Graz University of Technology

inter.noise HAMBURG 2016

SOUNDMAPPING APPROACHES IN A SMALL SUBURBAN STUDY AREA

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inter.noise 2016, Hamburg
23.08.2016

Background

„Only a total appreciation of the acoustic environment can give us the resources for improving the orchestration of the world soundscape."[1]

- Currently, epidemiological studies use the A-weighted SPL
- Human perception of noise exposure from the variety of traffic sources is not always well represented by this approach
- Use of psychoacoustic indicators is currently hampered by its lack of modeling larger areas
- First step into further research is done within the project RA²MSES

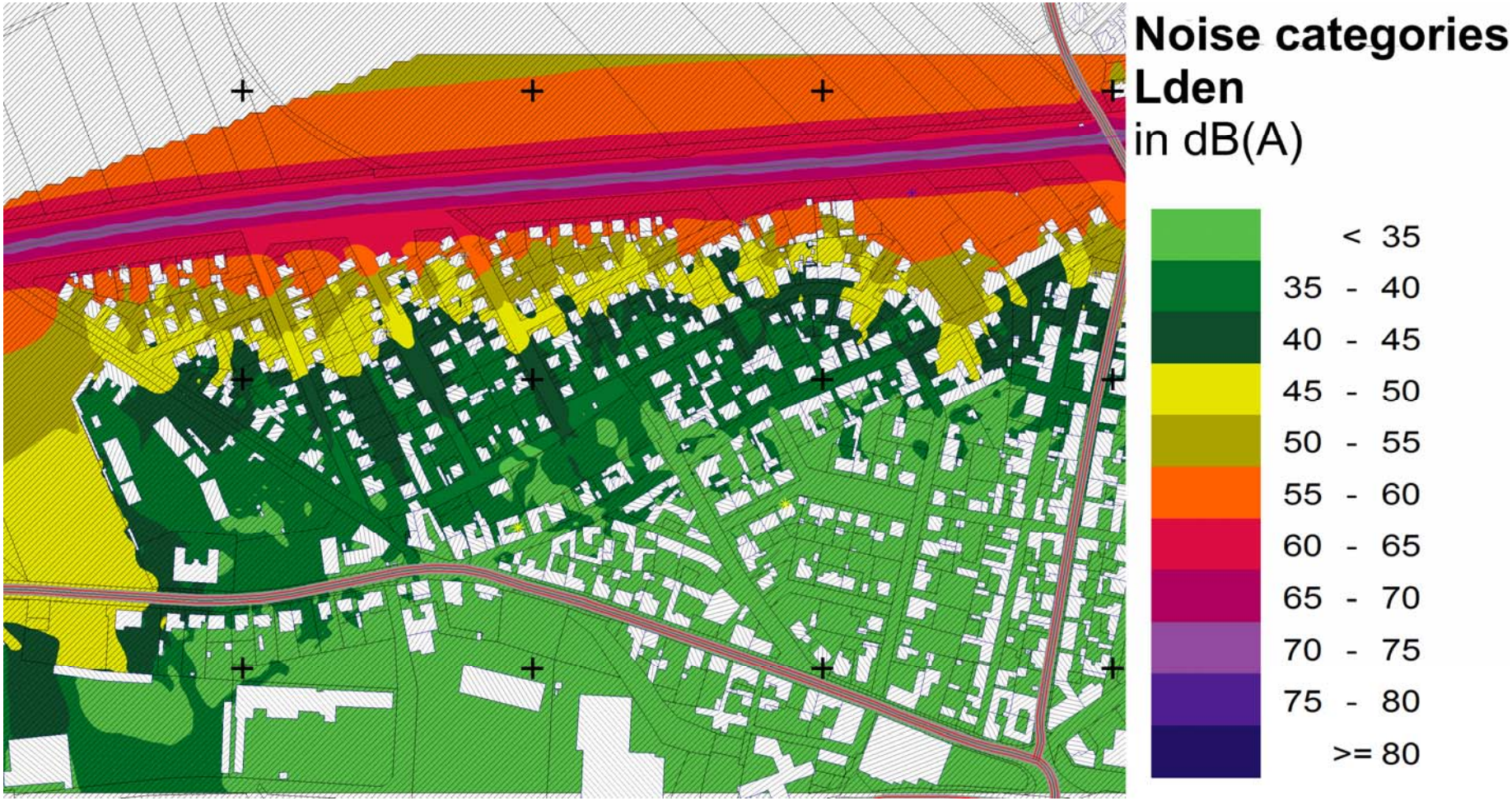
[1] Schafer R. M. The soundscape: our sonic environment and the tuning of the world. Destiny Books, Rochester, 1977.

