

Determination of the district heating supply structure based on geospatial and statistical data

6th International Conference on Smart Energy Systems
6-7 October 2020
#SESAAU2020

Abdulraheem Salaymeh, Johannes Pelda, Prof. Dr.-Ing. Stefan Holler,
6.-7. October 2020

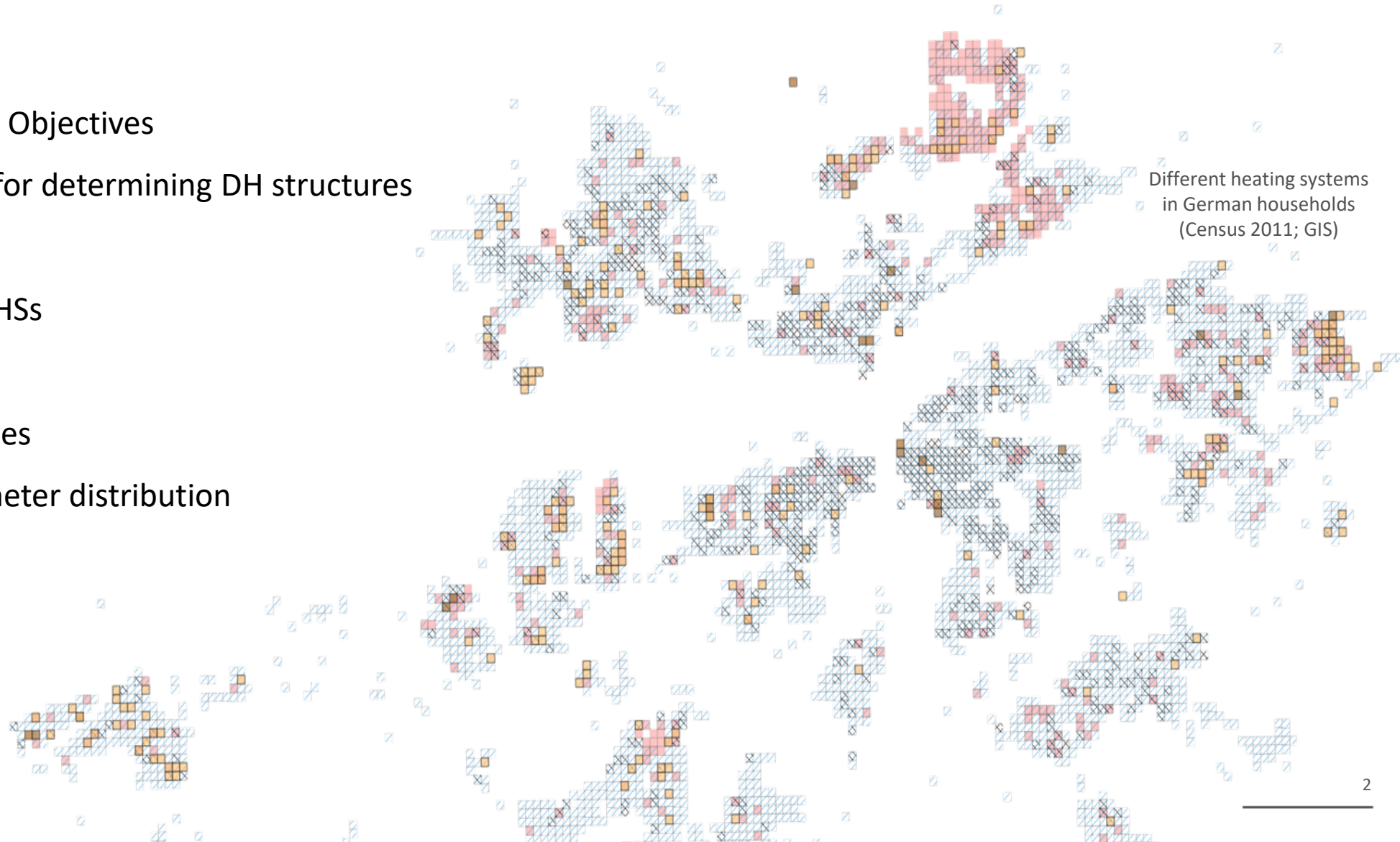
Supported by:



on the basis of a decision
by the German Bundestag

Content

- Background and Objectives
- Methodologies for determining DH structures
- Results
 - Location of DHSs
 - DH demand
 - DH load profiles
 - Nominal diameter distribution
- Discussion



Background

- No access to information on district heating systems for research purposes
 - for data protection reasons
 - due to operational purposes

- Preliminary studies only provide results in aggregated form (best-case)
 - Structure and DHS area will not be disclosed
 - District heating demand is not broken down by sector

Objectives

- Determine the location of DHSs and estimate the DH demand in order to integrate renewable and waste heat sources.
- Create district heating load profiles for the sector coupling of electricity and heat.
- Calculate the nominal diameter distribution of pipes in order to identify the available storage volume.

