Für Mensch & Umwelt

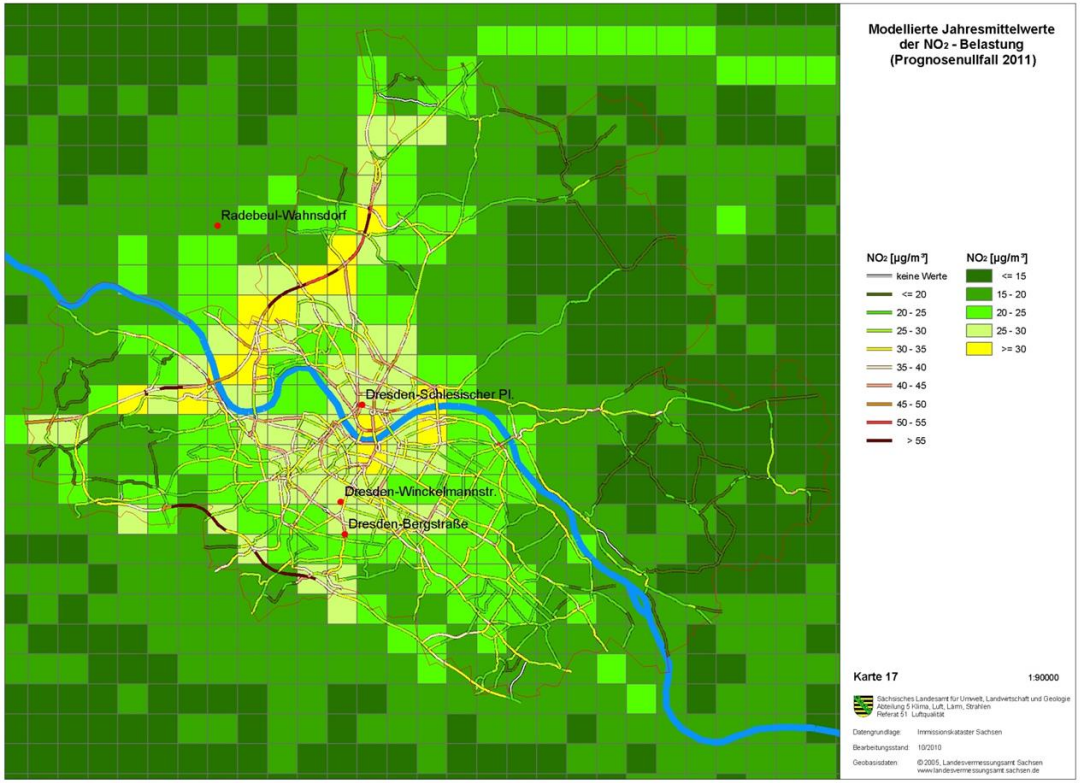
Umwelt Bundesamt

FAIRMODE Technical Meeting 2021

# Application of the FAIRMODE CT8 methodology for the estimation of representativeness of observation sites in Germany

UBA, LANUV NRW, LLUR SH, LFULG SN, LUBW, Senat Berlin

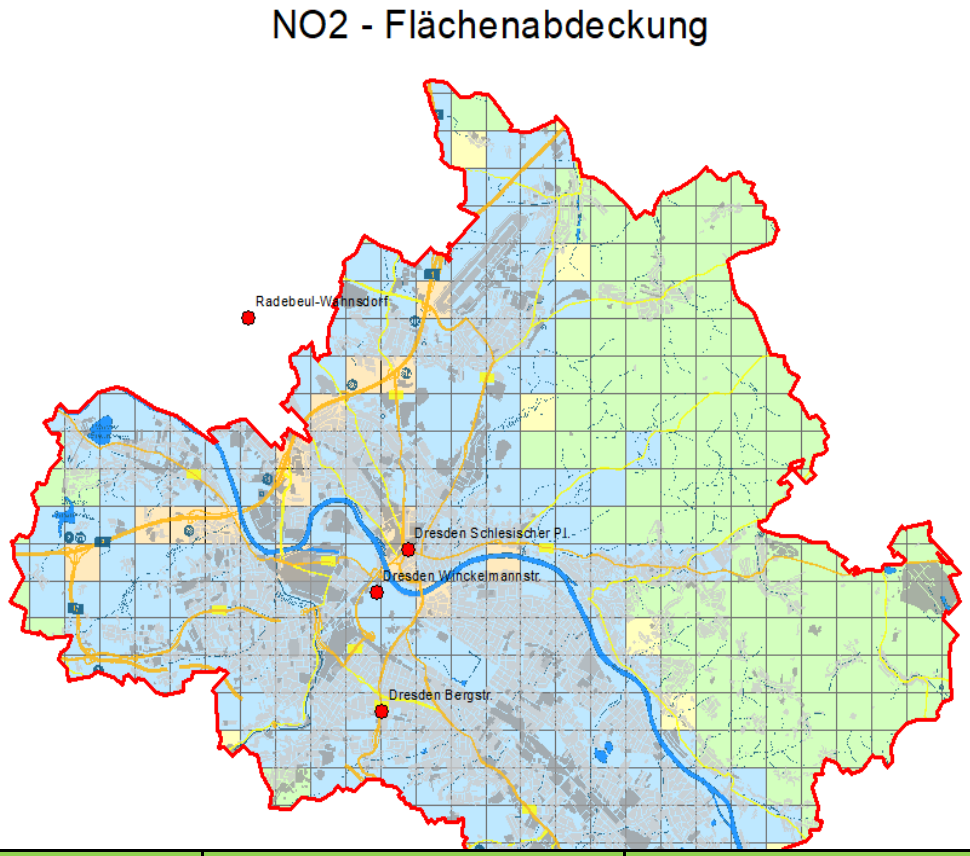