Case study

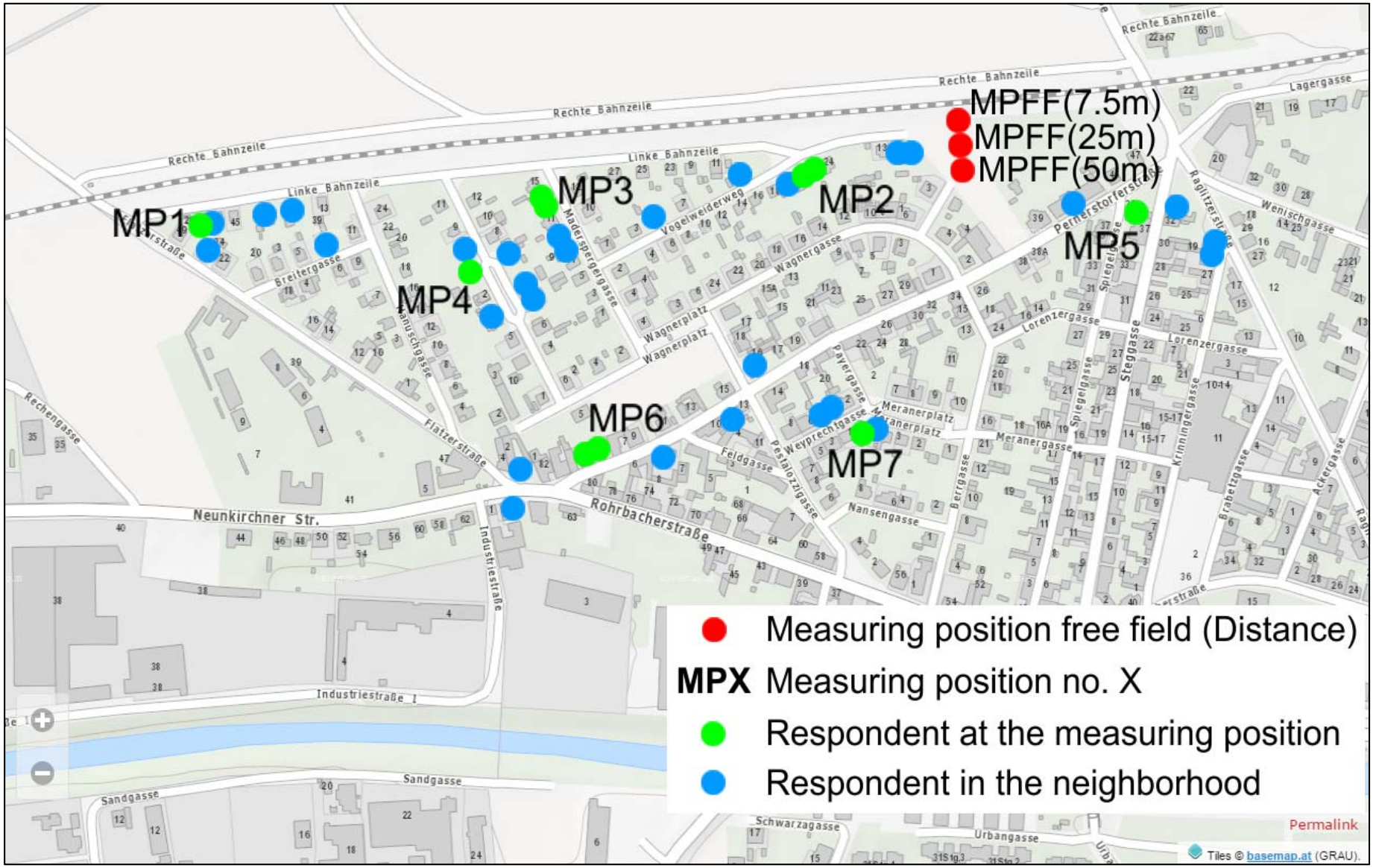
- Within the project RA²MSES a comprehensive case study on a railroad south of Vienna has been conducted
- Binaural measuring equipment was installed on changing sites
- Additional interviews in the neighborhood should assess the subjective annoyance due to railroad noise
- Area offered all needed topological and traffic-related requirements:
  - Sub-urban settlement
  - Railroad is the major source of noise.
  - Medium to high traffic volumes (mixed traffic).
  - Homogenous housing characteristics (no towers etc.).
  - No noise control measures at the infrastructure.
  - Measurement positions on open field, but also sheltered from the wind to some extent

