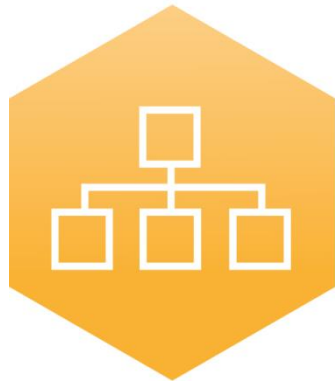


International Conference on Smart Energy Systems and 4th Generation District Heating  
Copenhagen, 25-26 August 2015

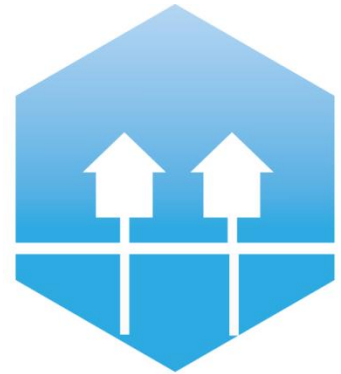


**AALBORG UNIVERSITY**  
DENMARK

# Energy Planning and Planning Tools

## Track 3 Keynote

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# 4DH

4th Generation District Heating  
Technologies and Systems

# Rationale



**“The future is unwritten” (Joe Strummer)**

**A desirable future needs to be planned**

**Planning needs proper data**

**Data is the result of action**



# Three entities form the decision basis for future, smart energy systems



- 1) The Past: statistics, registers of the present building stock, properties of existing units.**
- 2) The Present: currently available technologies, current markets, current agendas.**
- 3) The Future: Significant uncertainty in all aspects, diverse desires, normative approaches.**

**A radical technological change (Hvelplund) may require some emancipation from past and present data, but will nevertheless rely on such.**



# Modelling and Planning of 4DH



**Consequently, the next generation of DH systems is a successor or a continuation of present DH.**

**Energy models however need to free themselves from the technical, economic, social and cultural boundaries of the past and present.**

**The modelled, ideal future then needs to be communicated to the present and adapted to current policies for not sounding too Utopian.**



# Challenges



**Many actors in the “liberalized” energy system counteract the notion of free and open data, but see data as an asset and a competitive advantage.**

**New sources of data are prospected and developed all the time, see the Big-Data mania of the networked corporate world.**

**Public regulation may be too weak and slow to react.**

**New ways of combining data into models are being developed and new models appear all the time.**



# The geographical dimension



**When passing beyond the interest for the absolute, planning and modelling is going to show interest in the relative and the marginal.**

**An increasing emphasis is on the location and distribution of energy resources, infrastructures and efficient demand in terms of amounts and costs.**

**Decision support systems must therefore increasingly address the small scale geography of the present.**



# The European approach



**Increasingly, the EU formulates future energy policies.  
The EU collects data at the least common denominator:  
Eurostat, spatial geodata etc.  
This is good *in average*: while it promotes common  
standards, it caps advanced public data systems.  
The diversity across European countries makes it  
challenging to seek for Pan-European modelling and  
data solutions.**



