

OVERVIEW OF EUROPEAN GEOTHERMAL PROJECTS IN BELGIUM

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Estelle Petitclerc, geologist/geothermal energy (SGB-IRSNB)

Contact: Estelle.petitclerc@naturalsciences.be



R&D IN GEOTHERMAL ENERGY IN BELGIUM

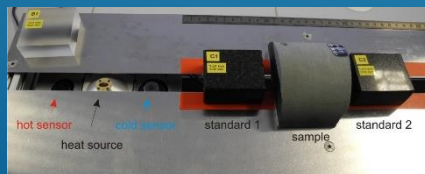
- ▶ Investment in geothermal research and development have essentially focused until 2015 **on characterizing the sub-surface potential**
- ▶ 2005-2009: **0,24 M€** were invested on R&D
- ▶ 2009-2015: **13,40 M€** of funding on geothermal R&D (95% public 5% private funding)
- ▶ EU projects represent a large amount of these funding in Belgium
- ▶ Belgian research teams acquired a large experience through these projects...



Yellowstone, Belgian Pool, USA



Drilling « Bois de la Cambre », January 2017



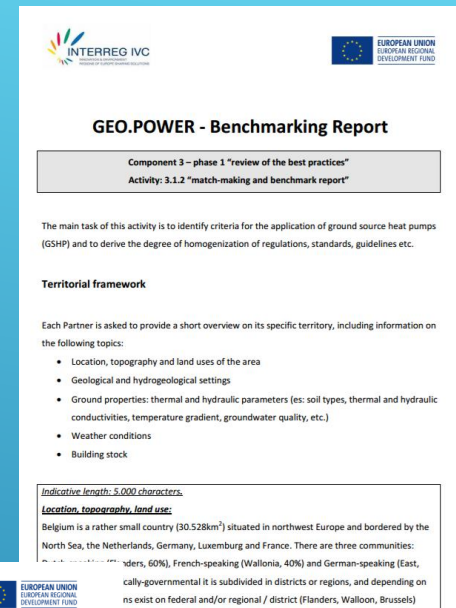
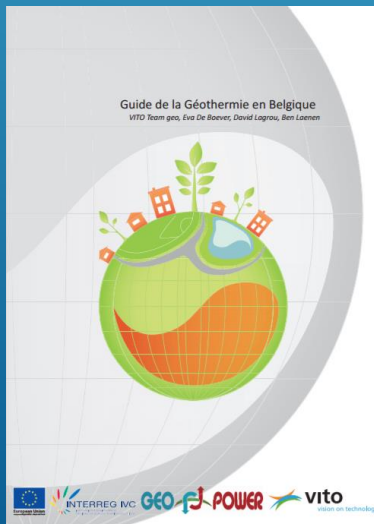
Thermal laboratory analyses at GSB

EUROPEAN PROJECTS LINKED TO BELGIUM

- **Geotrainet** ➔ Non technical barriers, Training for shallow geothermal energy
- **Regeocities**
- **GeoPower** ➔ Promote the use of geothermal energy
- **ThermoMap** ➔ Mapping very shallow geothermal potential <10m
- **ESTMAP** ➔ Energy storage (not only thermal)
- **Mijnwater** ➔ First mine water geothermal plant
- **Cheap GSHP** ➔ Systems efficiency/ reduction of the installation costs.



- 2010-2012 (Partner: VITO), INTERREG IVC program
- Result : elaboration of 11 in-depth and well-tailored **action plan** (in each project region) on technical and financial criteria of applying GCHP systems together with the legislative solutions on how to promote the use of geothermal energy in residential, industrial and agriculture sector....
- Geothermal guidebook for Be with definitions, best practices, recommendations...