Case study

Study area



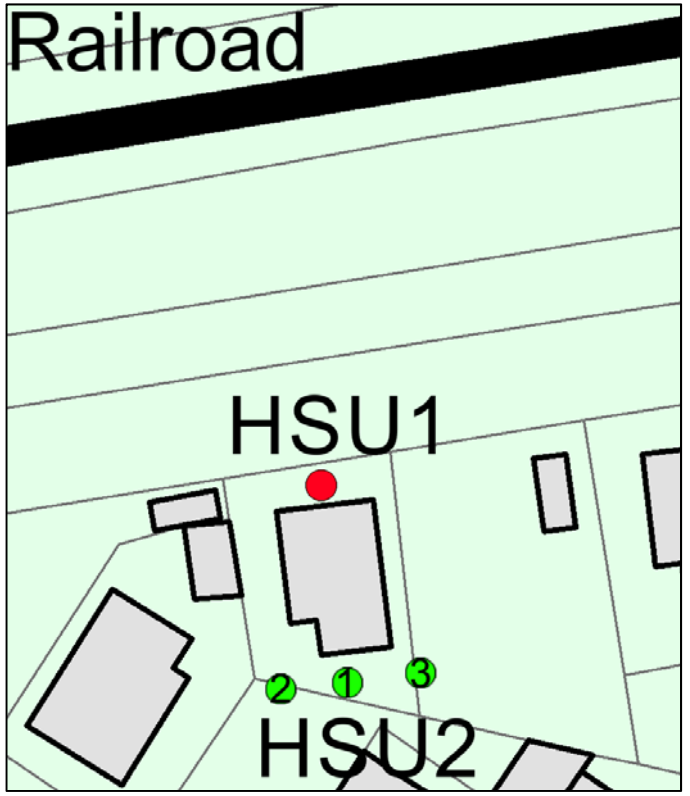
Case study


MPFF(7.5m)
MPFF(25m)
MPFF(50m)
MP1
MP2
MP3
MP4
MP5
MP6
MP7
Measuring position free field (Distance)
MPX Measuring position no. X
Respondent at the measuring position
Respondent in the neighborhood
Rechte Bahnzeile
Linke Bahnzeile
Neunkirchner Str.
Rohrbacherstraße
Industriestraße
Sandgasse
Wagnerplatz
Meranerplatz
Lorenzergasse
Steggasse
Wagnergasse
Feldgasse
Nansengasse
Urbangasse
Schwarzagasse
Permalink
Tiles © basemap.at (GRAU).

Case study

Additional measurements

- Rail noise is distinguishable from other noise sources only up to a distance of about 100 m to the rail track
- Additional measurements were conducted in order to roughly determine the dimension of shadowing effects
- Therefore 3 out of the 7 measuring sites were selected for a further analysis
- At each measuring site 2 Head Shoulder Unit's were used for an entire measuring period of 4 hours
- Measurements at each site were done at 3 different locations

