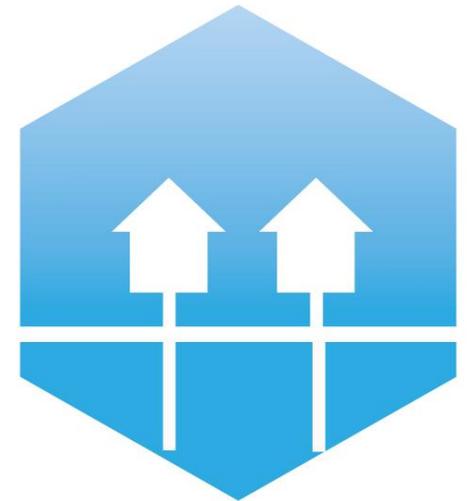
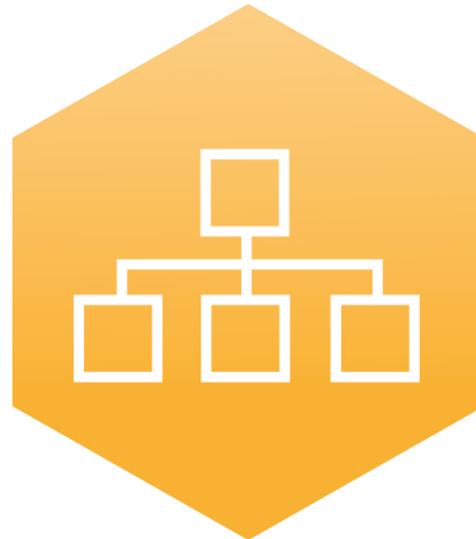


# Optimal Heat Pump Use in European Cities

Susana Paardekooper



**AALBORG UNIVERSITY**  
DENMARK

# 4DH

4th Generation District Heating  
Technologies and Systems



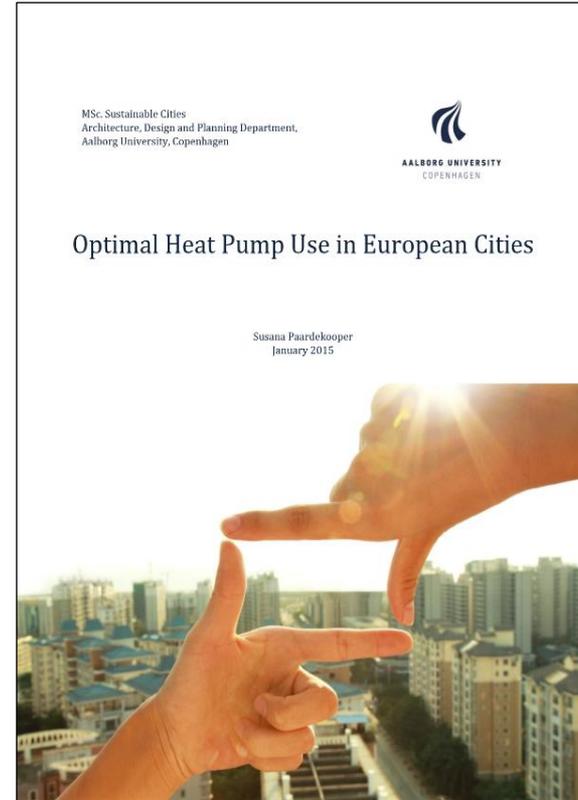
International Conference on Smart Energy Systems and 4th Generation District Heating,  
Copenhagen, 25-26 August 2015



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# Project

## MSc. Eng. Sustainable Cities Semester Project



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# Methodology

## Demand in 2050

- City size
- Service and HH
- Energy efficiency

## Supply in 2050

- Gas boiler scenario
- Individual heat pumps
- Large scale HPs and DH



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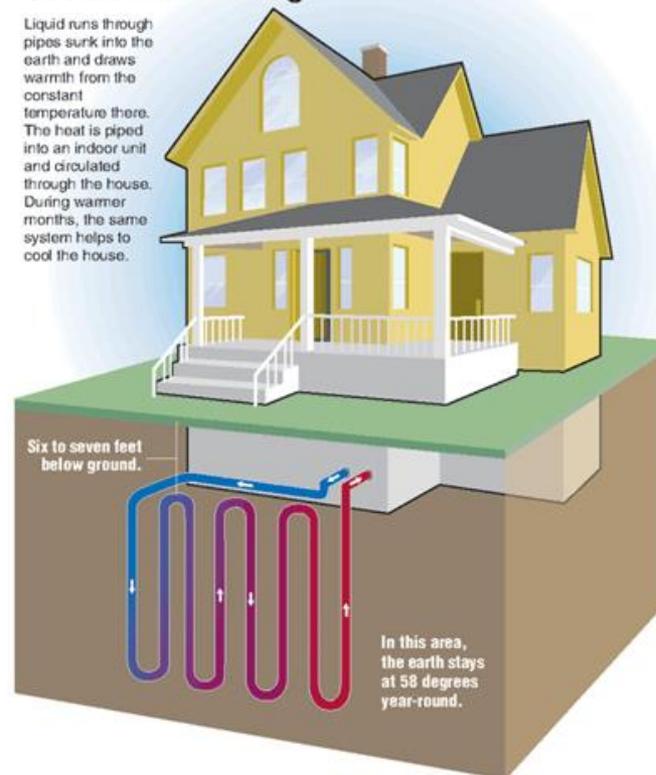
# Knowledge gaps

- **Urban specific data**
- **Heat pumps and density**
- **Cooling**



## Geothermal heating

Liquid runs through pipes sunk into the earth and draws warmth from the constant temperature there. The heat is piped into an indoor unit and circulated through the house. During warmer months, the same system helps to cool the house.



