

POTENTIAL DIFFUSION OF RENEWABLE-BASED 3GDH AND 4GDH ASSESSMENT THROUGH ENERGY MAPPING: A CASE STUDY IN MILANO

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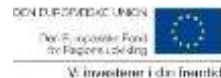


POLITECNICO
MILANO 1863



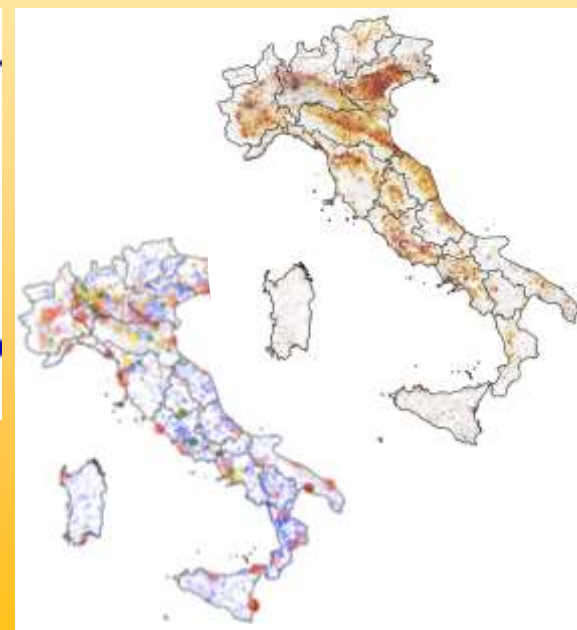
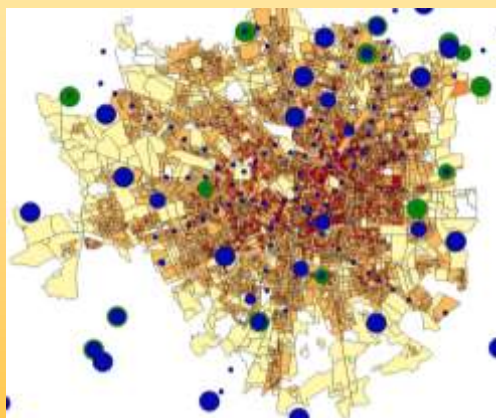
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FRAMEWORK

Assessing excess heat-based district heating potential through energy mapping. Focus on 4GDH. Case study: Metropolitan city of Milan



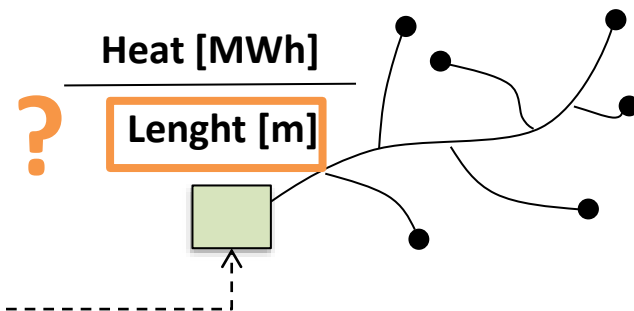
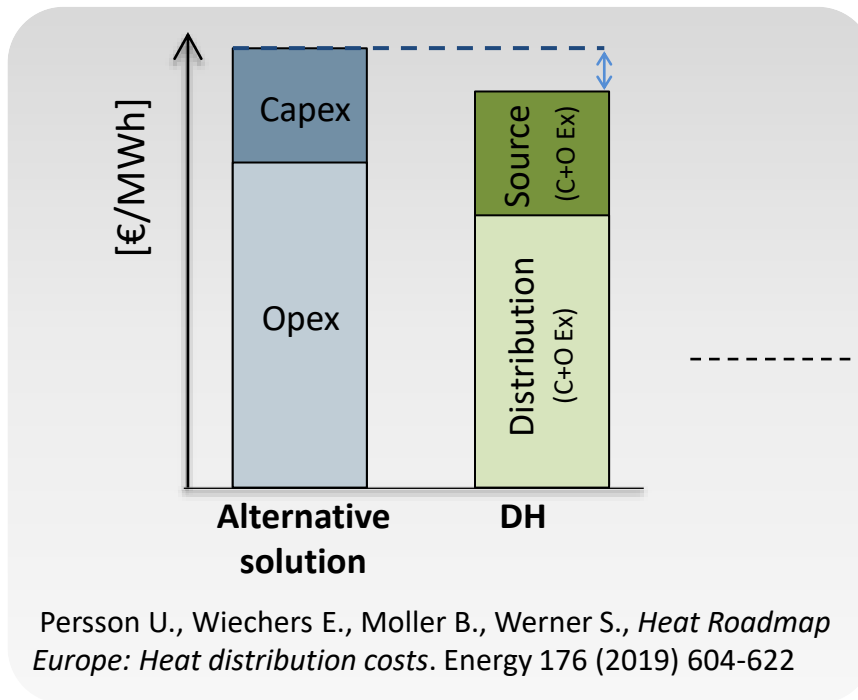
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DH POTENTIAL DEFINITION

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Assessing the potential diffusion of district heating from a technical, environmental and economic point of view

