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# HEAT DENSITY MAPS OF EUROPE AND WAYS TO IMPROVE THE ACCURACY

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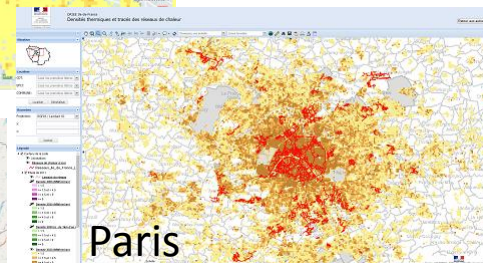
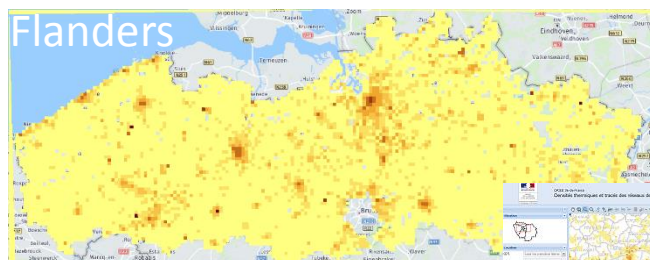
# Importance of heat density maps

- ▶ To support heating and cooling planning.
- ▶ To understand the spatial dimension of energy demand and to:
  - spot areas with highest demand,
  - determine where heat should be supplied,
  - see which (renewable) energy source(s) can be used.
- ▶ To locate the potentials for increasing the energy efficiency, i.e.:
  - integration of renewable energy systems,
  - transition from individual, carbon intensive energy sources to collective renewable base energy sources,
  - expansion of district heating systems.

# Heat density maps in Europe

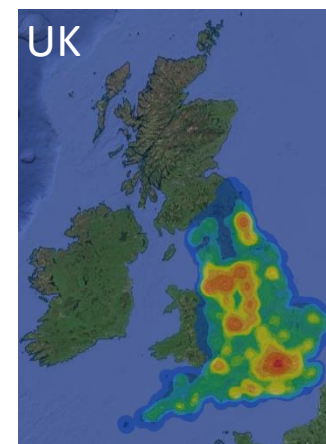
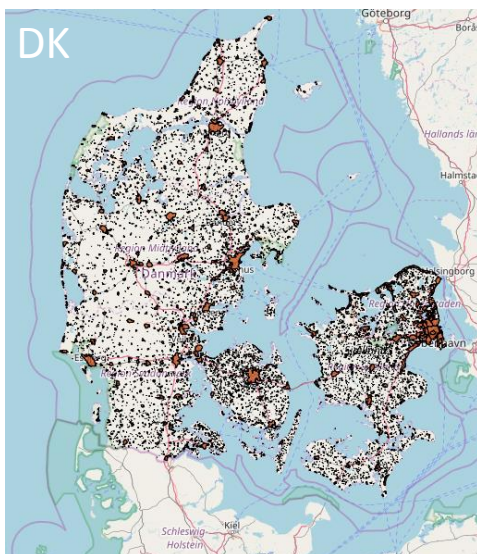
## ▶ Regional:

- Flanders (Belgium)
- Paris (France)



## ▶ National:

- Austrian Heat Map
- Danish Heat Atlas
- The Heatmap of Luxemburg
- National Heatmap UK
- Scotland Heatmap



## ▶ International:

- GeoDH (14 EU member states)
- Peta4 from Heat Roadmap Europe (14 EU member states)
- Hotmaps – in progress

# Hotmaps\* project

- ▶ The Hotmaps project (Oct. 2016 - Sep. 2020) develops a toolbox that supports heating and cooling mapping and planning processes.