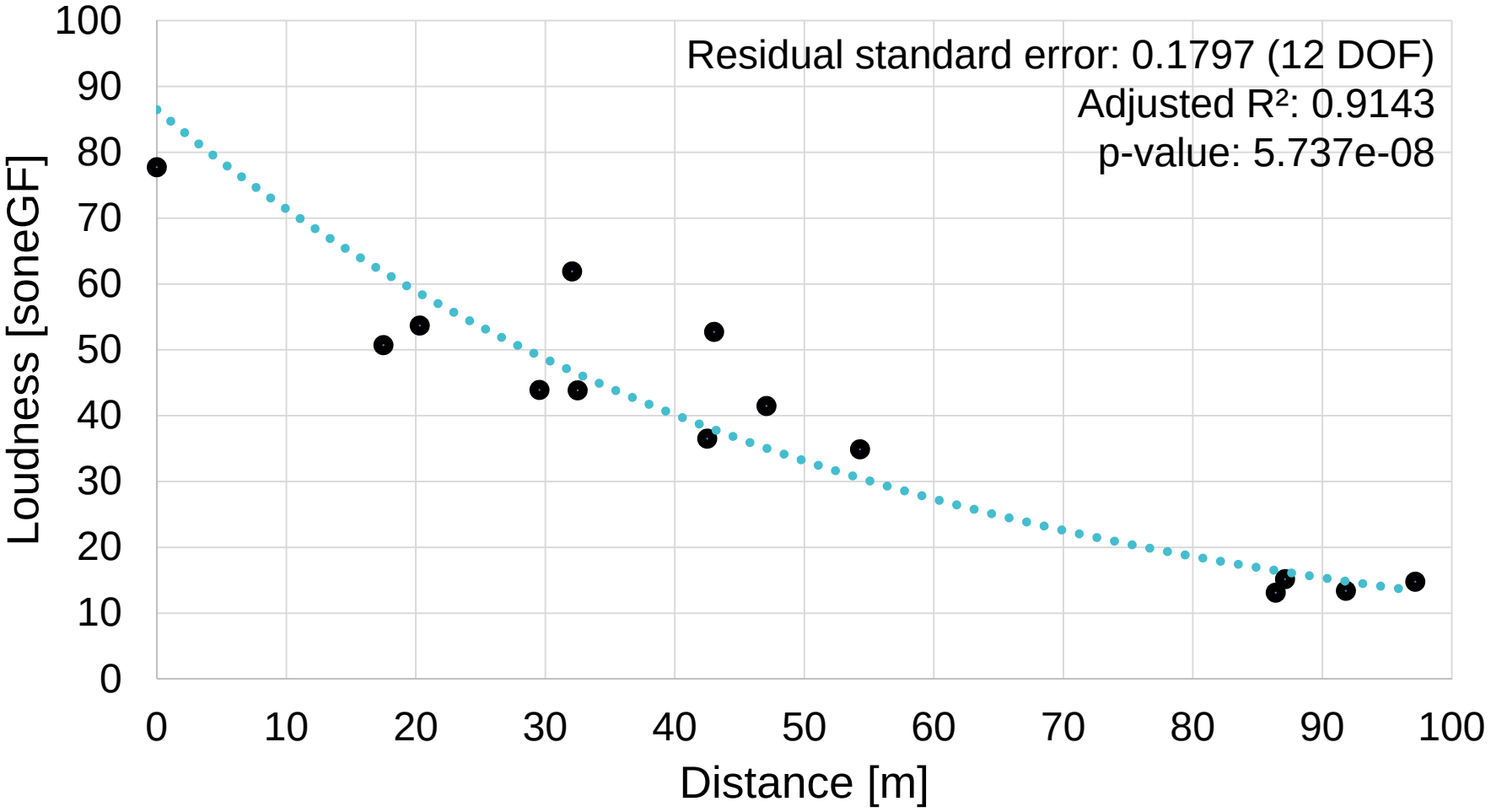


Data evaluation

- Following the data acquisition, an evaluation scheme needed to be developed
- In a first step data was analyzed on a per train and measurement location basis
- Results needed to be transformed into a numerical representation of the acoustic exposure at a specific point
- Problem was that different train types were using that part of the railroad network in different quantities at each location
- Solved by using the mean value out of all median loudness values of each train passage on a specific location

