



2050

**Heat Roadmap Europe**  
A low-carbon heating and cooling strategy

# Energy Mapping in Heat Roadmap Europe

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13 June 2017

District Energy in Chile



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 695989.

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# Who are we?



## Energy planning:

- **Highly renewable** energy systems with **radical technological change**
  - Smart Energy Systems
  - Cost-efficient and sustainable use of resources



## Today: mainly Denmark and the European Union

- Energy systems analyses
- Feasibility studies
- Public regulation analysis



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# Heat Roadmap Europe 4

## Overall Aim

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**To identify how 14 EU countries can cost-effectively decarbonise their heating and cooling sectors...**

**...by quantifying the impact of various alternatives**



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# Heat Roadmap Europe 1, 2, 3, and 4

- Study 1 (2012): will **district heating** play a role in the decarbonisation of the European energy system?
- Study 2 (2013): what is the balance between **heat savings and heat supply** at an EU level?
- Study 3 (2015, STRATEGO WP2): low-carbon **heating and cooling strategies** for 5 member states
- Study 4 (2016-2019): low-carbon **heating and cooling strategies** for 14 member states

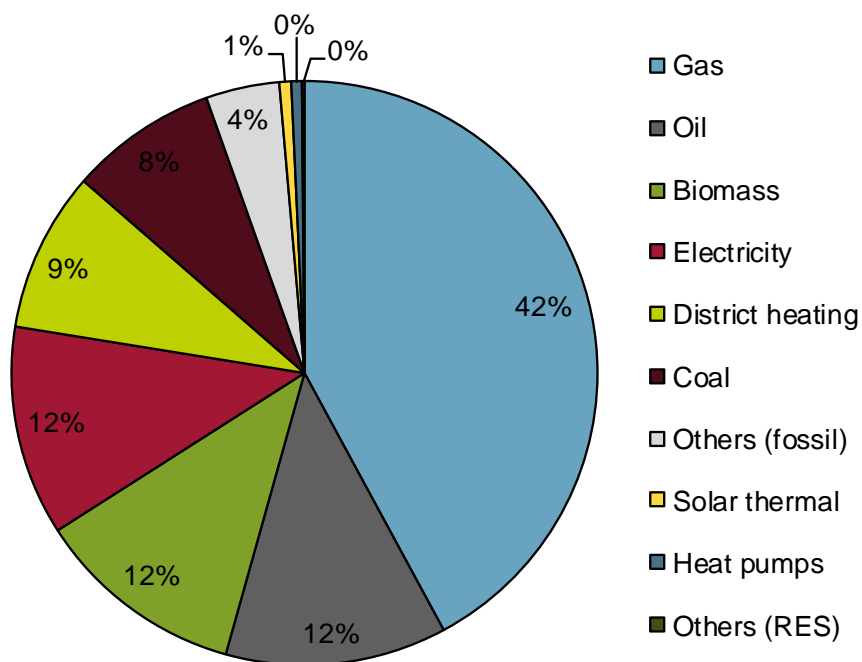


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# H&C final energy by energy carrier in 2015 (EU28)