INTERREG IVC
EUROPEAN UNION
EUROPEAN REGIONAL
DEVELOPMENT FUND

GEO.POWER

Component 3 – phase 2 “Assessment for BPs transferability & local adaptation”
Activity: 3.2.1 “Evaluation of the reproducibility of BP in each area”

GEO.POWER SWOT Analysis & Transferability Assessment

PART I - External analysis (OT)

Name of region/area: Belgium (Flanders)	External analysis	Opportunities (O)	Threats (T)	Score (S)
Market segment size	As Belgium is behind in GSHP development in Europe, the market needs a boost by showing potential in other countries	about 13 000 GSHP's installed; compared to neighbouring countries a very small number		1
Growth rate	growing, but not a “booming” market. 1250 units in 2010, 1000 units in 2011	market is slightly growing, but not every project is successful which can lead to bad publicity and growing pains		-1
Interest from customers	high energy pricing worries current building owners which enhances interest to alternatives, minimal building energy requirements also push customer interest	despite several very nice cases and a large potential, the actual numbers of geothermal applications is still low		2
Degree of acceptance	all renewables are promoted strongly which enhances degree of acceptance	bad publicity by troubling GSHP installations in 80's has developed bad degree of acceptance in the past		2
Price sensitivity	A lot of competitor drillers are on the GSHP market which shows pressure on price setting	Market grows, at some times there is a lack of drilling rigs causing higher pricing		1
Attracting cooperation	no specific cooperation opportunities	no specific cooperation threats		0
Job creation potential	drillings for installing vertical loops are very labour intensive, in 2011 about 5 extra drilling and HP installing teams are required	uncertainty on market growth leads to careful approach by drillers / HVAC installers for extra investments / job creation		1
Government subsidies and incentives	the market growth is small but sure, since incentives are insufficient to have major impact anyway, growth is not dependent on it and thus more secured regarding future HP development	support is rather limited with minimal impact on economics, it's not significant in order to induce market growth		-1
Growing economy	despite European crisis dealt with in 2011, Belgian economy grew as one of the best - top 5-	Forecast of economy growth are rather dramatic on short and mid term perspective		-1

1

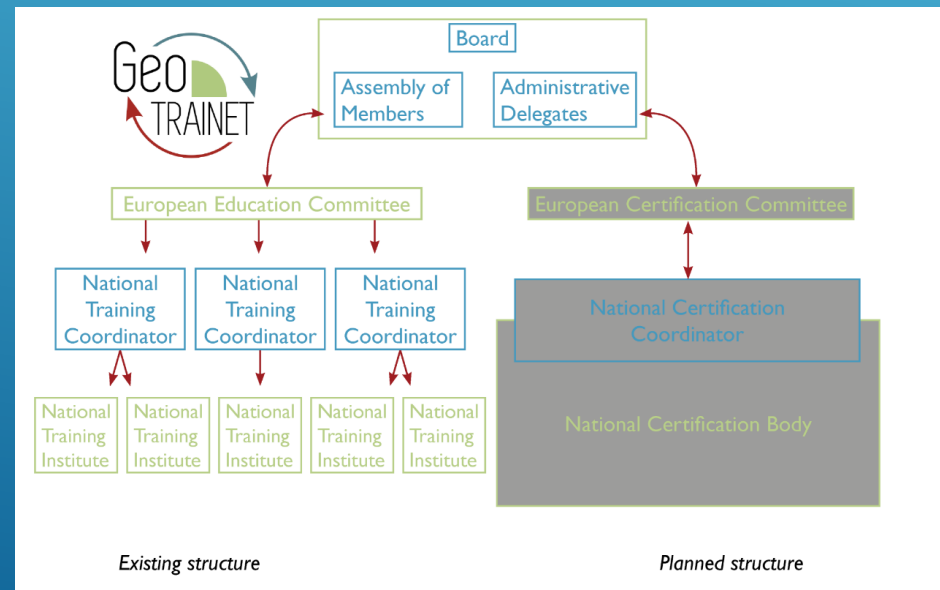
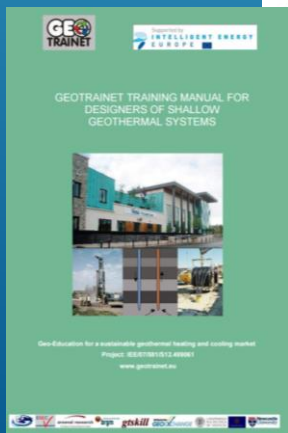
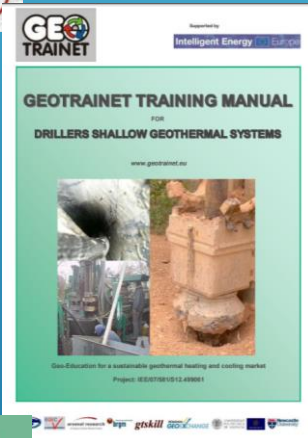
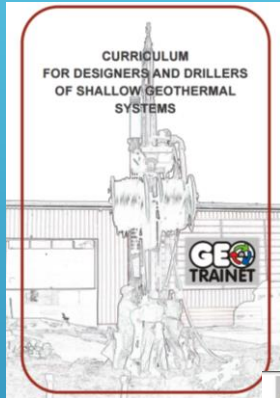
► <http://geotrainet.eu/>

