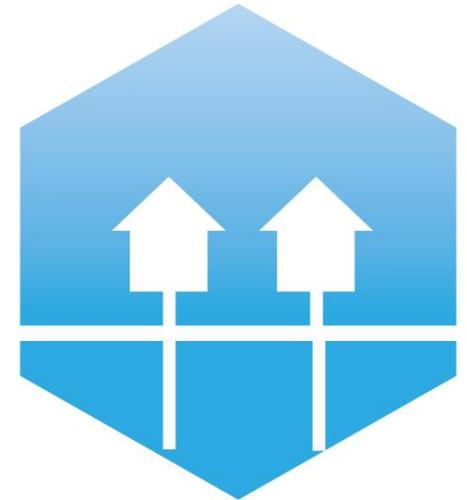
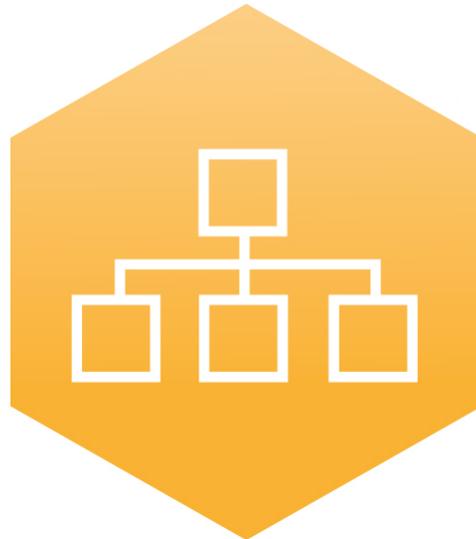


International Conference on Smart Energy Systems and 4th Generation District Heating  
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## Ringkøbing-Skjern energy atlas for analysis of heat saving potentials in building stock

Stefan Petrović, Kenneth Karlsson

Systems Analysis division, Department of  
Management Engineering, Technical  
University of Denmark



**AALBORG UNIVERSITY**  
DENMARK

# 4DH

4th Generation District Heating  
Technologies and Systems

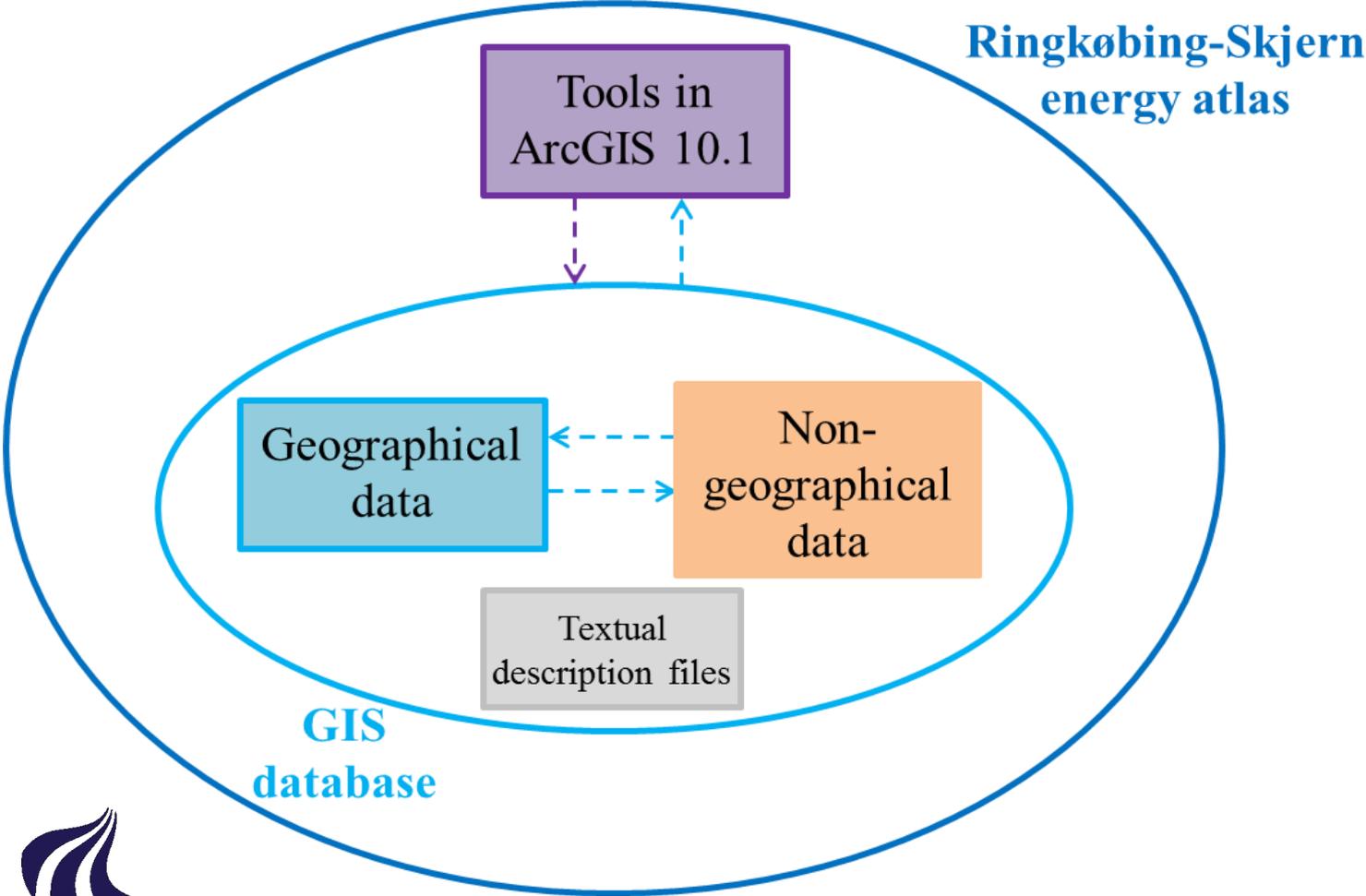
# Ringkøbing-Skjern renewable energy goals