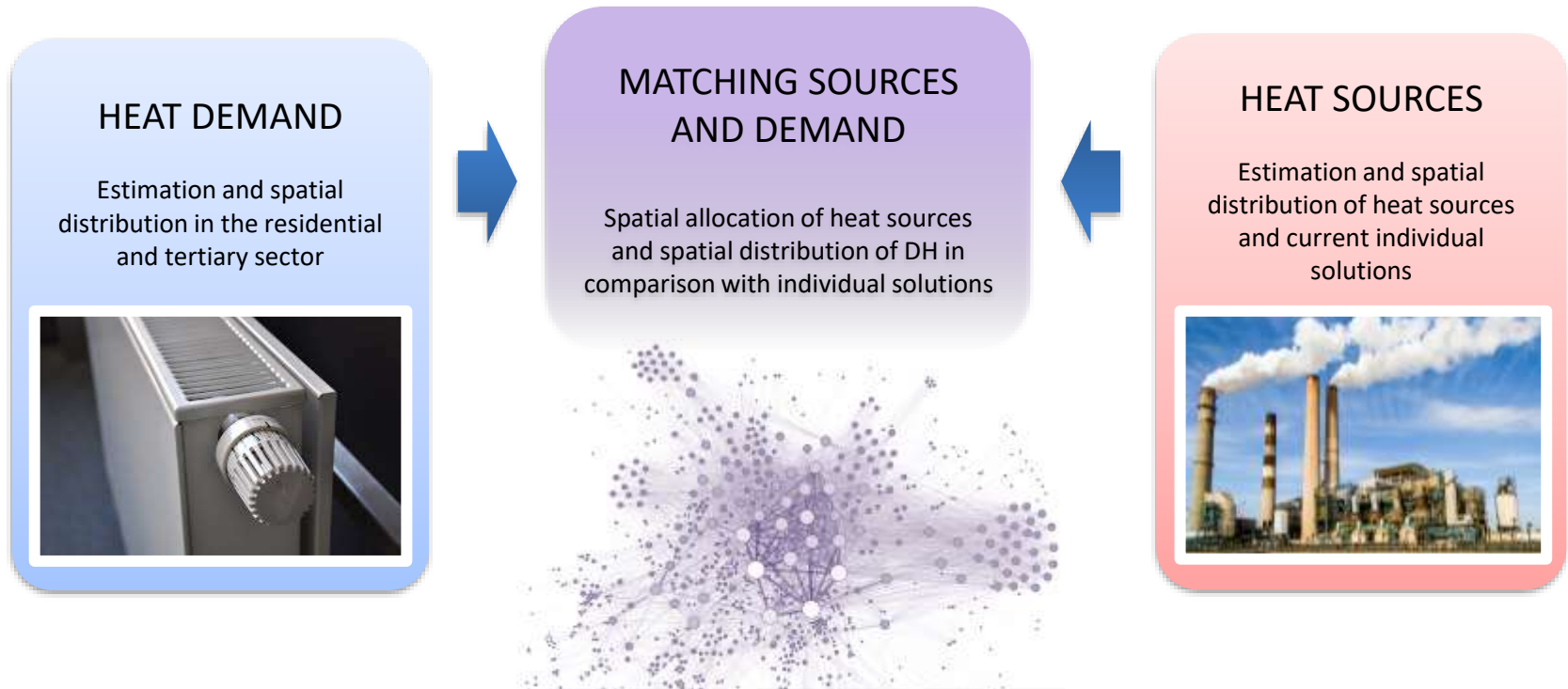


Specific problem
Estimating infrastructural network cost in areas in which there's no DH

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STRUCTURE OF THE WORK



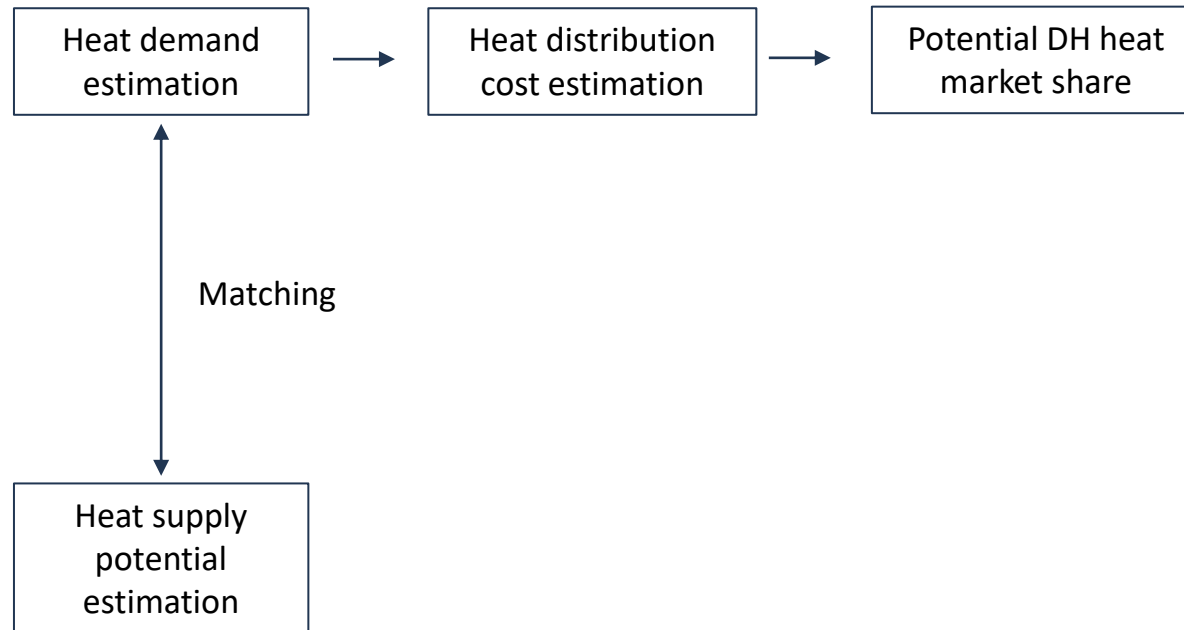
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METHODOLOGY

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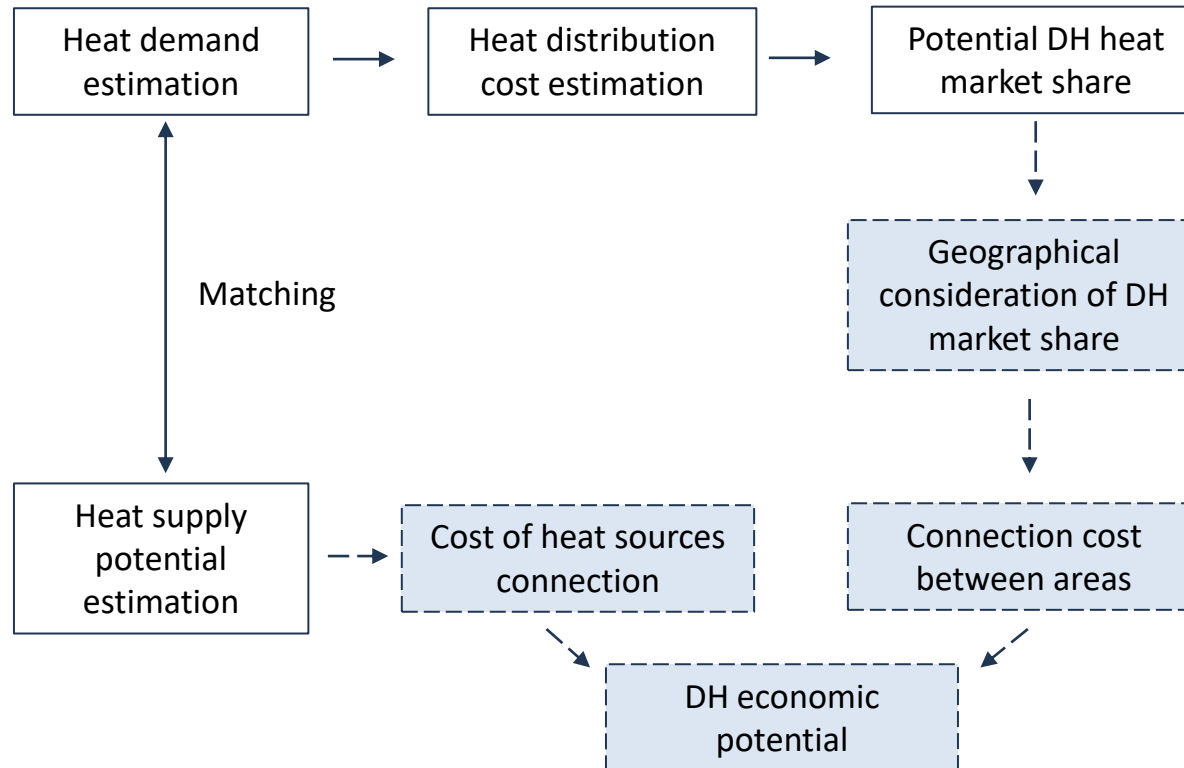
REFERENCE
APPROACH
(HRE)



