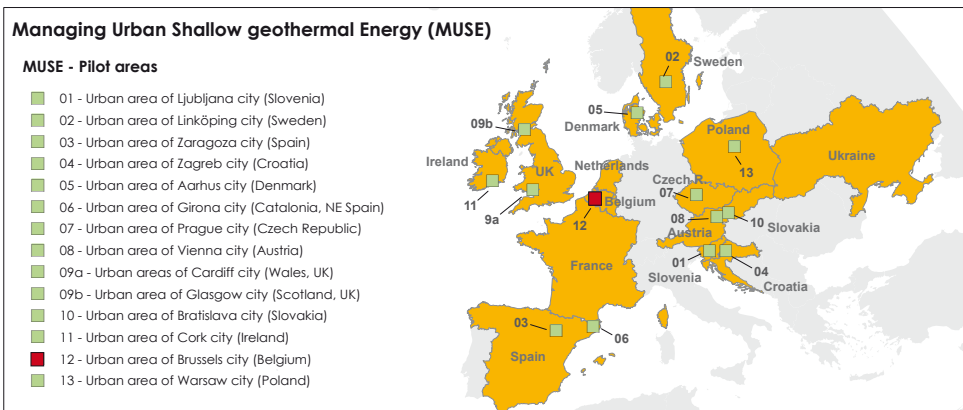




## Pilot area information



The MUSE Brussels Pilot Area is represented by the entire Brussels Region (RBC) (161.4km<sup>2</sup>). 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.

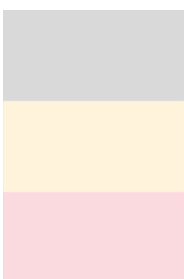
Despite several incentives/grants by regional governments, market of shallow geothermal development hasn't grown in the way it was expected over the past few years, but a new positive trend last months is observed in RBC.

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

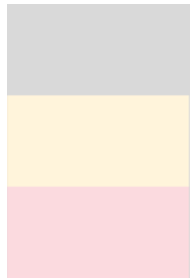
## Climatological settings

| 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>

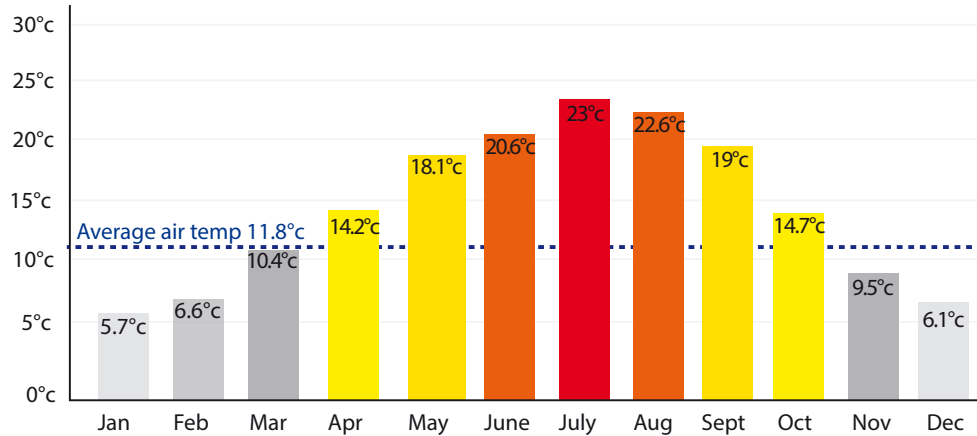


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## Average monthly and annual air temperature



## Market situation

|  |                      |  |
|--|----------------------|--|
| Number of SGE installations in pilot area  | OLS<br>V-CLS         | 4 (OD)<br>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:<br>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) <sup>1</sup> |             |
|--|-------------|
| 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

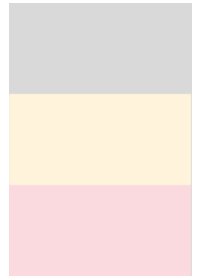
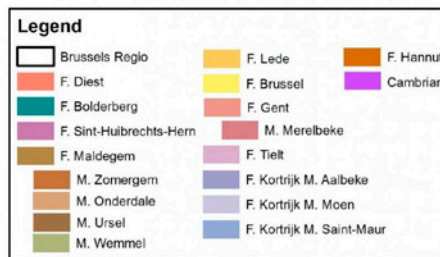
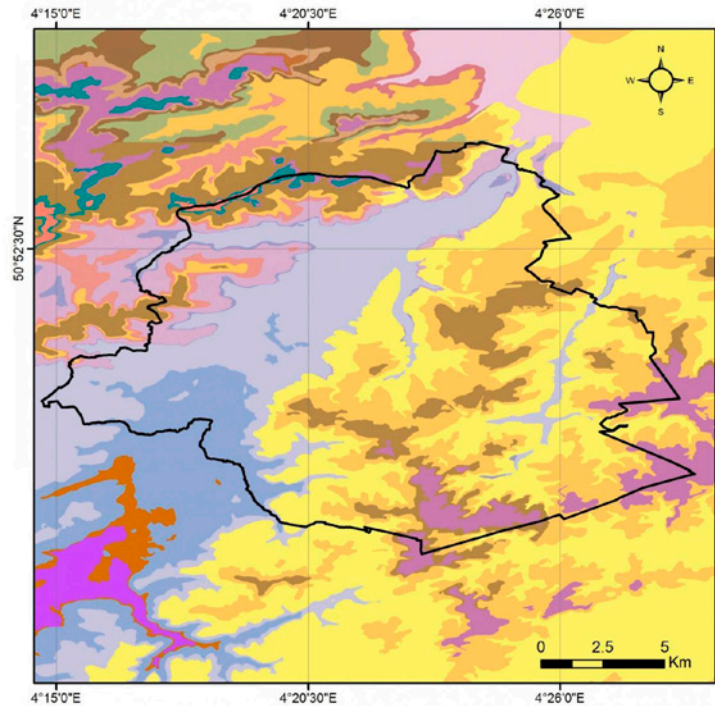
5 target aquifer units in Brussels:  
Tertiary sandy layers, Cretaceous chalk, Cambrian fractured reservoir.  
Pumping test data available, TRT and eTRT data available.

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](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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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731166

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