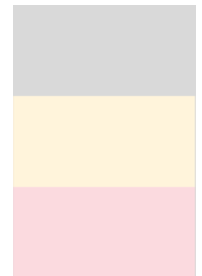
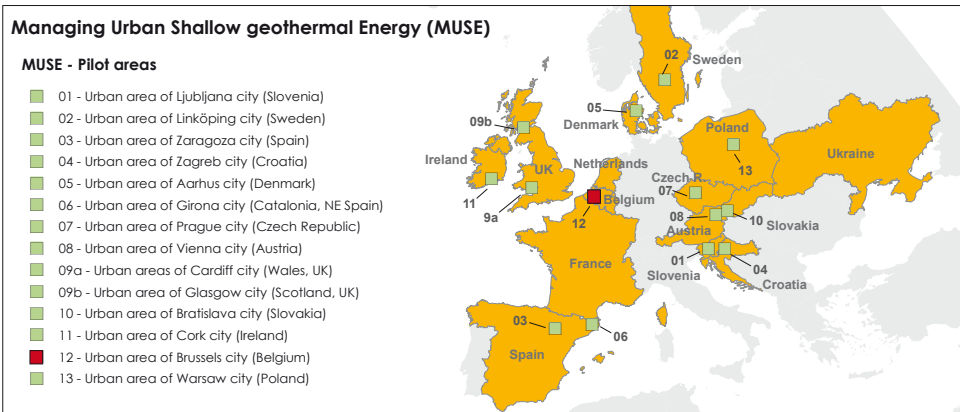




Pilot area information



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The MUSE Brussels Pilot Area is represented by the entire Brussels Region (RBC) (161.4km²). Most of the shallow geothermal systems installed are closed vertical loops (85%). Unfortunately, collecting information on existing small geothermal installations (below 10kW) is complex because no legal authorization/declaration is currently legally required in RBC.

The shallow geological setting in RBC is highly diverse and therefore widely suitable to different GSHP applications. The variability of underground conditions (from soft Tertiary sediments to Cambrian quartzite, from 1 aquifer to 5 aquifers available) in an urban context implies different techniques and variable costs related. The importance to well characterize the SGE potential and interaction with other resources in this area appears essential for the development of the SGE market.

Despite several incentives/grants by regional governments, market of shallow geothermal development hasn't grown in the way it was expected over the past few years, but a new positive trend last months is observed in RBC.

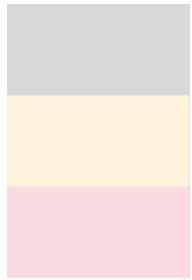
Pilot Area	Brussels
Task (MUSE)	T-4.13
Country	Belgium
Area (km ²)	161.38 km ²
Total number of inhabitants (date)	1,205,309
Inhabitants per km ²	468.76
Level of urbanization	86%
Elevation range (m a.s.l.)	10-130

Climatological settings

HDD/CDD data according to EUROSTAT method	
Heating degree days (HDD); [baseline reference values]; (period for data calculations)	2440 [15/18] (2017)
Cooling degree days (CDD); [baseline reference values]; (period for data calculations)	17 [21/24] (2017)
Length of the heating season (days)	Unknown
Length of the cooling season (days)	Unknown

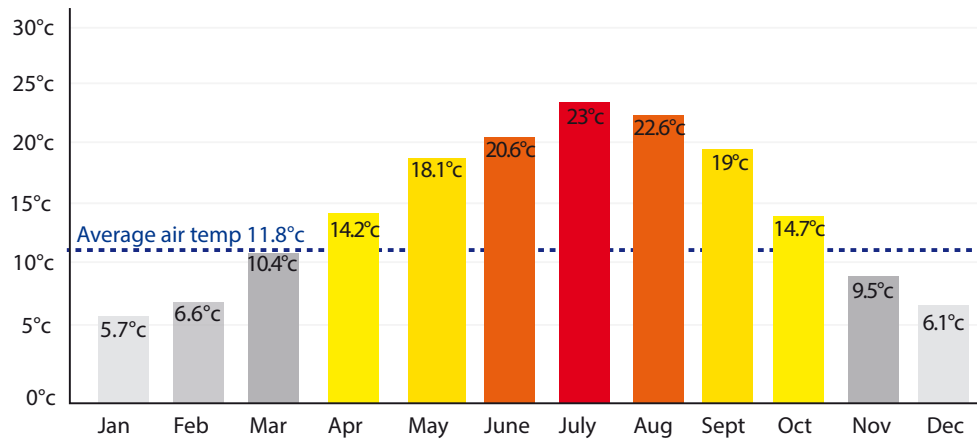
Source of data: Eurostat. <https://ec.europa.eu/eurostat/data/database>

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Average monthly and annual air temperature



Market situation

Number of SGE installations in pilot area	OLS V-CLS	4 (OD) 40 (OD)
Current growth rate	No. of Installations	5% (est)
Estimated share of open loop systems		15% (est)
Estimated share of closed loop systems		85% (est)
Estimated total share of shallow geothermal methods in the heating market	V-CLS	No official figures yet for Brussels but <1%
Other SGE technologies: Eg. Inter-seasonal heat storage schemes or energy piles	UTES	
Estimated total share of RES in the heating energy market (%) (specify local or national values)		12%

Economic boundary conditions

Estimated average installation costs for shallow geothermal systems (€/kW output) ¹	
Open loop systems	1000-2000
Closed loop systems	1800
Estimated average heating costs (€/kWh)	
Open loop systems	Unknown
Closed loop systems	Unknown
Drilling cost range per meter (€/m) for Open Loop	110-225 €/m

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Regional geological and hydrogeological characteristics

The Brussels test site has a Cenozoic soft cover (Quaternary and Tertiary) where aquiferous sandy formations and relatively more impermeable clayey layers alternate. The thickness varies from 10 to over 120m.