- ▶ Development of a toolbox that will be:
  - **User-driven:** developed in collaboration with pilot areas
  - **Open source:** the developed tool will run without requiring any other commercial tool or software and the code will be accessible
  - **EU-28 compatible:** the tool will be applicable for cities in all 28 EU Member States

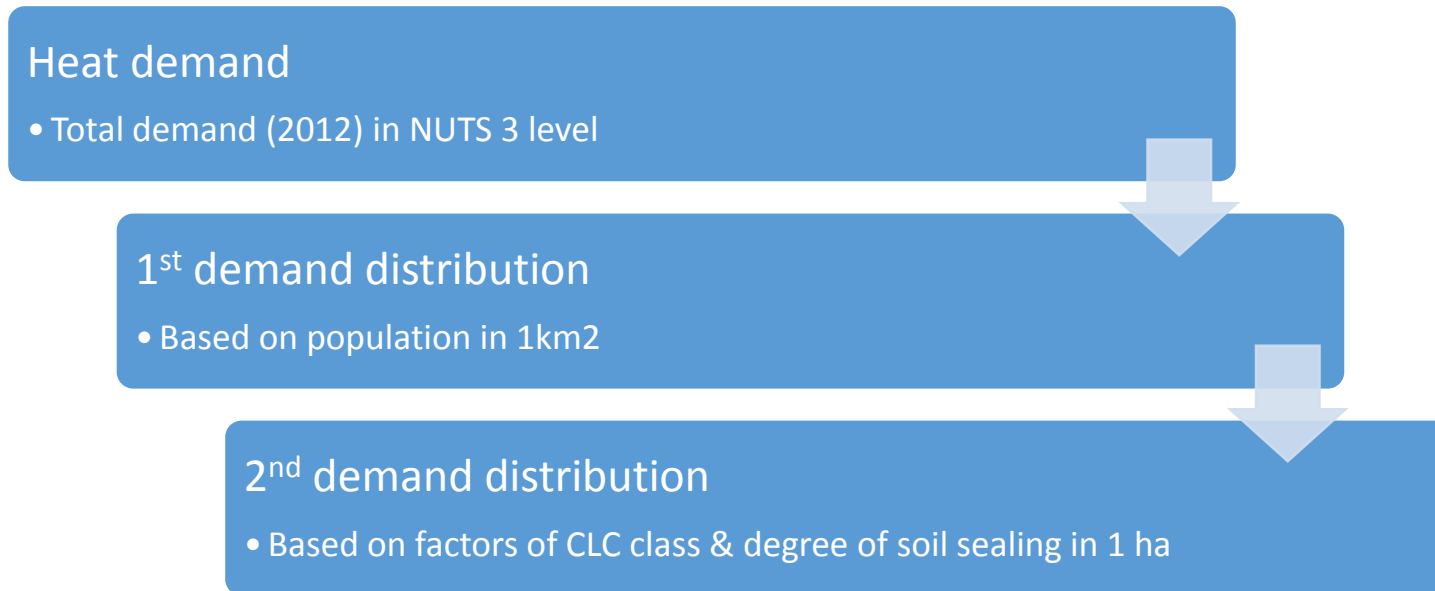
- ▶ **The experts behind the project:** 16 partners combining scientific institutions and pilot areas for developing and testing the tool