## 2015 shares FED:

- Fossil: 66%
- RES: 13%
- El+DH: 21%

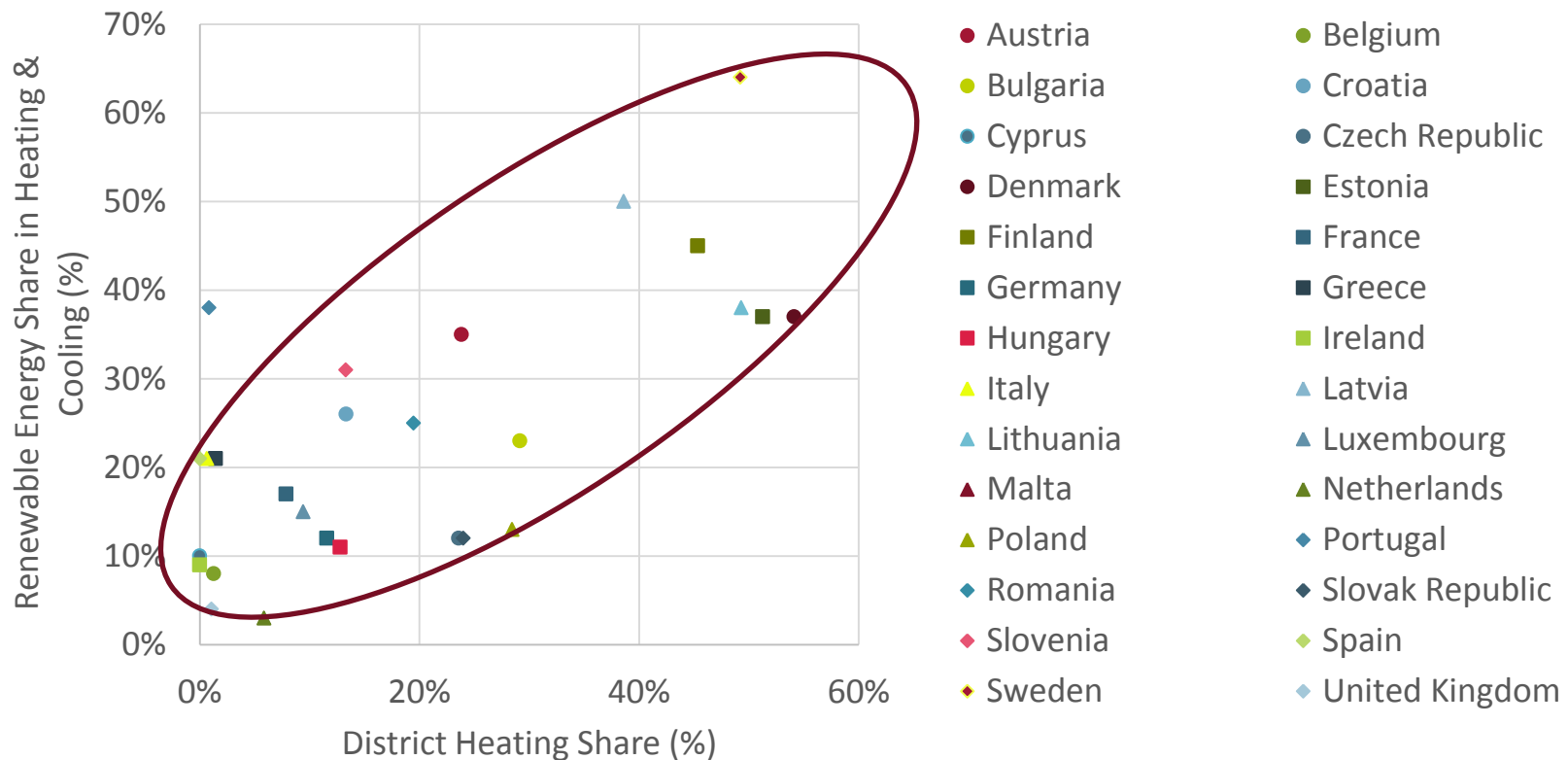


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# Renewable energy vs. DH



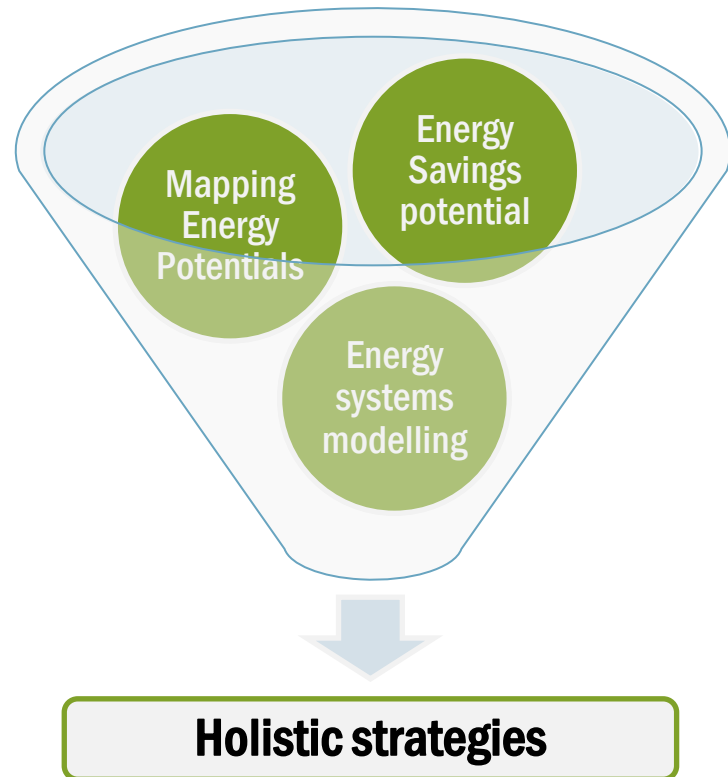
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# HRE Approach

- Energy mapping
- Energy system modelling
  - Integration of sectors to assess impact on whole energy system



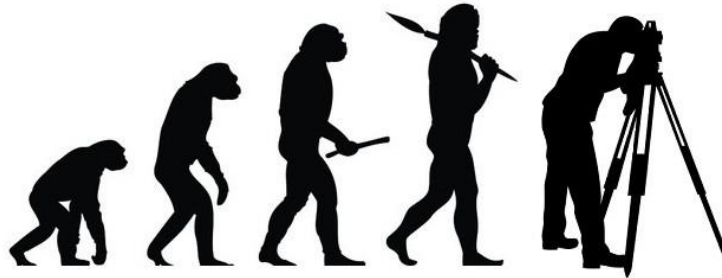
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# Energy mapping is key to energy planning

- Infrastructure!
- Heating sector information is highly **local** or highly **aggregated**
  - Heating is local and requires **explicit mapping**
  - Coherent mapping of demand and supply on national scale? Where to start?
  - **Mapping can also be expensive**



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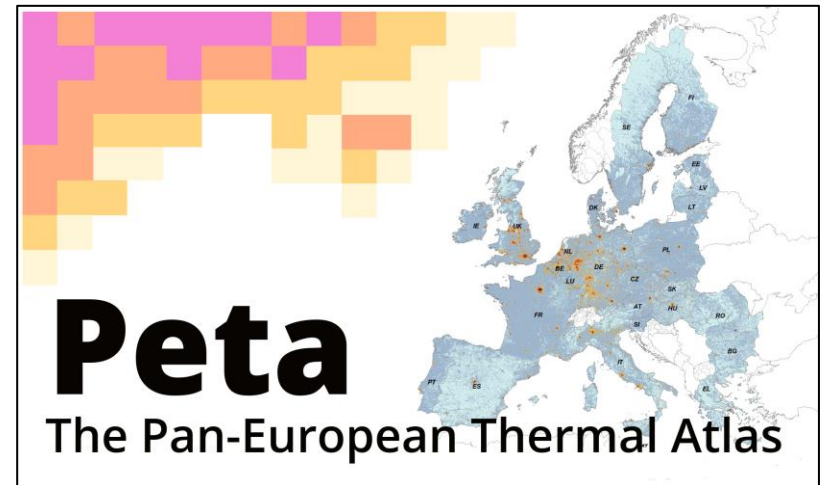
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# Energy Mapping in HRE4