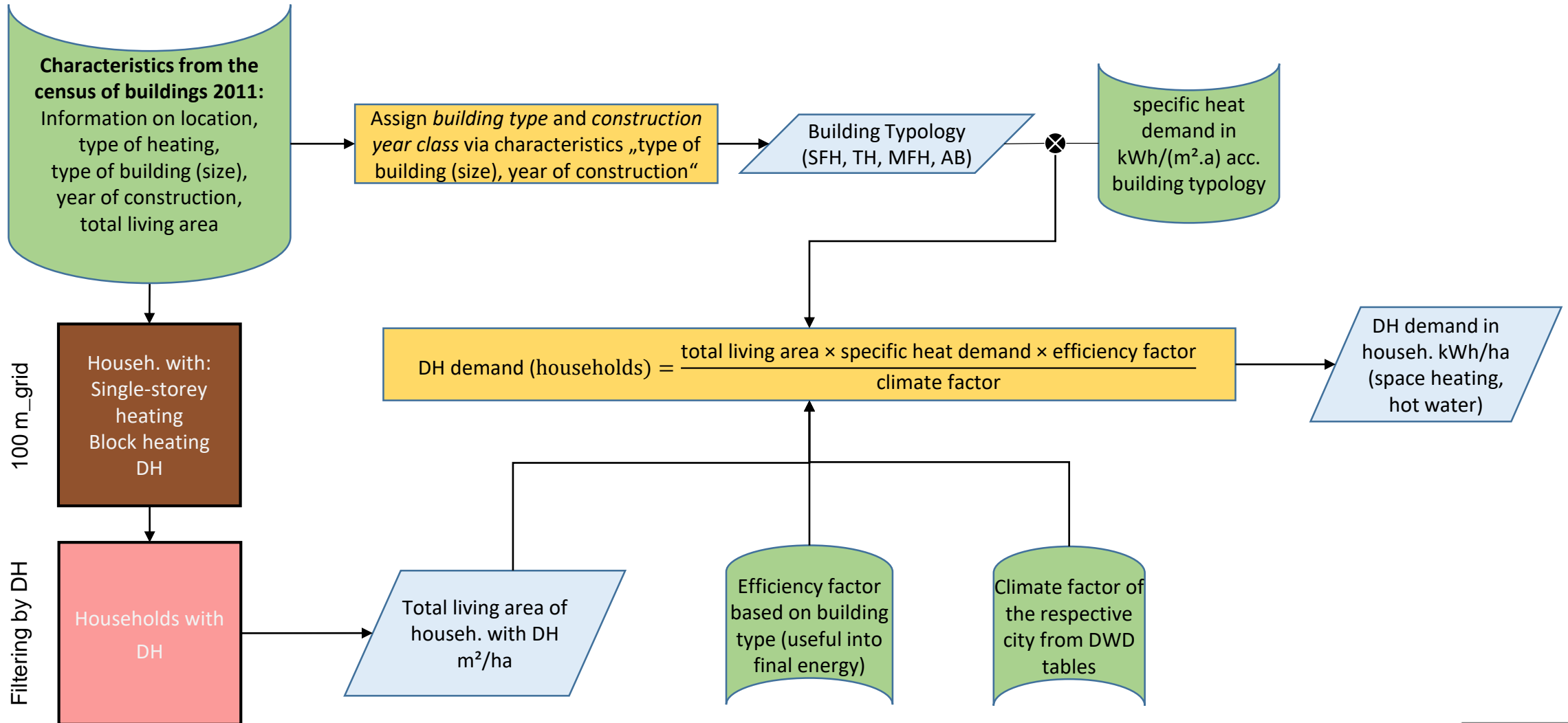
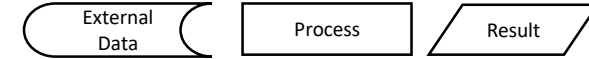
Methodology: Location of DHSs