- Municipal energy strategy is called Energy 2020
- The goal is to achieve 100 % self-sufficiency in renewable energy supply by 2020 by:
  - increasing production from wind, bioenergy and other renewables
  - switching transport sector to renewables
  - achieving energy savings in buildings



# Ringkøbing-Skjern energy atlas



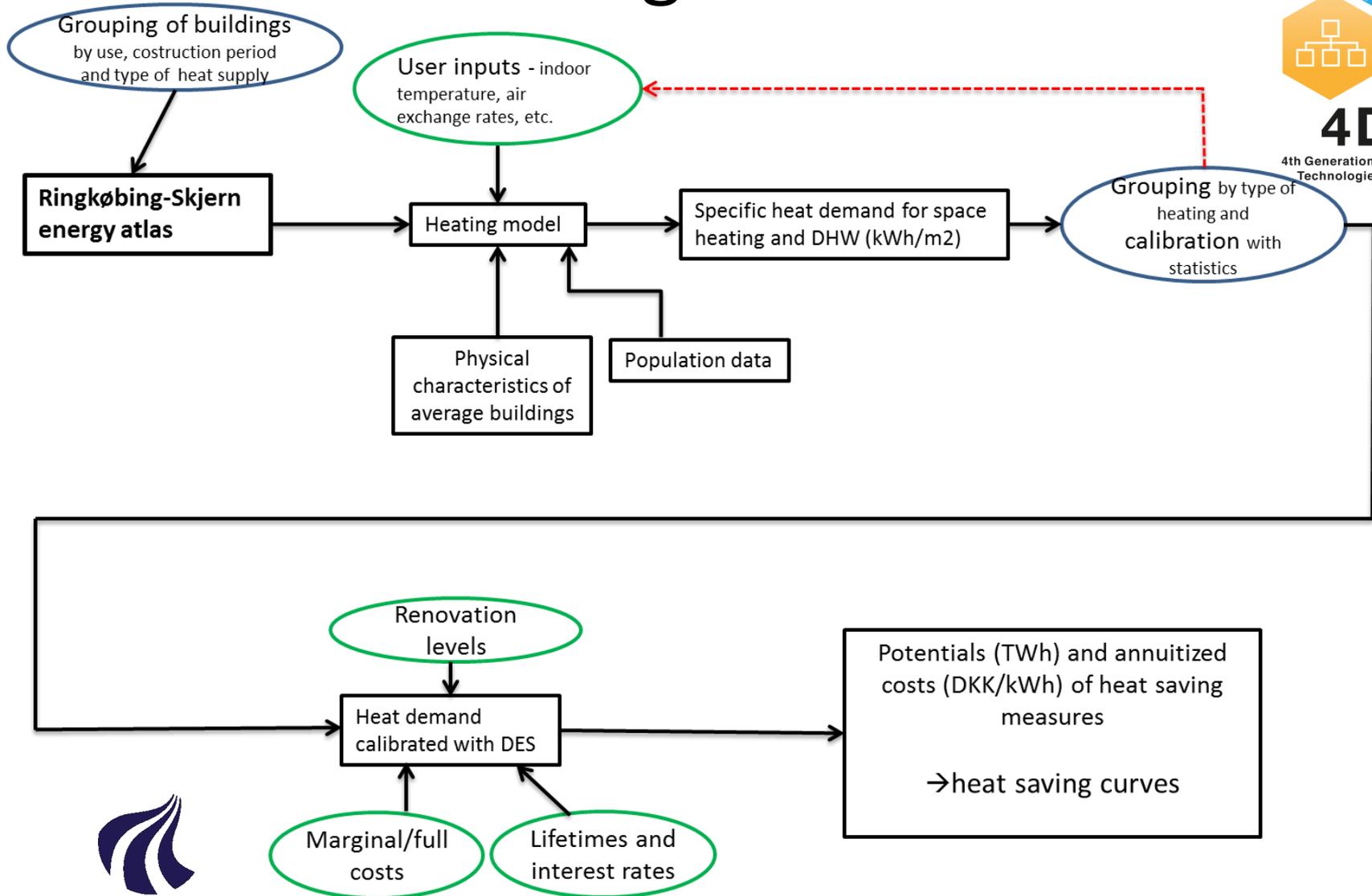