# Example LFULG Saxony




- Modelling approach on 1x1km² grid cells based on LASAT and interpolation with measurements
- Concentrations on street level calculated with the model PROKAS/PROKAS-B

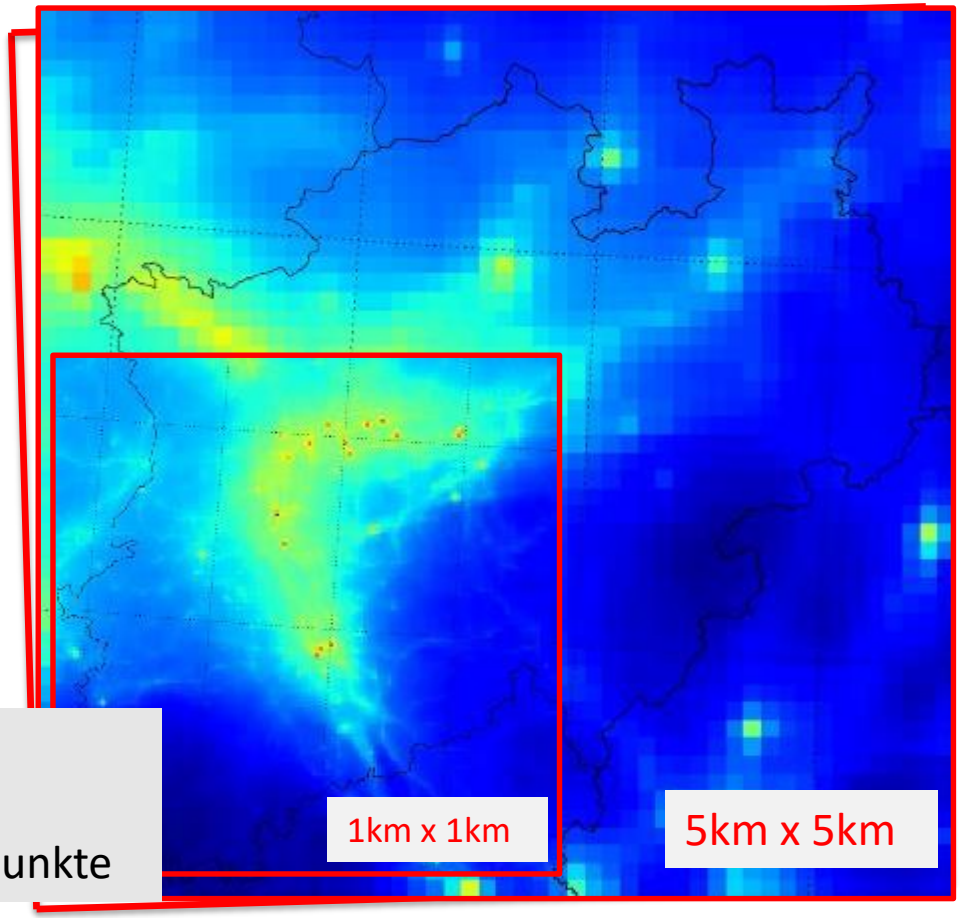
**Only raster data on 1x1km² is used for the FAIRMODE exercise**

