MUNICIPAL HEAT PLANNING

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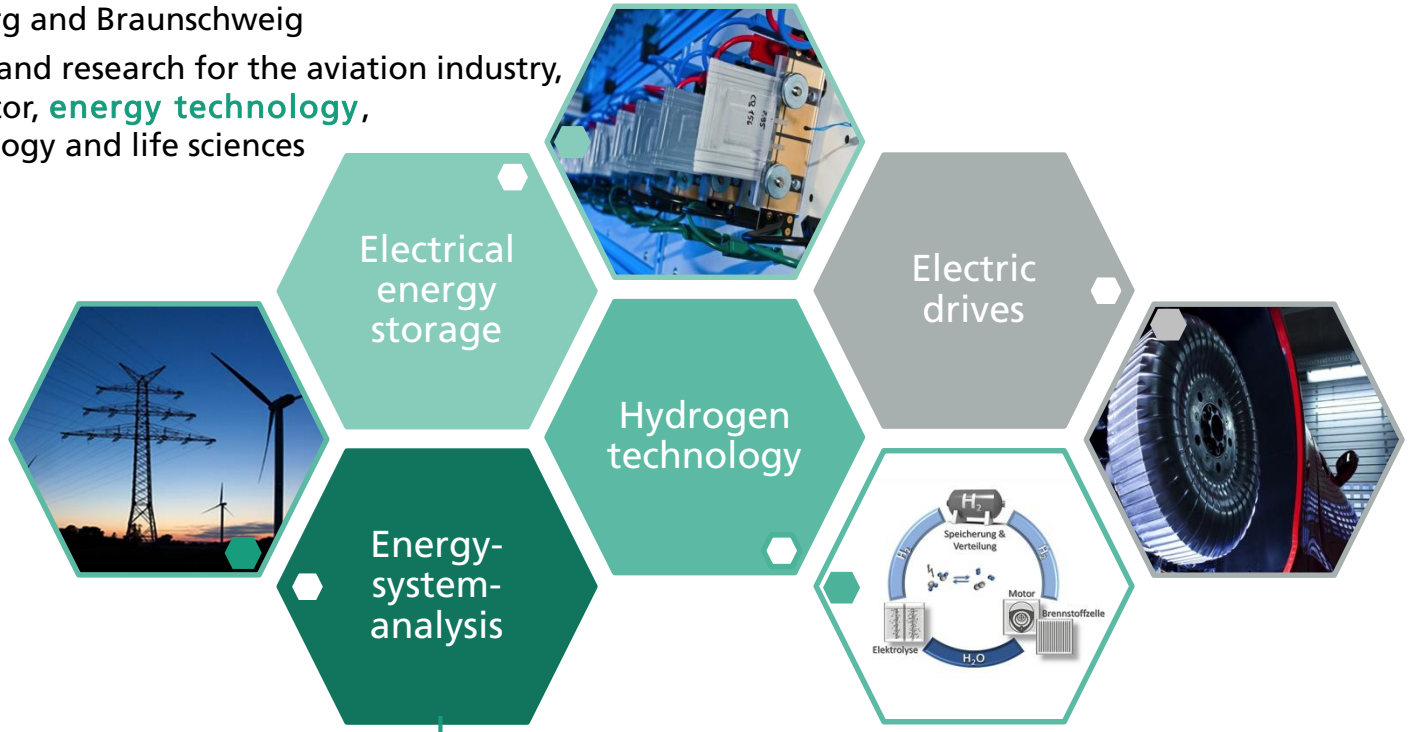
Energy research at the Fraunhofer IFAM

Fraunhofer IFAM (about 700 employees)

- **Headquarters: Bremen**; further locations in Dresden, Stade, Wolfsburg and Braunschweig
- Product design and research for the aviation industry, automotive sector, **energy technology**, medical technology and life sciences



Energy supply
- Heat grid & CHP
- Concepts for energy supply and climate protection

Energy economics
- National economy analysis
- Market forecasts and -design

Energy efficiency
- Electric mobility
- Energy efficiency of buildings

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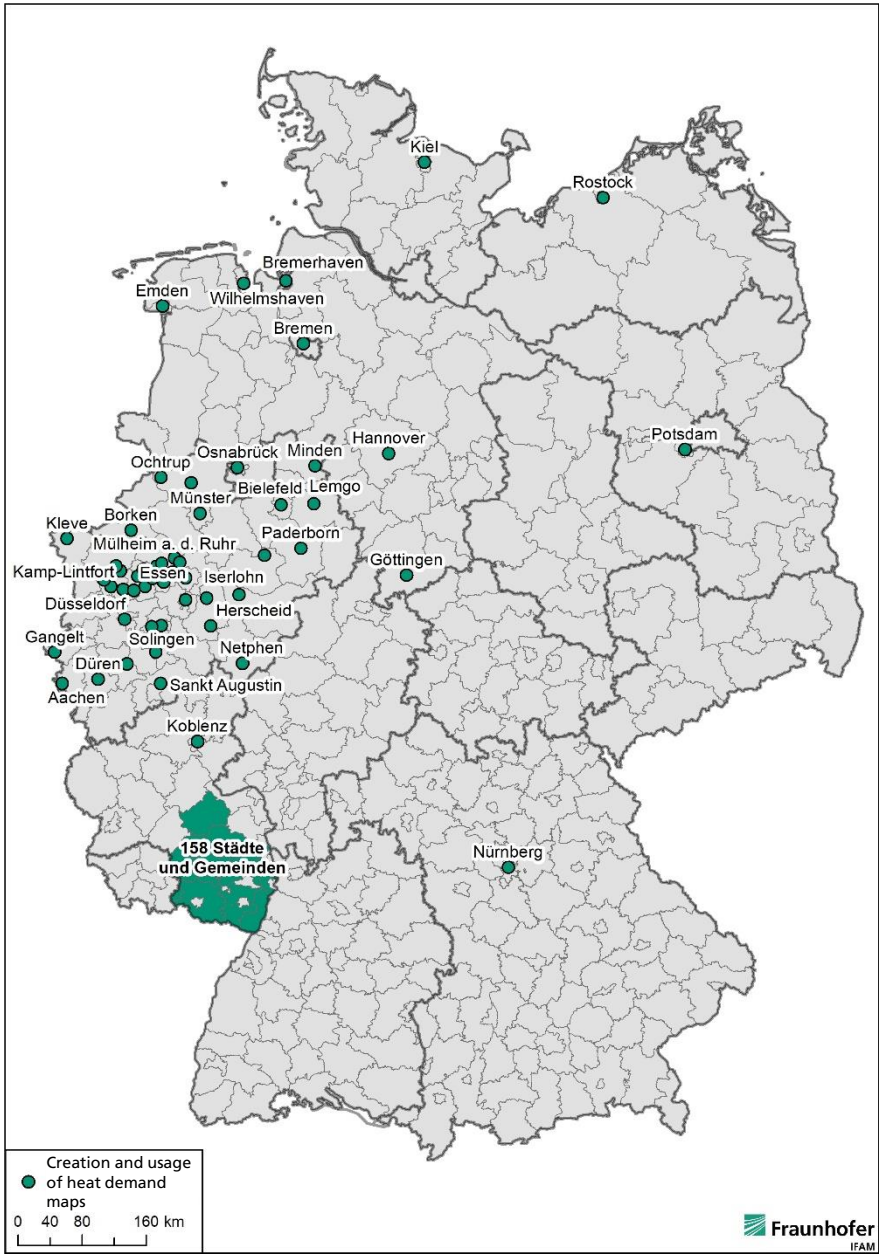
Heat maps at IFAM



