Questions / tests to be addressed

- **Q1 – Is the MQI robust?**

1. Choose and document the data and stations you want to use for the MQI analysis
2. Compare FAIRMODEs on-the-fly MQI with own home calculation
3. Carry out ONE analysis of your choice

   - Check robustness of your MQI with respect to the number of stations
   - Check robustness of your MQI with respect to aggregation area (polygons vs. country)
   - Check robustness of your MQI across pollutants
   - Compare your MQI with others MQI – if beaten by CAMS – analyse the emission data
   - Check MQI ability to assess specific modelling purpose

- **Q2 - Are the MQI stringent enough and consistent among pollutants?**
- **Q3 – Does the fail/pass MQO test ensure a valid distinction between Fit/non-Fit-for-purpose modelling applications ?**

FAIRMODE WG2 MQI Mapping Exercise
Contribution from Germany

Second interpretation webinar - 3rd September 2024

“on-going work”

WG2 - on-going work

3.4.3. Minimum number of stations for MQO (Technical Guidance in the field of Air Quality Modelling):

Preliminary studies conducted in the scope of the FAIRMODE network have shown that the ***minimum number of stations to be used in the evaluation of the MQO should be around 10****. When fewer stations are used, the probability that the MQO is not properly evaluated increases. Poor models might pass and good models might fail the criterion, purely based on a statistical analysis of the uncertainties.* ***To overcome this risk, it is recommended that in a validation with fewer than 10 stations, the MQI shall be below 1 for all of the available stations*** *and the 90th percentile principle does not apply.*

WG2 - Data Used in the exercise

Model used: REM-CALGRID (RCG) in 2x2km²

Main uses of the modelling system under the AAQD: Assessment of national/regional air quality, scenario analysis (e. g. national air pollution control program for NEC-directive)

Monitoring Stations data used: fixed monitoring background stations ((sub)urban, rural) in Germany

Emissions: GRETA (2018 Sub 2020, Germany), CAMS (Europe)