► 2008-2011 (Consultancy: GSB)

► The GeoTrainet project was set up to develop an educational programme which could provide a benchmark standard for training in the sector.

► Main results: courses, manuals (3)

► Continue as association since 2014 (Thomas Moore University= coordinator for Be, Be regions and SGB are also involved)

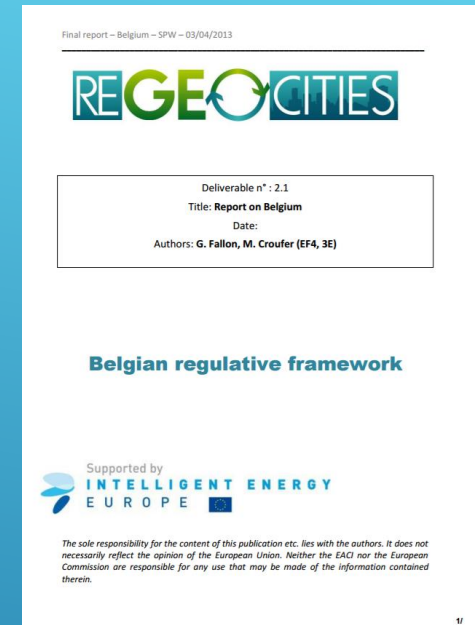


► 2012-2015 (Partner: Walloon Region, +GSB consultancy)

- REGEOCITIES worked on the integration of shallow Geothermal Energy at a local and regional level. It examined and promoted best practices and an intelligent regulatory framework,
- **Overcome barriers** referred to regulation of geothermal resources and administrative procedures

► Results: reports , analyses, tools, brochures, factsheets are available

- Overview of Shallow Geothermal Legislation in Europe
- Best practice analysis report
- Database and tools for public authorities
- Report on the Belgian regulatory framework



ENREGISTREMENT DE L'OPERATION

A. PROPRIETAIRE OU SON REPRESENTANT		E. SYSTEMES EN BOUCLE FERMEE	
A.1. Nom		E.1. Type de boucle	
A.2. Adresse (rue/h°/Code Postal)		E.2. Puissance installée	kW
A.3. Ville		E.3. Nombre de boucles	
A.4. Téléphone		E.4. Sondes verticales: longueur totale	m
A.5. E-mail		E.5. Sondes verticales: Profondeur Max	m
B. LOCALISATION DE L'OPERATION		E.6. Ecartement moyen entre les sondes	m
B.1. Adresse (rue/h°/Code Postal)		E.7. Type antigel et concentration	g/m ³
B.2. Ville		E.8. Résultats du TRT : (Δ) et résistance thermique	W/m/K and (mK)/W
B.3. Localité		F. SYSTEMES BOUCLE OUVERTE (EAU SOUTERRAINE)	
B.4. Région / Département		F.1. Nombre de forages	
B.5. Coordonnées ⁽¹⁾ (Longitude/Latitude)		F.2. Profondeur (max)	m
B.6. Cadastre unit		F.3. Débit d'exploitation	m ³ /h
B.7. Inclure carte de localisation		F.4. Impact thermique	
C. INFORMATION SUR LE BATIMENT		F.5. Rejet de l'eau prélevée:	
C.1. Type de bâtiment / Année de construction		G. POMPE A CHALEUR-PAC	
C.2. Surface au sol	m ²	G.1. Nombre de PAC	
C.3. Besoin annuel de chaleur	kWh	G.2. Puissance installée (Chaud/Froid)	kW
C.4. Besoin annuel de froid	kWh	G.3. COP / SCOP/COP annuel	
C.5. Besoin annuel eau chaude sanitaire	kWh	G.4. Température de chauffage	°C
D. INFORMATIONS INSTALLATION GEOTHERMIQUE		G.5. Température de refroidissement	°C
D.1. Date de mise en service		H. PERMIS/DECLARATIONS	
D.2. Type de système		H.1.	Type Reference
D.3. Dispositif		H.2.	
NOTES		H.3.	
* Champs obligatoires		H.4.	
(1) Par rapport au point central de l'installation (égéré décaus)		H.5.	