- Individual projects may not be named for reasons of confidentiality

Survey of the status-quo: creation of a digital heat map using the example of Bremerhaven

Core elements: digital heat map

Consumption data

- Annual value
- Energy carrier
- Tariff information
- …

Objectives: integral consideration of supply aspects

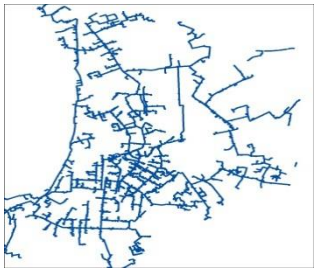
Building data

- Footprint
- Height
- Number of floors
- Type of use
- …

3D-Laserscanningdata

Digital heat map

Grid data



- Grid connections
- Co-supply
- …

Additional data, e.g.:

- Construction age
- Refurbishment status
- Owner
- Solar roof cadastre
- …

Data base digital heat map - Bremerhaven

- 3D building model (including building height to deduce the number of floors and type of use)
- Additional geodata:
  - Addresses
  - Parcels
  - Road network
- Consumption data of grid-bound energy sources of the last years:
  - Natural gas
  - District heating
  - Night storage heating
  - Heat pumps
- Information about co-supply
- Construction age classification

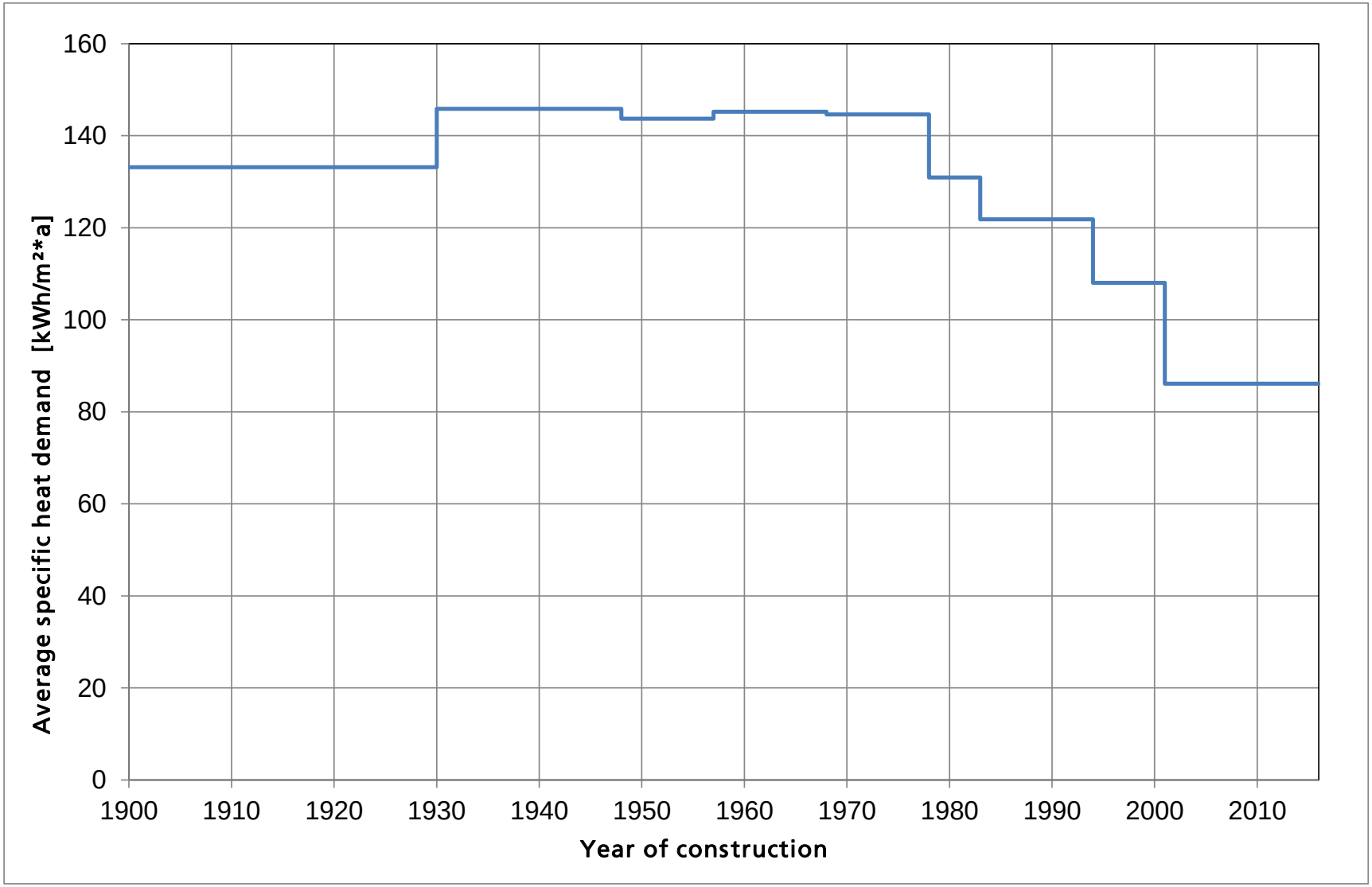
Workflow to create a heat map

- Checking, correction and completion of data
- Identification of not heated buildings
  - Type of use (e.g. garages)
  - Allotments
  - Combination of attributes like base area, height, number of floors, contact to heated buildings
  - ➢ 24.532 of 45.650 objects are considered to be heated in Bremerhaven
- Calculation of the heated floor area
- Assignment of the construction age
- Assignment of consumption data (after climate correction)
- Calculation of specific values, plausibility checks
- Creation of an individual building typology
- Assignment of the typology values for buildings without consumption data

Creation of an individual building typology

- The individual typology is based on all buildings with plausible heat demand values
- In addition the database is supplemented by an IFAM typology database, based on > 600.000 buildings with > 2 million consumption values
- Residential building typology
  - Construction age
  - Individual consideration of the settlement environment instead of rigid building type classification
- Non-residential building typology
  - Type of use (further differentiated in particular cases)

Residential building typology of Bremerhaven: Specific heat demand depending on the year of construction