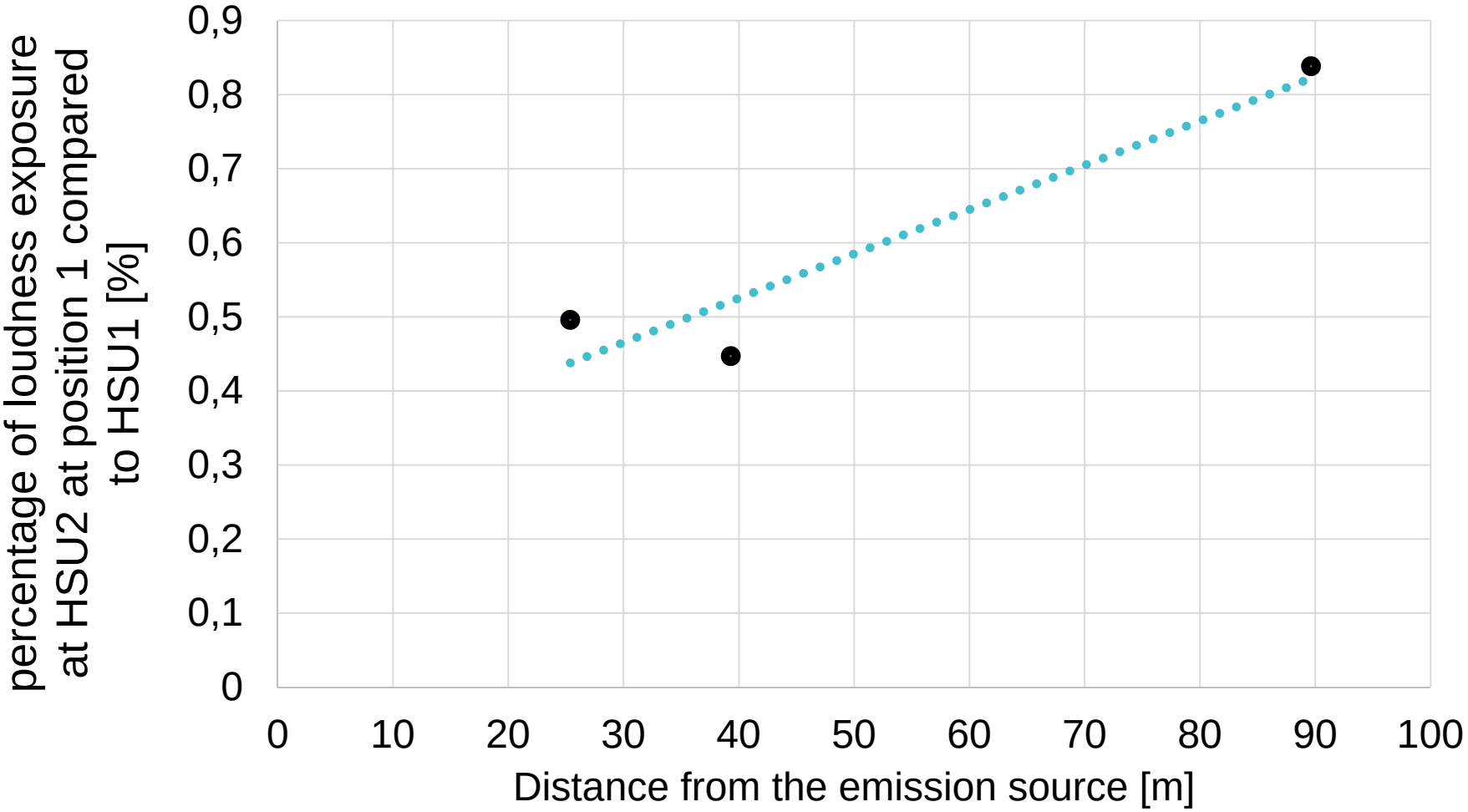
Development of spatial distribution models