Drop-down list tag

Avant page Applicant

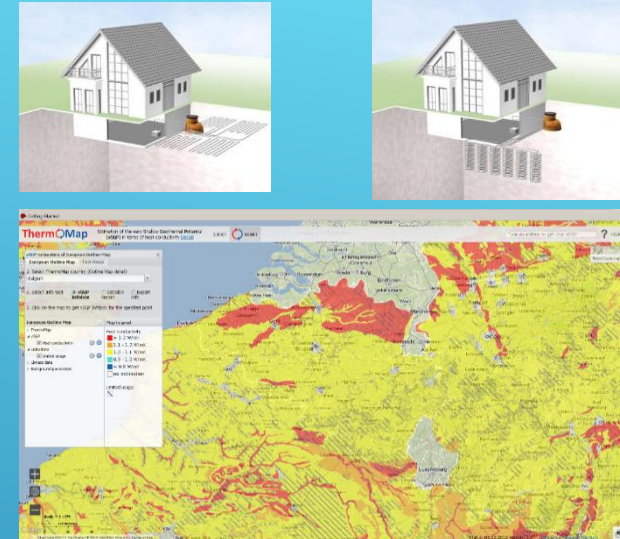
THERMOMAP

► <http://www.heatunderyourfeet.eu/useful-tools/thermomap-mapping-shallow-geothermal-potential-across-europe/>