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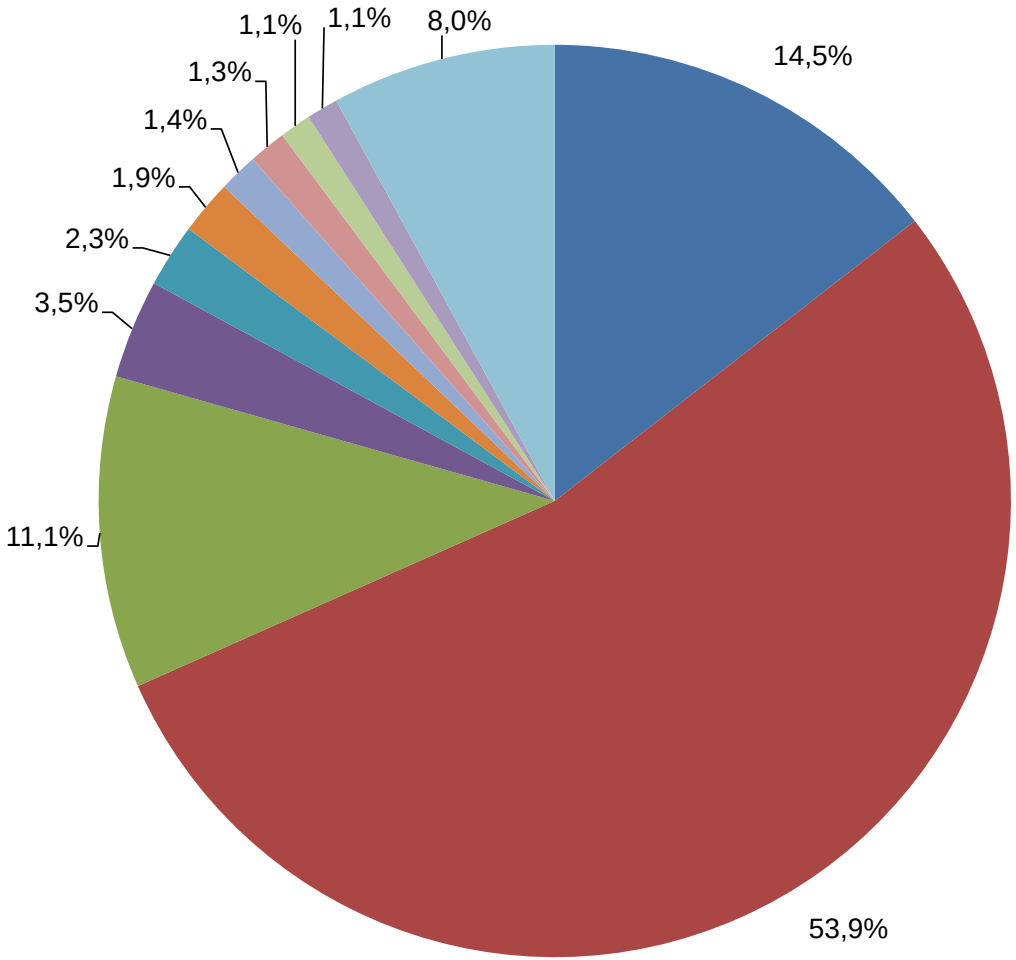
Heat demand structure of Bremerhaven



Total: **1.353 GWh/a**
RB: **729 GWh/a**

- Industry
- Residential buildings (RB)
- Buildings for commerce and industry
- Buildings for trade and services
- Hospitals
- Schools
- Buildings for public purposes
- Office buildings
- Storage
- Commercial premises
- Other non-residential buildings

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Heat map: resolution by objects

Heat map: resolution by objects

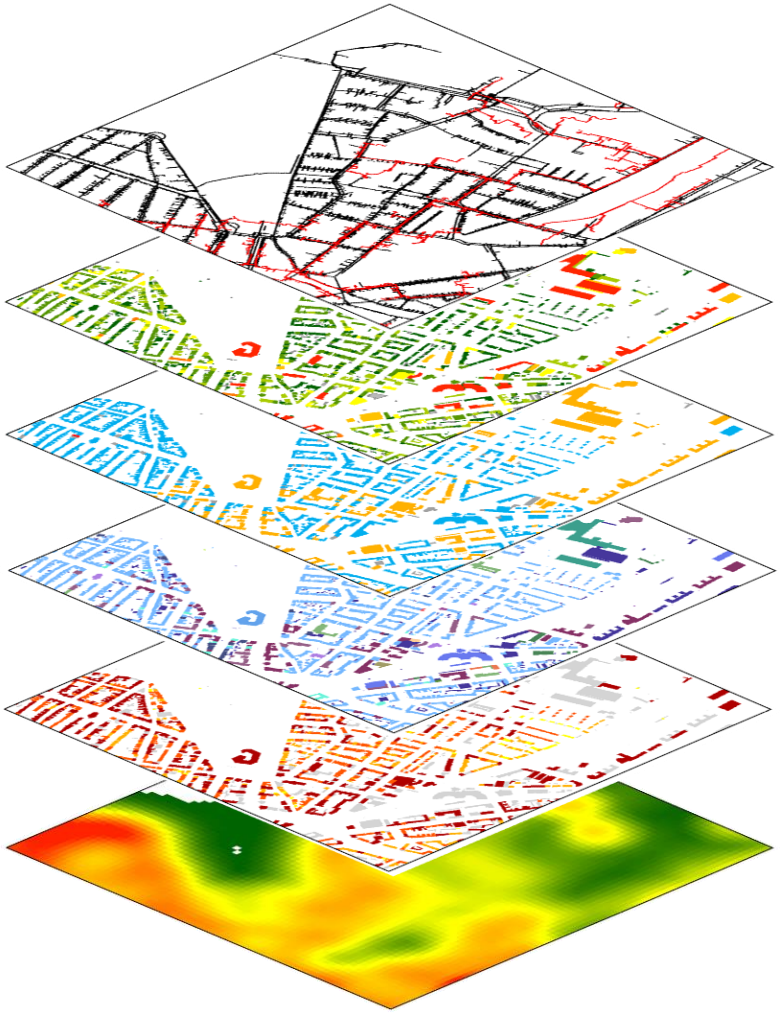
Possibilities of using a digital heat map

Examples of implementation of digital heat maps

- Display and filtering according to individual building characteristics, e.g.:
  - Heat demand
  - Heating system
  - Building owners (e.g. housing association)
  - Type of use
- Raster/density map
- Exploration of heat demand
- Linear heat density
- Determination of potentials for renewable energies, e.g.
  - Solar potential
  - Heat pumps
  - Waste heat
- Adding socio-economic data
- Buffer analyses for grid expansion
- Integrated neighbourhood strategies / Concepts for energy supply / Concepts for climate protection
- Presentation of results / communication