# Ringkøbing-Skjern energy atlas



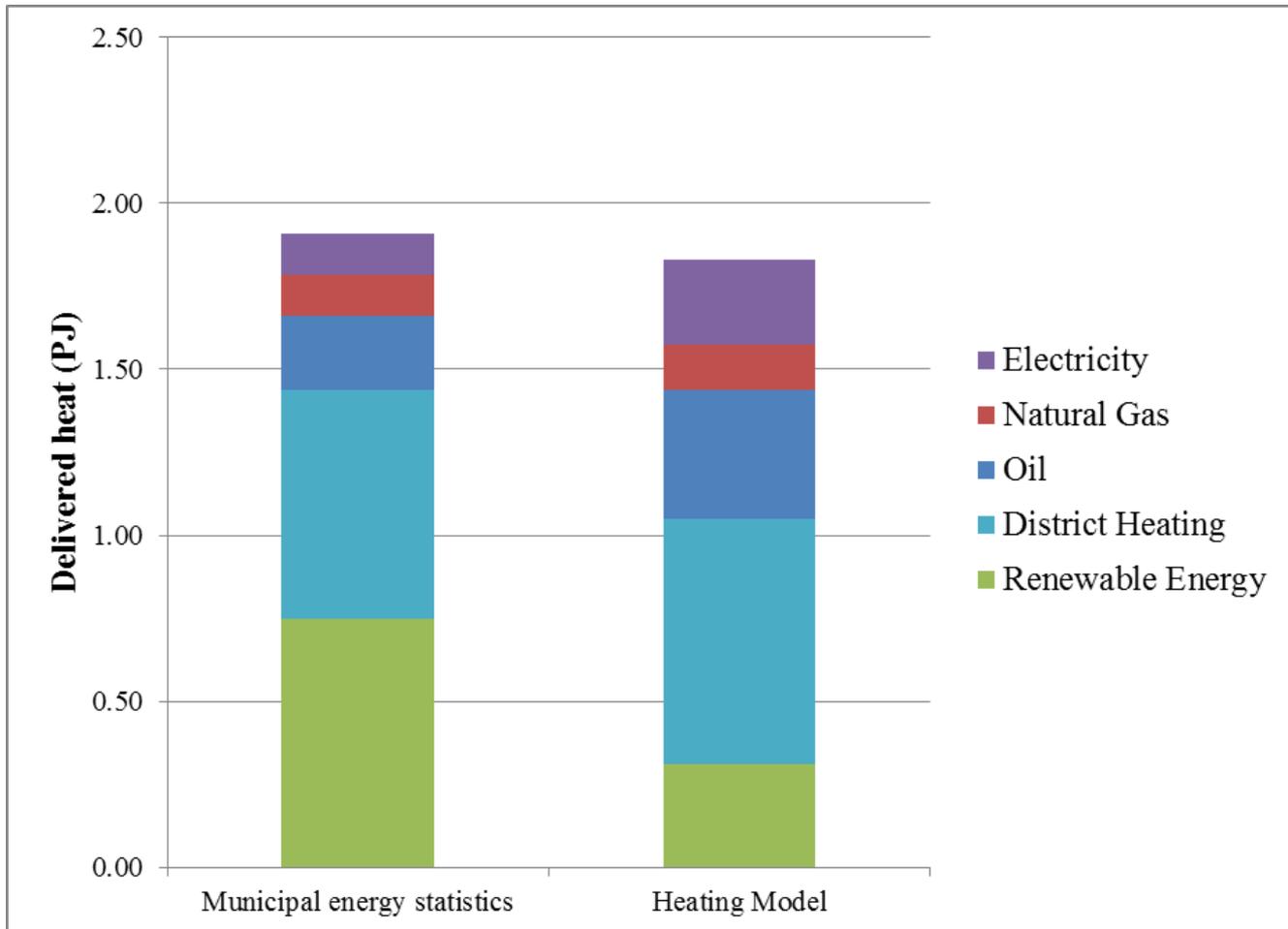
- GIS-based tool for energy planning and analysis in Ringkøbing-Skjern municipality
- It is composed of a GIS database and tools built in ArcGIS 10.1
- Five main thematic data groups: Energy resources, Transmission and distribution infrastructure, Supply and demand, Social data and Other energy data.