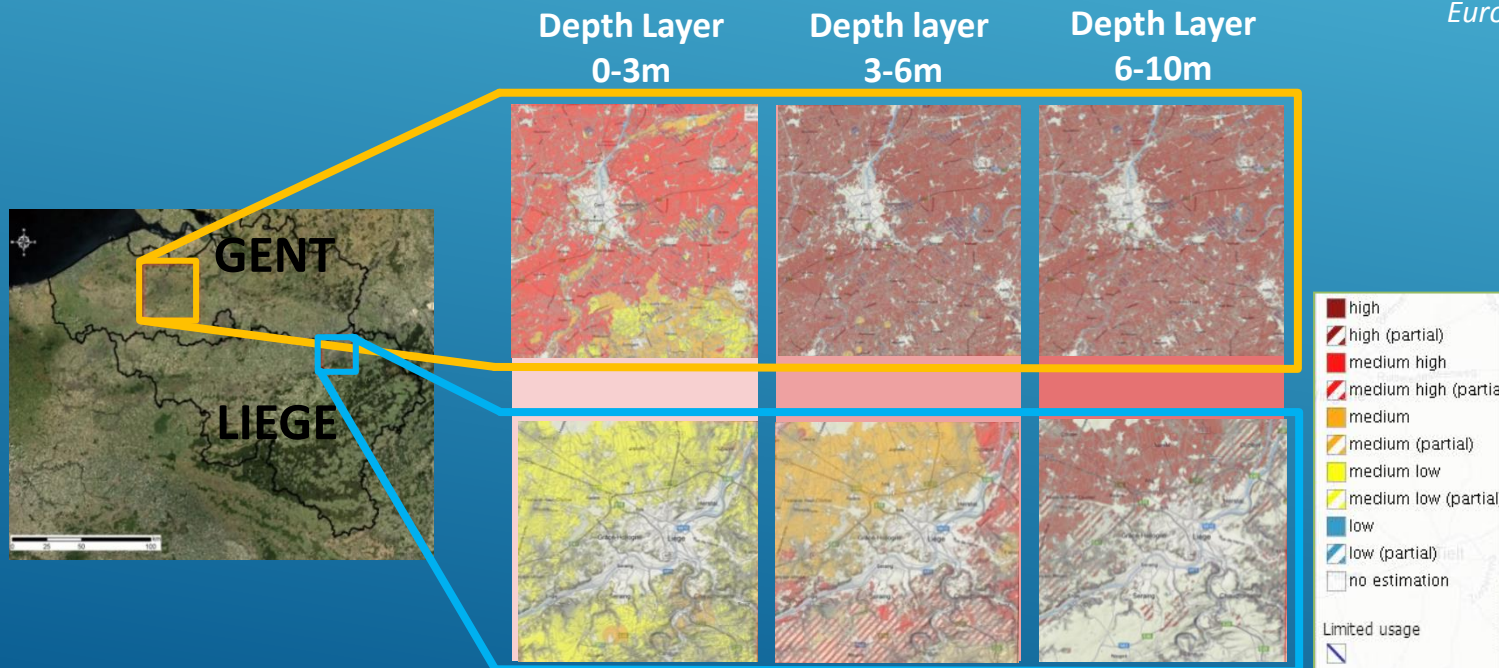
Therm↻**Map**

► 2010-2013 (Partner: GSB), EU-ICT-PSP program

- Estimate the very shallow geothermal potential (<10m) using combined geoscientific data (soil, climatological, topographical, geological, groundwater and administrative data)
- Provide a visualization system (ThermoMap MapViewer)
- Creation further background information on a large (European Outline Map) to medium (14 Test Areas) scale across Europe.



European Outline map (extract)



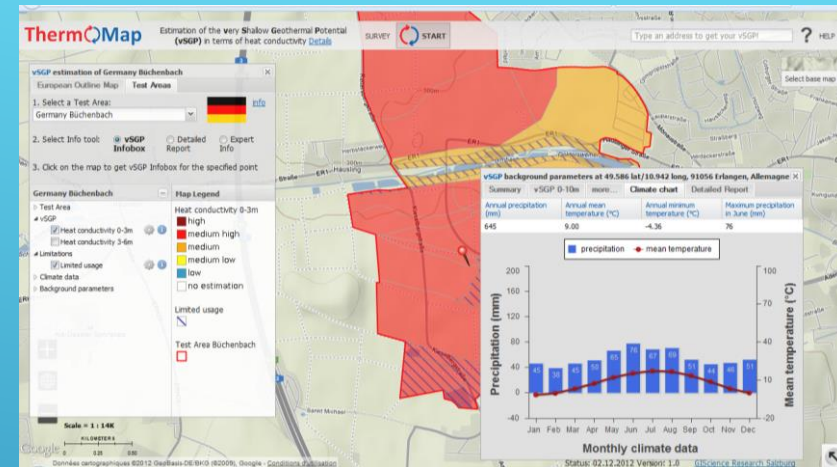
Belgian Test Areas situation and Thermal conductivity maps for each depth layer

THERMOMAP

ThermoMap Mapviewer and calculator

Visualisation of the parameters as maps:

Slope, annual temperature, annual precipitation, water table, thickness of the softrock zone, soil type (WRB classification), **grain size at three depth levels** (USDA classification), **heat conductivity at three depth levels** (Kersten formula)....

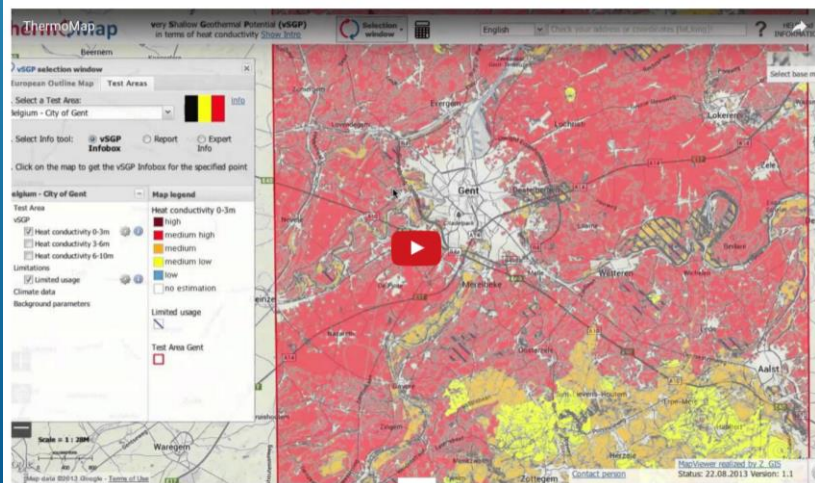


German Test Area vSGP and climatic data

Watch the video !