Loudness



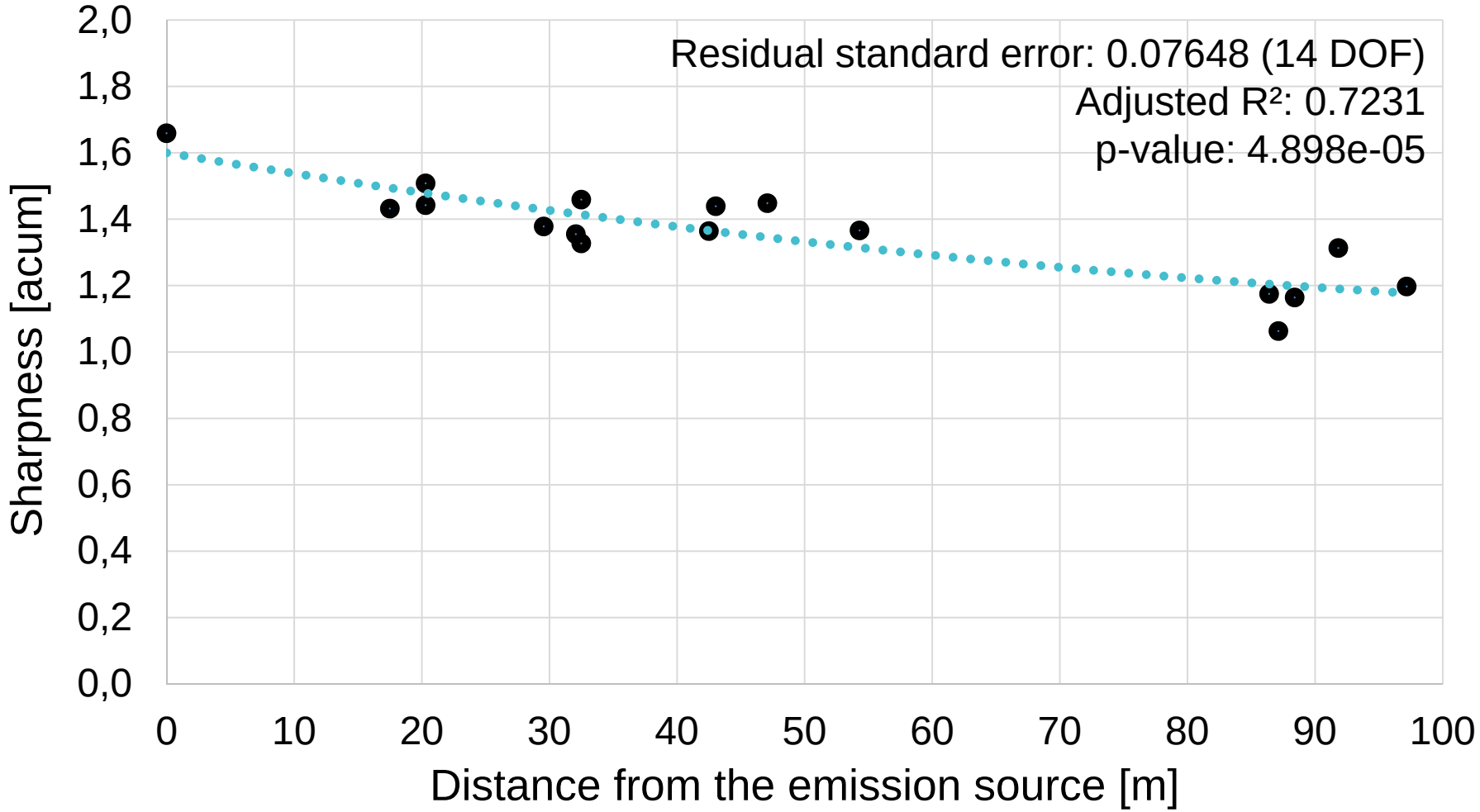
Development of spatial distribution models