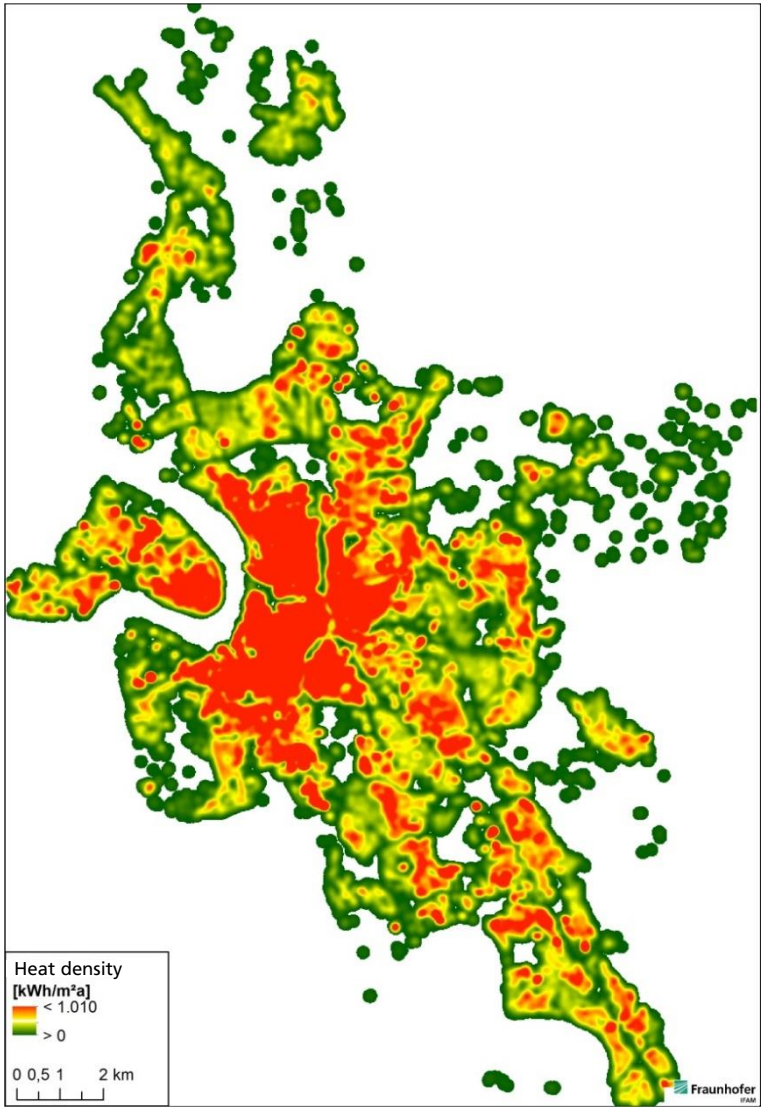
Modular design

- Integration of additional data is possible at any time



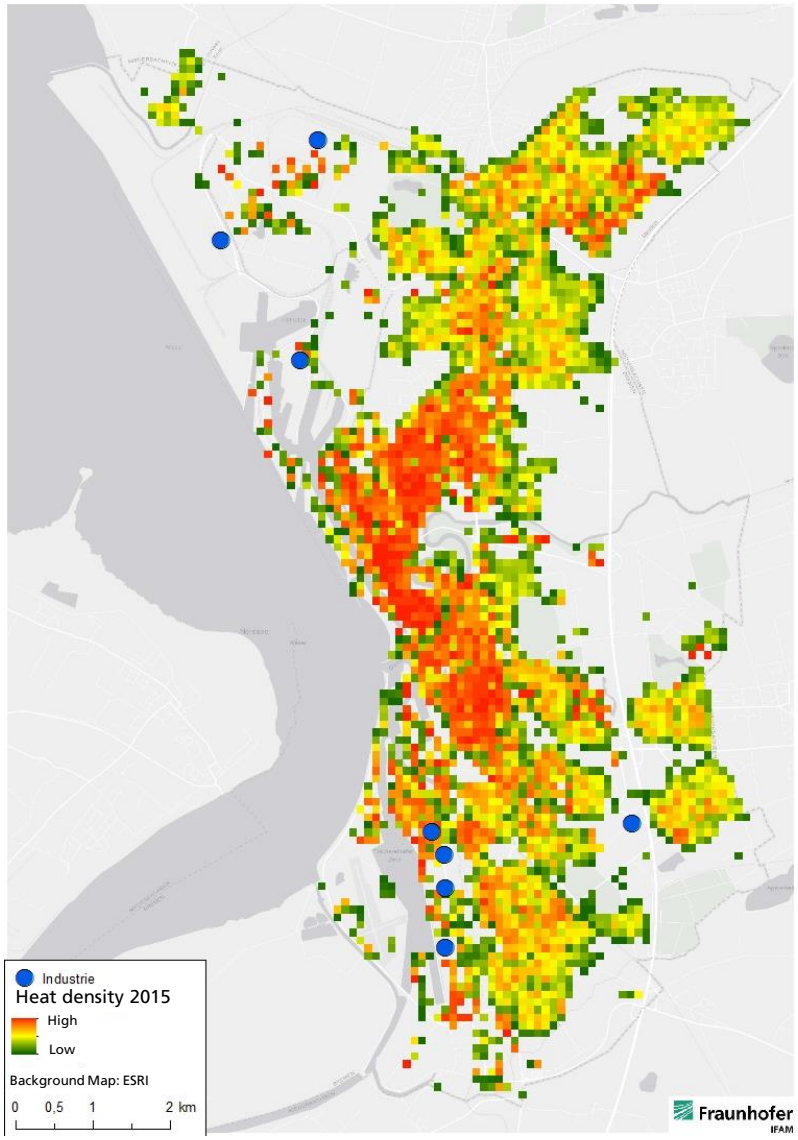
- Grids and generation units
- Current and future heat demand
- Current and future heating system
- Further building attributes (e.g. type of use)
- Potentials for renewable energies (e.g. solar potential)
- Raster maps (dissolution from a single building)

Raster/density maps



- Determination of the heat density: heat demand of the individual buildings is distributed over a radius of 160 m with decreasing intensity, added up in a grid of 20 x 20 m and divided by the area of the grid
- Heat density maps show areas with high/low heat density at a glace

