziget K-2	HU	124
249	Szeleste K-5	HU	125
250	Szeleste K-7	HU	125
251	Szentgotthárd B-44	HU	126
252	Szentgotthárd K-41/A	HU	43
253	Szentgyörgyvár K-2	HU	28
254	Szil B-3	HU	127
255	Szombathely B-108	HU	43
256	Szombathely B-11	HU	43
257	Szombathely B-46/A	HU	43
258	Szombathely B-47/B	HU	43
259	Szombathely K-43/C	HU	43
260	Szombathely K-71	HU	128
261	Szomód K-5	HU	49
262	Szomor K-3	HU	129
263	Tapolca B-28	HU	130
264	Tapolca K-15/A	HU	131

LEGEND OF BOREHOLES

Borehole code	Borehole name	Country	Organization code
265	Tapolca K-16	HU	131
266	Tata B-47	HU	51
267	Tata B-48	HU	51
268	Tata K-28/a	HU	26
269	Tata K-31	HU	132
270	Tata K-34	HU	133
271	Tata K-35	HU	134
272	Tata K-39	HU	132
273	Tata K-61	HU	135
274	Tata K-63	HU	135
275	Tét B-12	HU	31
276	Tét B-13	HU	31
277	Tófej K-5	HU	136
278	Ukk K-4/A	HU	92
279	Vág B-17	HU	137
280	Vág K-22	HU	23
281	Várvölgy K-4	HU	28
282	Vasvár K-10	HU	138
283	Visegrád K-7	HU	139
284	Zalacsány B-2	HU	140
285	Zalacsány Zcs-1	HU	48
286	Zalaegerszeg B-21	HU	141
287	Zalaegerszeg K-193	HU	142
288	Zalaegerszeg K-249	HU	142
289	Zalaegerszeg K-286	HU	143
290	Zalagyömörő K-4	HU	92
291	Zalakaros K-11	HU	144
292	Zalakaros K-12	HU	47
293	Zalakaros K-14	HU	144
294	Zalakaros K-15	HU	144
295	Zalakaros K-16	HU	144
296	Zalakaros K-18	HU	145
297	Zalakaros K-5	HU	144
298	Zalakaros K-6	HU	144
299	Zalakaros K-7	HU	47
300	Zalakaros K-8	HU	144
301	Zalakomár K-11	HU	144
302	Zalalövő K-11	HU	146

LEGEND OF BOREHOLES

Borehole code	Borehole name	Country	Organization code
303	Zalaszántó K-1	HU	147
304	Zalaszentgrót K-37	HU	148
305	Zalaszentgrót K-72	HU	149
306	Zsira-1	HU	48
307	B-2/85	SI	150
308	B-3/88	SI	150
309	Be-2/04	SI	151
310	Do-1/67	SI	152
311	Do-3g/05	SI	153
312	Fi-14/57	SI	154
313	Jan-1/04	SI	155
314	Kor-1gα/08	SI	156
315	Le-1g/97	SI	157
316	Le-2g/94	SI	158
317	Le-3g/08	SI	158
318	Mb-1/90	SI	159
319	Mb-2/91	SI	159
320	Mb-4/91	SI	159
321	Mo-1/58/73	SI	160
322	Mo-2g/08	SI	160
323	Mt-1/60	SI	161
324	Mt-2/61	SI	162
325	Mt-4/74	SI	161
326	Mt-5/82	SI	161
327	Mt-6/82	SI	161
328	Mt-7/93	SI	161
329	Mt-8g/06	SI	163
330	P-1/73	SI	164
331	P-2/88	SI	164
332	P-3/05	SI	164
333	Pt-20/49	SI	157
334	Pt-74/50	SI	157
335	Sob-1/87	SI	165
336	SOB-2/88	SI	166
337	T-4/88	SI	167
338	T-5/03	SI	167
339	Ve-1/57	SI	168
340	Ve-2/57	SI	168

LEGEND OF BOREHOLES			
Borehole code	**Borehole name**	**Countr y**	**Organization code**
341	Ve-3/91	SI	168
342	BL-1	SK	169
343	BPK-1	SK	170
344	BPK-2	SK	170
345	BS-1	SK	171
346	Č-1	SK	172
347	Č-2	SK	172
348	ČR-1	SK	173
349	Di-1	SK	174
350	Di-2	SK	175
351	Di-3	SK	175
352	DS-1	SK	176
353	DS-2	SK	177
354	FGB-1	SK	178
355	FGB-1/A	SK	178
356	FGČ-1	SK	179
357	FGDŽ-1	SK	180
358	FGG-1	SK	181
359	FGG-2	SK	182
360	FGG-3	SK	182
361	FGGa-1	SK	183
362	FGHP-1	SK	184
363	FGK-1	SK	185
364	FGKr-1	SK	186
365	FGS-1	SK	187
366	FGS-1/A	SK	187
367	FGŠ-1	SK	188
368	FGT-1	SK	189
369	FGTv-1	SK	190
370	FGV-1	SK	191
371	GN-1	SK	192
372	GNZ-1	SK	193
373	GRP-1	SK	202
374	GŠM-1	SK	194
375	GTM-1	SK	195
376	GTŠ-1	SK	196
377	HGŽ-1	SK	197
378	HTŠ-2	SK	198

LEGEND OF BOREHOLES			
Borehole code	**Borehole name**	**Countr y**	**Organization code**
379	HTŠ-3	SK	198
380	HBV-1	SK	199
381	HBV-2A	SK	199
382	M-2	SK	200
383	M-3	SK	200
384	OPKS	SK	188
385	PGT-11	SK	201
386	Po-1	SK	202
387	RGL-1	SK	203
388	RGL-2	SK	204
389	SB-1	SK	205
390	SB-2	SK	205
391	SB-3	SK	205
392	VČR-16	SK	206
393	VDK-15	SK	207
394	VHP-12-R	SK	184
395	VŠ-1	SK	188
396	VŠE	SK	208
397	VTP-11	SK	209
398	VZK-10	SK	210
399	VZO-13	SK	211
400	VZO-14	SK	212
401	Csepreg K-13	HU	28