Pollutant: all

Area used for the MQI evaluation: Germany

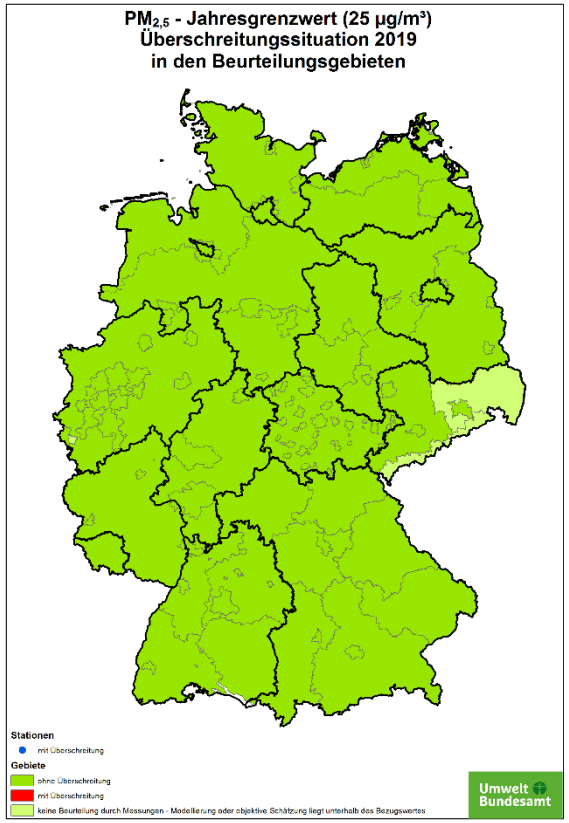
Meteorological year used: 2019