Heat demand exploration - Bremerhaven



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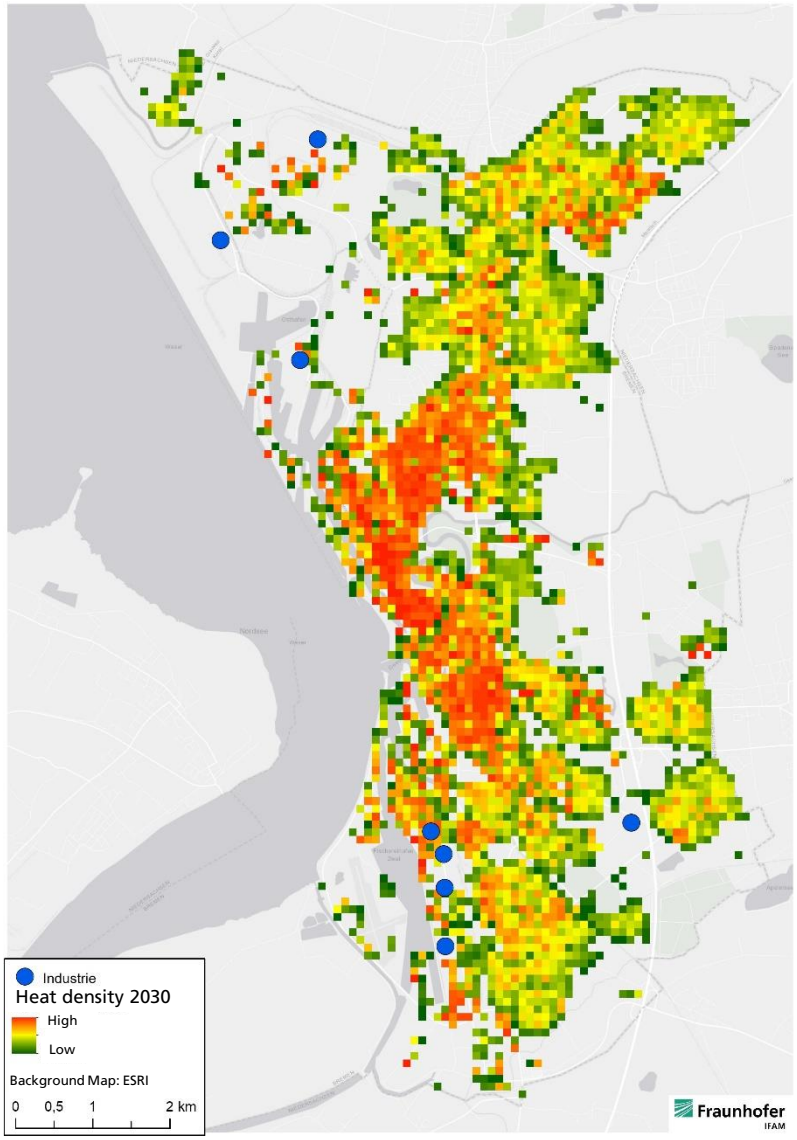

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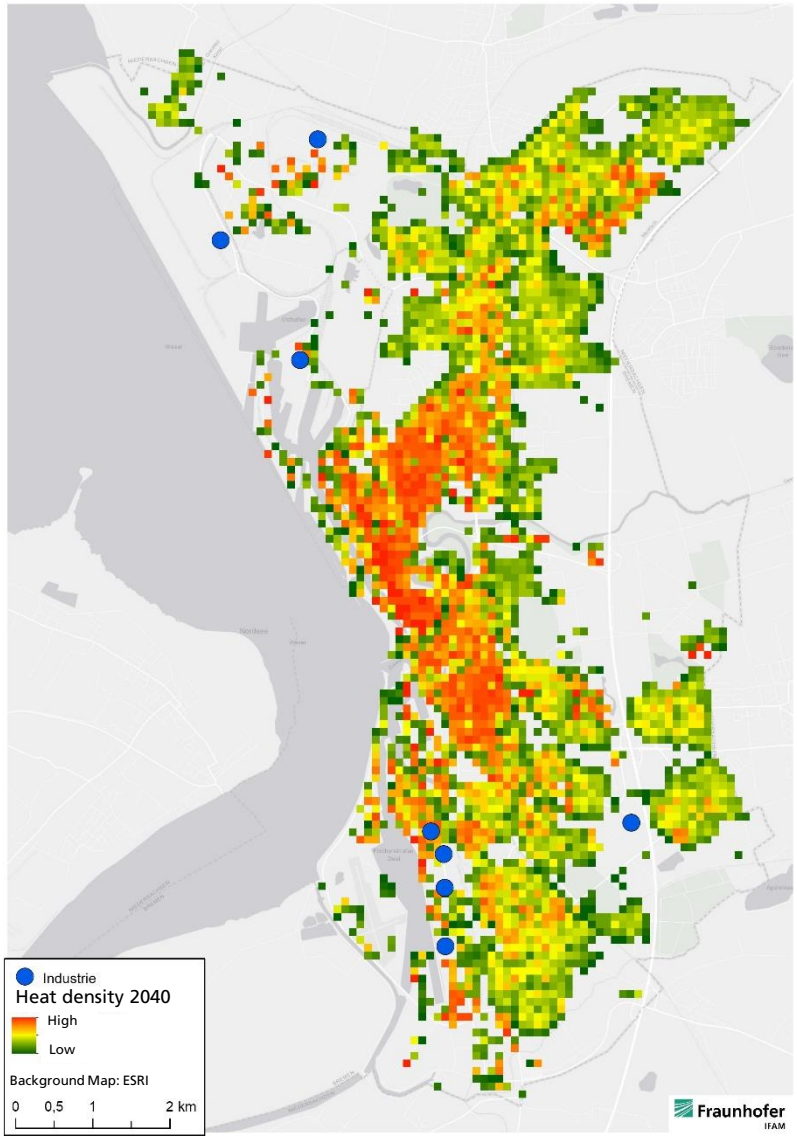
Heat demand exploration - Bremerhaven



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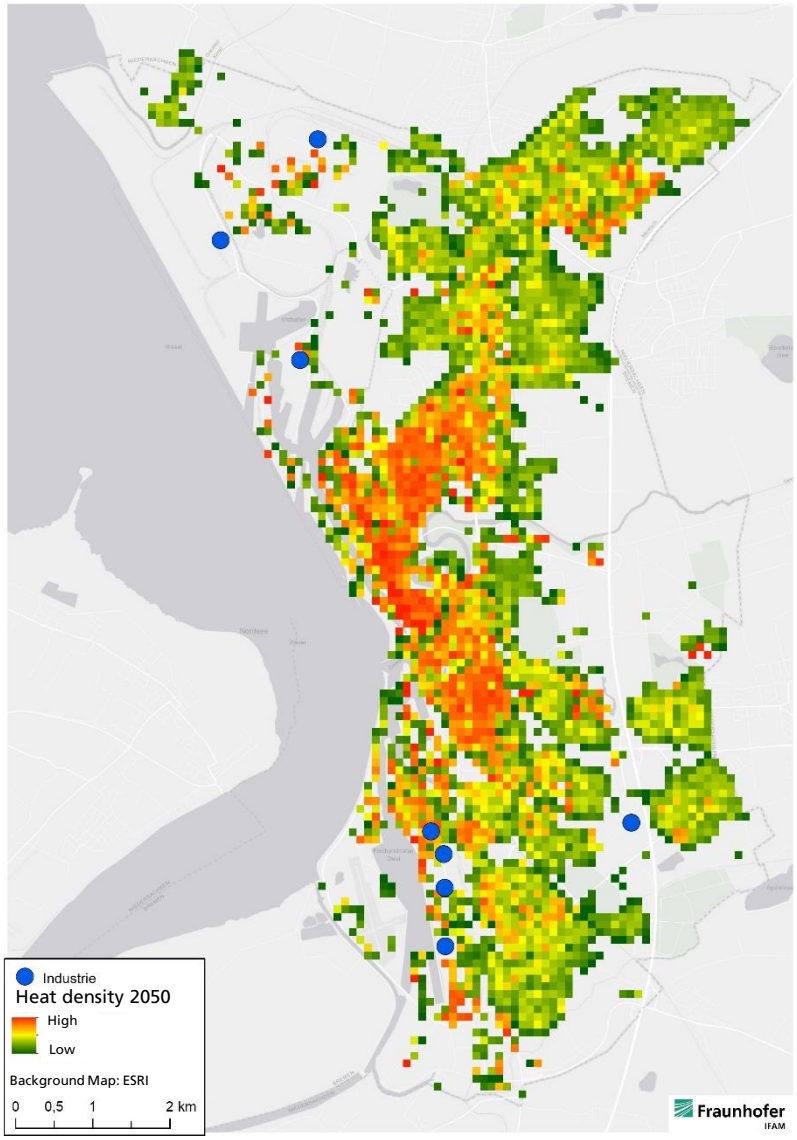