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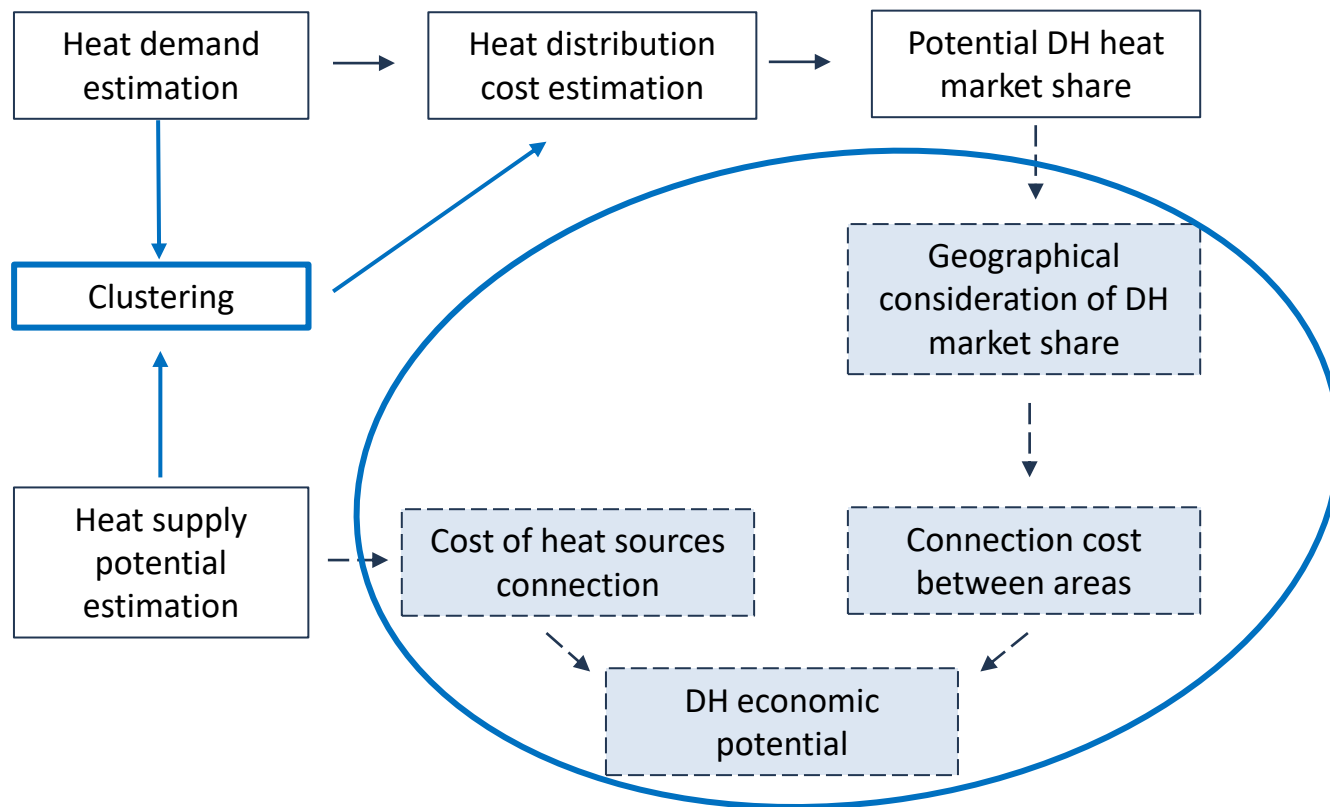
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REFERENCE
APPROACH
(HRE)



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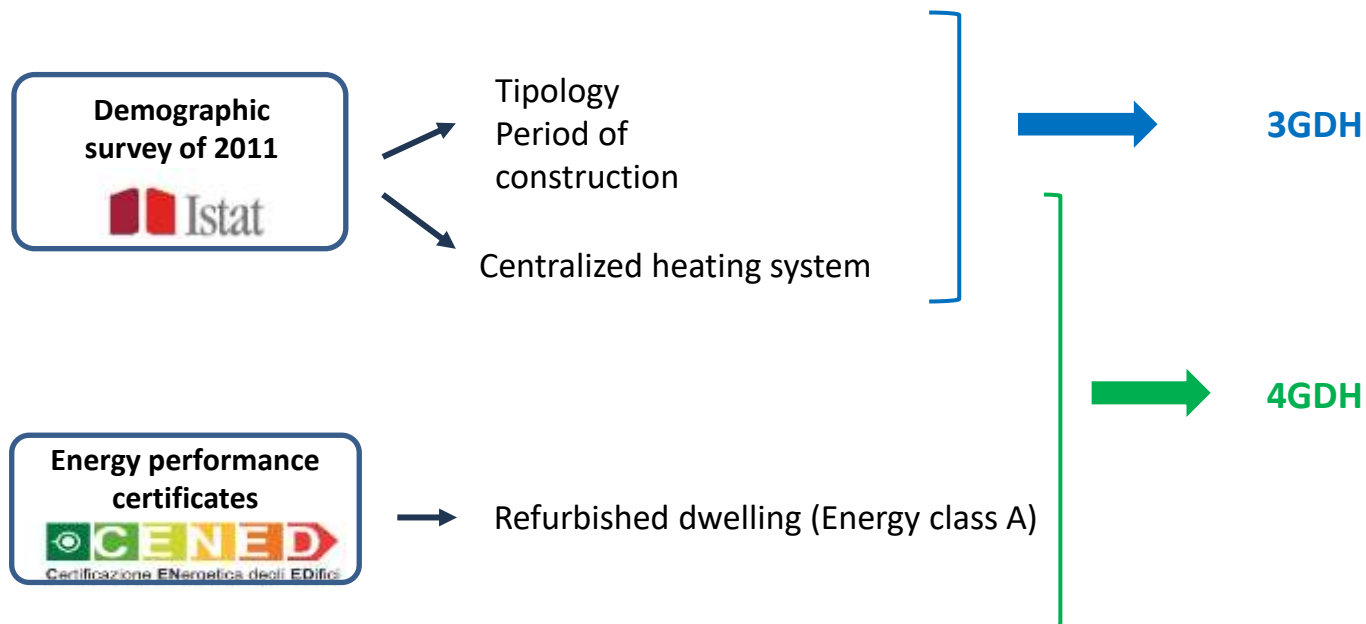
PROPOSED APPROACH