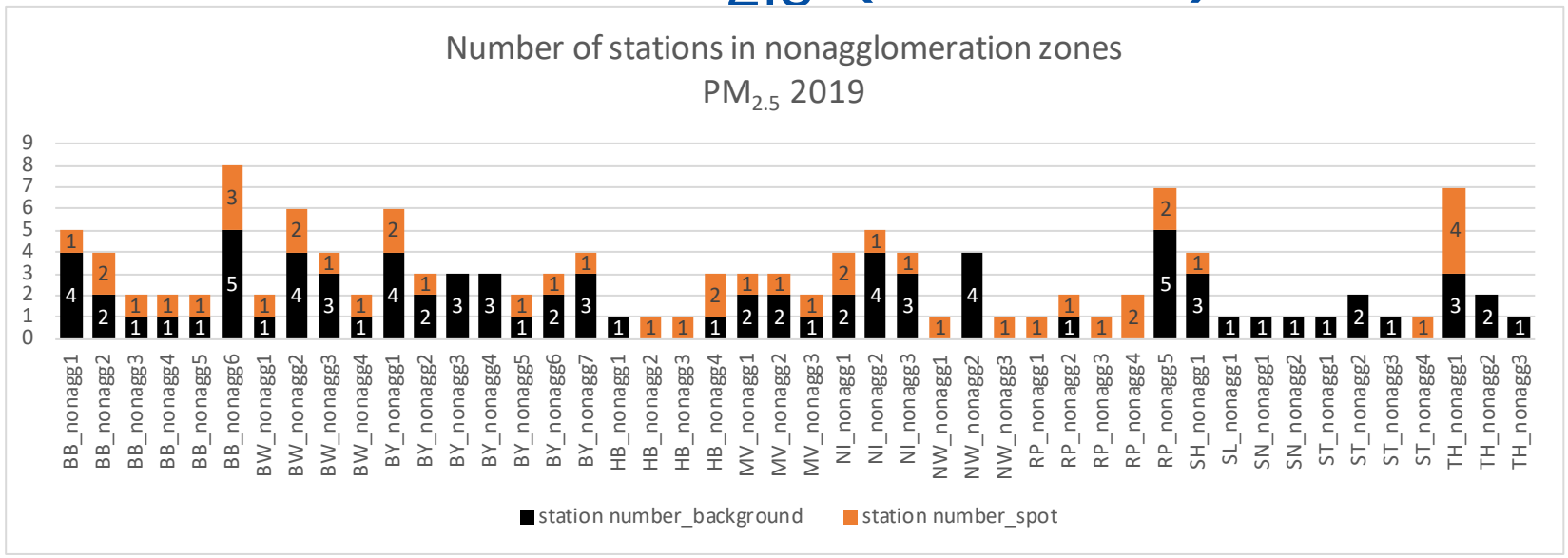
Selected MQI/Stringency level: default

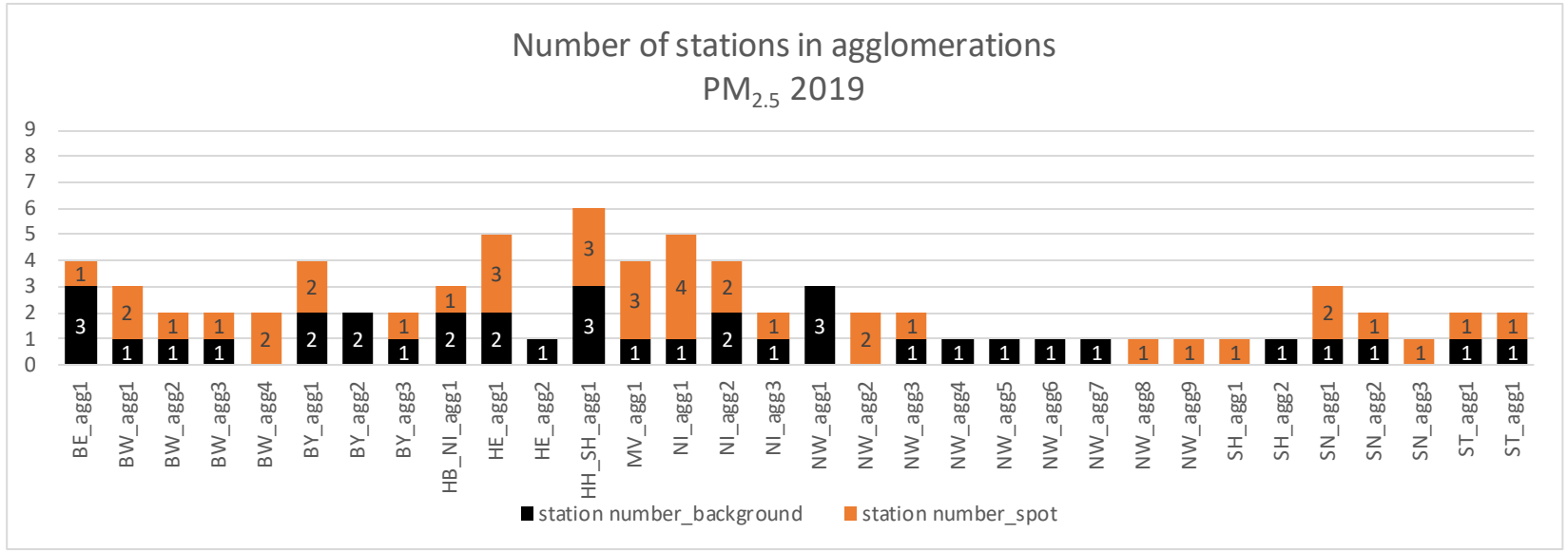
WG2 – number of stations $PM_{2.5}$ (in 2019)