- Denmark: data very readily available
- Pan-European Thermal Atlas:
  - Part of the Heat Roadmap Europe projects
  - Covers currently 14 countries
  - Developing Peta4: update in September
  - [www.heatroadmap.eu/Peta4](http://www.heatroadmap.eu/Peta4)



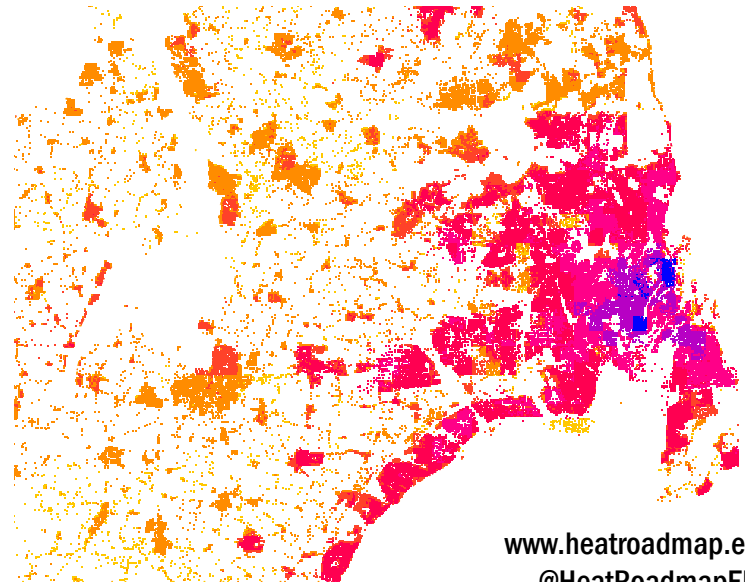
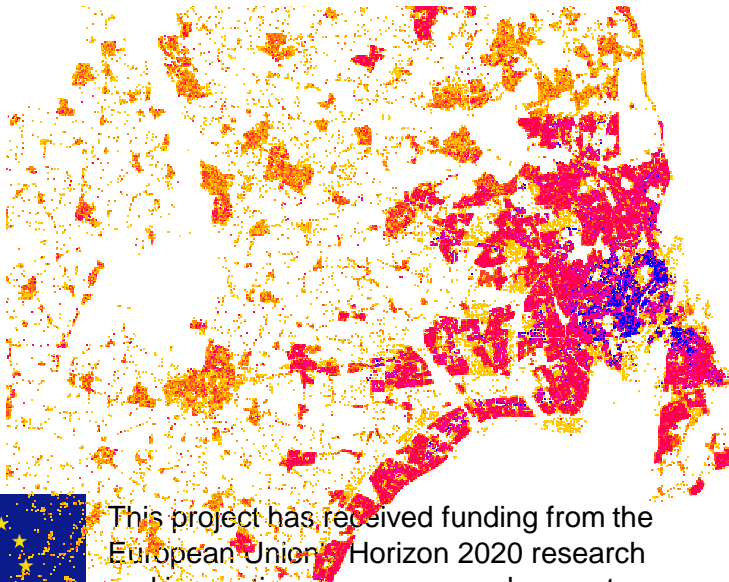
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# Peta: localising demand

- Peta is a **model** – not measured or counted data!
- Spatial statistical analysis: we work towards measured data
  - Hypothesis testing
  - Model training



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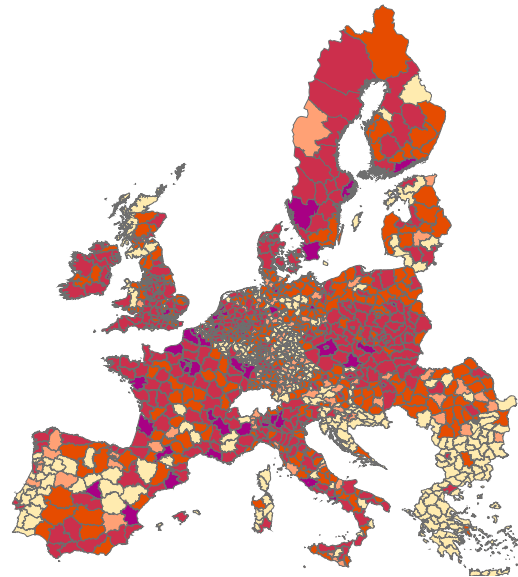
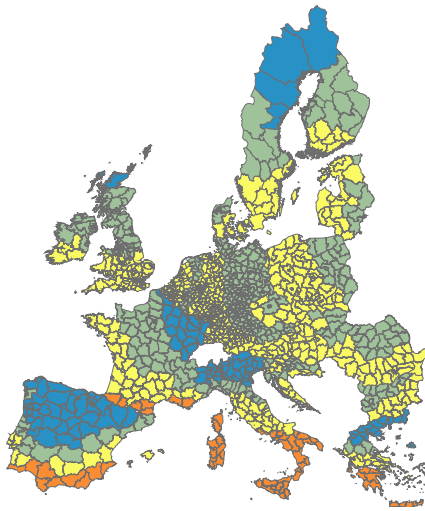
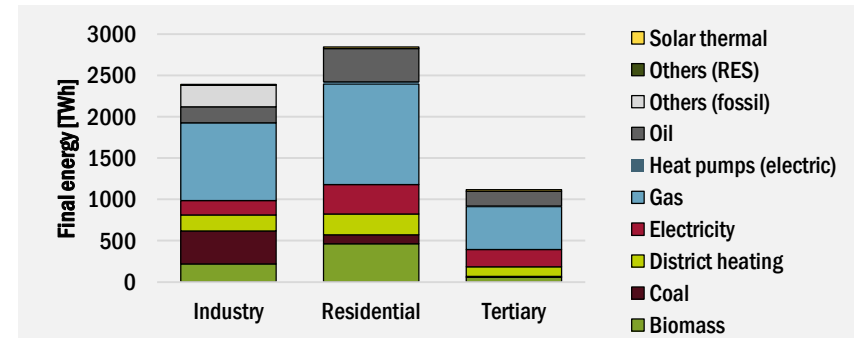
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# Top-down: aggregate data