https://www.youtube.com/watch?v=EYACwM_UHY

INTRODUCTION TO THE THERMOMAP VIEWER AND THE THERMOMAP CALCULATOR



vSGP Calculator
English
ThermMap

Location for Report
Enter an address, location or coordinates [lat, long]:
Apply address

1. General location parameters (optional)

Protection zone :	NO	Slope (°)	Soil type (WRB)
Name:			
Code:		< 15°	Select a soil type
Type:			

2. Climate parameters

Temperature (°C)			Precipitation (mm)		Humidity Index SCHREIBER (1973)
Annual average	Soil temperature (optional)	Annual minimum (optional)	Annual sum	Monthly maximum (optional)	

3. Depth layer specific settings
Select depth layer definition
No depth information (like European Outline Map)

4. Depth layer specific parameters

Bulk density (g/cm³)	Soil texture (USDA)	Water content Vol.-%				Saturation
		minimum (arid/unsaturated)	maximum (arid/unsaturated)	saturated	measured (optional)	
1.3	Select Soil texture group/class					
	Select Soil texture					

5. Calculation

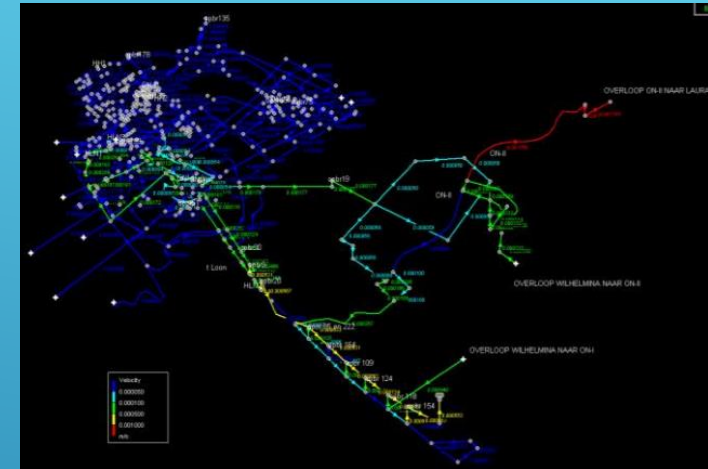
Heat capacity (J/(kg·K))	Heat conductivity (W/mK)	vSGP (Test Area legend)
DESHNER (2007)	KERSTEN (1949)	
Current vSGP value	minimum (arid/unsaturated)	maximum (humid/unsaturated)

6. Report with specified parameters
Person responsible:
Report title:
Reset

2006-2008 (BE Partner: VITO): Interreg North-West Europe

Heerlen (NL): First mine water geothermal plant

- In 2005 feasibility study for the mine water concept
- In 2005, with support from the EU and Agentschap NL, five wells were drilled
- In 2006 the “Minewater Project” started under the Interreg IIIB NEW Programme. It demonstrates how the geothermal energy stored by mine water can be used as a safe and ecological way to heat buildings.
- In 2008 the first mine water geothermal plant in the world, was put into operation: 52000 m² of indoor space were connected and heated....