# Heat density map generated in Hotmaps

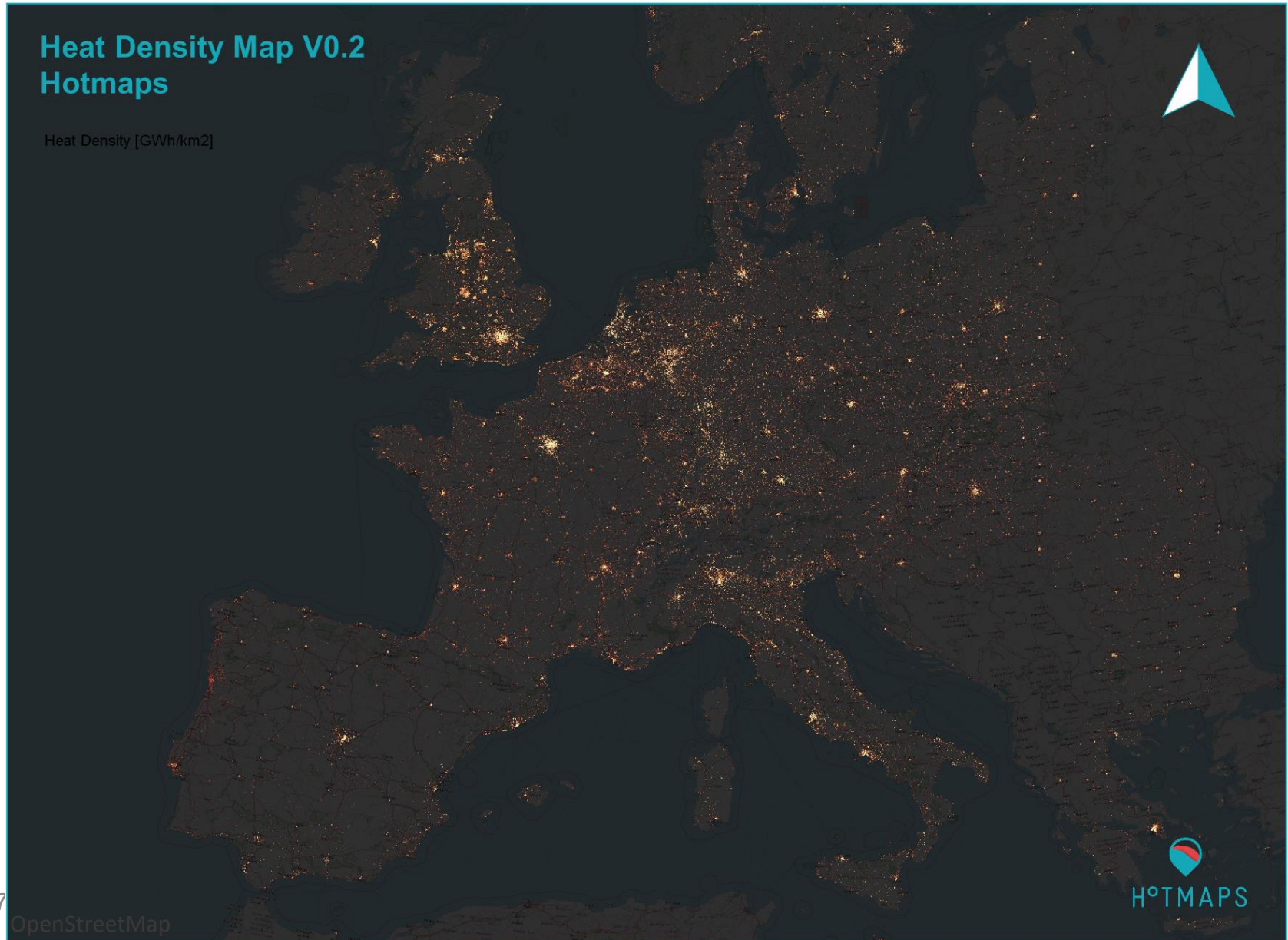
## ▶ Data sources

- Heat Demand (2012, space heating & hot water – residential and service sectors) in NUTS 3 Level from bottom-up building stock model Invert-EE Lab\*
- Population with 1x1km resolution (2011 census)
- Soil sealing with 1ha resolution (Copernicus, Imperviousness 2012)
- Corine Land Cover with 1ha resolution (CLC, 2012)

