

Bavarian Energy Atlas – Project profile

Energie-Atlas Bayern – Bavaria-wide, spatially detailed estimation of the realizable potential of near-surface geothermal energy for integration into the Bavarian Energy Atlas

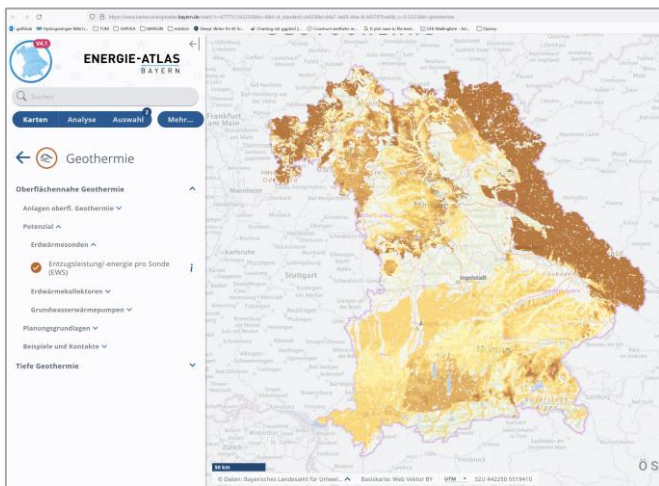


Figure 1: Presentation of near-surface geothermal energy for geothermal probes in the Bavarian Energy Atlas.

The challenge

The Free State of Bavaria plans to be climate-neutral by 2040, and greenhouse gas emissions are to be reduced by 65% per capita by 2030 compared to 1990. The Bavarian Energy Atlas provides local authorities and citizens in Bavaria with an initial overview of the potential of renewable energies that can be implemented in specific areas. Energy action plans and municipal heat planning, in which these potentials are also determined for specific buildings, form a further tool.

Due to the climate crisis and the resulting challenges of achieving specified climate protection targets, the requirements for the use of urban areas are also increasing. These are under increasing strain due to growing population pressure and, in particular, the expansion of underground infrastructure. As a result, the focus is increasingly shifting to the geological subsurface as a carrier of important georesources such as groundwater and rock bodies

Implementation

1) The potential of near-surface geothermal energy was determined for the three most common systems - groundwater heat pumps, borehole heat exchanger and geothermal collectors - in two ways in consultation with the Bavarian State Office for the Environment (LfU): Firstly, the potential is shown Bavaria-wide in the Bavarian Energy Atlas using a grid data set, and secondly, it is calculated for the mixing panel ("Mischpult") on a plot basis and aggregated by municipality. The potentials are presented quantitatively as thermal output (MW) or as energy (MWh/a) in relation to a defined area (10 m x 10 m in the grid data set or plot size in the mixing panel) in order to be comparable with other renewable energy potentials.

2) By comparing the geothermal-technical potential and the heat demand of the existing buildings on the respective plot, both in the actual state and after renovation, assuming a maximum heating demand of 100 kWh/(m²a), the theoretical maximum coverability of the heat demand of the buildings in Bavaria through the use of near-surface geothermal energy was determined.

Project name: Bavaria-wide, spatially detailed estimation of the realizable potential of near-surface geothermal energy for integration into the Bavarian Energy Atlas

Project duration: 2021 bis 2024

Authorization: Bayerisches Landesamt für Umwelt (LfU)

Funding: Bayerisches Staatsministerium für Umwelt und Verbraucherschutz (StMUV)

Implementation: TU München
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ENIANO


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Results

In general, near-surface geothermal systems can be used almost everywhere in Bavaria. There are hardly any exclusion areas for the use of geothermal collectors in particular. Borehole heat exchanger have a slightly lower overall potential, which is essentially limited by the drilling depth restrictions that apply in Bavaria. The use of groundwater heat pumps is limited to locations where a groundwater-bearing geological layer (quaternary aquifer) is present at an accessible depth. The proportion of heat demand covered by near-surface geothermal systems can be increased from 4.5 % to 61.9 % through energy-efficient refurbishment.

For further studies, the potential can be evaluated with regard to the mutual influence of neighboring geothermal systems and their use for cooling purposes, heat storage and in heating networks.

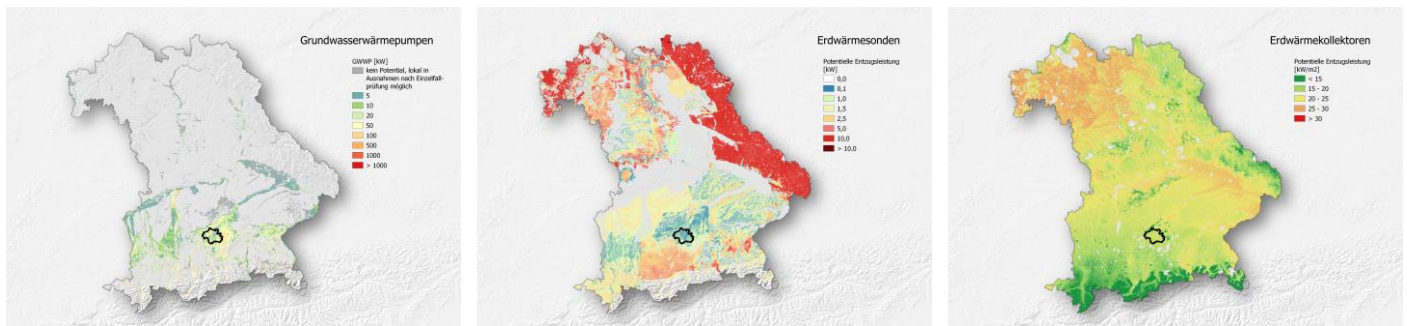


Figure 2: Potential of near-surface geothermal energy for Bavaria, shown as extraction capacity in grid format (10 m x 10 m) for groundwater heat pumps, geothermal probes and geothermal collectors (from left to right).

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