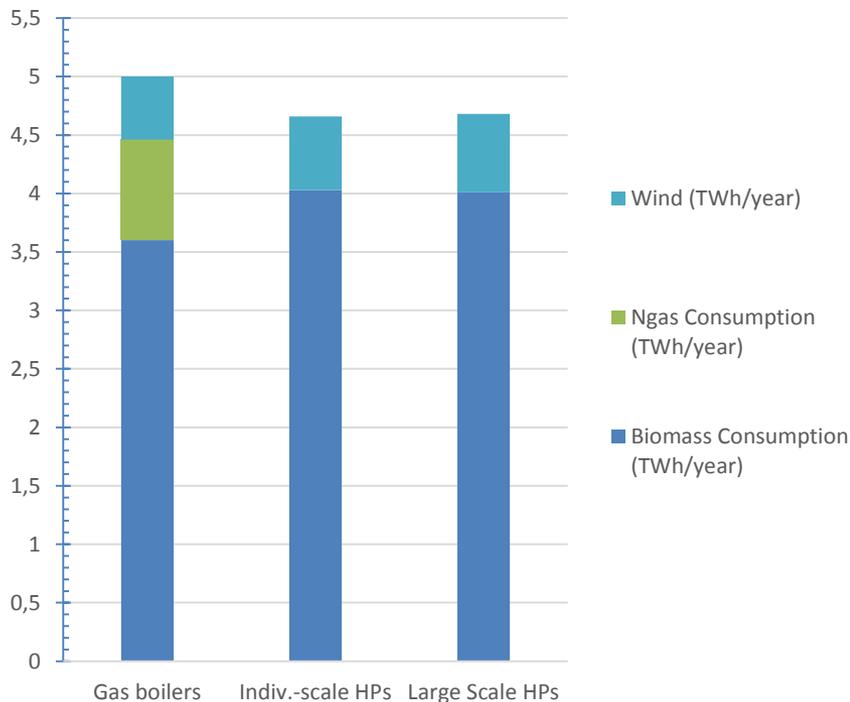
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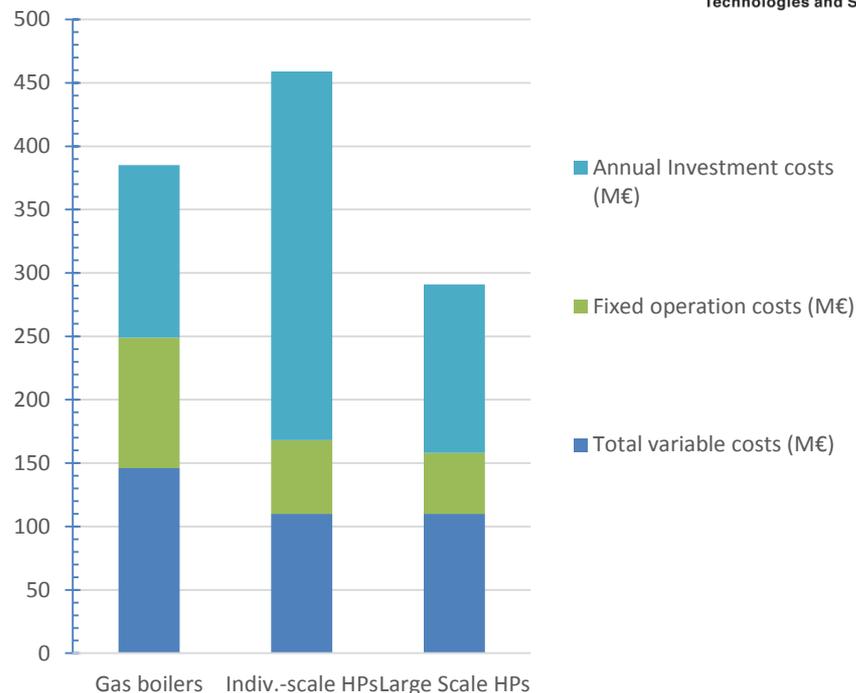


# Results

Total fuels types



Total costs



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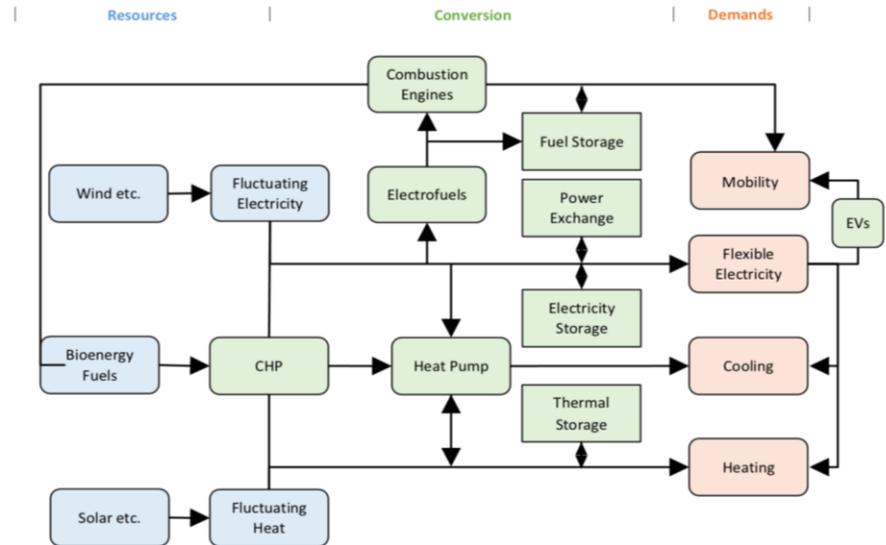




# Conclusions

- Heat pumps in urban areas
- District heating is a good use of HP technology
- Heat pumps to create energy system synergies

## Smart Energy System



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# Questions?

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