

Using least cost renovation combinations in buildings for developing future heat demand density maps: case studies in three cities in Europe

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- (1) Aim
- (2) Methodology
- (3) Results
- (4) Conclusions and discussion







## Section 1 Aim of the analysis



# **Derive scenarios for future H&C**





- Set-up databases of the buildings in the cities containing information of location, gross floor area and heat demand
- Find least cost renovation combinations for the building stock in the cities for reaching different overall saving targets
- Create several heat demand density maps per city for further analysis of the potentials for district heating







## Section 2 Methodology



# **Approach (for each city)**





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## Section 3 **Results**



# **Differences in the building stocks**





Figure: Distribution of gross floor areas of buildings in the different types and construction periods within the three case study cities

# **Costs for heat savings**





# **Heat demand density maps**





Figure: Heat demand density maps for current situation and for different renovation states for the city of Frankfurt





### Section 4

## **Conclusions and discussion**



# **Conclusions** and discussion

### Costs for savings

- Remarkable differences in the costs for savings in the different cities up to around 35% savings of overall heat demand
- To save more heat the costs increase rapidly in all cities

### Overall approach

- Method is working and is suitable to derive geographically explicit renovation scenarios
- Resulting data and maps are useful for analysing future potentials for district heating
- Uncertainty due to missing information on the current status of renovation of the existing buildings
  - Data on the status was not available in any of the cities  $\rightarrow$  an average status is included for each of the building types and construction periods
  - Remarkable difference in the costs per saving in the buildings [EUR/MWh] between the case it is renovated and it is not renovated

#### Further uncertainties

- Missing entries / values in the building databases of the cities
- If building is not occupied, renovation does not lead to savings
- New construction currently reflected as increase in gross floor area on the existing buildings
- Suitability of renovation measures and costs in the concrete buildings