# Example LFULG Saxony




| | NO2 DD-Winckelmannstr | NO2 Radebeul Wahnsdorf | NO2 Gesamt | PM10 DD-Winckelmannstr |
|---|---|---|---|---|
| +/- 5% | 12% | 9% | 21% | 66% |
| +/- 10% | 26% | 20% | 46% | 98% |
| +/- 15% | 42% | 28% | 70% | 98% |
| +/- 20% | 58% | 36% | 94% | 100% |

# Example LANUV North Rhine-Westphalia




Grobes Gitter:

2600 Modellpunkte

Feines Gitter:

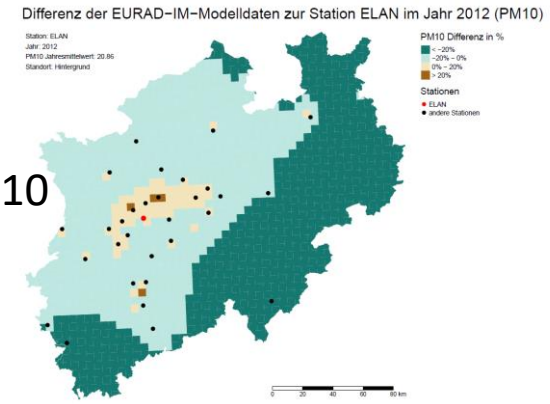
20016 Modellpunkte

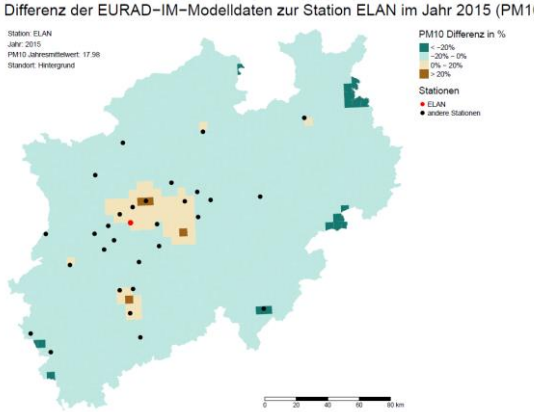
- Modelling results from CTM EURAD-IM, combination with measurements via assimilation

