

# **Heat Roadmap Europe – potential to save money and carbon emissions**

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## **Outline**

1. Current heat market context
2. 4DH – Fourth generation district heating systems
3. Heat Roadmap Europe – Logic and results
4. Heat Roadmap Europe – Mapping
5. Conclusion

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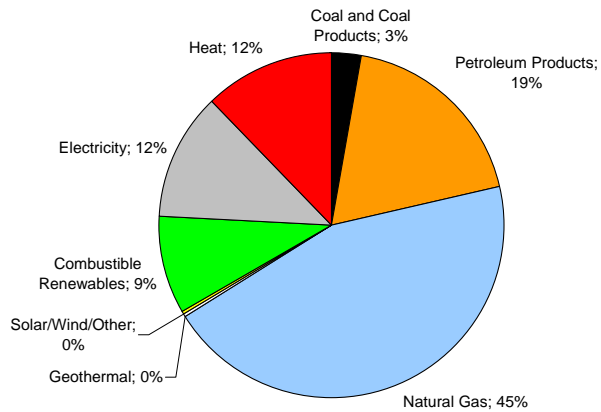
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## Current heat market context

### EU27 during 2008, Origin of heat supply for heat demands in residential and service sector buildings

Total heat supply was 11.5 EJ, not including indirect heat supply from all indoor electricity use



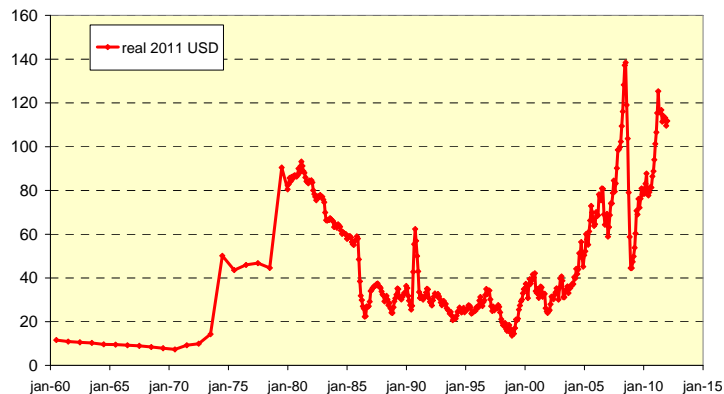
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## Current heat market context

### USD/barrel Crude oil, import price to Europe until January 2012



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## 4DH research centre, Denmark

- Aalborg University (professor Henrik Lund) as coordinator with 31 active partners.
- 2012-2017, with a total budget of almost 10 M€, mainly financed by DSF, the Danish Council for Strategic Research. Currently, the largest academic district heating project in Europe.
- Considering future market conditions (technology, supply/demand, and institutional frameworks) for the 4th generation of district heating technology.
- 13 PhD students

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## 4DH, Denmark

New future market conditions:

- Supply: Less heat from CHP using fossil fuels. More heat from renewables as solar, geothermal, biomass, and wind.
- Demand: Lower specific heat demands
- Technology: More efficient heat distribution with lower distribution temperatures

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## Heat Roadmap Europe

- Market project within the 4DH research centre in cooperation with Euroheat & Power, Brussels
- **What is the future market for district heating in Europe?**
- Heat Roadmap Europe, prestudy 1 (2012) concerning business-as-usual scenario with current heat demands
- Heat Roadmap Europe, prestudy 2 (2013) concerning a high energy efficiency scenario

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## Heat Roadmap Europe - Why this study?

- The **heating and cooling sector has largely been overlooked** in all scenarios exploring the energy future towards 2050.
- **Heat Roadmap Europe** focuses on the future European heat and cooling market and its importance in terms of cost-savings, job creation, investments, and **a smarter energy system.**

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## Heat Roadmap Europe - Logic