This cover rests (unconformably) in the Eastern part of Brussels on the aquifer chalks of the Gulpen Formation (Cretaceous) and then on the faulted and folded Cambro-Silurian basement of the Brabant Massif composed of coherent rocks (shales, sandstones, quartzites). The basement top is usually weathered (argilized) for a few meters. The Cambrian basement is relatively close to the surface (30-40m of depth) the SW of the pilot area (in the Senne Valley), whereas it can deepen to 200m in the North.

Hydrogeology

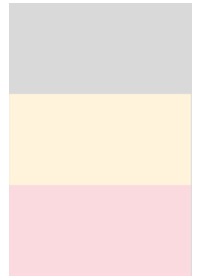
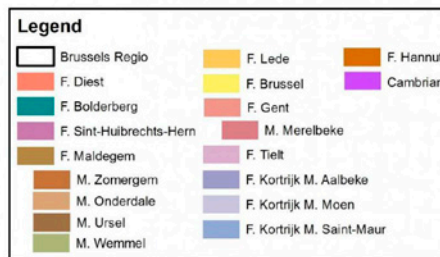
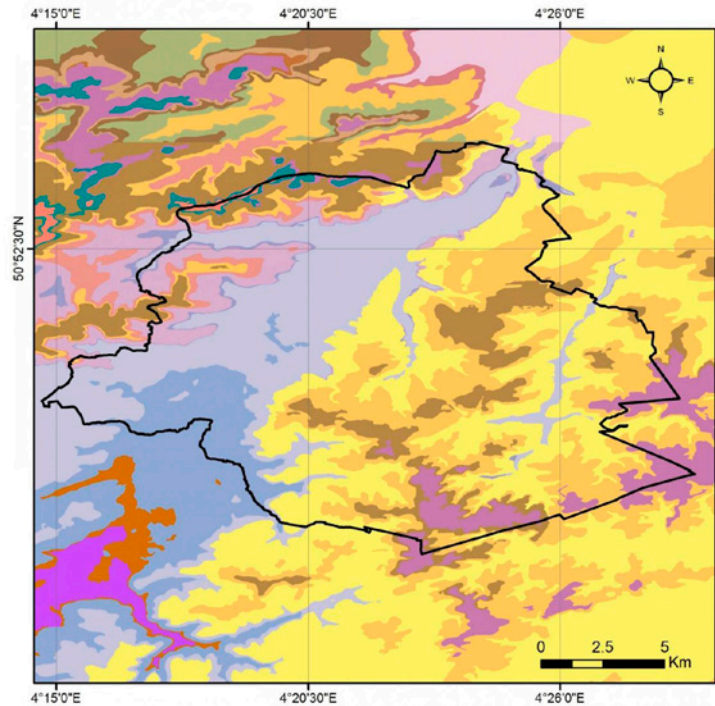
5 target aquifer units in Brussels:
Tertiary sandy layers, Cretaceous chalk, Cambrian fractured reservoir.
Pumping test data available, TRT and eTRT data available.

Depth to water table(s): 3-10m below surface

Aquifers unit thickness variable, hydraulic conductivities data available for some aquifers (3D hydrogeological models exist for 2 aquifers in Tertiary sands).

Thermogeology

Groundwater temperature: 11.8°C (to be validated)



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Summary of works and timeline

Main Objectives	
✓	Evaluation and characterization of geology/ hydrogeology / thermal conditions
✓	SGE assessment resources (for OCS and/or CLS) / and evaluation of UTES-BTES)
	Study of conflicts of use (OLS / GWL - OLS/CLS). Hazards/interferences, effects on subsurface
	Strategies and actions for management and local energy plans

Relation of foreseen tasks	
✓	Data collection (TRT, DTRT, rock samples, GWL, T-profile's etc)
✓	New field works (TRT/geophysics /new samples and lab etc)
✓	Monitoring existing SGE/GWL/T etc)
✓	Mapping (in general terms)
✓	2D/3D Modelling (in general terms)

Detailed summary of works at the Pilot Areas and brief timeline *Planning in progress.*

References

Royal Institute of Meteorology: <https://www.meteo.be/meteo/view/fr/360955-Normales+mensuelles.html>
Brussels Institute of Statistics and Analysis: http://bsa.brussels/themes/population#.W_aGeuhKiUk
Brussels Environnement Institute: <https://environnement.brussels/etat-de-lenvironnement/rapport-2011-2014/contexte-bruxellois/levolution-demographique-en-region>

Contact

Managing Urban Shallow geothermal Energy
Project number GeoE.171.006

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