- **Heat demand**

- Sector profiling (in HRE)
- NUTS3/'provinces': Eurostat
- Weighted heating index



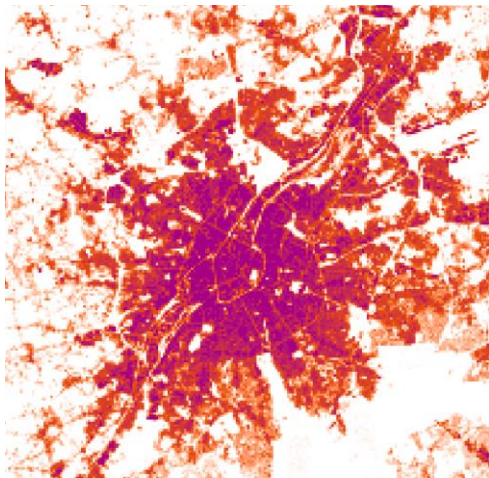
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# Bottom-up: existing spatial data

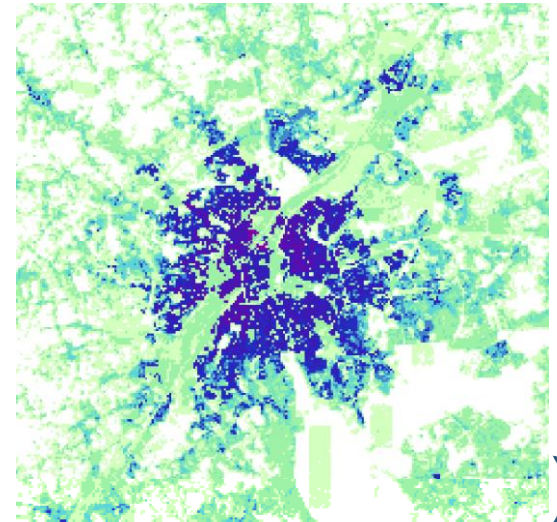
- Population
- Corine: land use and built-up area
- Iterative process (training)



**Degree of built-up (EEA)**  
European Union's Horizon  
programme under grant  
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**Population (JRC)**