1. Georeferencing and processing building data from the last census of buildings survey (2011) using GIS.
 2. Overlapping of the processed data with real DH networks.
- **Result: Validation of the method with real networks shows good results. Deviations can be attributed to expansion of the networks, errors in the census or existing non-residential buildings.**



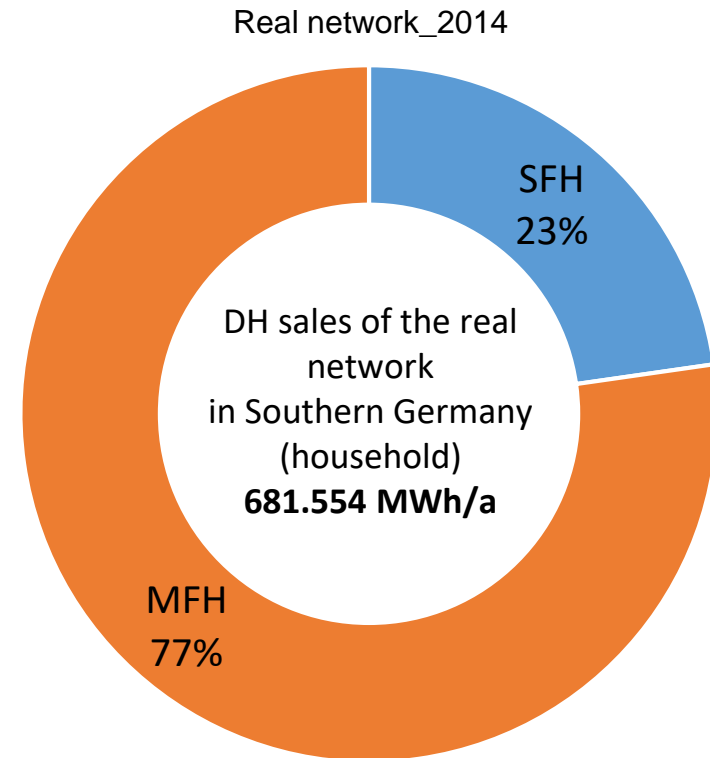
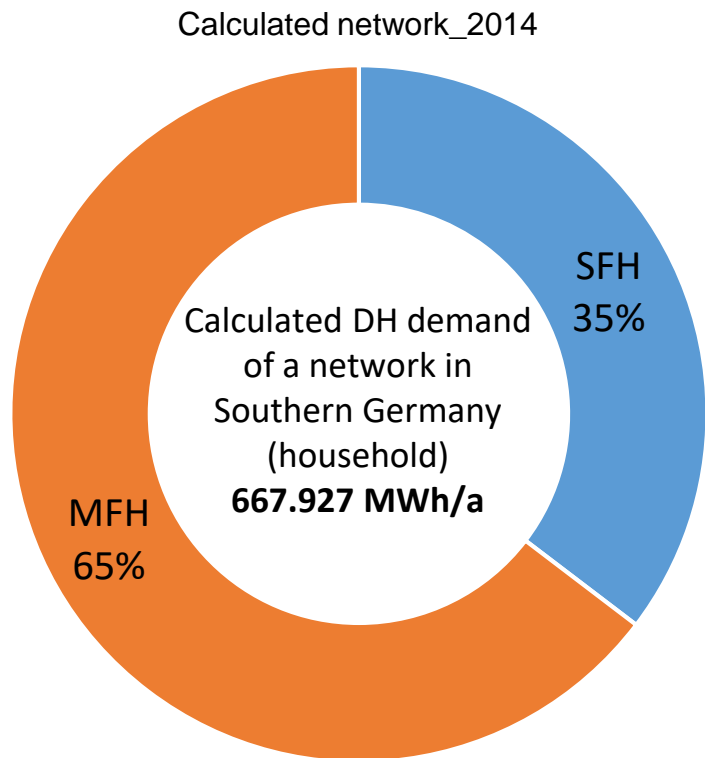
*extracted from the DH map at: www.rheinenergie.com