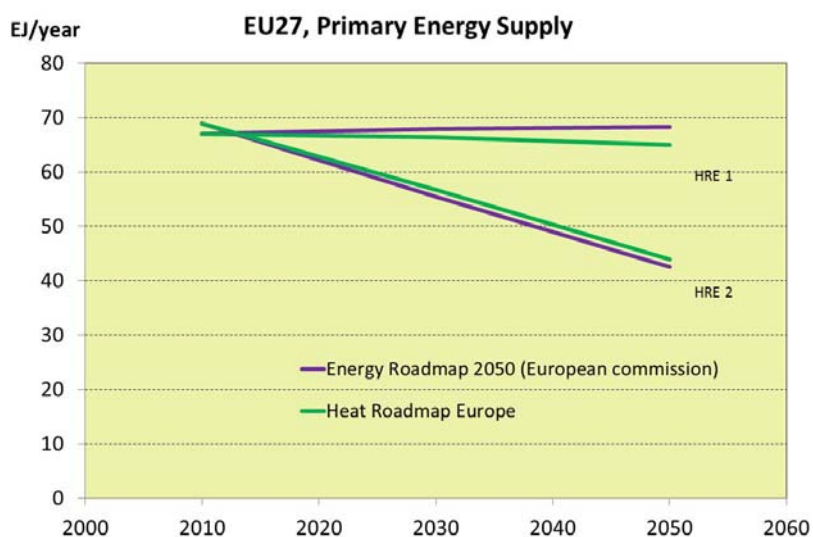
- All results are benchmarked against the EC communication called **Energy Roadmap 2050** (Dec 2011), which did not see a bright future for district heating with a market share of **10%** in 2050.
- **Heat Roadmap Europe** presumes a market share of **50%** for district heating in 2050 for heating the EU27 buildings.
- The current market share is **13%**.

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## Heat Roadmap Europe - Logic



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## Heat Roadmap Europe 1 - Results

- Reduced fuel costs of 30 Billion EUR with 50% district heating in 2050
- Total heating costs are reduced by **14 Billion EUR in 2050**
- Additional investments of a total of 500 billion EUR and additional jobs from 2013 to 2050: 8-9 million man-years in total
- Lower carbon dioxide emissions with 650 Mton in 2050 for heating buildings

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## Heat Roadmap Europe 2 - Results

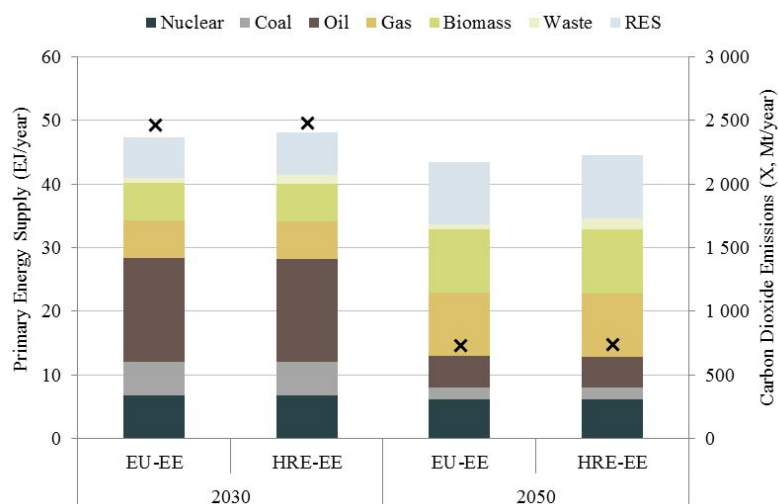
- Same primary energy supply, carbon dioxide emissions, and import dependence as in the **Energy Roadmap 2050**
- **Heat Roadmap Europe:** But the price tag with 50 % district heating in 2050 will be lower : **100 Billion EUR/year** in less end use investments.

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## Heat Roadmap Europe 2 - Results



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## Heat Roadmap Europe 2– Main results

- A. News:** First ever estimation of the district heating benefits in the future European energy system.
- B. Less costly:** We can avoid the most expensive end use energy efficiency measures and use district heating as a energy efficient tool.
- C. Paradox:** District heating has a higher competitiveness in a future more energy efficient Europe.

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## Heat Roadmap Europe - Mapping

- Normally, future energy projections are based on national energy balances, as **27 slices** for EU27, and generic options
- Heat Roadmap Europe uses a higher resolution, about **1300 slices** (NUTS3 regions). We consider specific regional and local options (existing district heating systems, heat surpluses, renewables etc)

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### HRE – Existing District Heating Systems in Europe by NUTS3 region