* fixed SPOs, which can be used for MQI calculation

83 air quality zones

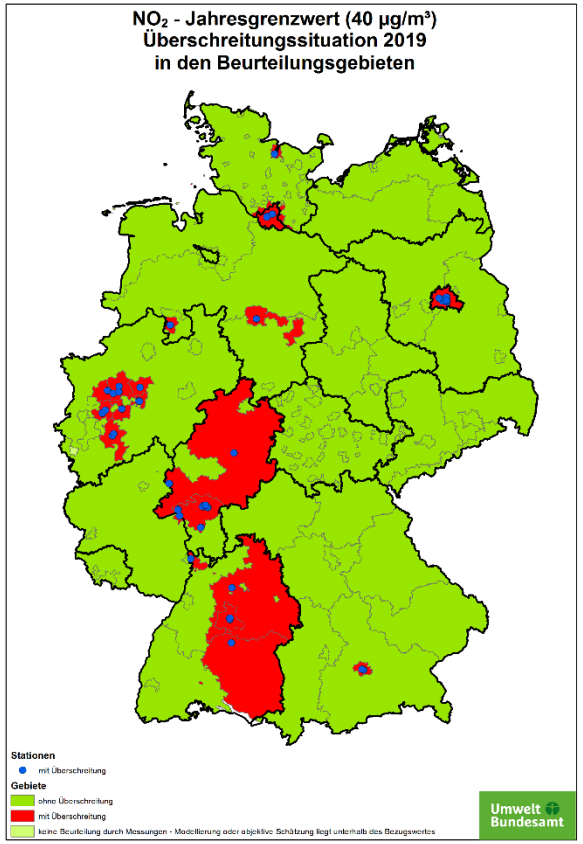


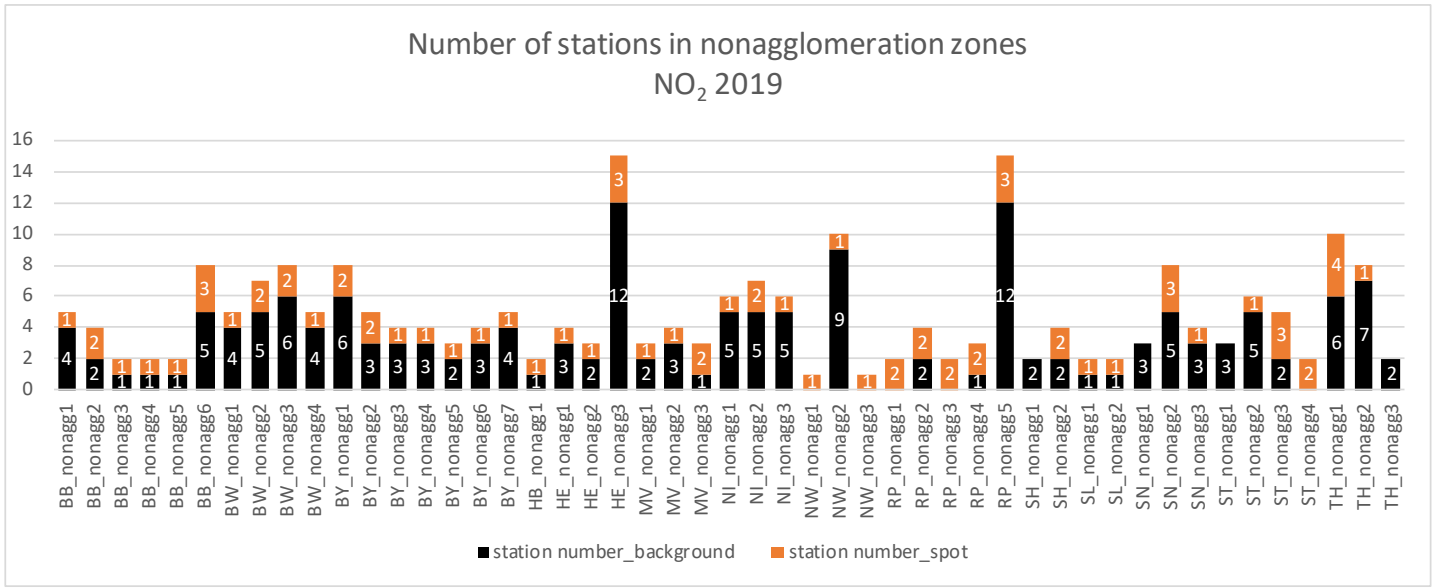


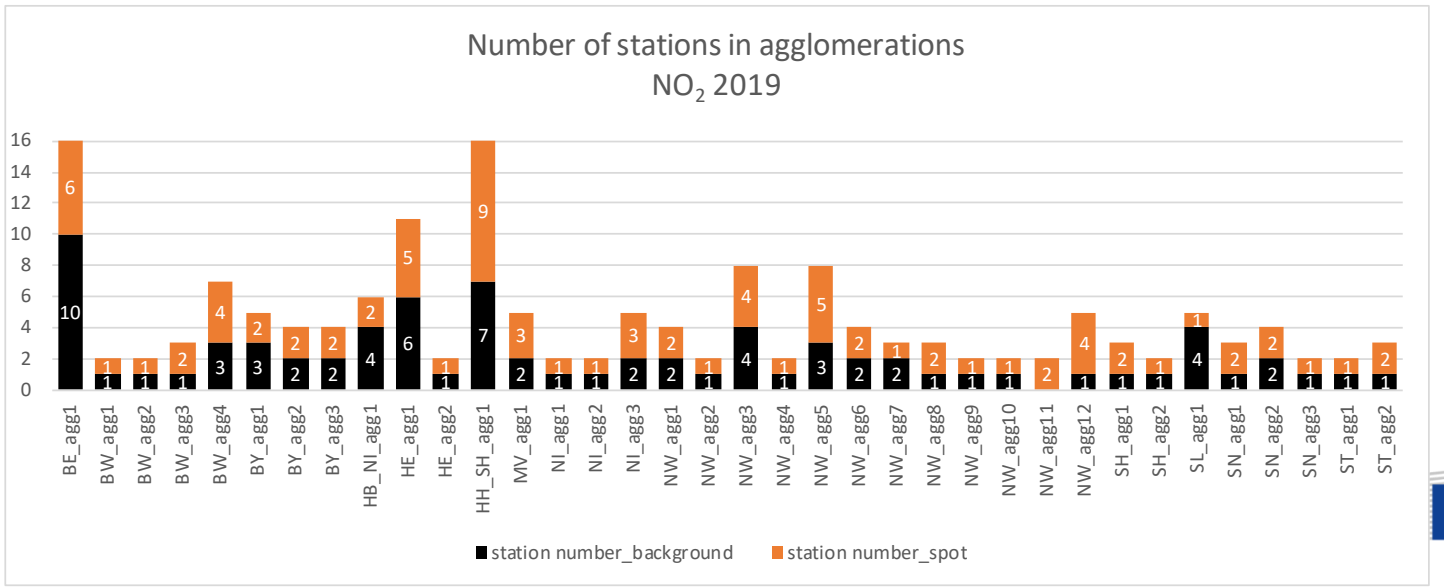


WG2 – number of stations NO_2 (in 2019)

