Scenarios for Cooling Demand in the Context of Climate Change in the Saarland

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As a result of global warming, space cooling demands are expected to increase significantly, especially in the north and central european countries. To efficiently meet them, various “active” and “passive” measures can be taken, but higher spatial and temporal resolutions are needed.

Background

Although having a minimal share of 0,8% of the final energy consumption in households in the EU (Germany: 0,4%) *per annum* (Eurostat 2024), there are high seasonal and daily dynamics.

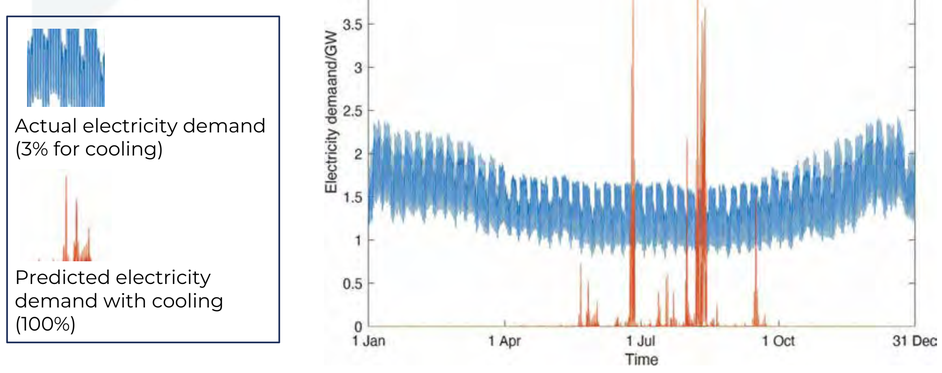


Figure 1: *Yearly total electricity demand and electricity demand for cooling in London 2020, from (Zhang et al. 2025).*

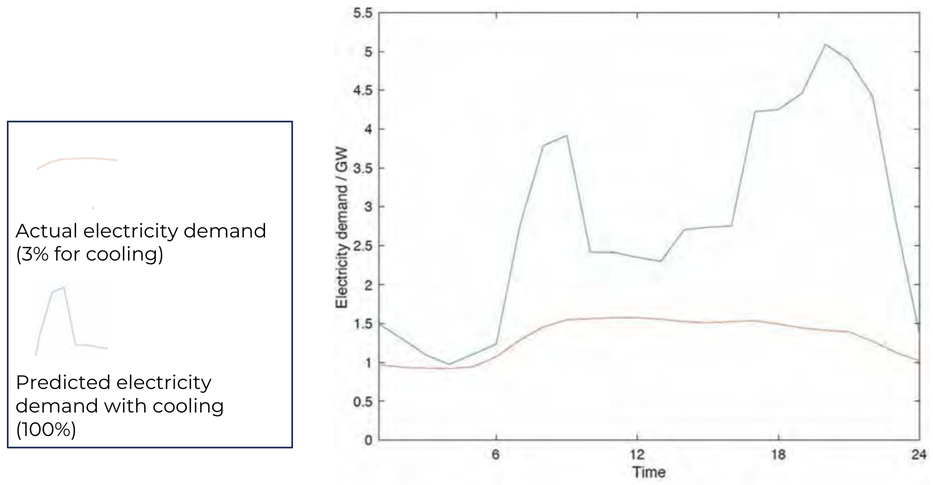
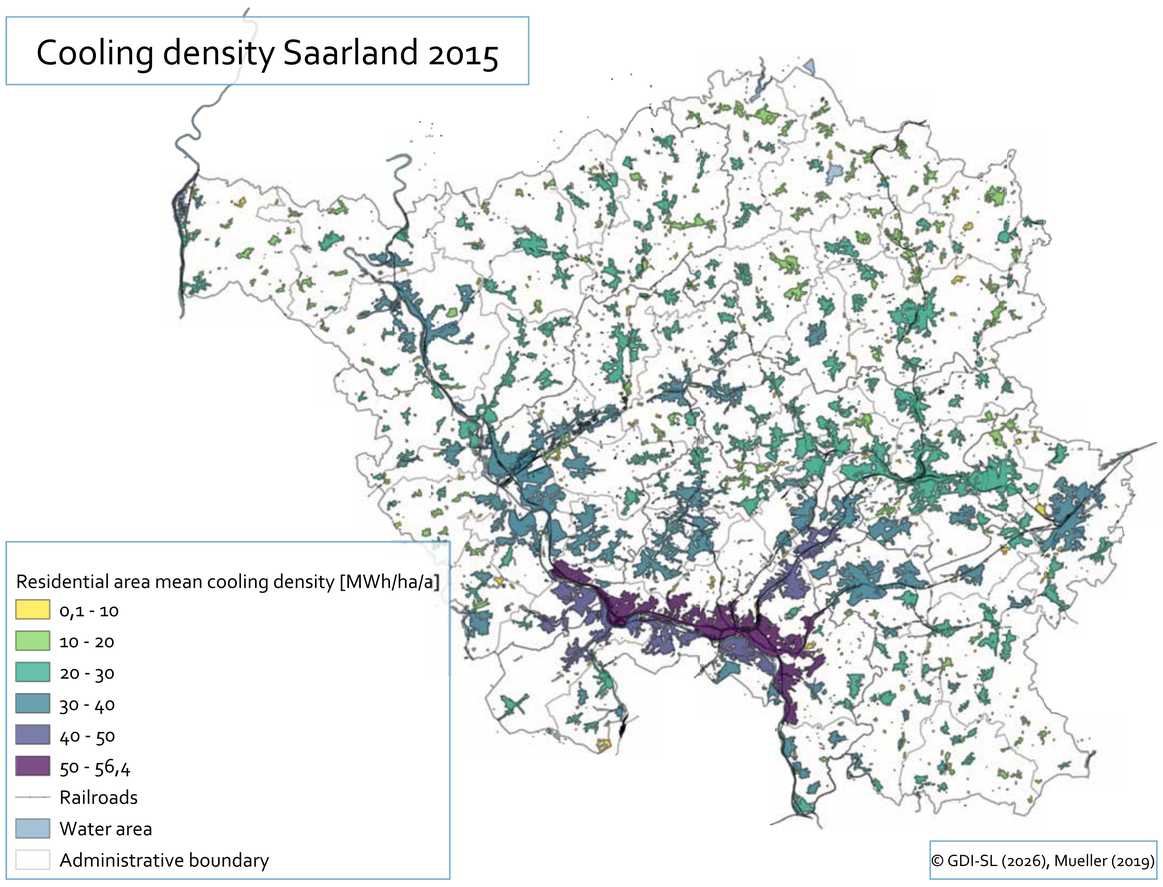


Figure 2: *Daily total electricity demand and electricity demand for cooling on a peak day in London, from (Zhang et al. 2025, modified).*

First Results

Key variables for the calculation of cooling needs are climate variables, whose values can differ significantly from one location to its surroundings. This is especially true for urban areas and in valleys, such as the Saar Valley.



Methods

- Applying a local climate model (ENVI-met, PALM-4U); coupling with a building energy model is optional
- District-level approach (micro- to mesoscale)
- Definition of scenarios (e.g., uptake and efficiency of technologies, nature-based solutions)
- Mapping and Analysis of local climate zones, cooling needs, and potential cooling supply, with QGIS

Next steps

- Literature review including appropriate models, key factors, and case studies

References

[Datasets]

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[Journal publication]

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