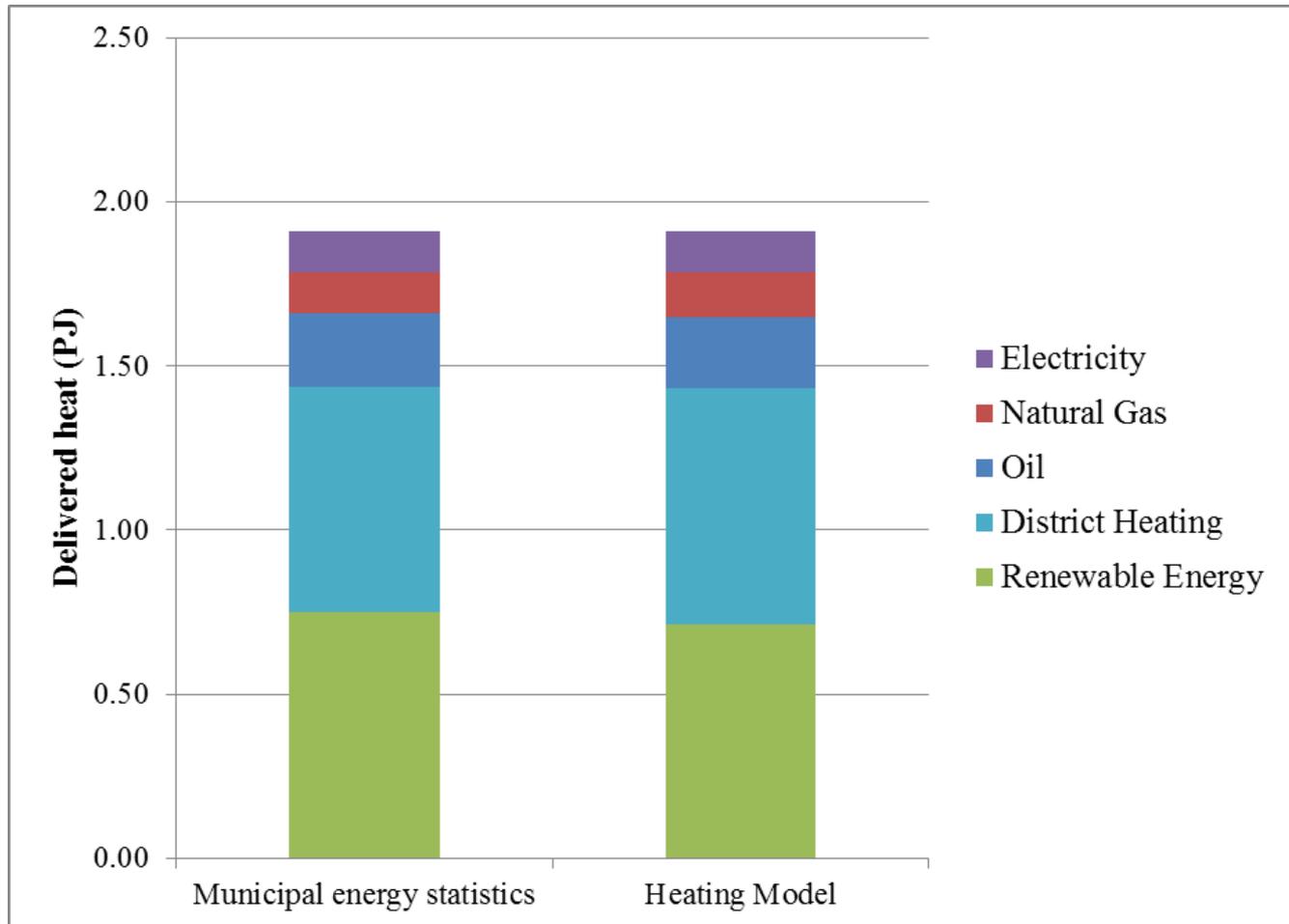
# Heating model



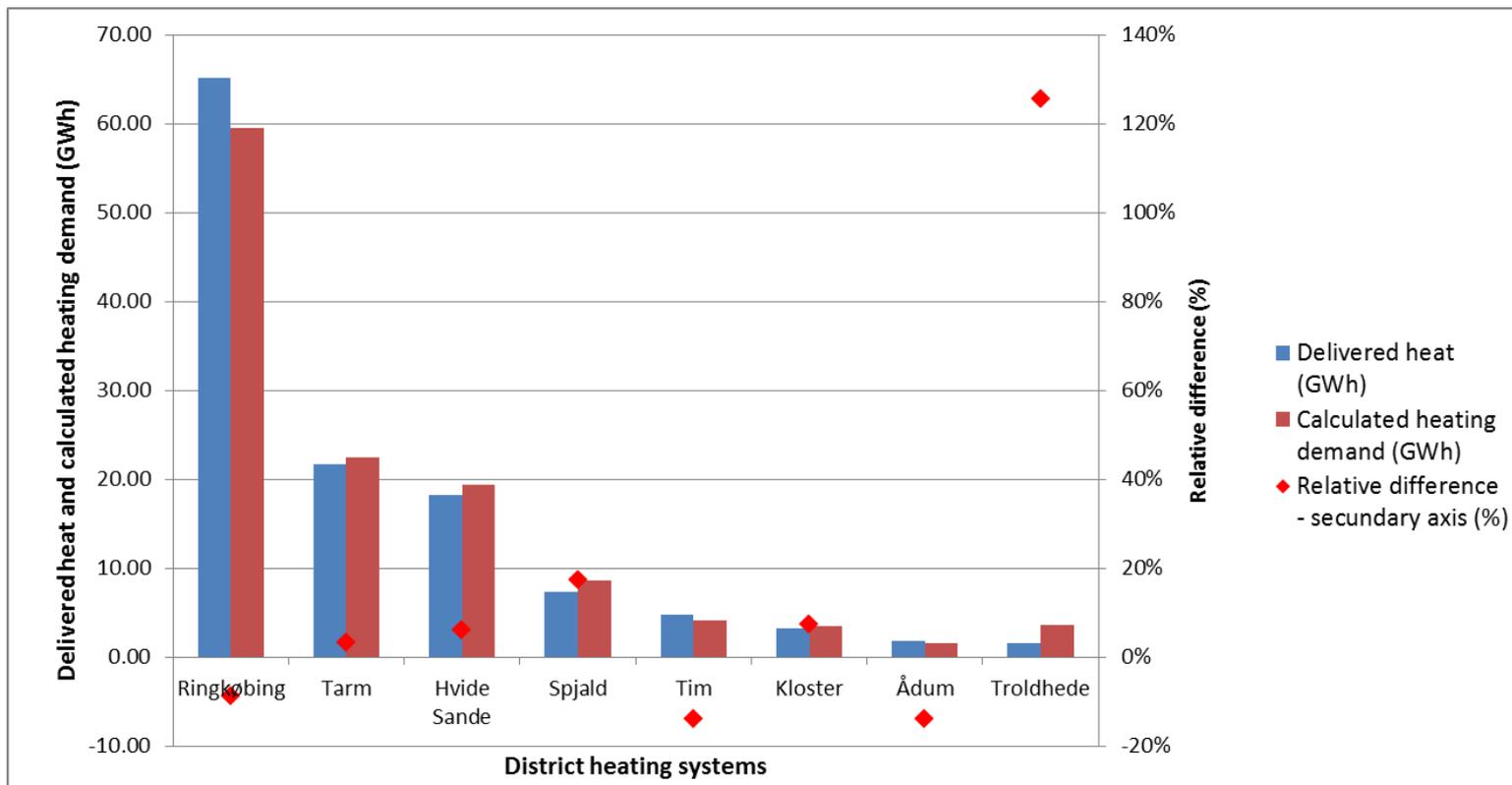
