

Estimation of the sustainable geothermal potential of Vienna

Carolin Tissen (1), Susanne A. Benz (1), Christiane A. Keck (1), Peter Bayer (2), and Philipp Blum (1)

(1) Institute of Applied Geosciences, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany (carolin.tissen@kit.edu),

(2) Faculty of Mechanical Engineering, Technische Hochschule Ingolstadt, Ingolstadt, Germany

Regarding the limited availability of fossil fuels and the absolute necessity to reduce CO₂ emissions in order to mitigate the worldwide climate change, renewable resources and new energy systems are required to provide sustainable energy for the future. Shallow geothermal energy holds a huge untapped potential especially for heating and hot water, which represent up to 50% of the global energy demand. Previous studies quantified the capacity of shallow geothermal energy for closed and open systems in cities such as Vienna, London (Westminster) and Ludwigsburg in Germany.

In the present study, these approaches are combined and also include the anthropogenic heat input by the urban heat island (UHI) effect. The objective of the present study is therefore to estimate the sustainable geothermal potential of Vienna. Furthermore, the amount of energy demand for heating and hot water that can be supplied by open and closed geothermal systems will be determined.

The UHI effect in Vienna is reflected in higher ground water temperatures within the city centre (14 °C to 18 °C) in comparison to lower ones in rural areas (10 °C to 13 °C). A preliminary estimation of the anthropogenic heat flow into the ground water caused by elevated basement temperatures and land surface temperatures is $3,5 \times 10^8$ kWh/a. This additional heat flow leads to a total geothermal potential which is 2.5 times larger than the estimated annual energy demand for heating and hot water in Vienna.