Geophysical Research Abstracts
Vol. 20, EGU2018-2058, 2018
EGU General Assembly 2018

Quantifying spatially and temporally disaggregated heat energy demands and thermal solar energy potentials via GIS to identify suited areas for district heating and demand for heat storage systems

Malte Schwanebeck
Christian-Albrechts-Universität zu Kiel, Geographisches Institut, LGI / ZfG, Germany (mschwanebeck@gis.uni-kiel.de)

Transforming the energy system towards a decarbonized and spatial dispersed system with regional differences in shares of volatile renewable energies leads to an increased demand in energy infrastructural planning and energy storage use.

District heating systems provide an infrastructure that allows integrating different types of renewable heat energy sources (like solar, geothermal and biomass), as well as energy storage units, to supply heat to complete building stocks in a community. Thermal solar energy can provide heat especially in summer times while most of the heat energy demand occurs in winter months to heat buildings and to provide hot water. Here, subsurface energy storage systems can serve as a buffer, especially in urban areas, since they are able to store renewable heat energy locally and seasonally in the near-surface geological underground while consuming less area then aboveground energy storage systems.

GIS-based, integrated analysis of spatially and temporally varying heat energy demands, potentials, infrastructures and underground conditions using readily available geodata can help to identify potentially suited areas for district heating and energy storage units.

Within the context of the “ANGUS II” research project, such analyses are being performed now on different spatial scales for the North German federal state of Schleswig-Holstein.

On federal state level, heat demand of existing buildings (residential and non-residential) is quantified in a spatial and temporal disaggregated way based on a state wide low detail 3D building stock model (LoD1) parameterized via census data on building age and degree-days data. Potential district heating areas will be identified on a hectare raster based on a minimum annual heat demand density threshold value or heat demand per meter pipe.

For the federal state’s capital city of Kiel, spatial and temporal varying heat demands of existing buildings (residential and non-residential) and solar thermal potentials will be quantified and located using a more detailed and better parameterized 3D city model (LoD2) as well as an existing roof cadaster. To balance seasonal shifted heat production and demand, potentially suited spaces for near-surface underground heat storages (borehole heat exchangers or aquifer storage) shall be identified in the city area using geodata on existing subsurface usage and aboveground land use information.