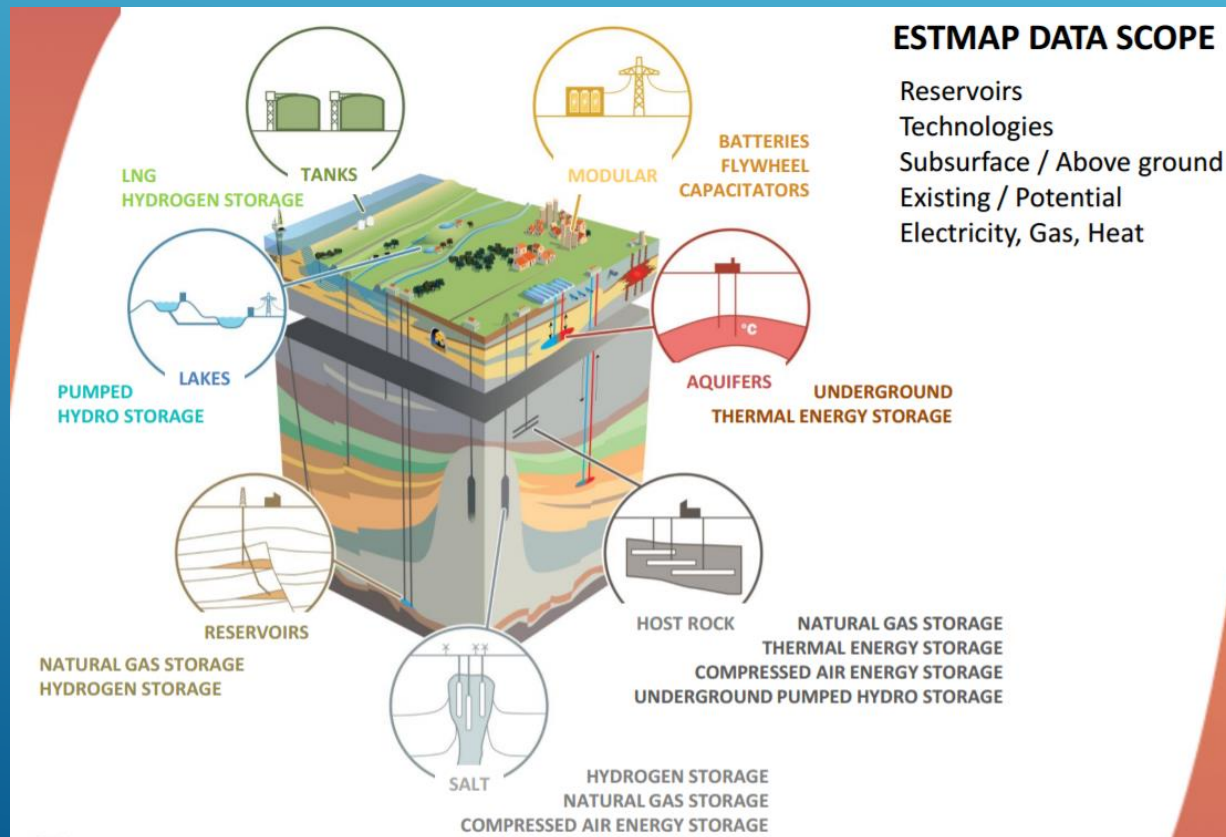


3D model of the underground geometry of the mine with overview of the flow and initial temperature conditions (VITO)

► **2014-2016, (Partner: VITO, subcontractor: EGS (SGB for Wallonia region))**

Contribute to energy storage development:

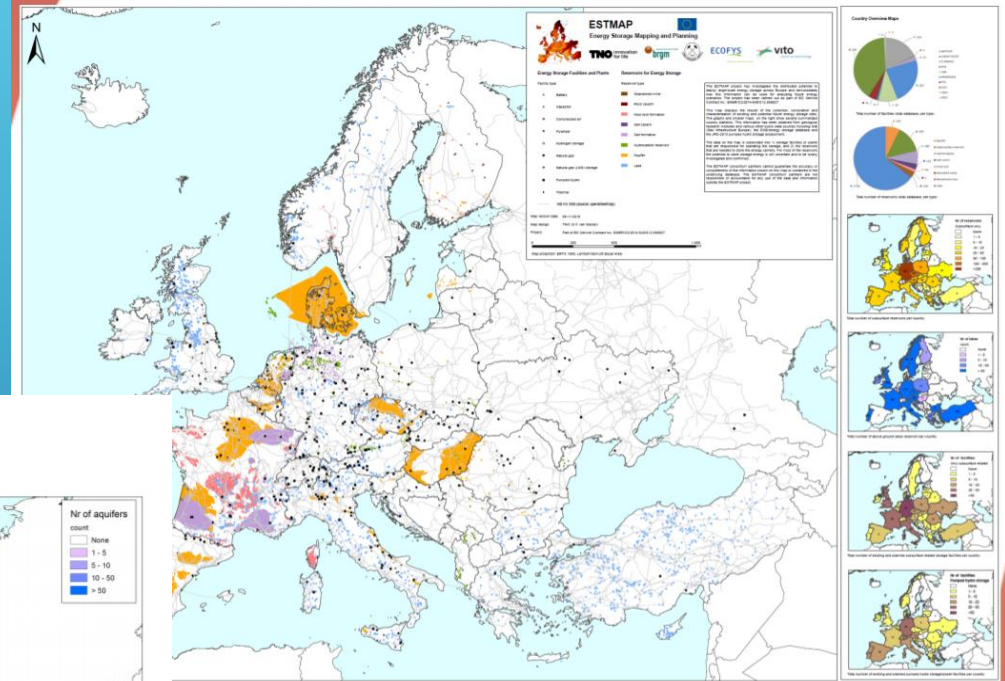
- Key knowledge and information on Europe's energy storage potential
- Spatial energy storage database for electricity, gas and heat technologies
- Case demonstration of European energy systems analysis and planning