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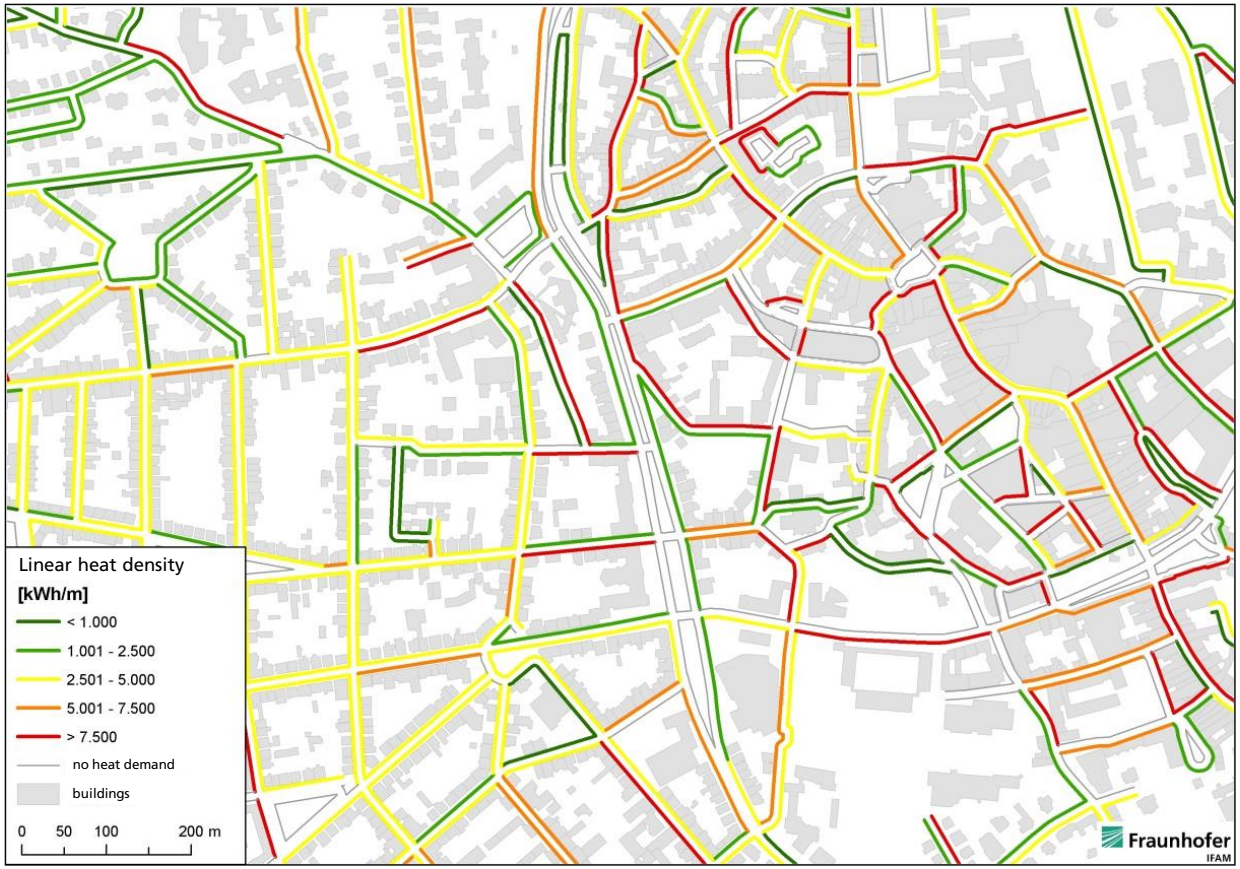
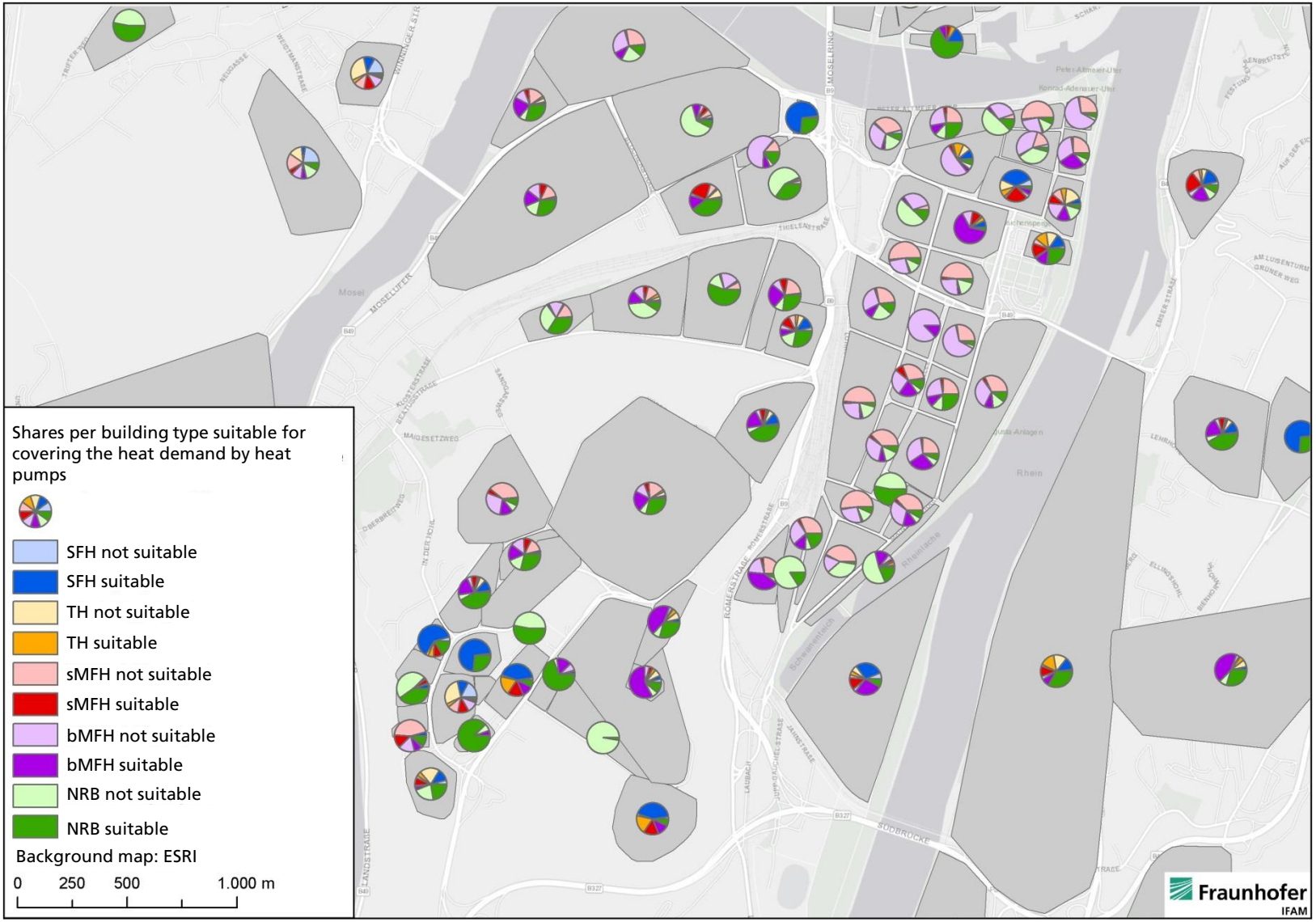
Linear heat density