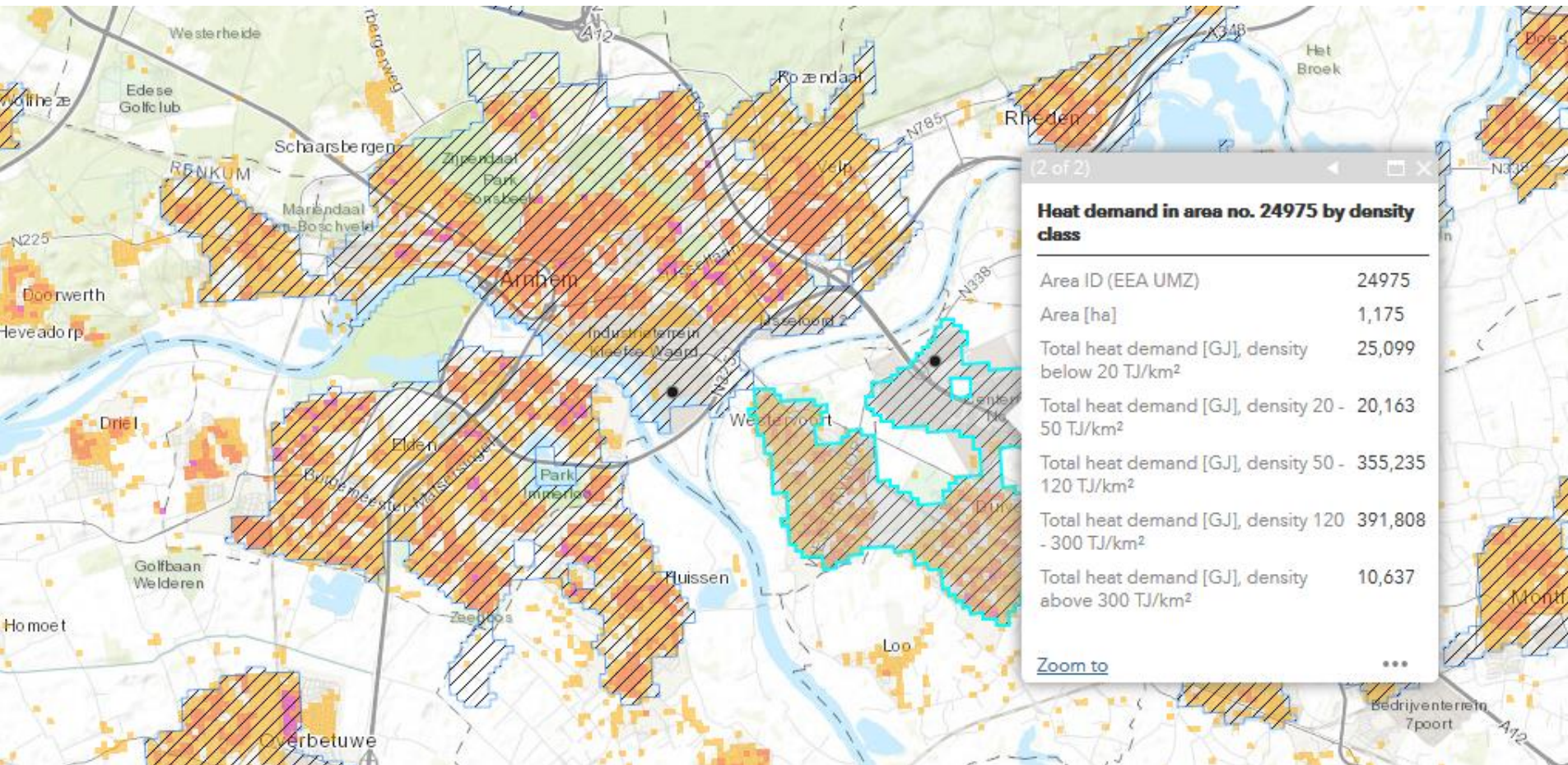


**Statistically derived  
floor area, 100m**  
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# Coming: Prospective Supply Areas



For all coherent urban areas (urban morphological zones), heat demand is summarised by density. Further attributes will be costs, allocation of excess heat, and renewable energy.



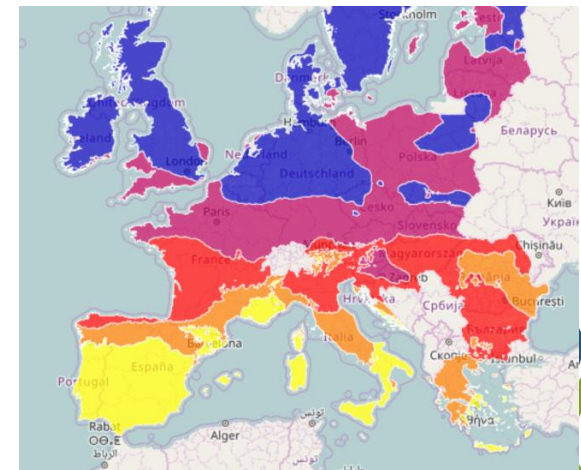
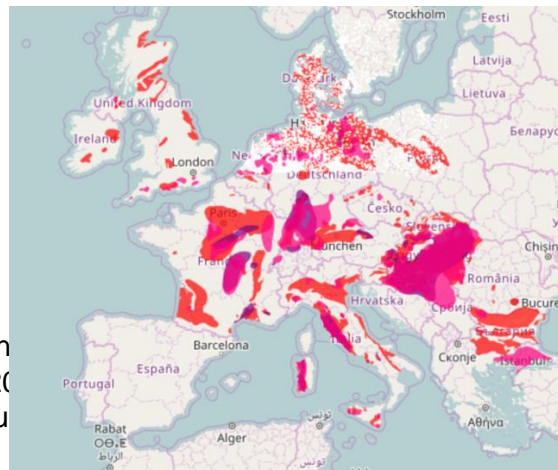
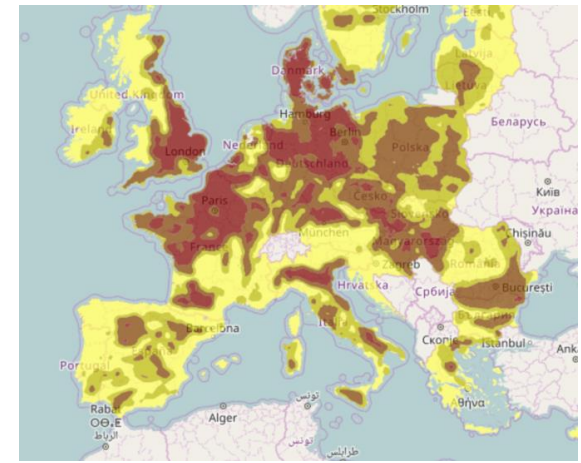
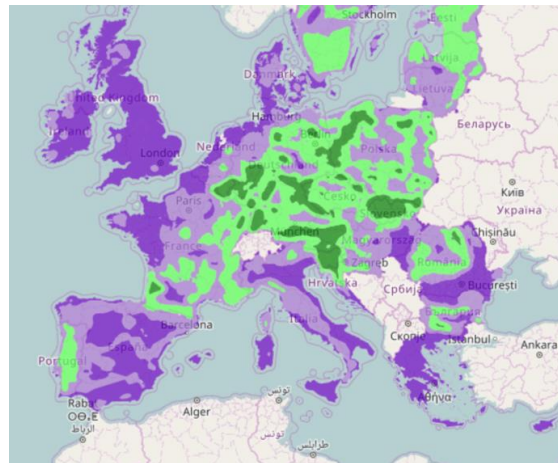
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# Mapping resources

- Excess heat from electricity production
- Excess heat from industry
- Residual biomass
- Geothermal
- Solar
- Access to water for heat pumps
- Existing DH (Halmstad)
- ...