# Mapping and modelling for energy planning

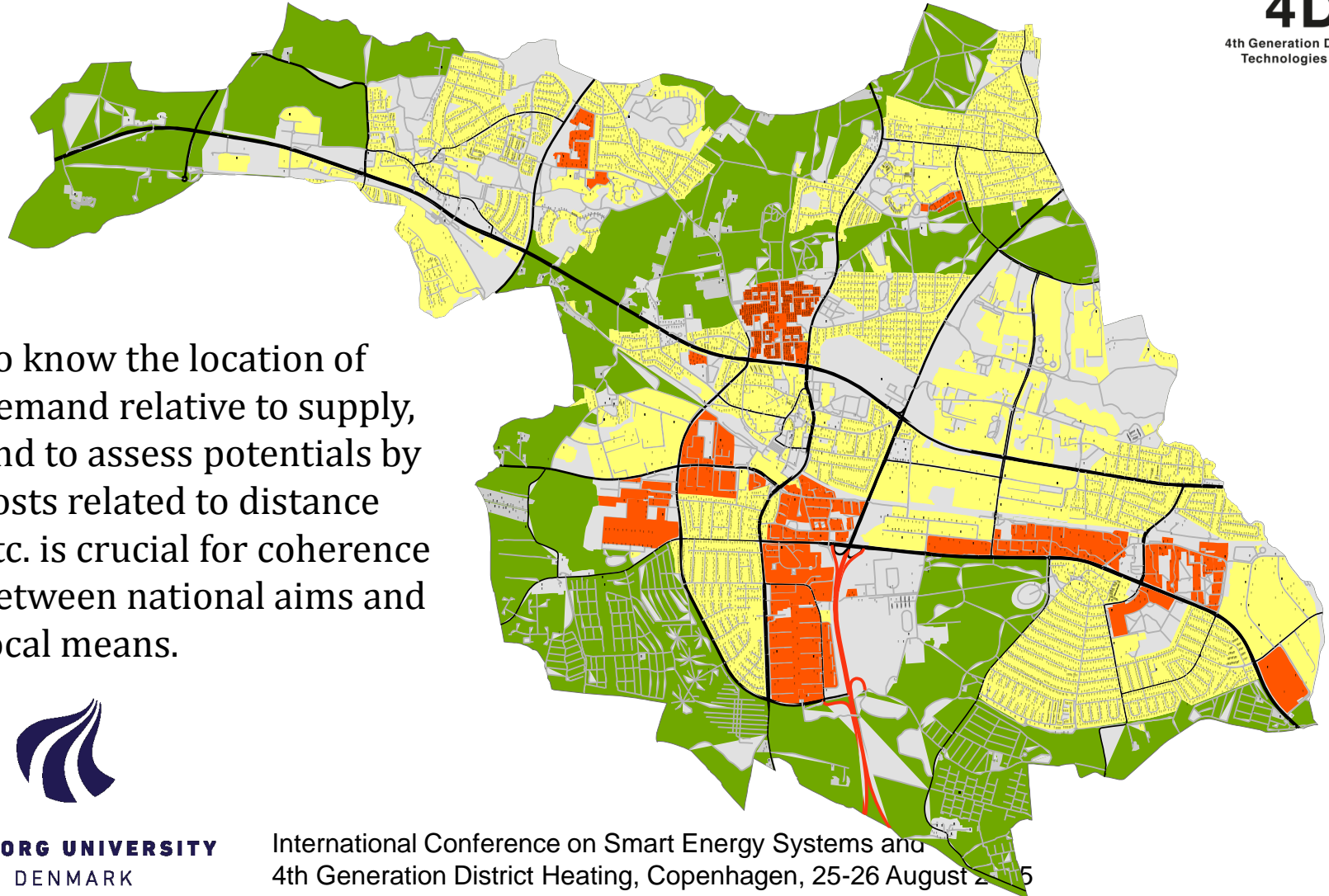


- Examples from current research:
  - Heat Atlas Denmark (See also Lars Grundahl and Stefan Petrovic in this session)
  - Heat Roadmap Europe
- An Outlook





# Heat Atlas DK: Spatially coherent data bases for systems analysis



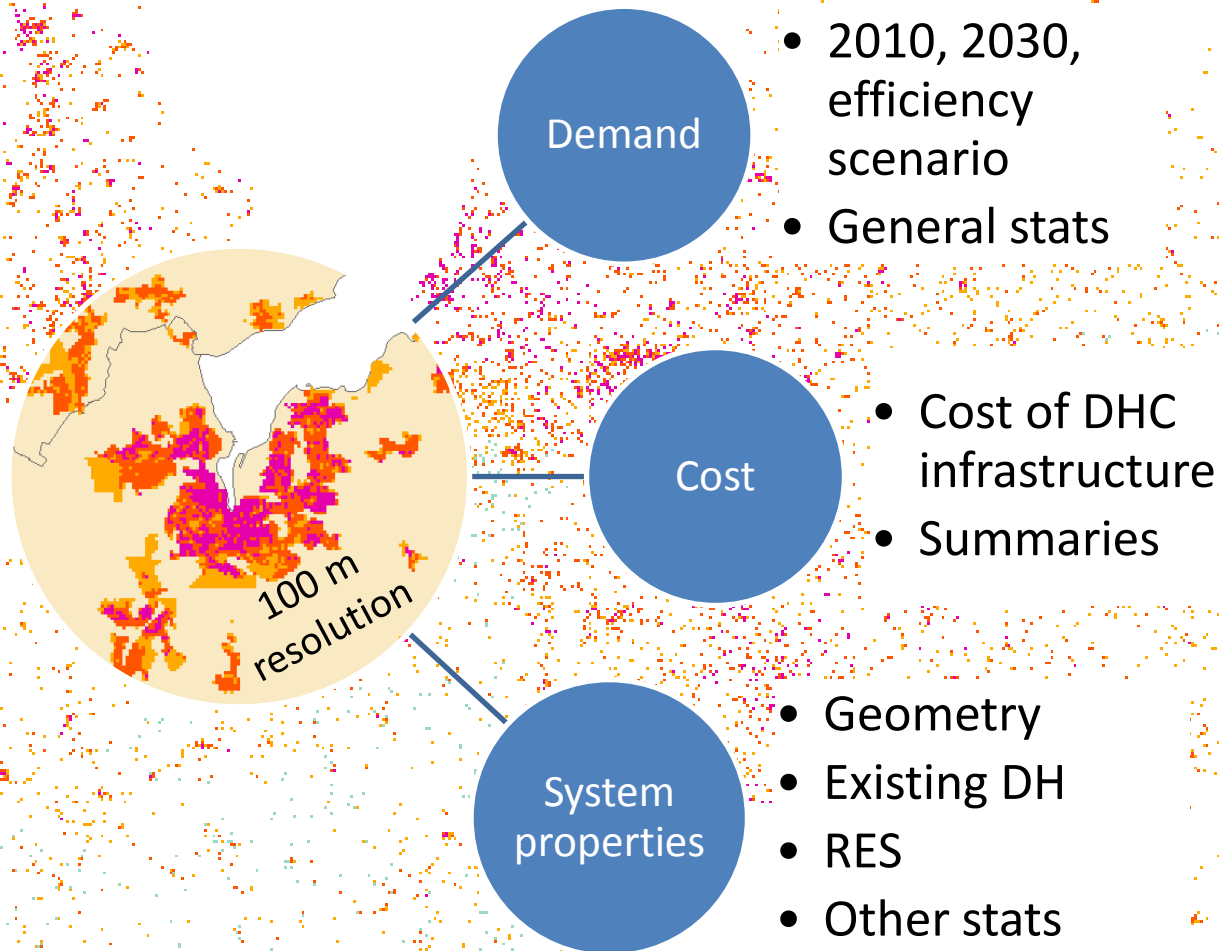
To know the location of demand relative to supply, and to assess potentials by costs related to distance etc. is crucial for coherence between national aims and local means.