Main results: Geographical energy storage database

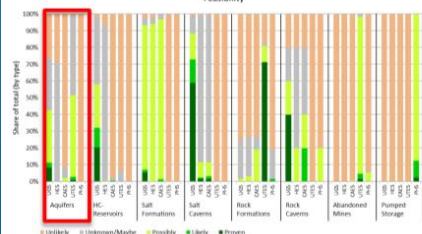
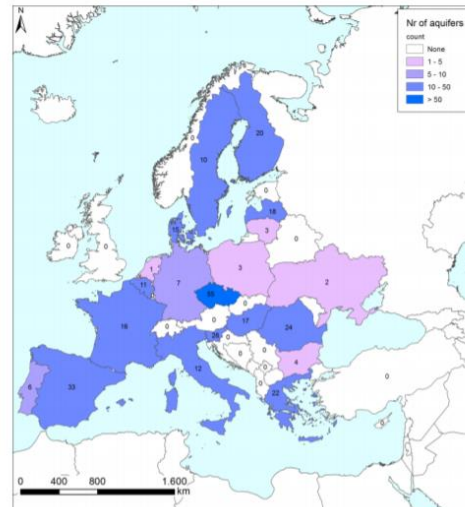
-> available online in February 2017

Geographical energy storage database

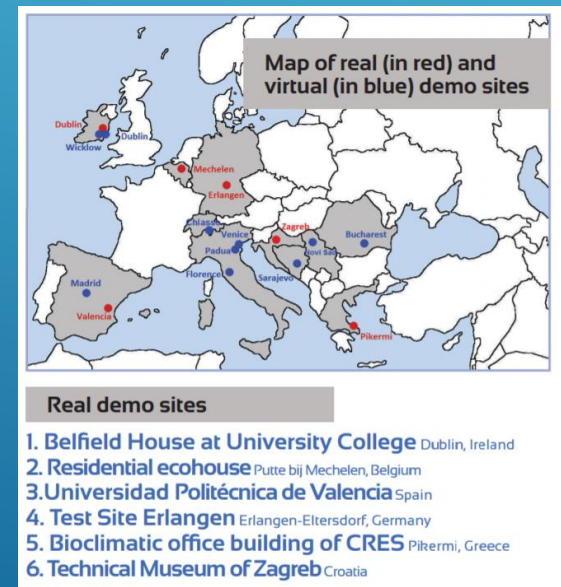


EU summary of collected sites: Aquifers

- Widely distributed reservoir type
- ~50% site-specific potential including good indication of capacity.
- The other half concerns regional formations without defined site-specific potential and capacities (regional): Focus areas for further identification and confirmation of realizable potential
- Key target for UGS and UTES. Competing uses: CO₂ storage and Geothermal
- Scope for including more aquifers (regional mapping, characterization, assessment)



- 2015-2019 (Be Partner: GeoGreen), GSB participate for laboratory analyses; H2020 program
- To reduce the total cost of shallow geothermal systems by 20-30 % (innovative vertical borehole installation technology, design of coaxial steel GSHE and newly designed basket type GSHE's)
- development of **more efficient and safe shallow geothermal systems**
- develop a **decision support system** (DSS) and other design tools covering the geological aspects, feasibility and economic evaluations
- The developments will be demonstrated in six sites whilst the tools will be applied to several virtual demo cases.



Thank you for your attention!

Bedankt voor uw aandacht!

Merci pour votre attention!