Methodology: DH demand



Methodology: DH demand

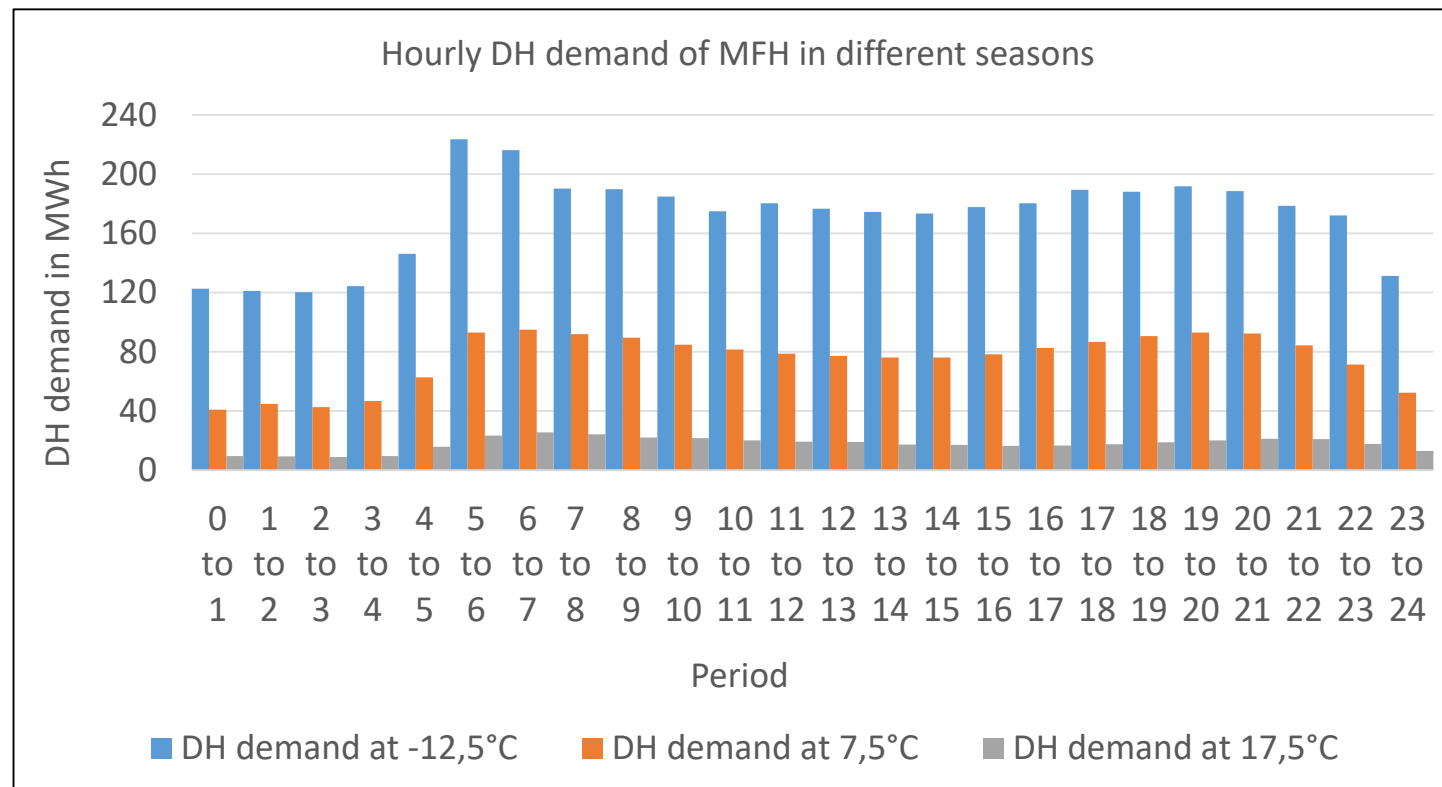
- **Result: The comparison of calculated DH demand with real networks data shows good agreement.**



Deviation from the real network -2%

Methodology: DH load profiles (exemplary for MFH)