Loudness – decrease after facing an obstacle over distance



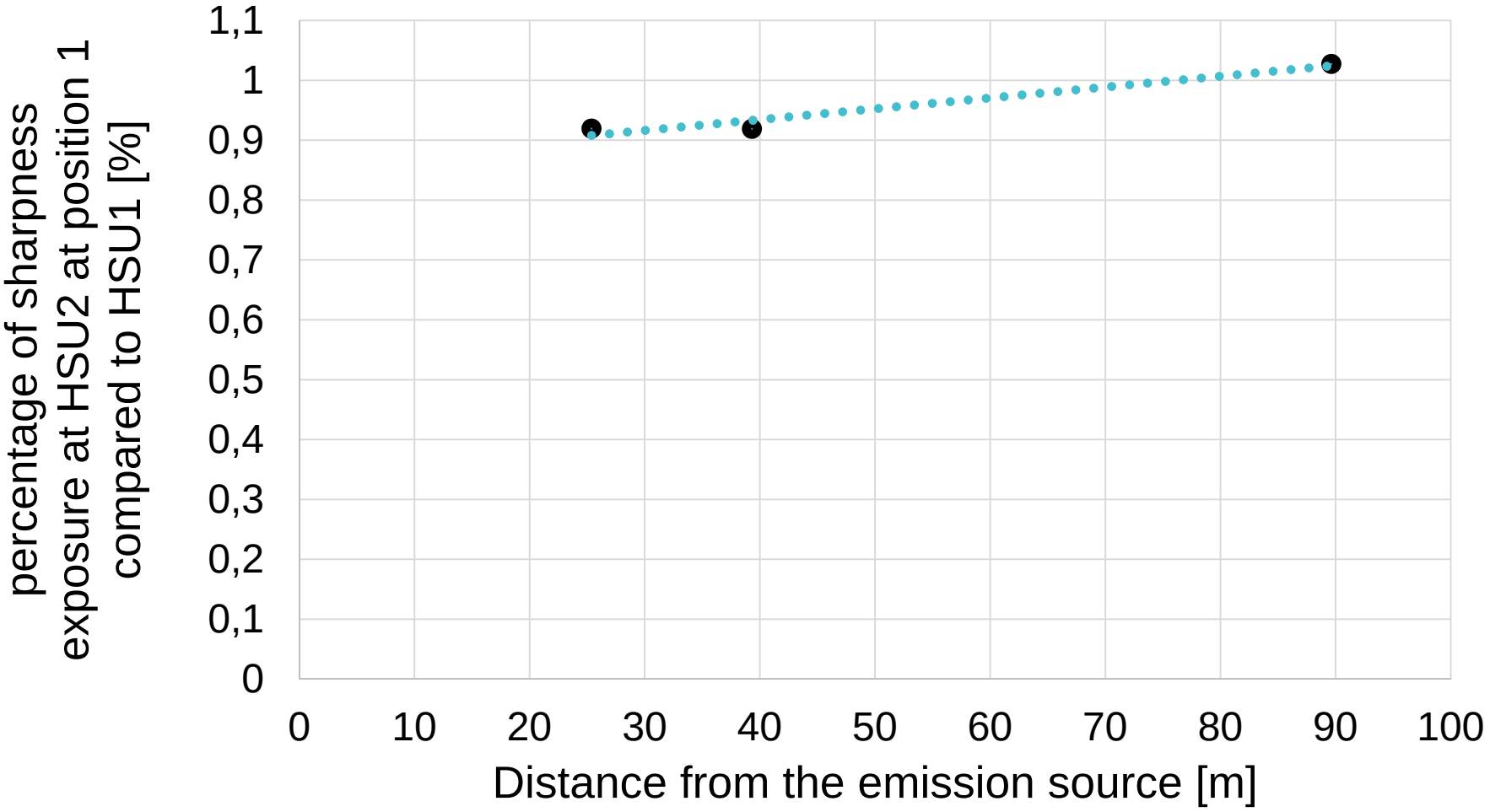
Development of spatial distribution models