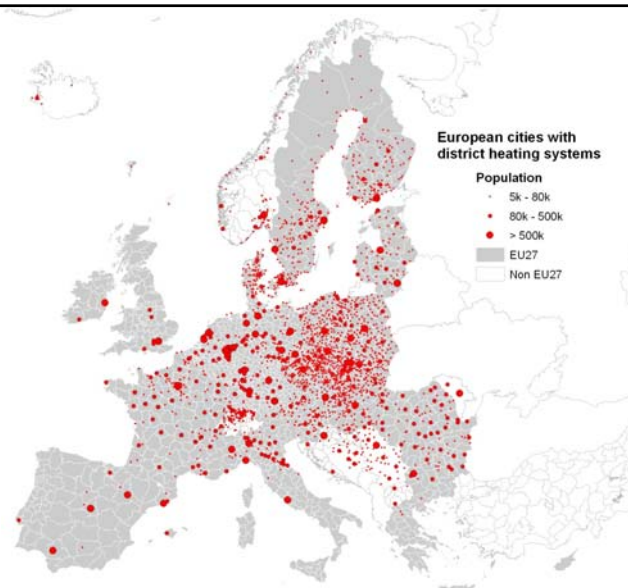


Figure 12-2. Map showing district heating systems in Europe in 2011. Systems have identified in 2779 cities and towns having more than 5000 inhabitants. Further 1395 district heating systems have been found in smaller towns and villages, mostly in Denmark, Sweden, Switzerland, Austria, the Czech Republic, and the Slovak Republic. According to national statistics, further about 1500 systems are in operation. Source: The European DHC database at Halmstad University (Urban Persson).

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HRE - Current waste incineration plants by NUTS3 region

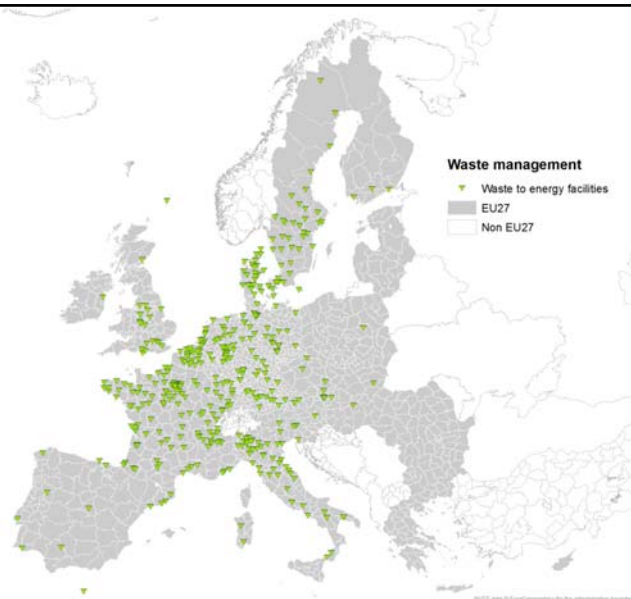


Figure 41. Locations of 414 waste incineration plants in Europe. Sources: CEWEP, E-PRTR, ISWA, and some national sources for Sweden, Denmark, and France.

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HRE – Energy intensive industries as heat sources

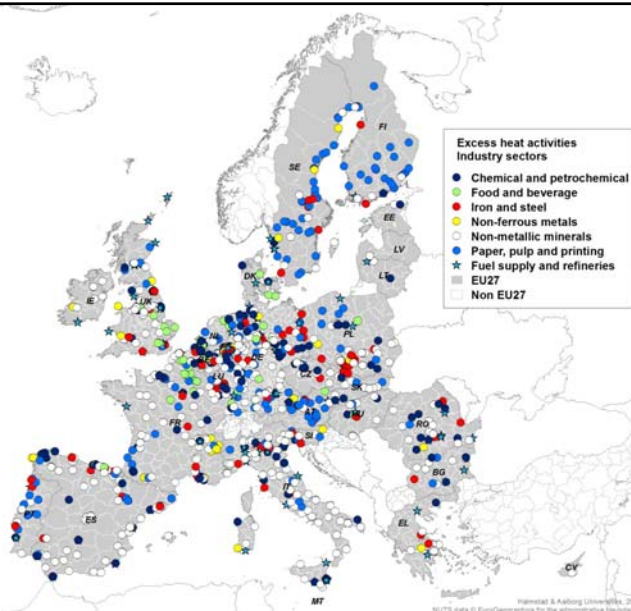


Figure 83: Locations of major energy intensive industries with considerable volumes of excess heat. Source: The E-PRTR database at EEA in Copenhagen.