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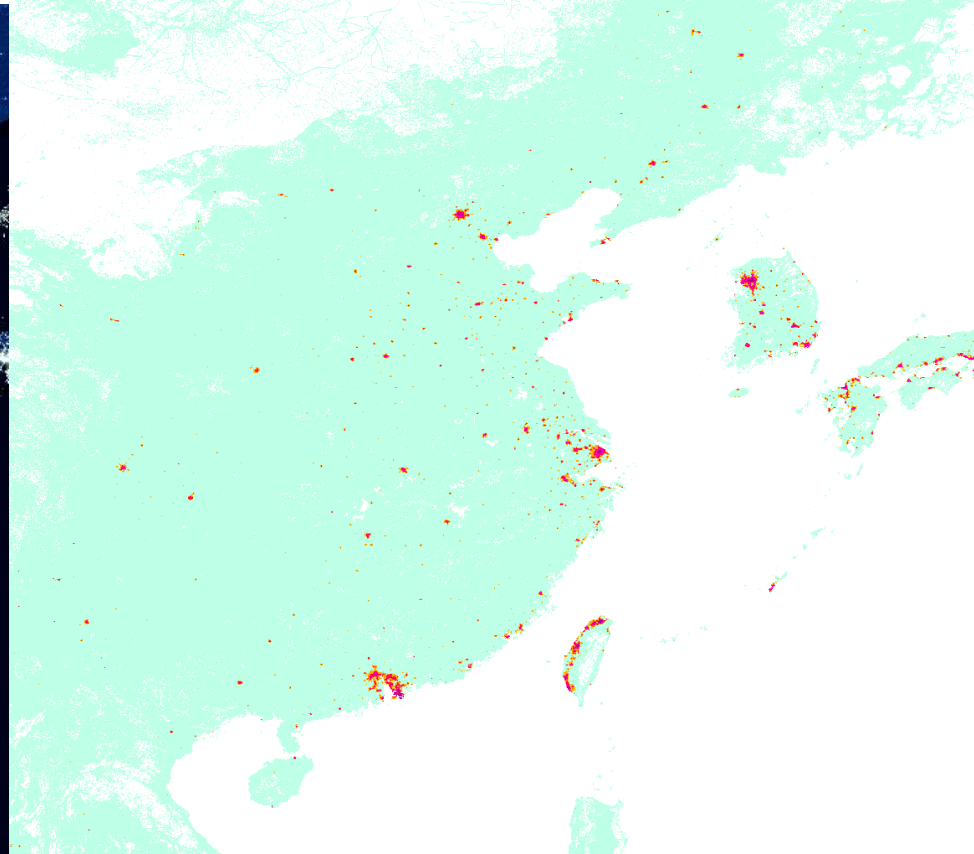
# Peta: Multi-dimensional data for the European heating and cooling sectors



# A World Thermal Atlas?



NOAA: Nightlights, approx. 3km



LandScan: 1km<sup>2</sup> modelled GDP