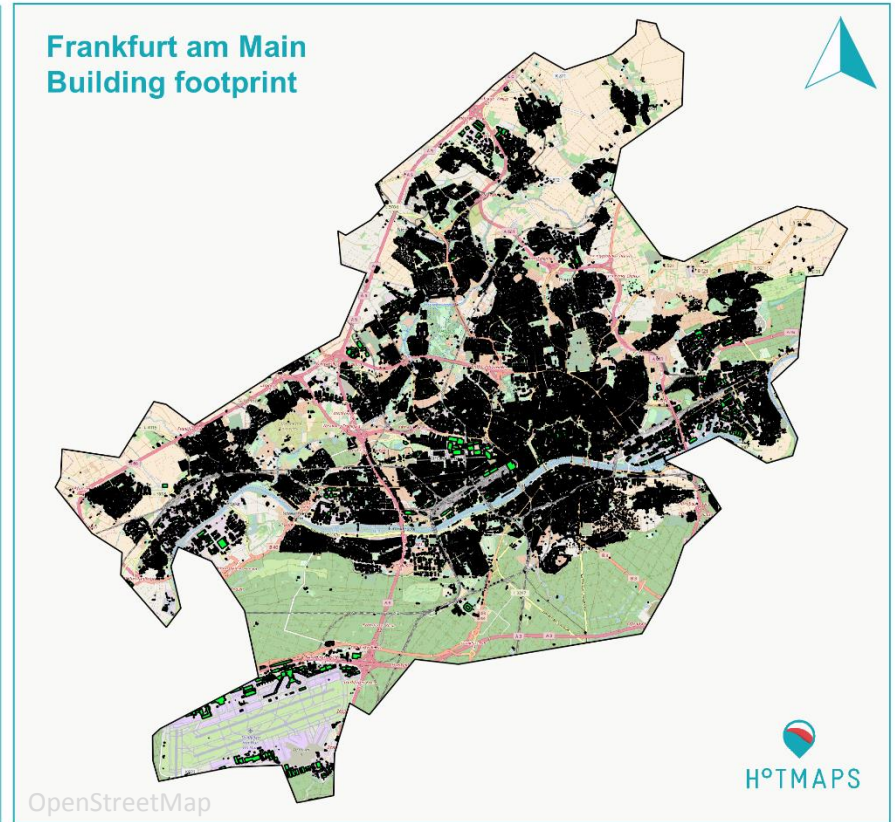
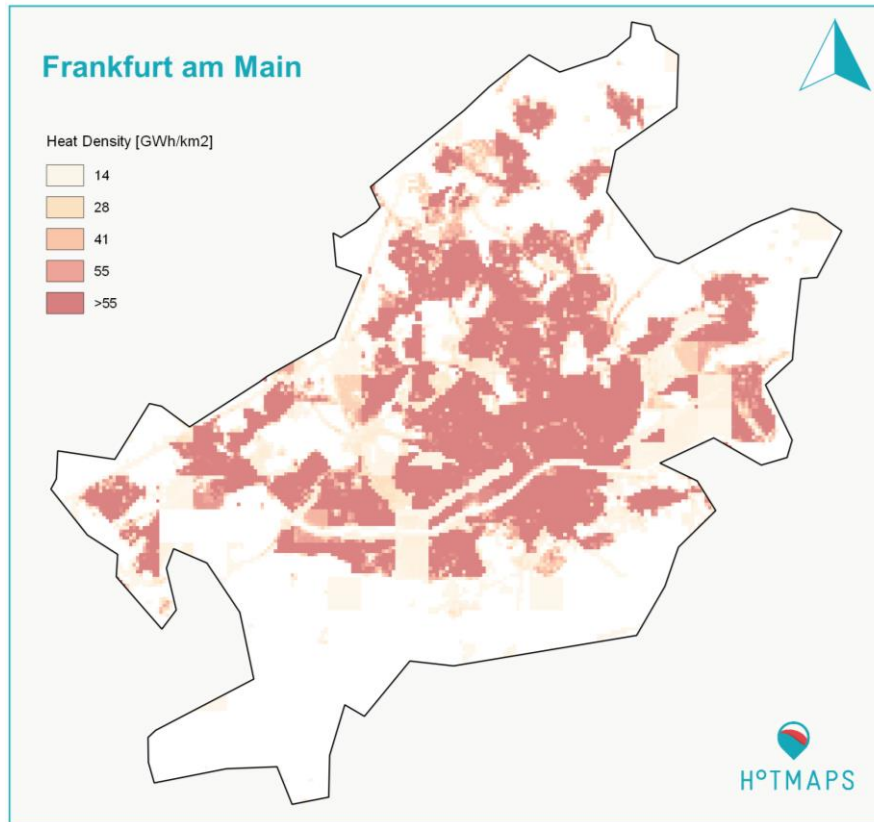
## ▶ Approach in Hotmaps