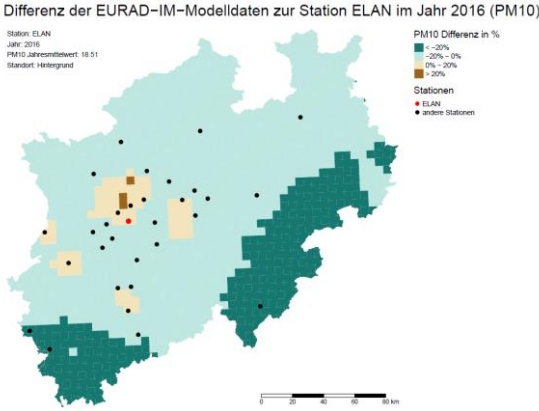
# LANUV North Rhine-Westphalia

2012 2015 2016

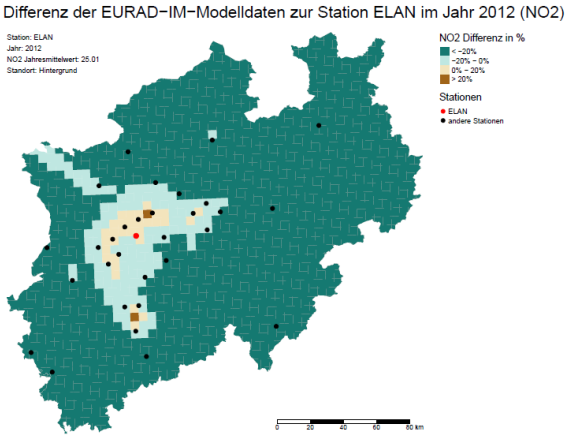
PM10

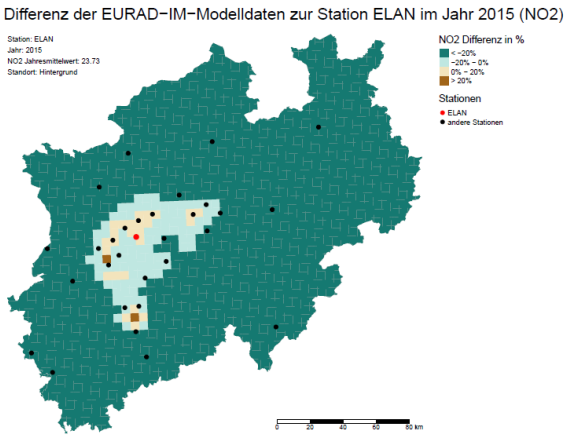


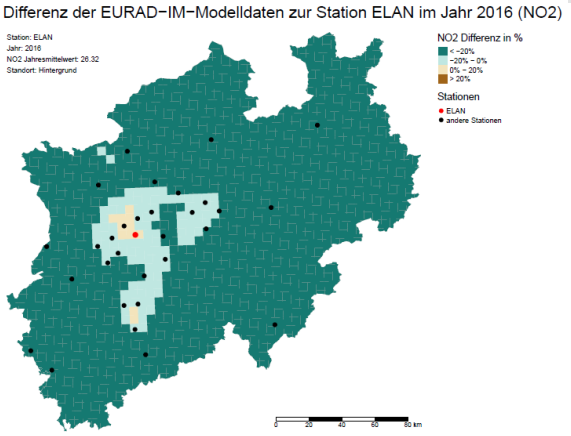




NO2



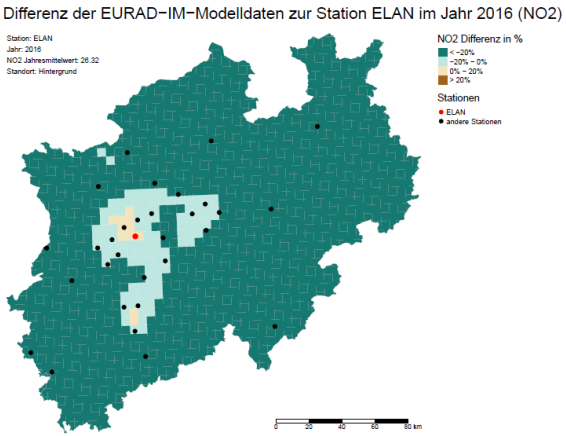



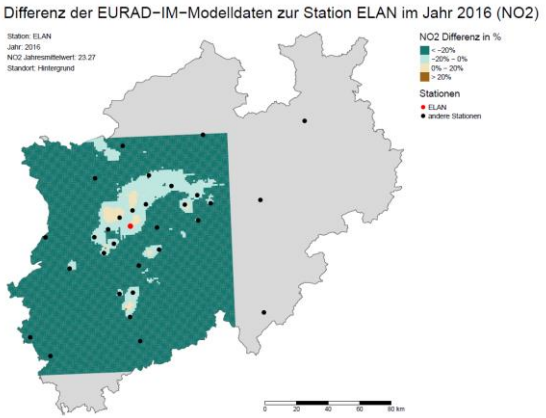
# LANUV North Rhine-Westphalia

5 km x 5 km