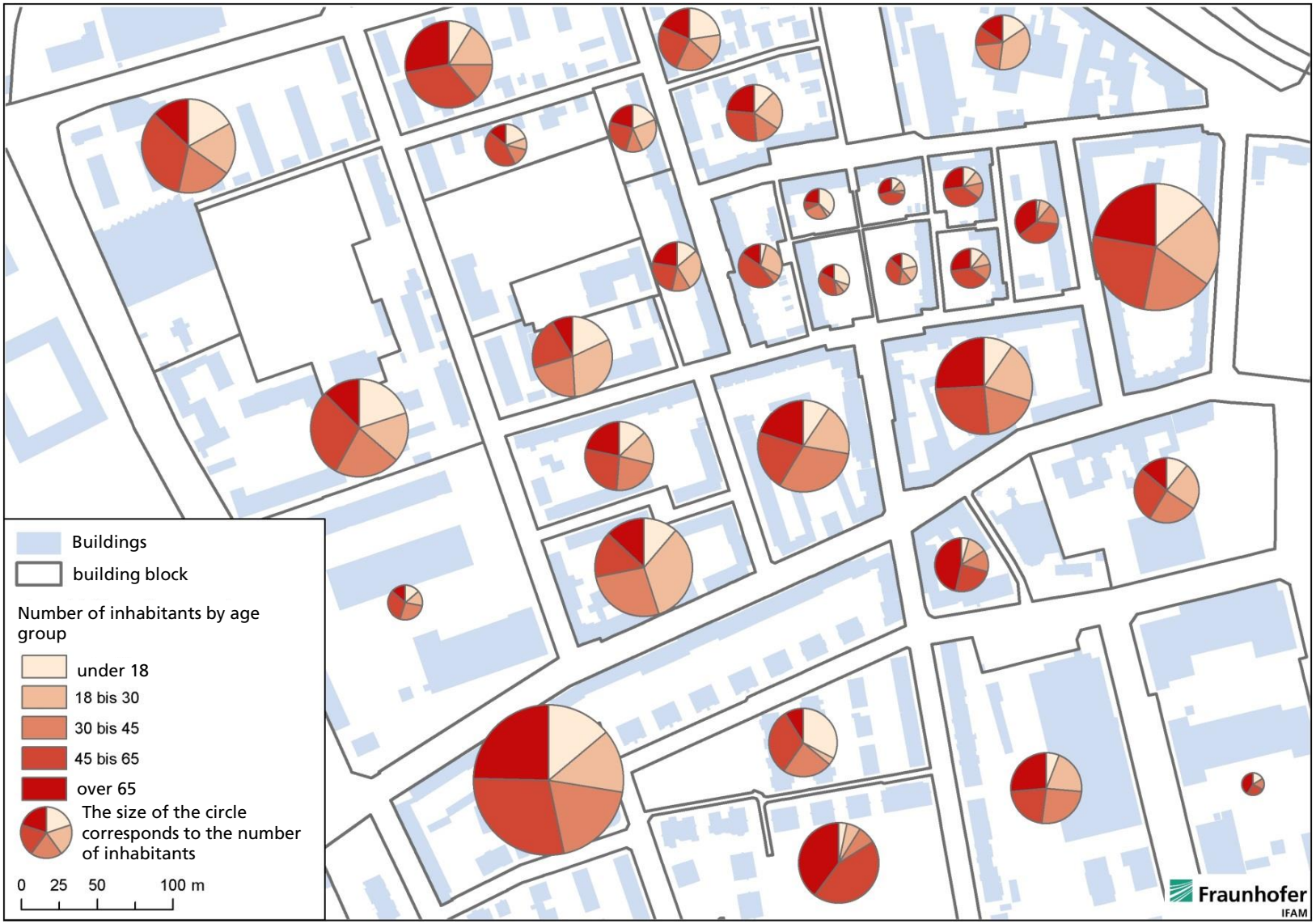


- Variants and details are possible:
  - Inclusion of the house connection lengths,
  - Only objects not yet connected
  - Expenditure for a laying etc.