86 air quality zones







* fixed SPOs, which can be used for MQI calculation

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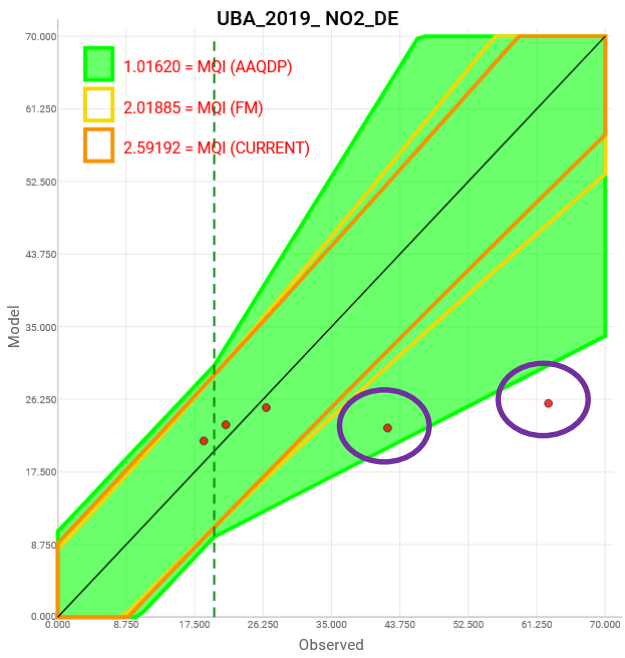
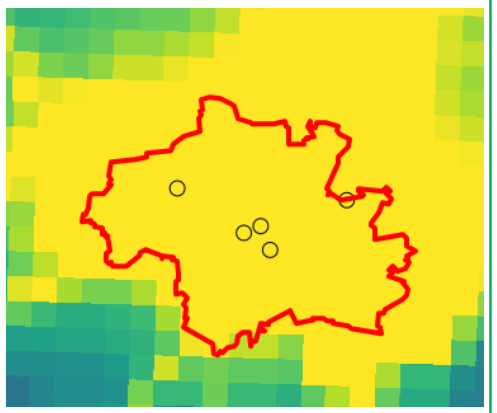
WG2 MQI robustness – Analysis

Robustness test I – MQI with respect to aggregation area (zone level vs. NUTS1)

NO_2 raw model – Munich (DEZDXX0001A)

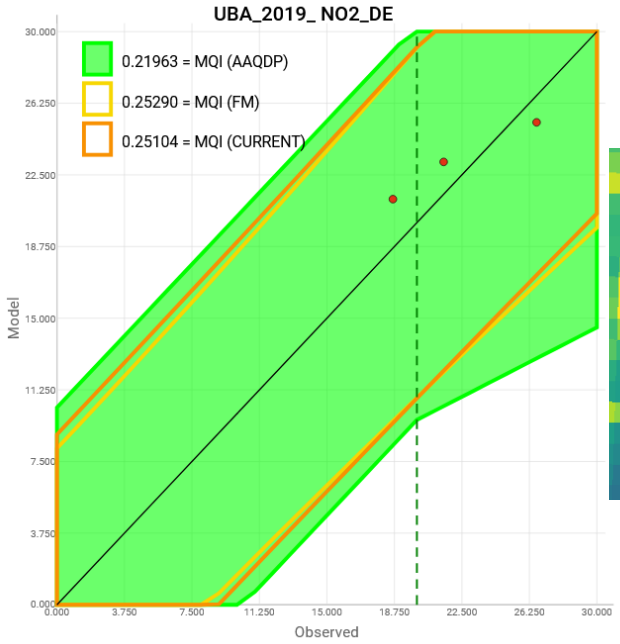


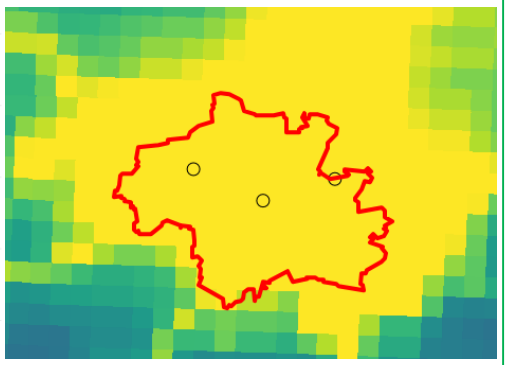
Not fulfilled



NO_2 raw model – Munich (DEZDXX0001A)