1 km x 1 km

NO2

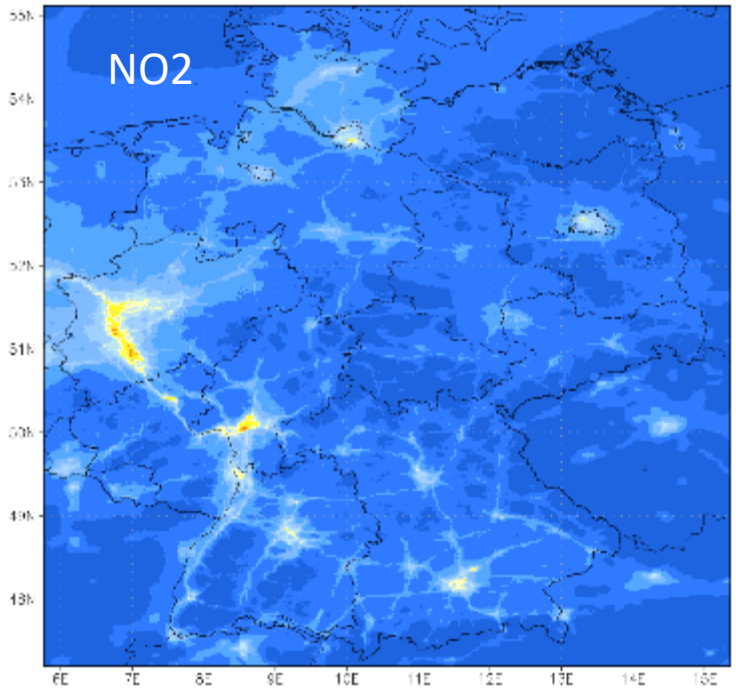



Differences in representative area with model resolution!

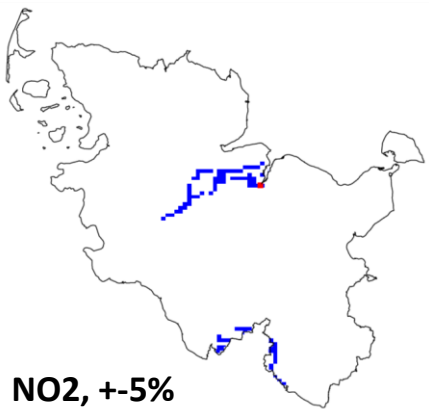
# LLUR Schleswig-Holstein

- Currently no own air quality modelling results
- Evaluation based on the UBA modelling with the CTM REM-Calgrid
- Resolution: 2x2km²
- Base year: 2019

