

# Analysing the thermal energy demand of development scenarios of a city district

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In contemporary urban planning an efficient use of resources is key. Therefore, information about the thermal energy demand of the area to be worked on is very important. Ideally, comprehensive data on both aspects, the status quo and future scenarios is at the disposal of the stakeholders involved. However, there is often little information on thermal energy demand in the status quo and data on possible development scenarios is usually not available at all.

Here we present the analysis of the thermal energy demand of a city district in Graz, Austria. For this, we used a multi-tool workflow for high-resolution urban building energy modelling (UBEM). We implemented the status quo and two different development scenarios into an urban information model (UIM). The scenarios were developed from the perspective of strengthening the quantity and quality of green spaces and to foster a circular use of resources in the buildings. In the in the urban simulation model, we varied parameters like the outdoor temperature prediction for Graz (IPCC RCP8.5), the building hull quality and usage class or the amount of gross floor area. The buildings were designed in 3D CAD in single-storey resolution using the BIM Tool IfcSpace. The energy relevant urban data which was provided by different stakeholders at the city of Graz was then stored in the CAD geometry. Hereafter we used an automated urban building modeler and the building simulation tool IDA ICE to calculate the heat energy (heating and domestic hot water) and the cooling energy demand in a dynamic building energy simulation for the timespan of one year.

As results the calculated heat and cooling energy demand for the status quo as well as for development scenarios for the year 2030 and 2050 are available in hourly mean values for each building in the district. In addition, the data was further processed in the form of georeferenced map representations, see Fig.1, and overall values. Thus, the results are easily available to the stakeholders and decision-makers involved and form the basis for the integrative development of the city of Graz.

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\*Hermann Edtmayer is a research associate at Graz University of Technology, Institute of Thermal Engineering and has his main field of research in the topics of renewable urban energy supply, building energy modelling and simulation and spatial energy planning.

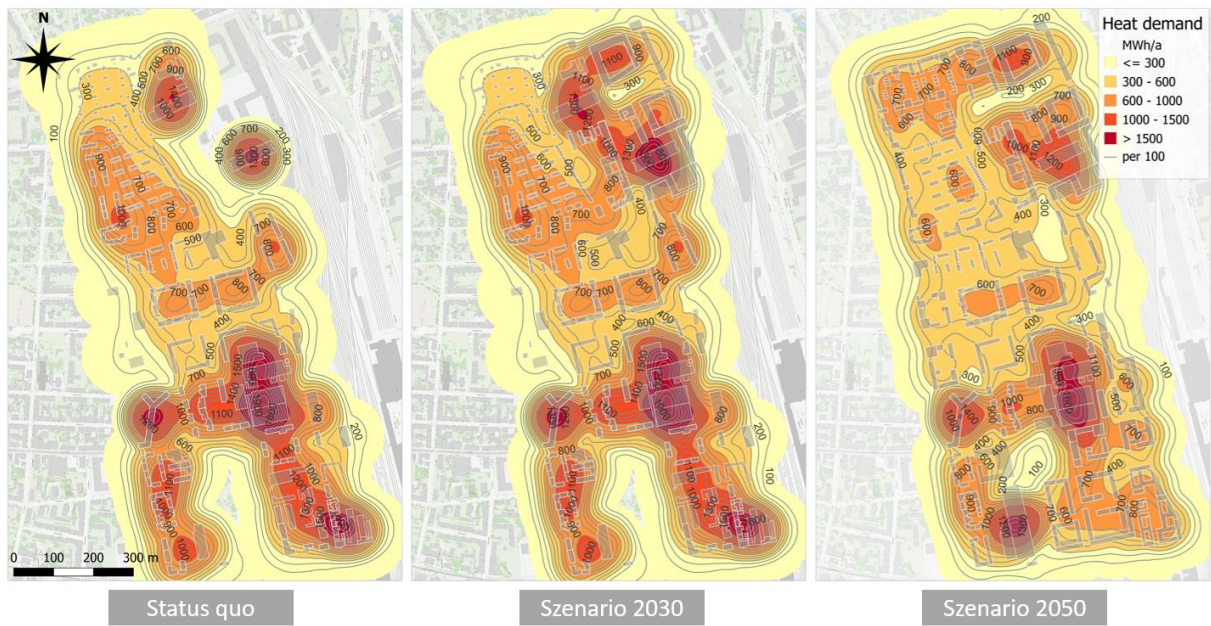


Figure 1: Comparison of status quo and the development scenarios of the district under consideration; heat map and contour plot of the calculated heat energy demand (heating + domestic hot water)