# Heat demand before adjustment



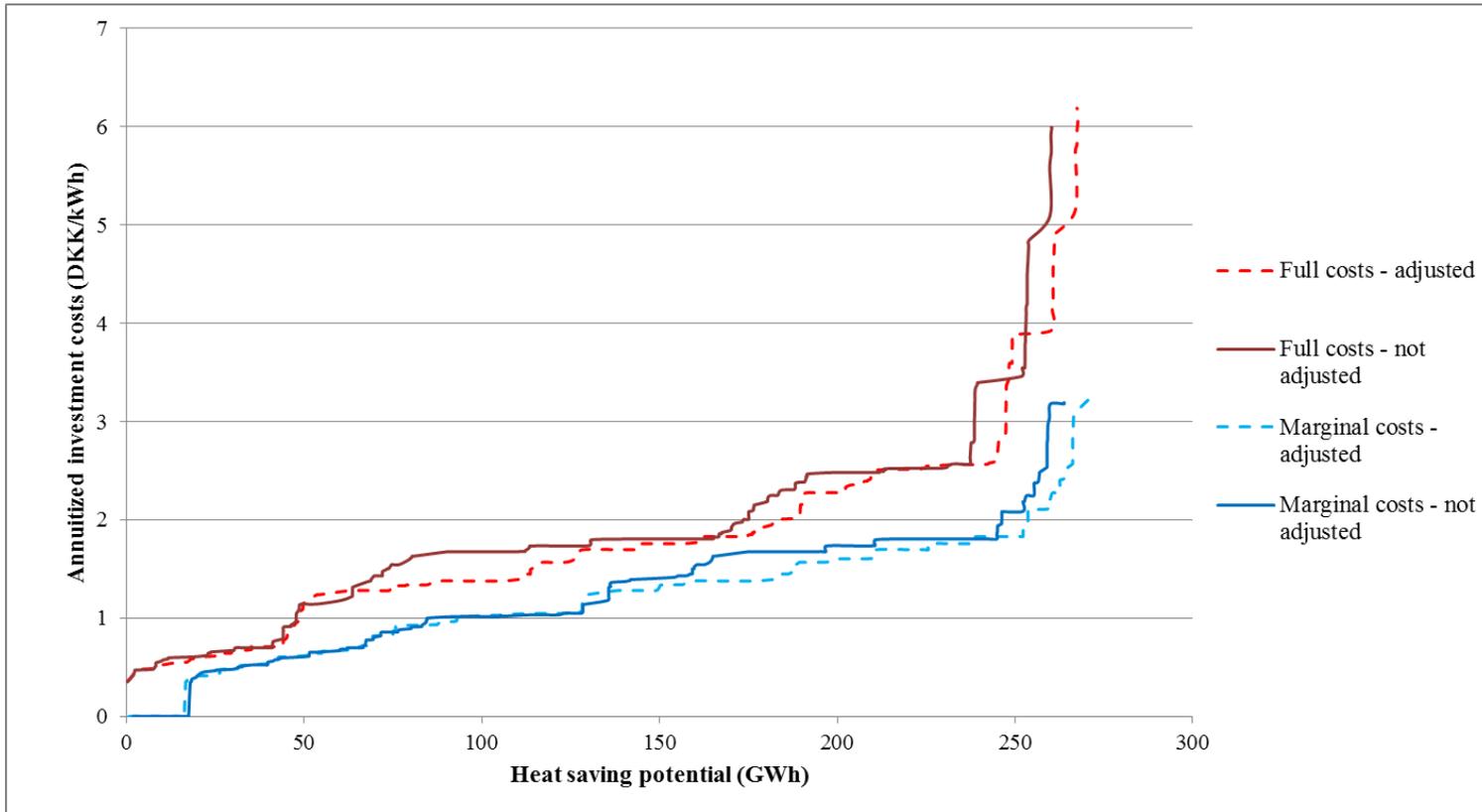
# Heat demand after adjustment