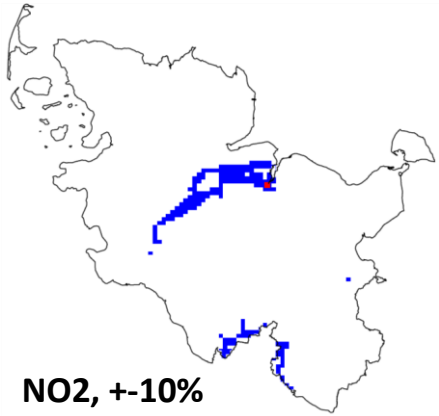


# LLUR Schleswig-Holstein

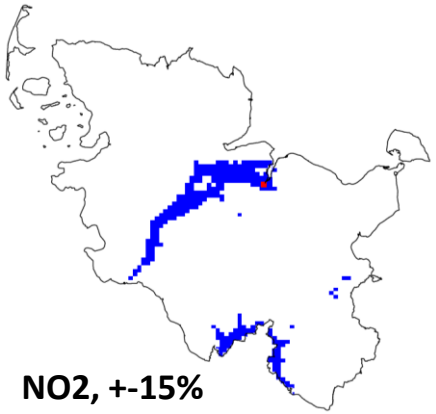
Traffic Station Kiel Theodor-Heus Ring



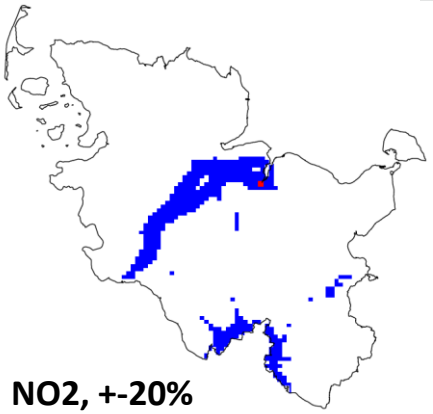
NO2, +-5%



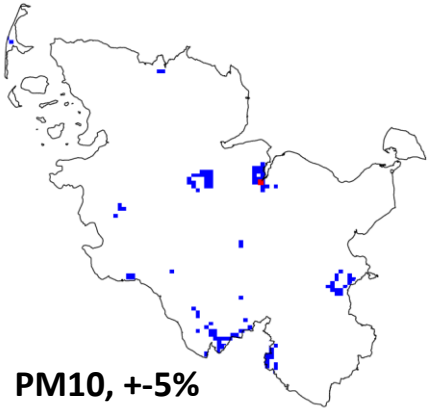
NO2, +-10%



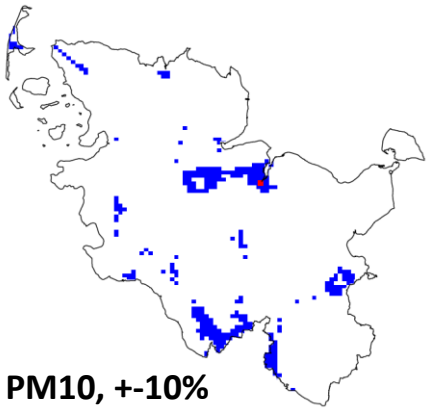
NO2, +-15%



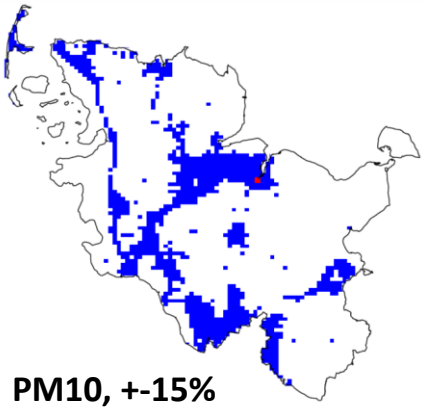
NO2, +-20%



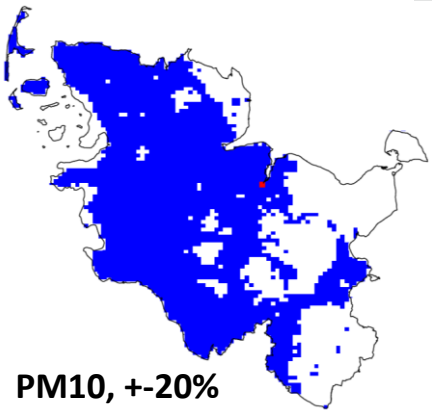
PM10, +-5%



PM10, +-10%



PM10, +-15%



PM10, +-20%

## Example Senat Berlin

- Gaussian multi-source dispersion model IMMIS-net
- Resolution:
  - ❖Spatial resolution: 500 m x 500 m
  - ❖Temporal resolution: annual mean 2015
- Main emission sources:
  - ❖Traffic
  - ❖Heating devices
  - ❖Industry
- Model Validation for urban background:
  - ❖$NO_2$ : +- 16 %
  - ❖$PM_{10}$ : +- 13 %
  - ❖$PM_{2.5}$: +- 11 %

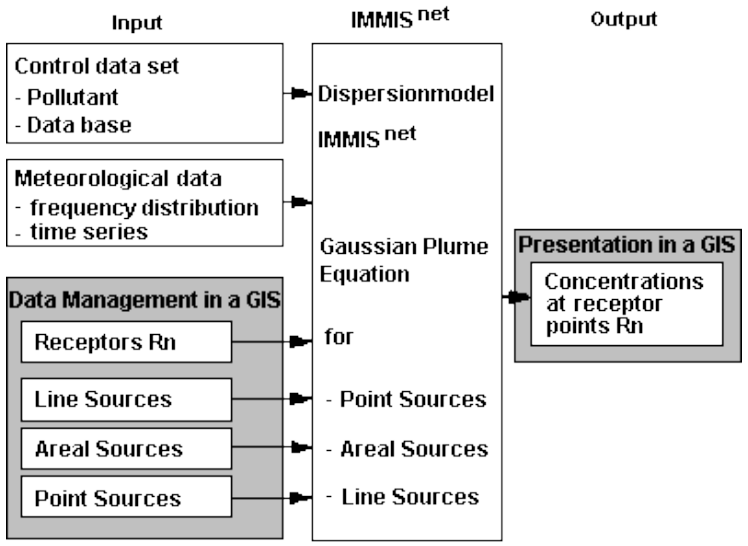
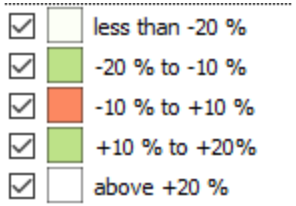