Sharpness



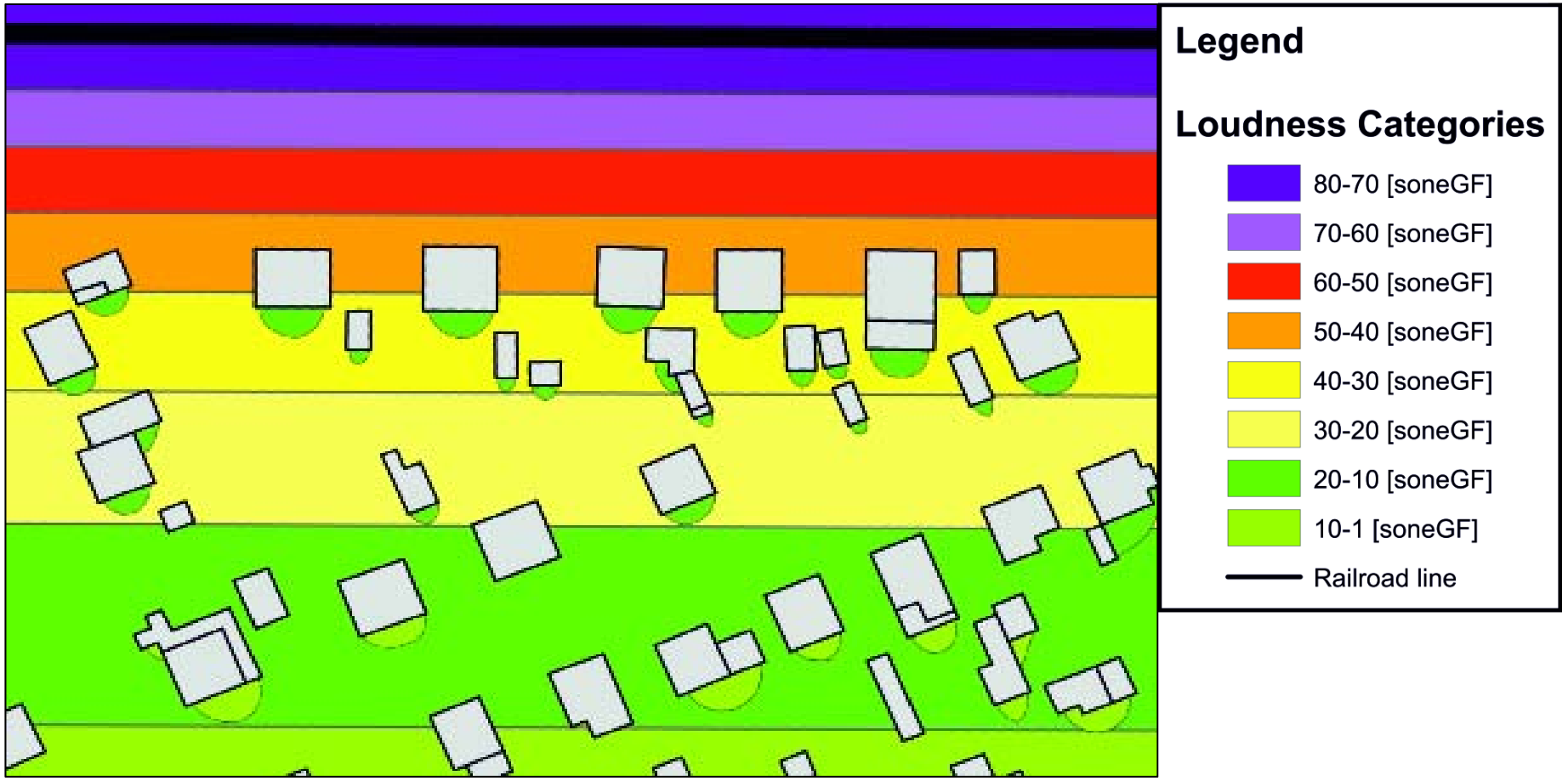
Development of spatial distribution models

Sharpness – decrease after facing an obstacle over distance



Development of spatial distribution models

Example of a Soundmap, based on the factor Loudness



Limits of the presented spatial distribution models

- Models were developed to test the feasibility of spatial distribution models of psychoacoustic factors
- Still at an early stage of development
- Representation of psychoacoustic soundscapes in regard of certain traffic modes has to be further investigated
- At the moment not compared to another study area

Future steps

- Detailed statistical analysis of the acoustic and psychoacoustic data
- Additional measurements at new locations
- Investigate more measurement points around the house, at different heights
- Development of a universal model for different landscapes, traffic noise sources and psychoacoustic parameters
- Integrate TNAR model (Traffic noise annoyance on road and rail – Cik, 2009)
- Goal is to visualize traffic noise annoyance at certain distances

Summary

- Currently, epidemiological studies use the A-weighted sound pressure level
- Human perception of noise exposure from the variety of traffic sources is not always well represented by this approach
- Use of psychoacoustic indicators is currently hampered by its lack of modeling larger areas
- First step into further research is done within the project RA²MSES
- Different models were fitted to the measured data of various locations in a specific study area
- Results have shown the possibility to use the shown methodology for the description of psychoacoustic parameters
- The next step will be to investigate more measurement points around the house at different heights
- Goal is to develop a universal model for different landscapes, traffic noise sources and psychoacoustic parameters