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HRE: Possible areas for use of geothermal heat by NUTS3-region

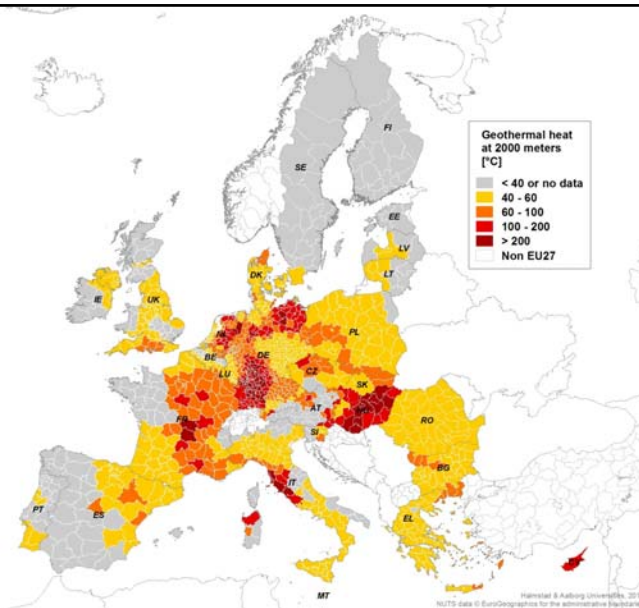


Figure 84: Identified geothermal heat resources by temperature at 2000 m depth by NUTS3 region. Source: European Commission, Atlas of Geothermal Resources in Europe. Publication EUR 17811, Luxembourg 2002.

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Biomass availability

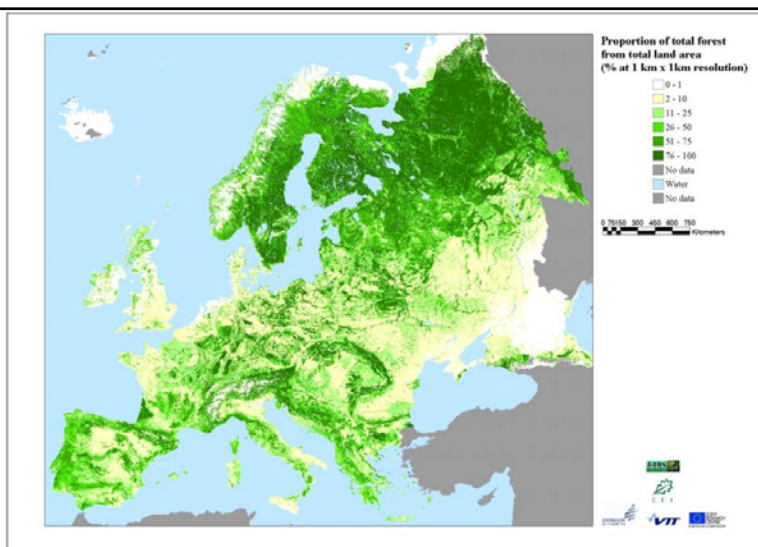


Figure 44: Proportion of forest area in various parts of Europe. Source: European Forest Institute.

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## Heat Roadmap Europe 2 – Results (hot spot regions)

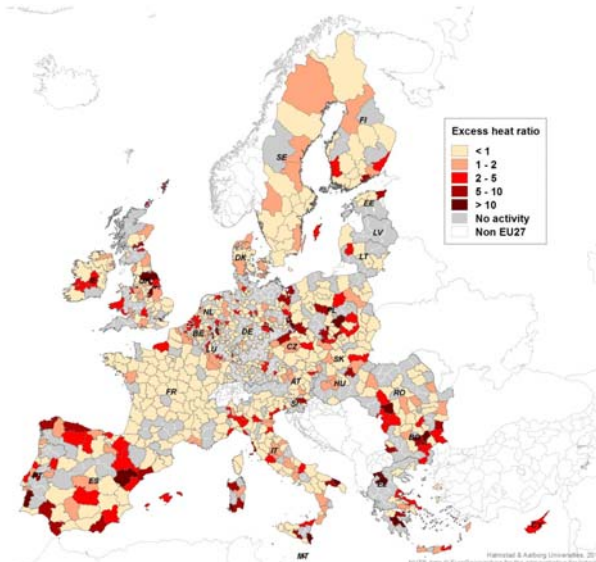
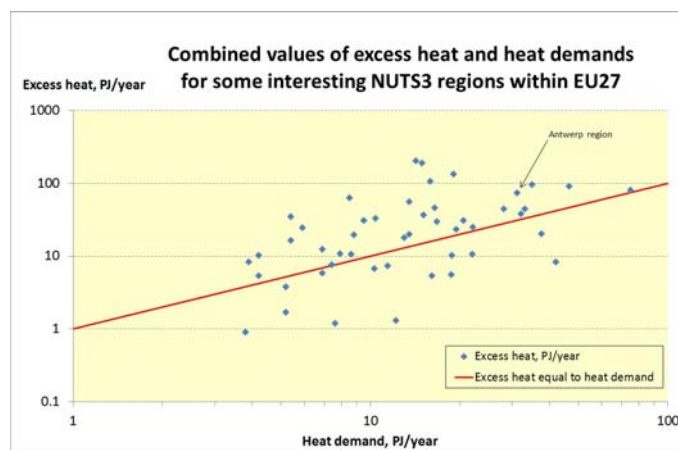