# Preliminary heat density map

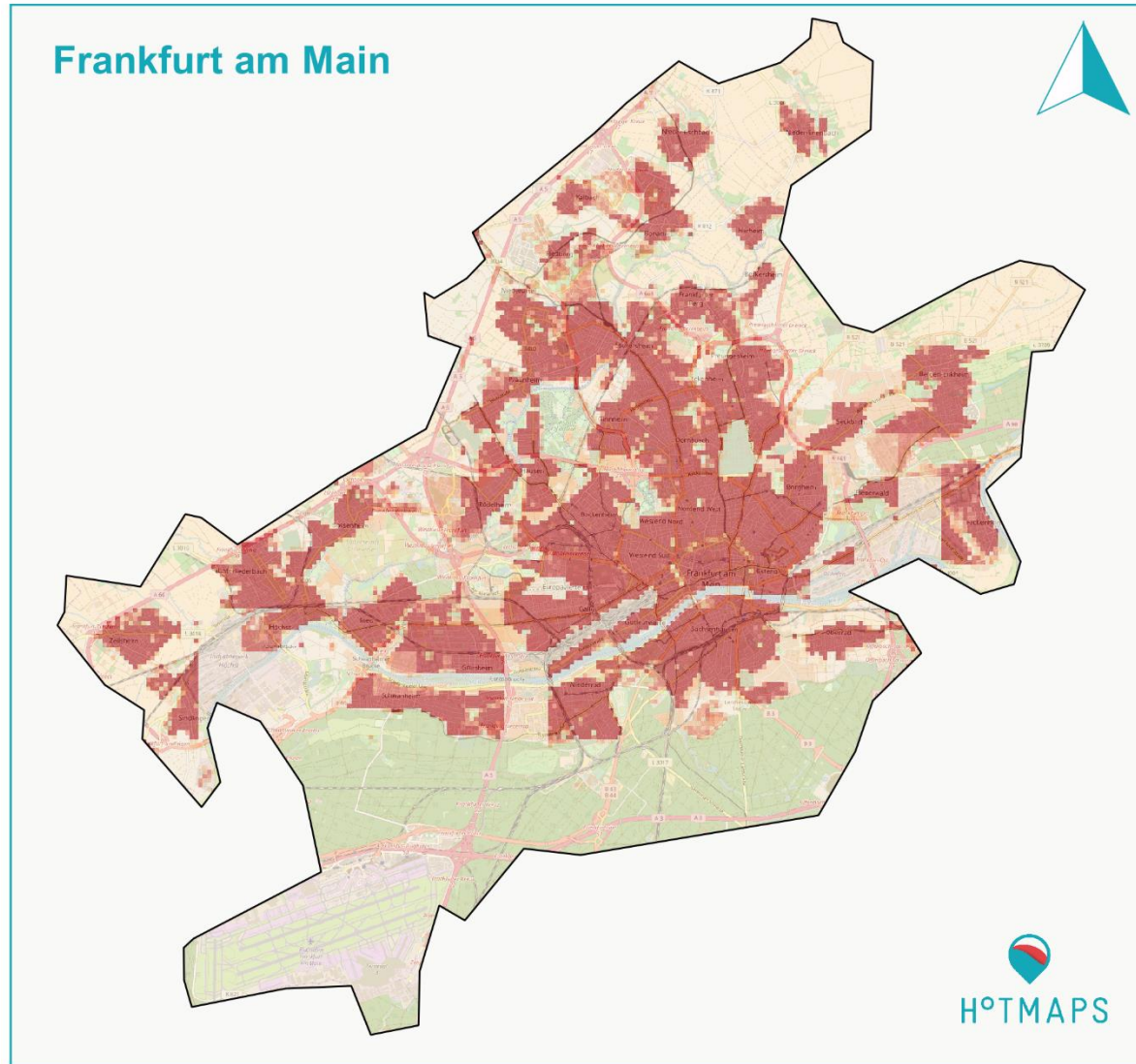


# Preliminary heat density map – Case Frankfurt

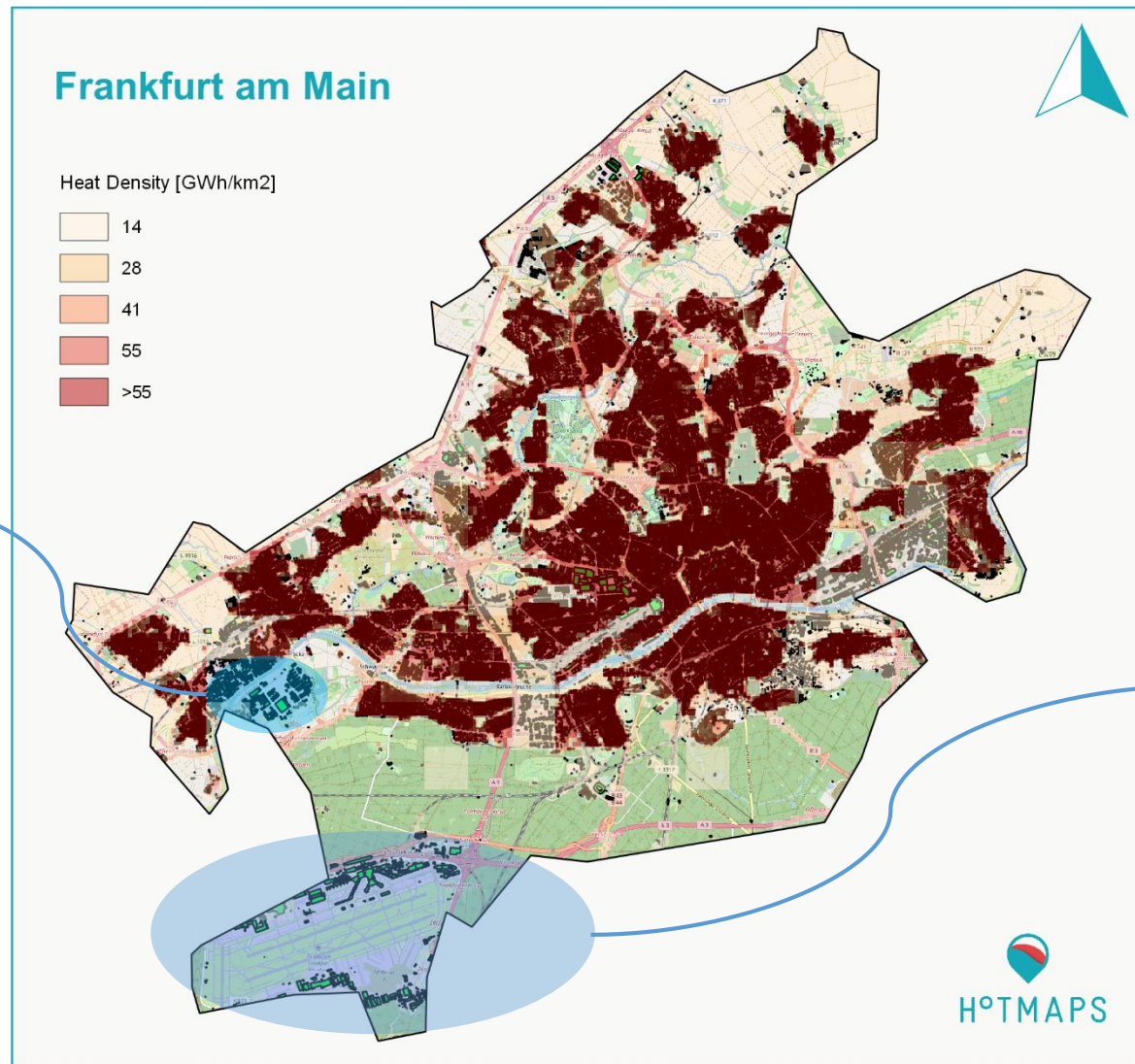




# Preliminary result of the HDM in Hotmaps



# Preliminary result of the HDM in Hotmaps



# Potentials to improve the accuracy

- ▶ Very large office districts or extensive shopping centers nearby large cities have low correlation with population distribution.
- ▶ In airports, the terminal buildings can be spotted by areas with high degree of soil sealing (>90%).
- ▶ Additional data/assumptions required to model heating demand distribution in these sectors.

# Conclusion

- ▶ Implementation of heating planning strategies requires regional knowledge about status quo, socio-economics, barriers and restrictions.
- ▶ Although the provided map matches very good to the buildings footprint and city districts, for the study of small scale local districts, more care should be taken.
- ▶ Open data sets and maps such OSM building footprint can helps to spot improvement potential of heat density map.
- ▶ The presented top-down heat density map should be validated in different regions across EU to make sure that the approach provides a good estimation for the whole EU.
- ▶ Cooperation with pilot areas in Hotmaps project, helps to achieve this goal.

Thank you for your attention!

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