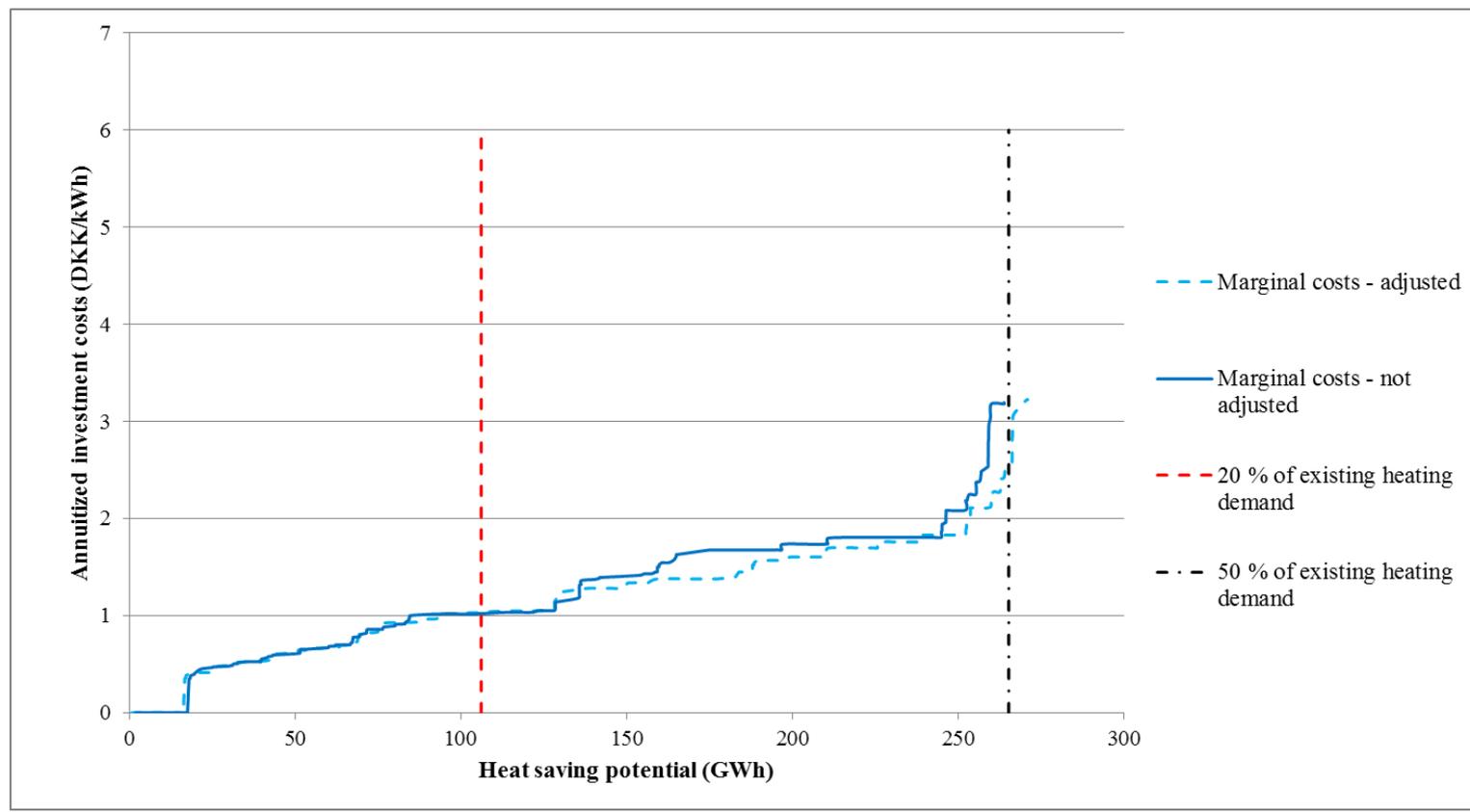
# Heat demand in district heating systems after adjustment