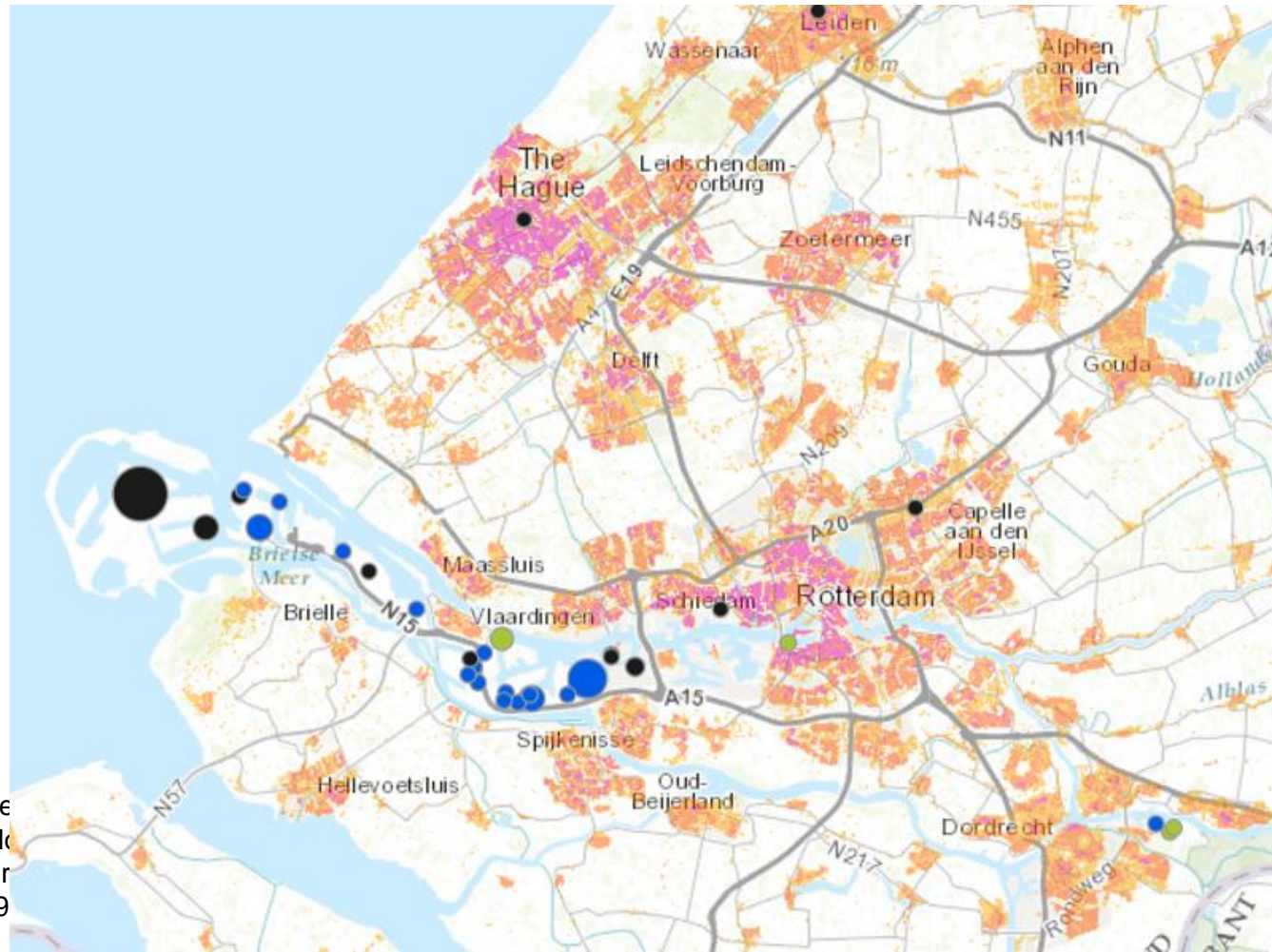
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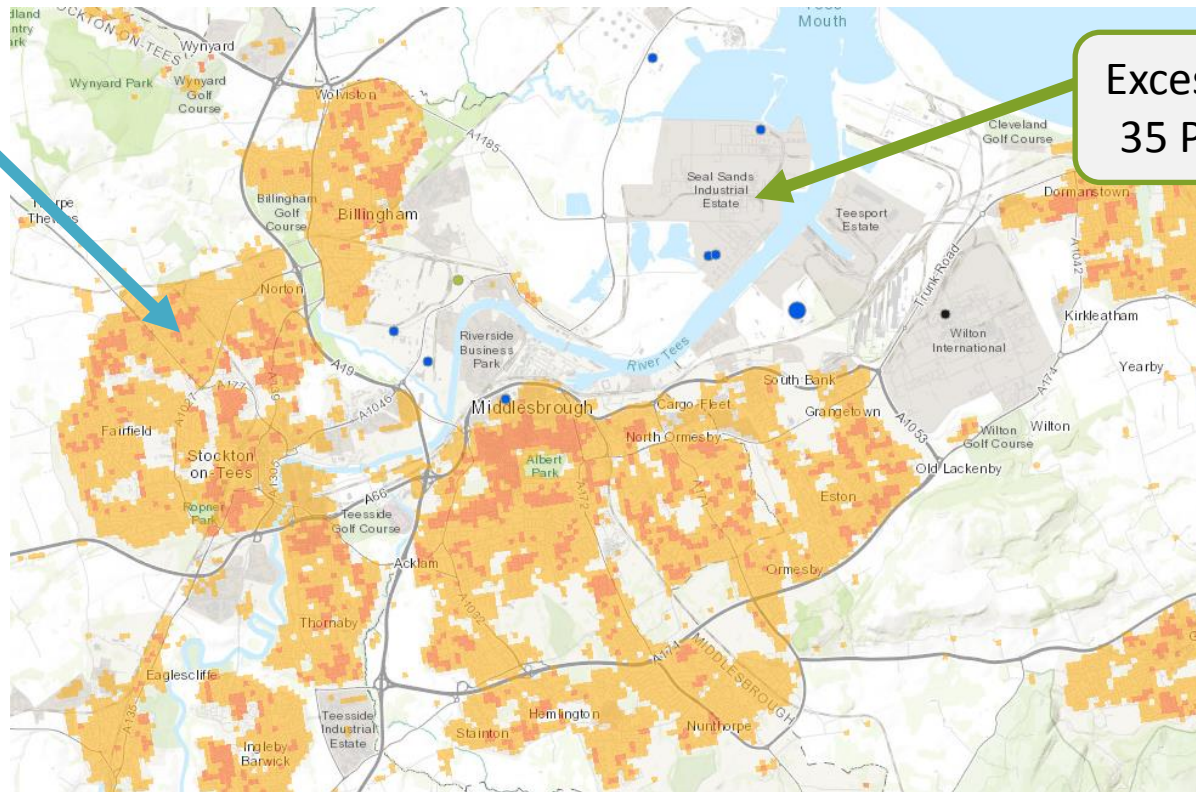