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HEAT DEMAND ESTIMATION

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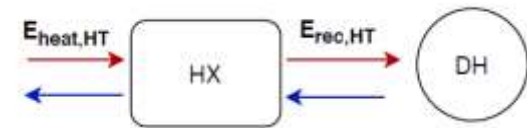
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Excess heat sources potential estimation

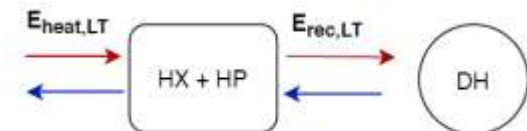
- Industrial sites and power production plants (AIA)
 - HT and LT
- Datacenters (Data Center Map)
 - $T_{average} = 30^{\circ}C$
- Wastewater treatment plants (Hotmaps)
 - $T_{average} = 18^{\circ}C$
- Metro stations (HRE)
 - $T_{average} = 13^{\circ}C$



$$50^{\circ}C < T < 200^{\circ}C$$



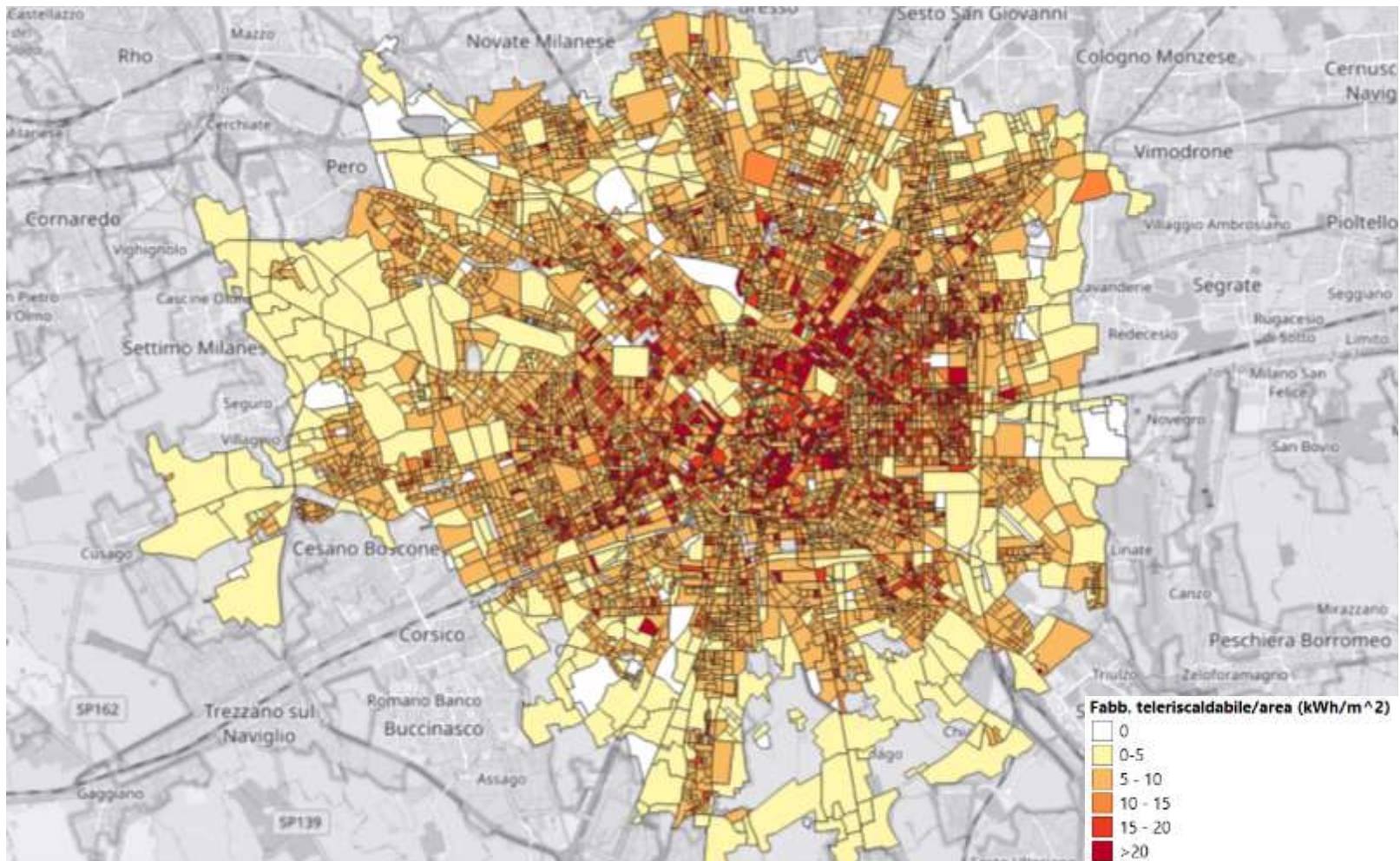
$$T < 50^{\circ}C$$



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HEAT MAPS OF MILAN AND CLUSTERING

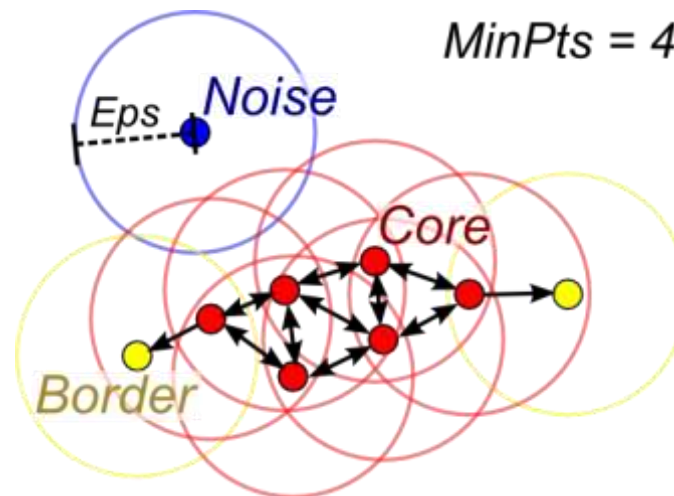
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DBSCAN algorithm