# Heat saving potentials and costs

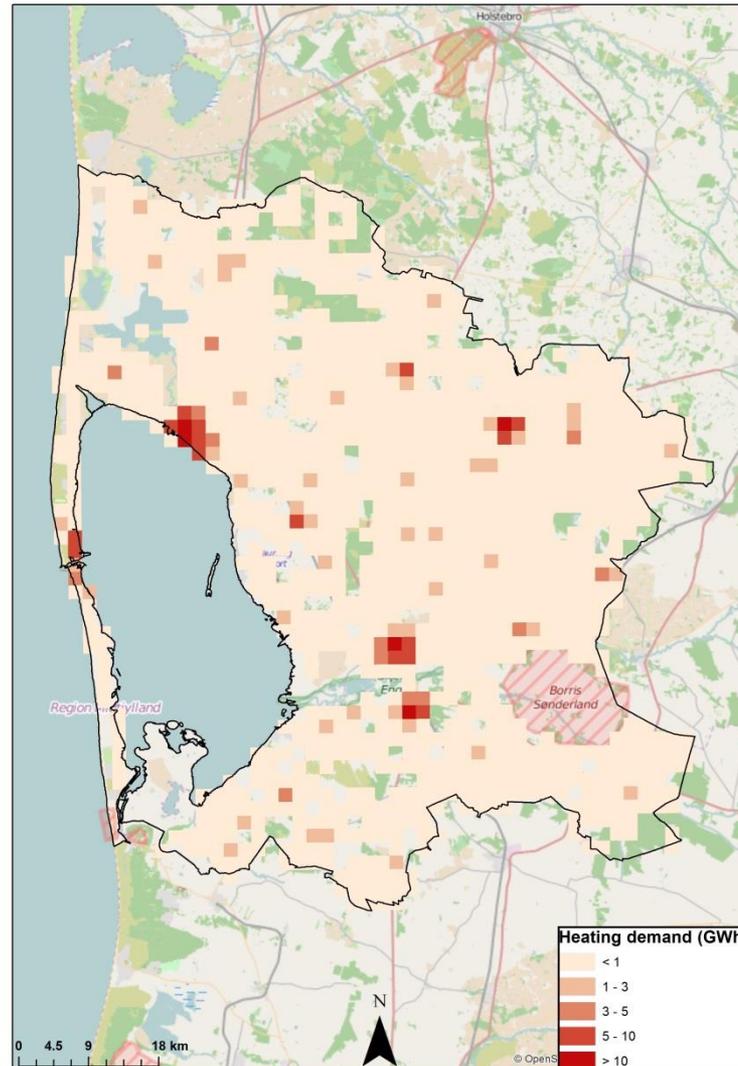


# Heat saving potentials and costs



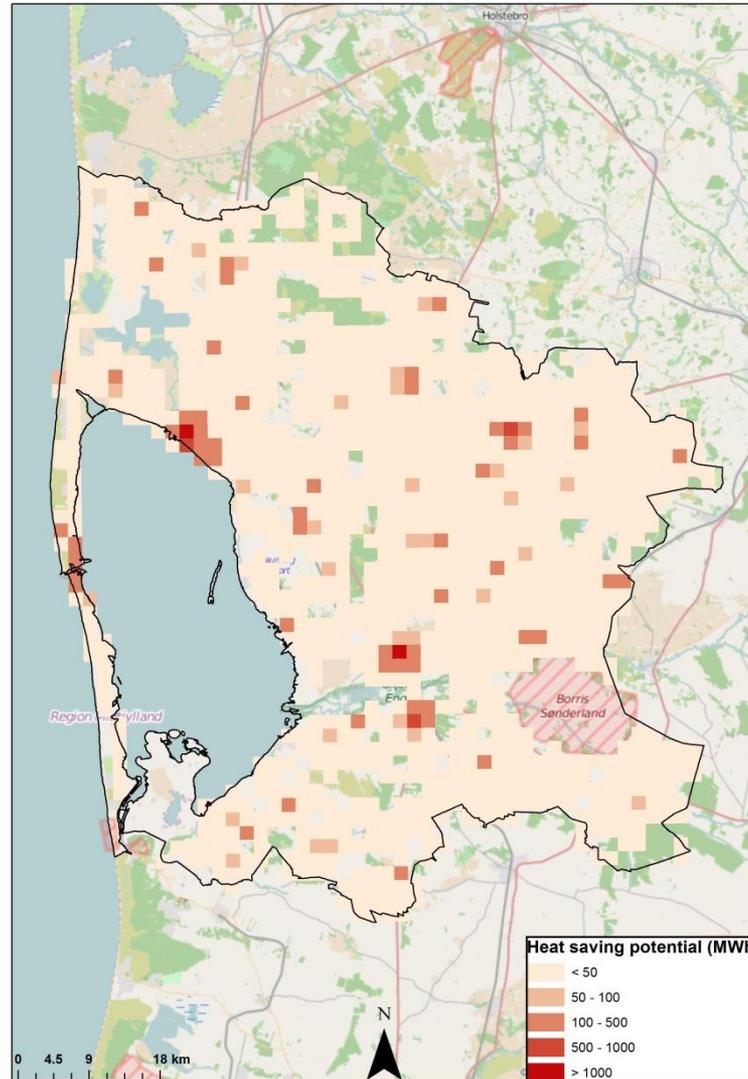
# Existing heating demand

- Existing heating demand
- Summed in Danish square grid (1km x 1km)