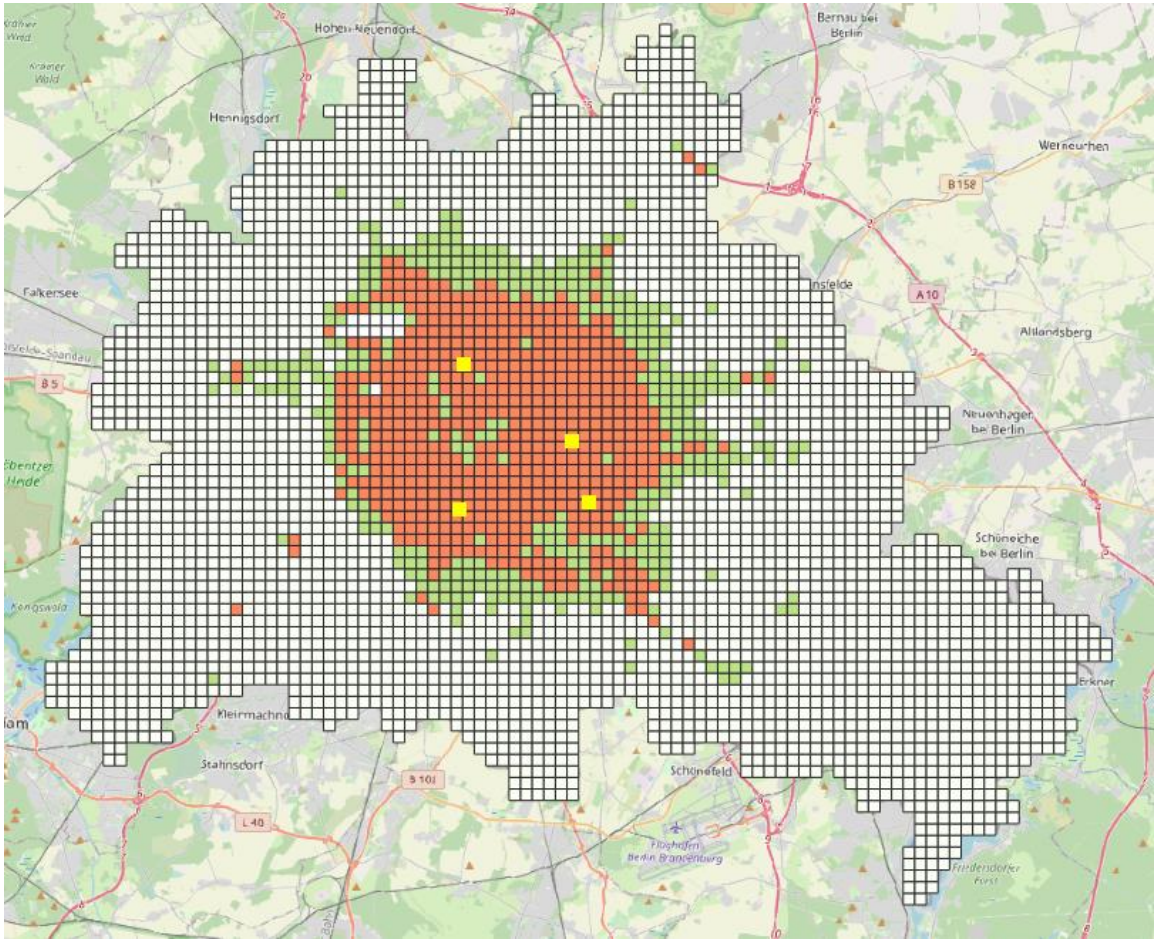

Fig: Data Management in IMMIS net

# Example Senat Berlin

MC010: **28 µg/m³**
MC018: **26 µg/m³**
MC042: **27 µg/m³**
MC171: **27 µg/m³**

**Model results:**
+- 20 %: **25.4 % of cells**
+- 10 %: **15.1 % of cells**



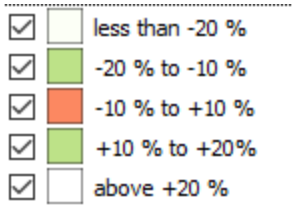
# Example Senat Berlin

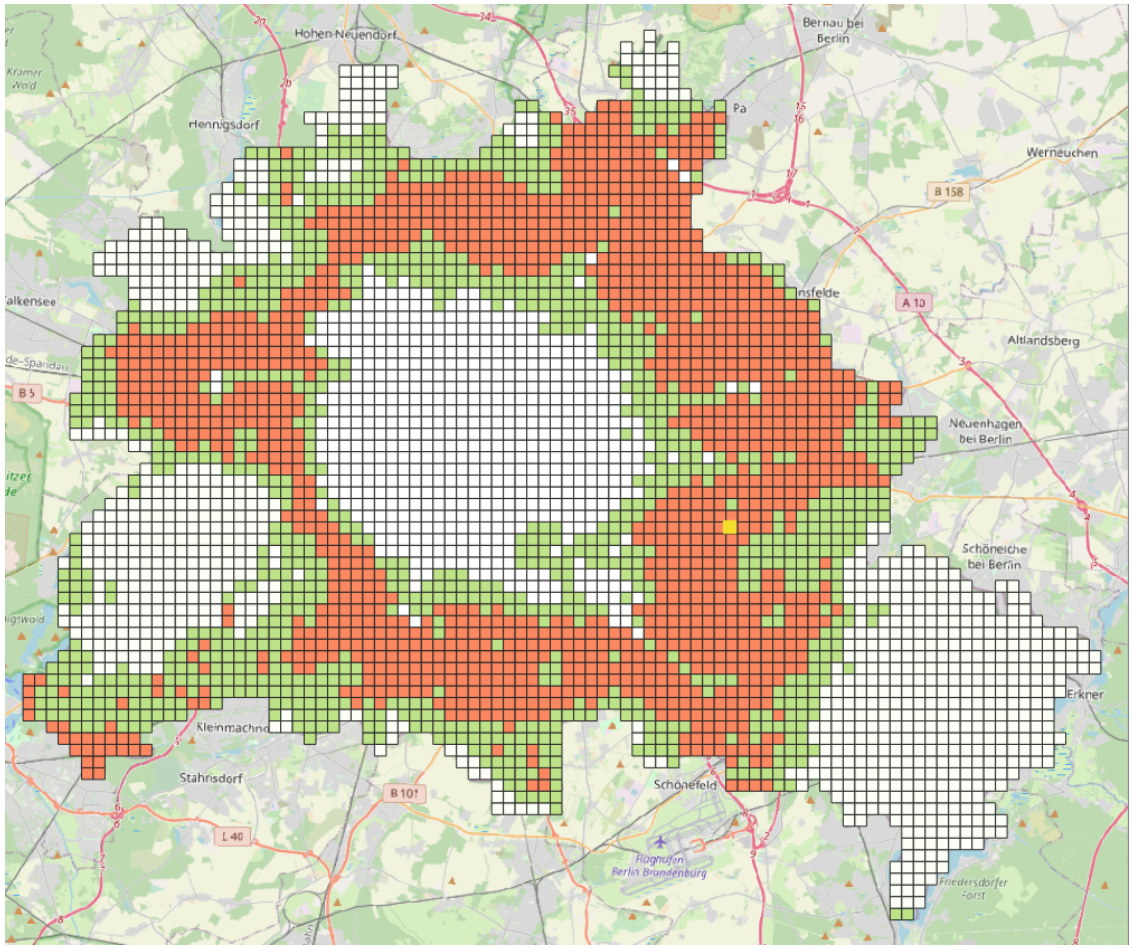
MC282: **20 µg/m³**

**Model results:**

+- 20 %: **61.5 % of cells**

+- 10 %: **34.5 % of cells**



## Summary

- Representative area varies from year to year (because it is based on varying concentration fields)
- The representative area based on a 20% range is too large in most cases, a lower range seems to be more appropriate
- The range depends on the pollutant under consideration (lower ranges more suitable for PM10)
- The representative area varies with model resolution
- Approach is not suitable for traffic and industrial sites – high resolution raster datasets are needed
- The knowledge of the modelled concentration field is not enough to estimate the representative area, knowledge of the local conditions (spatial characteristics- building development etc.) is necessary

## Discussion

- There is often a deviation between model and measurement. How should the approach be applied in such a case? Can we give an acceptable range of deviation?

- What is the reason for this approach? According to Annex III B in the AQD (macroscale siting) representative areas of sampling points are relatively unspecific (e. g. several km² for background sites).
  - Is it really necessary to have such detailed information about the representative area?
  - What question should be answered with that?
  - Is it even possible to give such a detailed information, because the conditions around the sampling points are changing (e. g. meteorology)?