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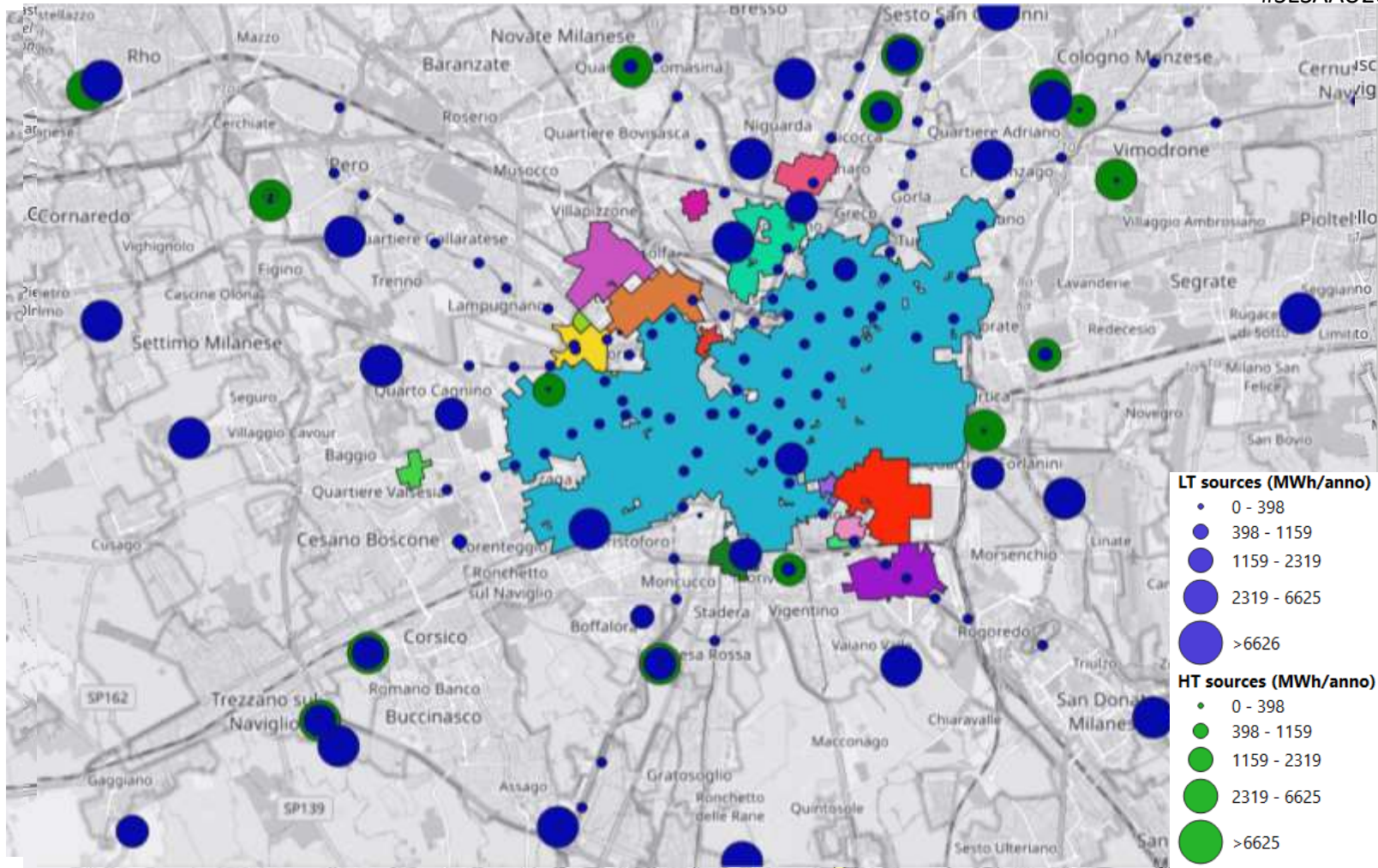


HEAT MAPS OF MILAN AND CLUSTERING

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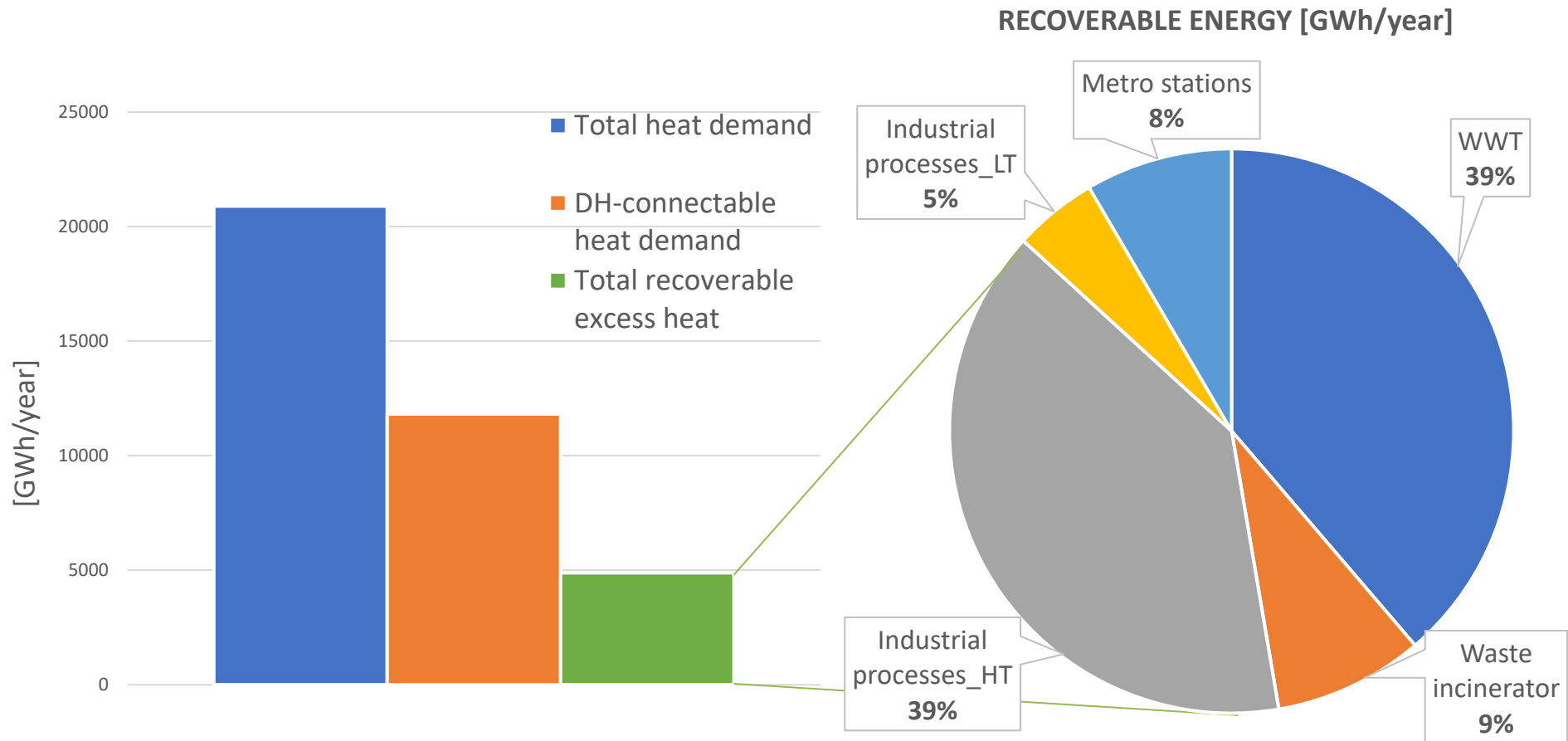