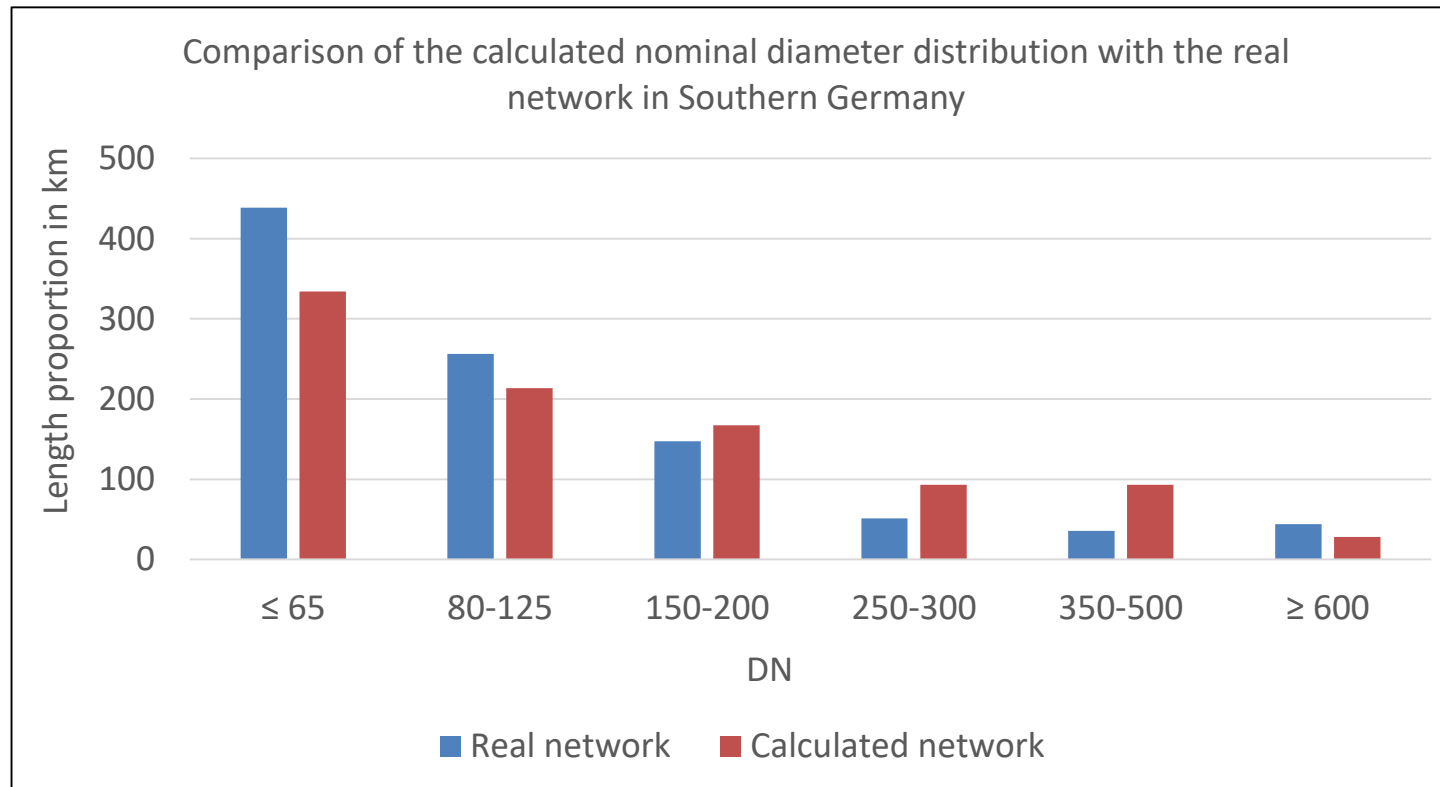
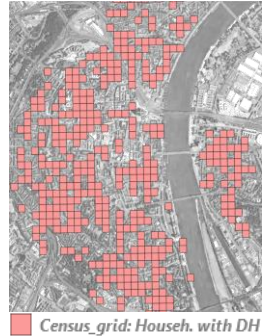
1. DH load profiles based on the calculated DH demand according to the BDEW standard load profiles.
 2. Detailed depiction of the DH demand depending on the seasons according to VDI 4655.
- **Result: Planning instrument for the implementation of sector coupling of electricity and heat.**



Methodology: Nominal diameter distribution

1. Calculate the length of the streets within the census grids from OpenStreetMaps.
2. Determine the nominal diameter distribution using typical values.

■ **Result: The overall lengths of the pipes match well. Deviations can be found in the DN distribution.**



Discussion

- Linking open-source-data with geospatial and technical data can provide a good data basis for DH research.
 - Future developments in DH supply can be estimated.
 - Still available potential areas for the expansion of DHSs can be identified and examined more closely.

- To establish the methods, it is necessary to validate the results with data from further cities (especially the method of DN distribution).

Contact

Abdulraheem Salaymeh

Rudolf-Diesel-Str. 12
37075 Göttingen
Germany

E-Mail: abdulraheem.salaymeh@hawk.de

Supported by:



on the basis of a decision
by the German Bundestag