Figure 25: EU27 NUTS3 regions by their excess heat ratio, i.e. their share of excess heat relative their share of low temperature heat demands in residential and service sectors.

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## Heat Roadmap Europe 2 – Results (hot spot regions)



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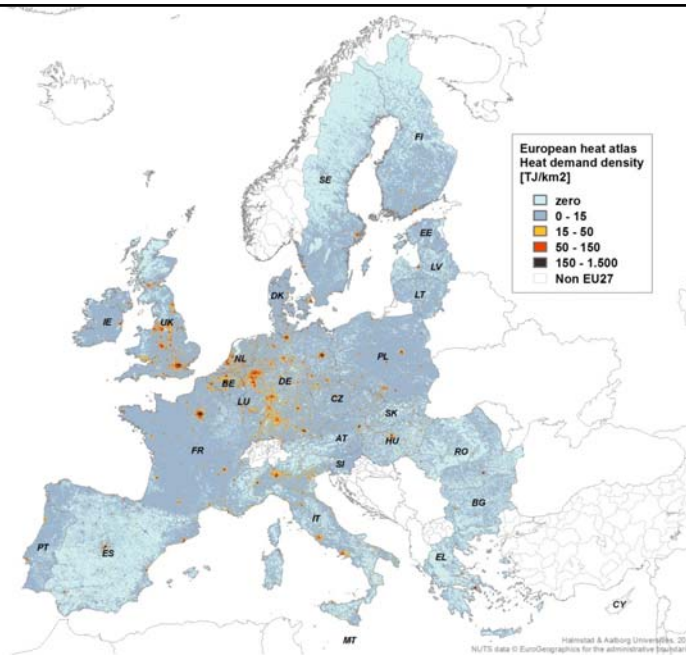
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## HRE – The European heat density atlas by km<sup>2</sup>

Two thirds of the EU population lives only on 4 % of the total land area (cities and towns).

Currently, only 0.3 % is covered by district heating systems.

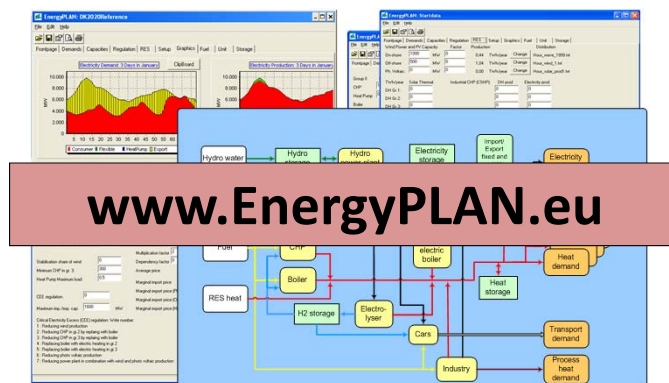


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## Heat Roadmap Europe - Modelling



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## Heat Roadmap Europe - Conclusion

# District heating is here to stay, but district heating has to change

(the 4th generation has to replace the 3rd generation  
of district heating technology)

Download the two HRE prestudies at

[www.4dh.dk/hre](http://www.4dh.dk/hre)

Download the HRE summary paper at

[www.sciencedirect.com/science/article/pii/S0301421513010574](http://www.sciencedirect.com/science/article/pii/S0301421513010574)

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The End

## ANY QUESTIONS?

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