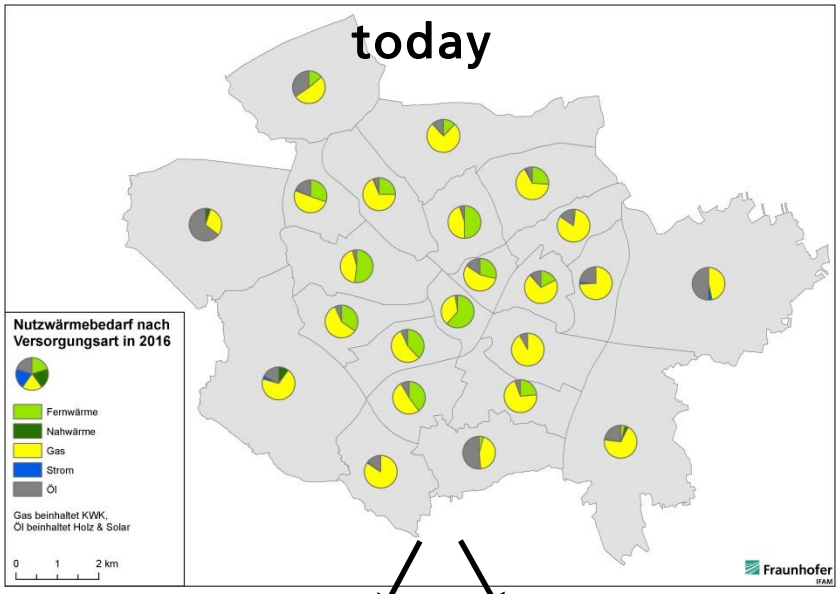
Determination of potentials: heat pumps

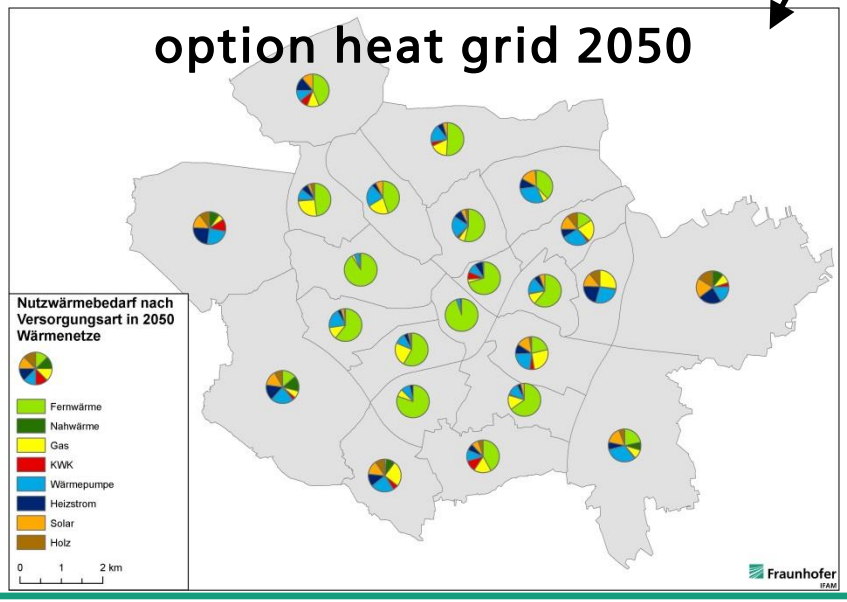


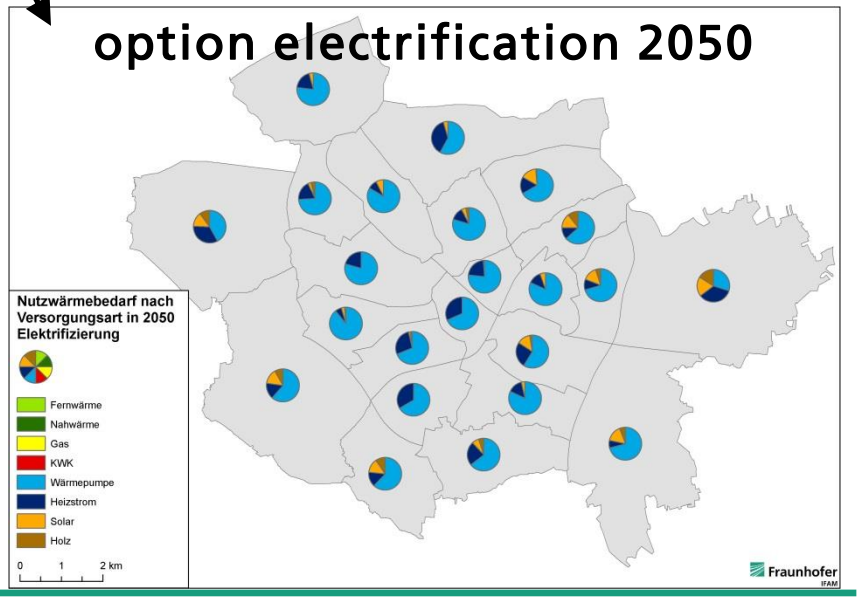
Adding socio-economic data



Quo vadis heat supply?







Illustrations are based on exemplary values

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Download: Heat Map Bremen and Bremerhaven

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OE ENERGIESYSTEMANALYSE

ERSTELLUNG EINES WÄRMEATLAS FÜR BREMEN UND BREMERHAVEN

BERICHT IST-ANALYSE

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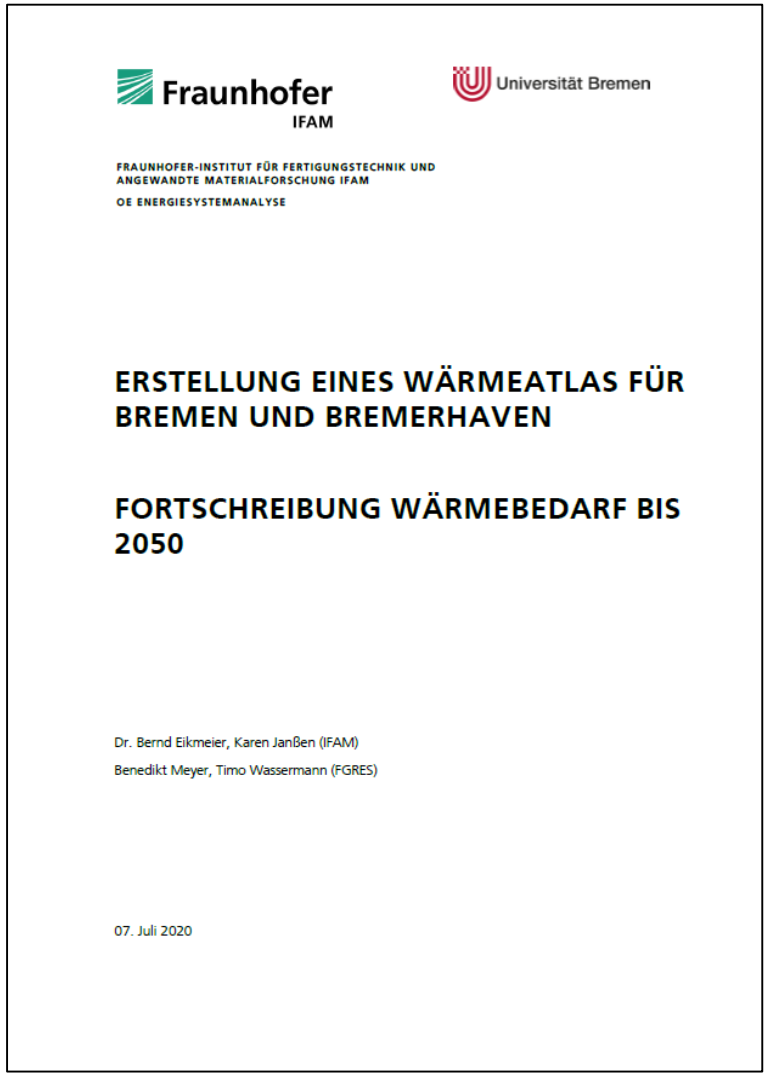
Timo Wassermann, Benedikt Meyer (FGRES)

15. Oktober 2019



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07. Juli 2020

https://www.wesernetz.de/ueber-uns/kompetenzen/waermeatlas

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