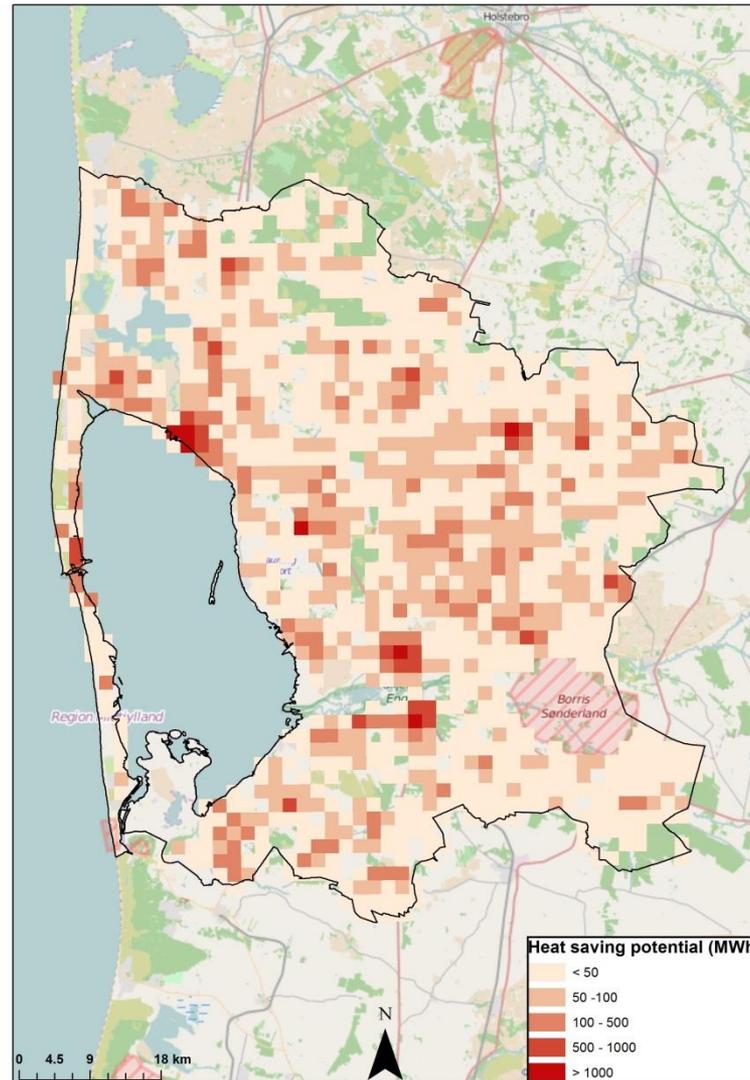
# Heat saving potentials

- Heat saving potentials with annuitized marginal costs lower than 0.5 DKK/kWh
- Summed in Danish square grid (1km x 1km)



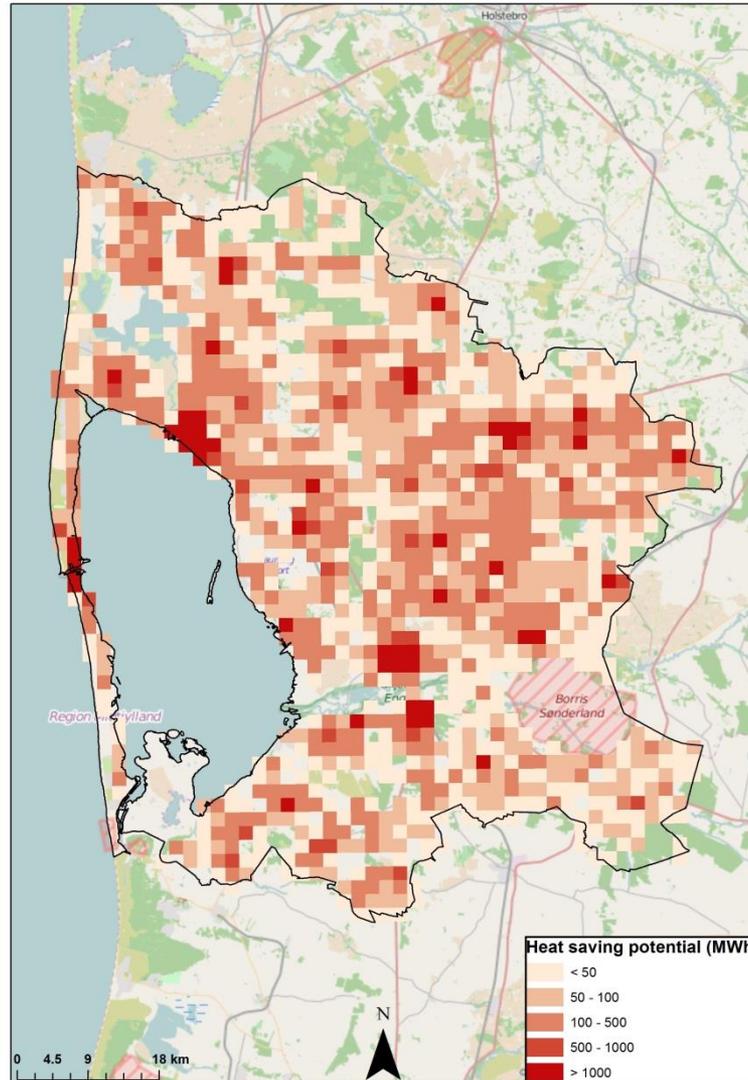
# Heat saving potentials

- Heat saving potentials with annuitized marginal costs lower than 1 DKK/kWh
- Summed in Danish square grid (1km x 1km)



# Heat saving potentials

- Heat saving potentials with annuitized marginal costs lower than 2 DKK/kWh
- Summed in Danish square grid (1km x 1km)



# Conclusions



- Ringkøbing-Skjern energy atlas provides foundation for analysis of heat saving measures and visualization of results.
- Geographical scope of analysis matters.
- Heat demand in residential sector can be halved at average annuitized price of 1.1 DKK/kWh.
- Affordability issues and non-occupied buildings should be included.



# Thank you for your attention



## Questions and answers

Contact:

Stefan Petrović, e-mail: [stpet@dtu.dk](mailto:stpet@dtu.dk)

mobile: +45 2465 5732



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