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# Hotspot identification

Heat Demand  
Suitable for DH  
10 PJ/Year

Excess Heat  
35 PJ/Year



 Europa-Universität  
Flensburg

 HALMSTAD  
UNIVERSITY

  
AALBORG UNIVERSITY  
DENMARK



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N.B.: very preliminary!

## Allocation of Excess Heat

### Percentage allocated

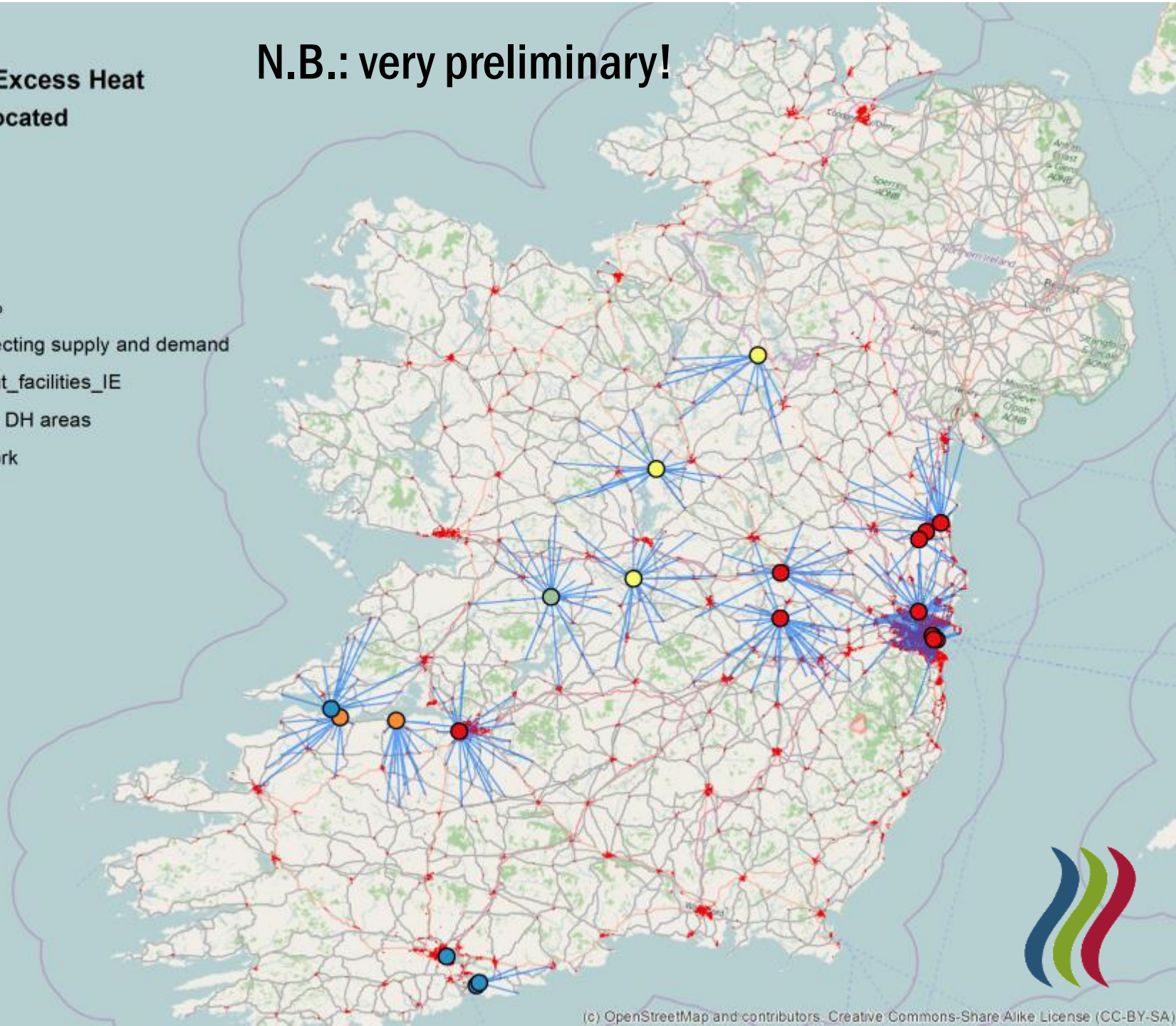
- 0% - 10%
- 11% - 20%
- 21% - 50%
- 51% - 80%
- 81% - 100%