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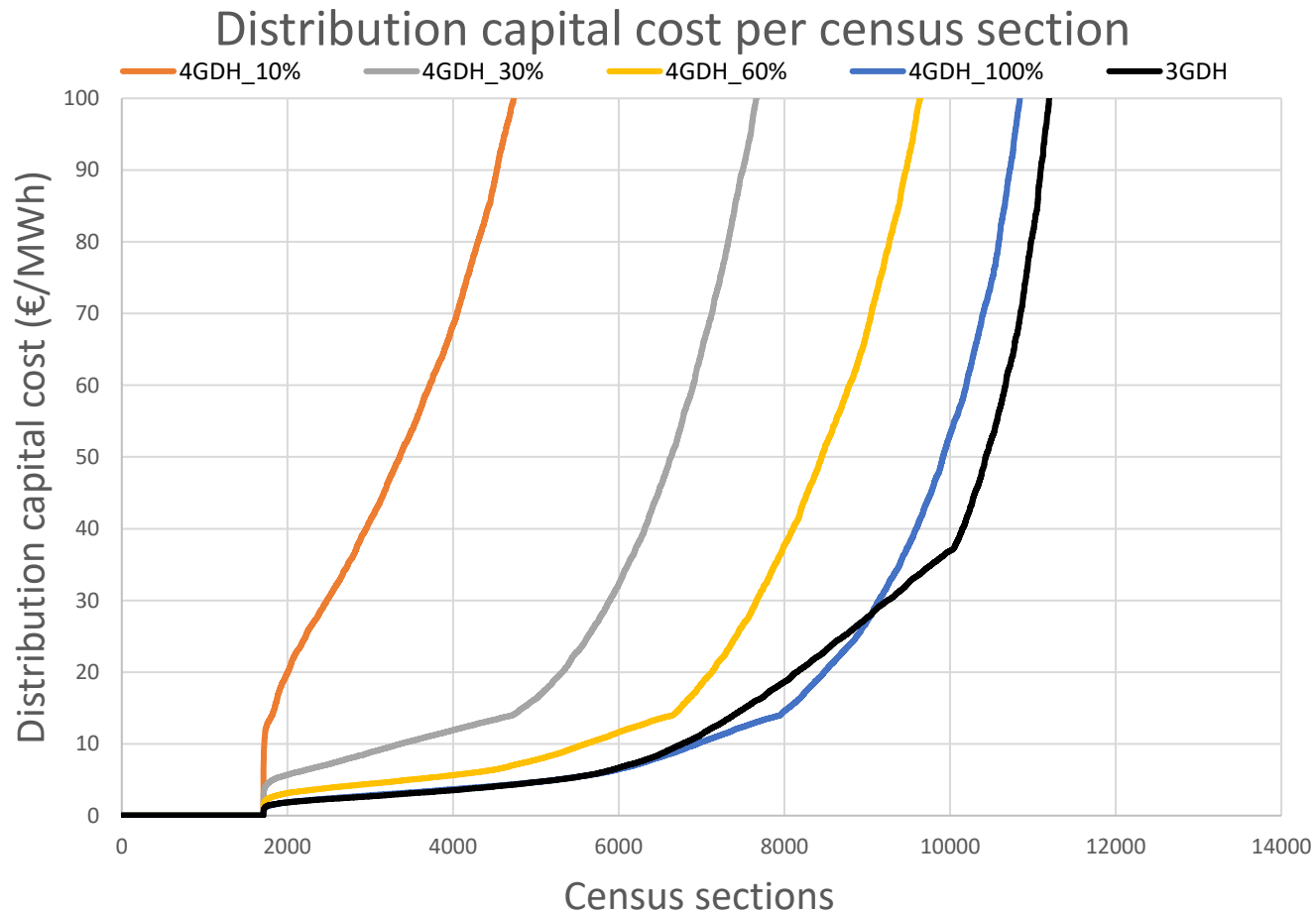
RESULTS – CASE STUDY

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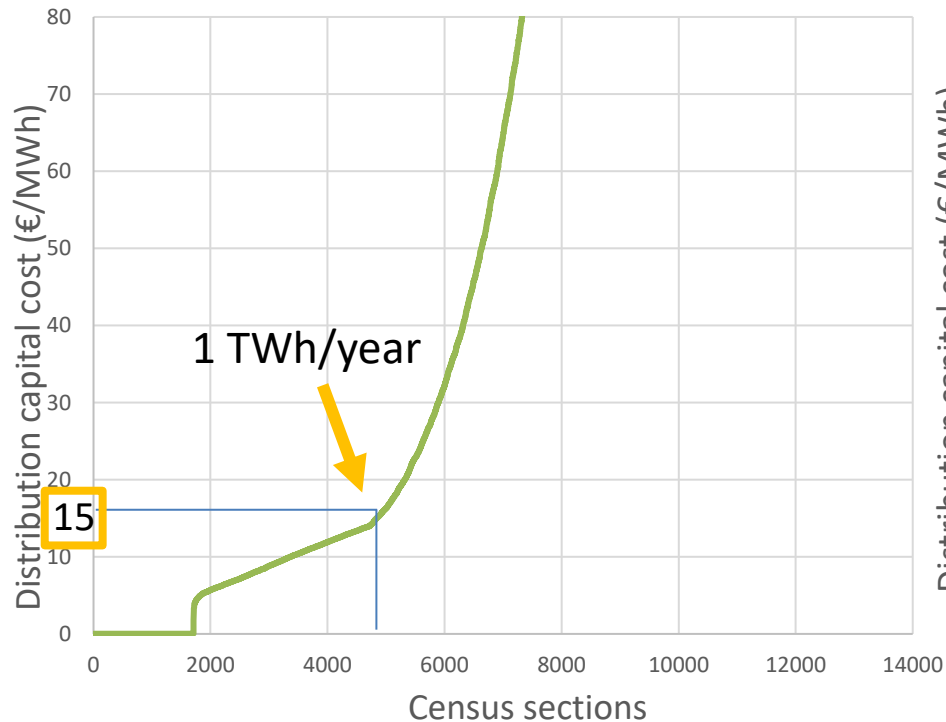
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RESULTS – 4GDH