Lines connecting supply and demand

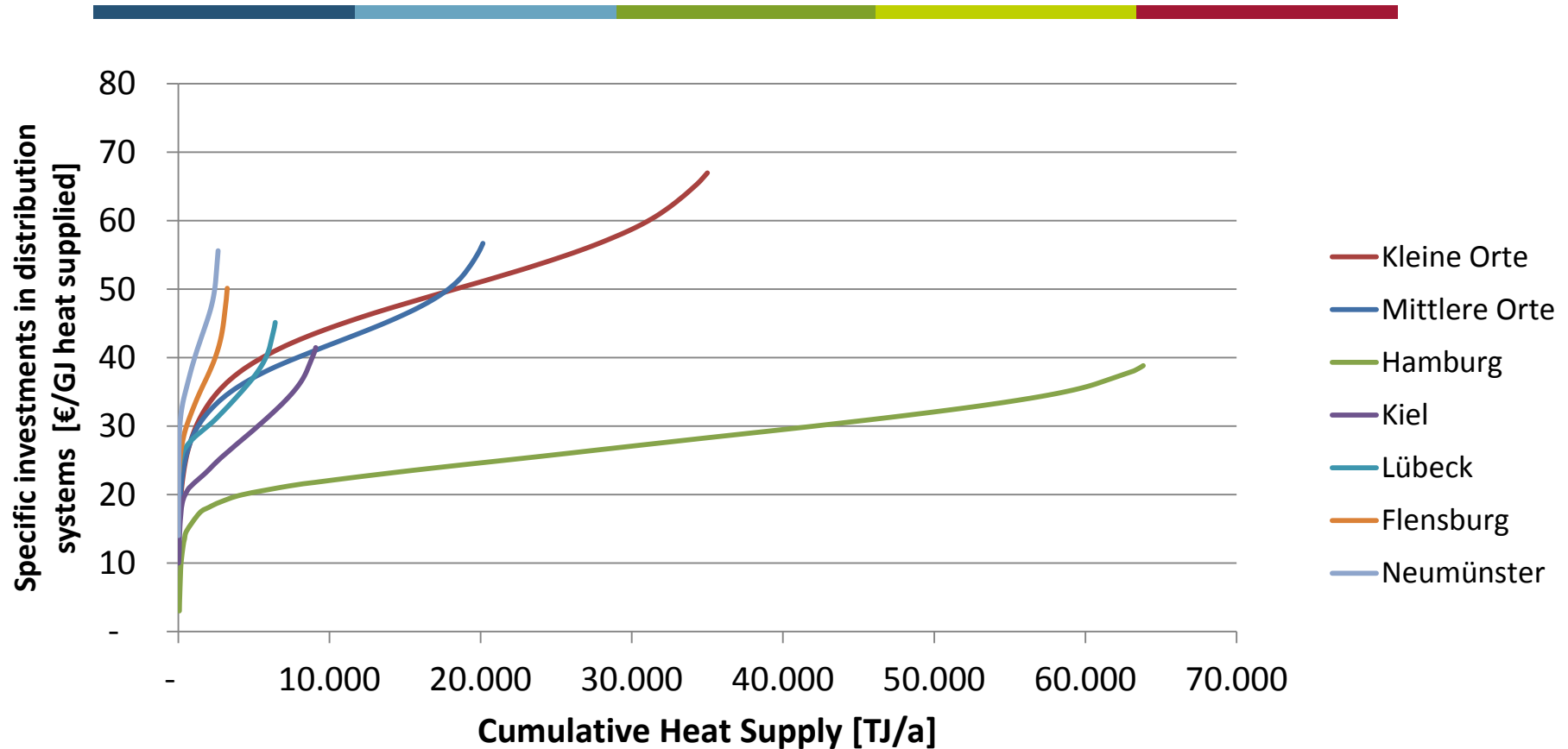
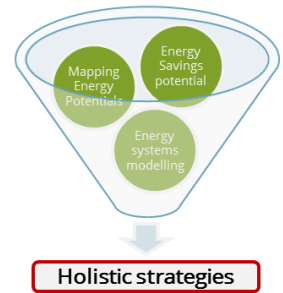
• excess\_heat\_facilities\_IE

Prospective DH areas

Road network



# Cost of infrastructure

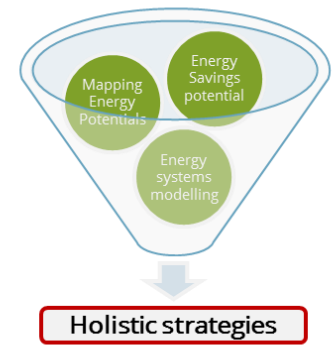


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# Key Recommendations for the Heat Sector



## Everywhere

Heat Savings

Balance Savings vs.  
Supply

30-50% Total Reduction

## Urban Areas

District Heating  
Networks

High Heat Density  
Areas

Supply ~50% of the  
Heat Demand

## Rural Areas

Primarily Electric Heat  
Pumps

Smaller Shares of Solar  
Thermal & Biomass  
Boilers

Remaining ~50% of the  
Heat Demand



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# THANK YOU



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