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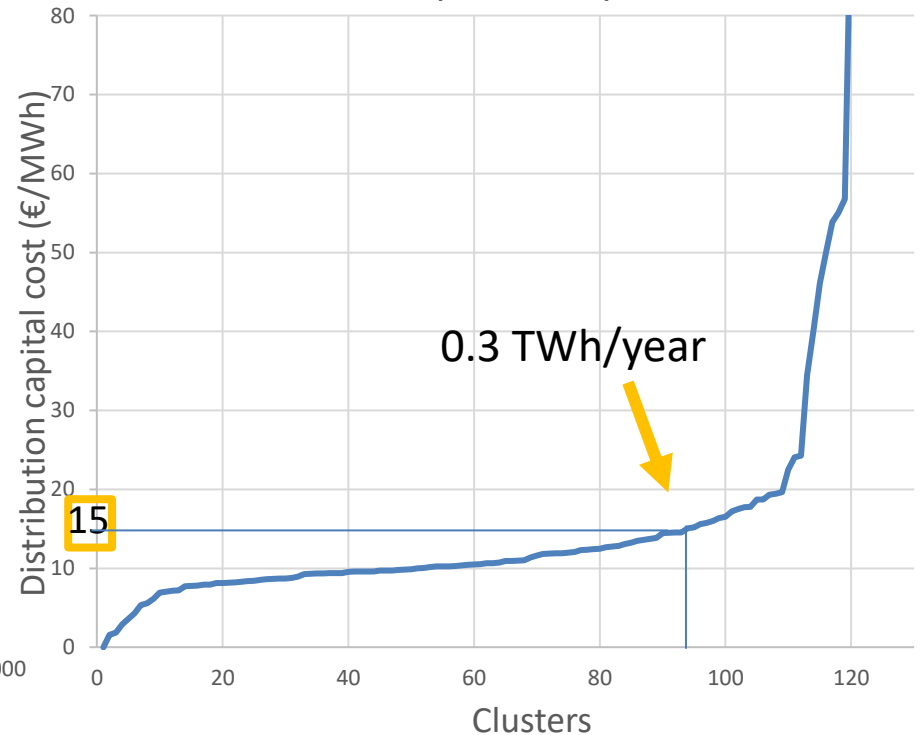
REFERENCE APPROACH

Distribution capital cost per census section



PROPOSED APPROACH

Distribution capital cost per cluster



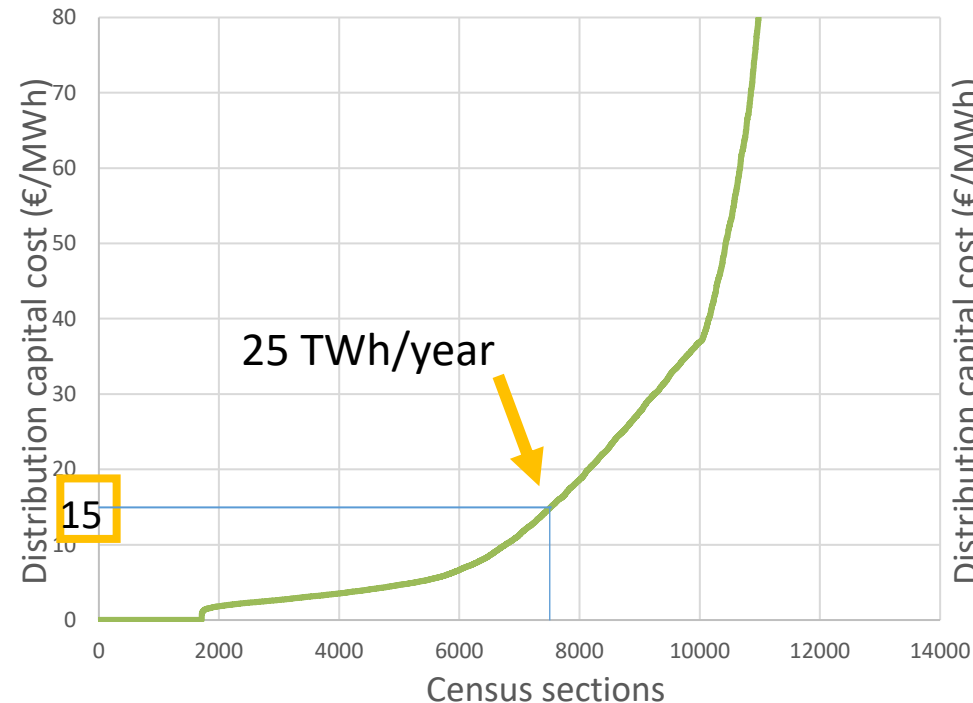
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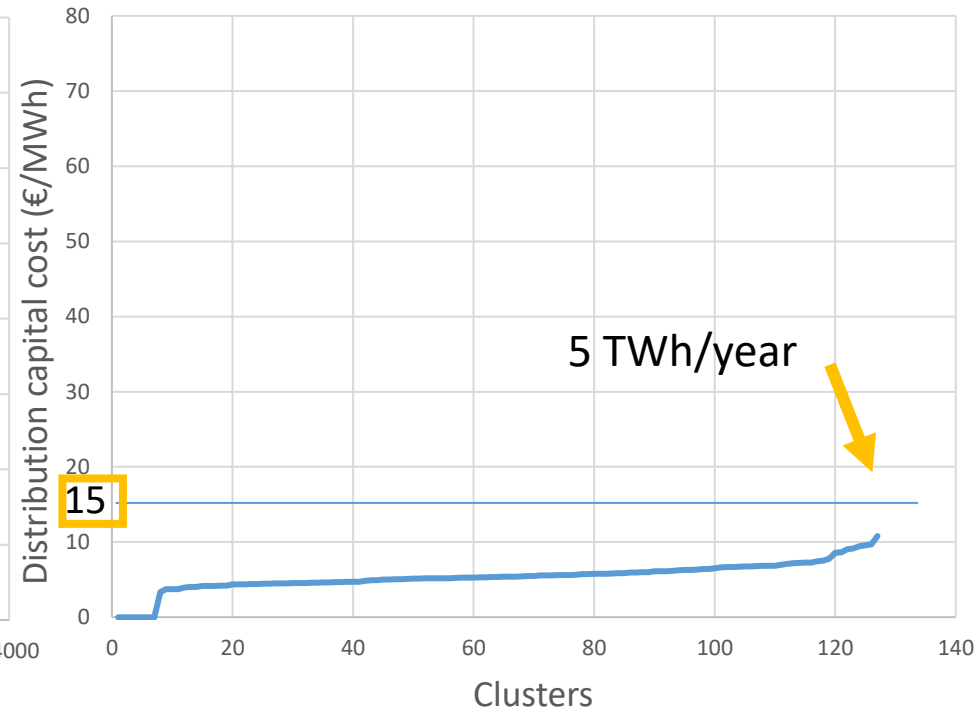
REFERENCE APPROACH

Distribution capital cost per census section



PROPOSED APPROACH

Distribution capital cost per cluster



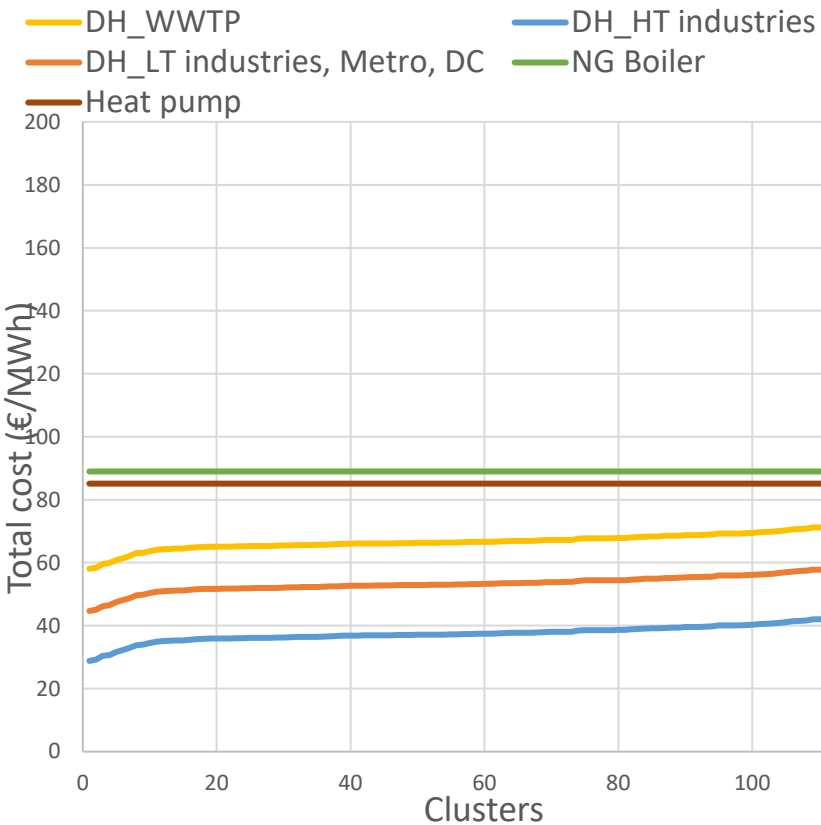
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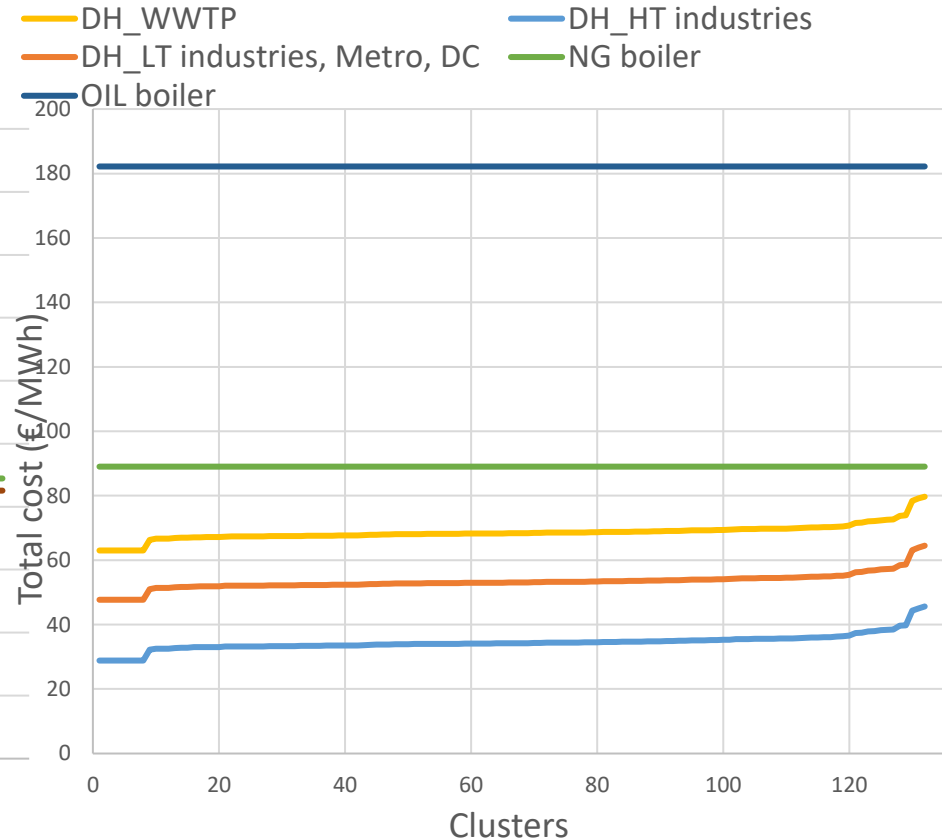
RESULTS – COMPARISON BETWEEN TOTAL COST OF DH AND THE INDIVIDUAL HEATING SOLUTIONS

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4GDH



3GDH



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CONCLUSIONS



Development of a new methodology

- High level of detail
- Georeferenced results
- High replicability



Viable potential of 3GDH and 4GDH in the province of Milan

Thank you for your attention

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