No traffic stations





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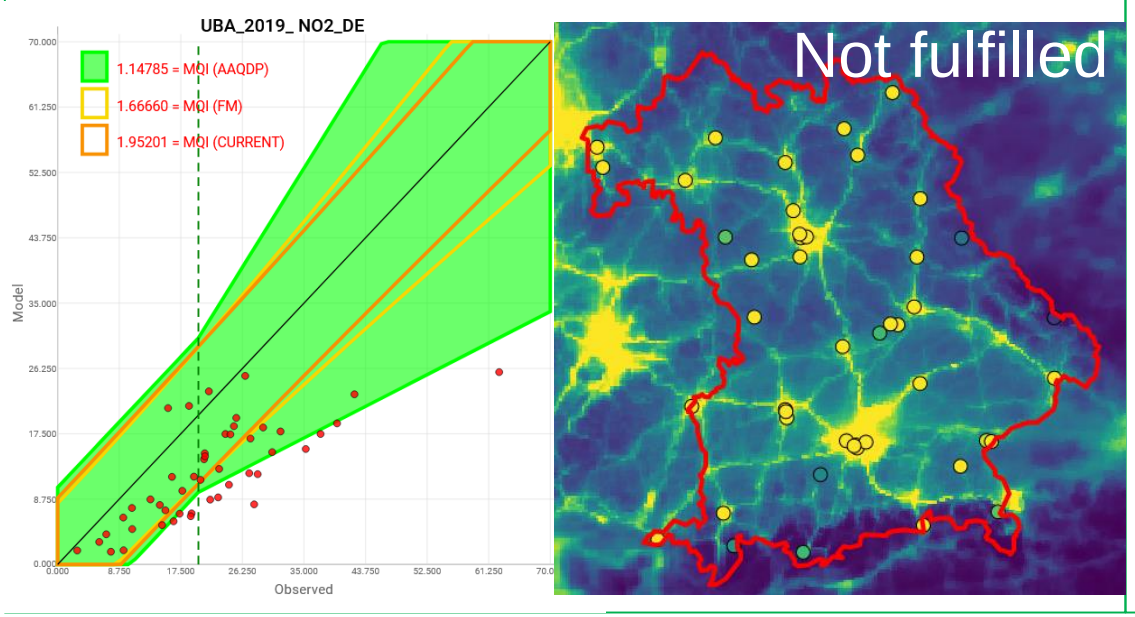
WG2 MQI robustness – Analysis

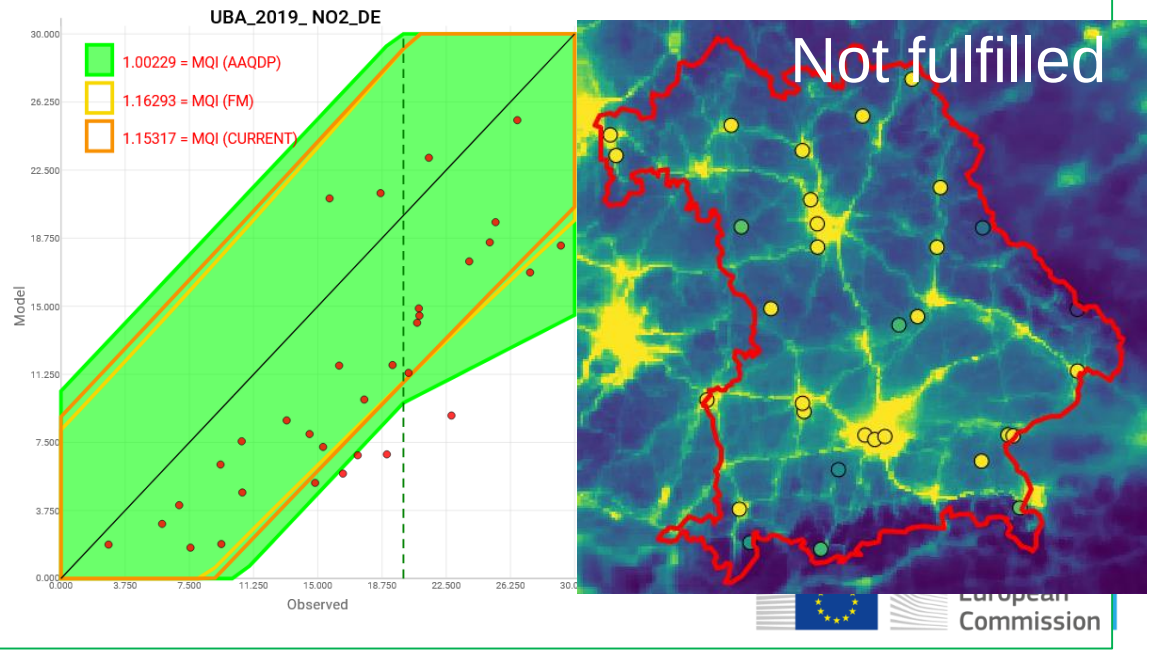
Robustness test I – MQI with respect to aggregation area (zone level vs. NUTS1)

NO_2 raw model – NUTS1 (Bavaria) – 47 SPOs



NO_2 raw model – NUTS1 (Bavaria) – 32 SPOs

No traffic stations



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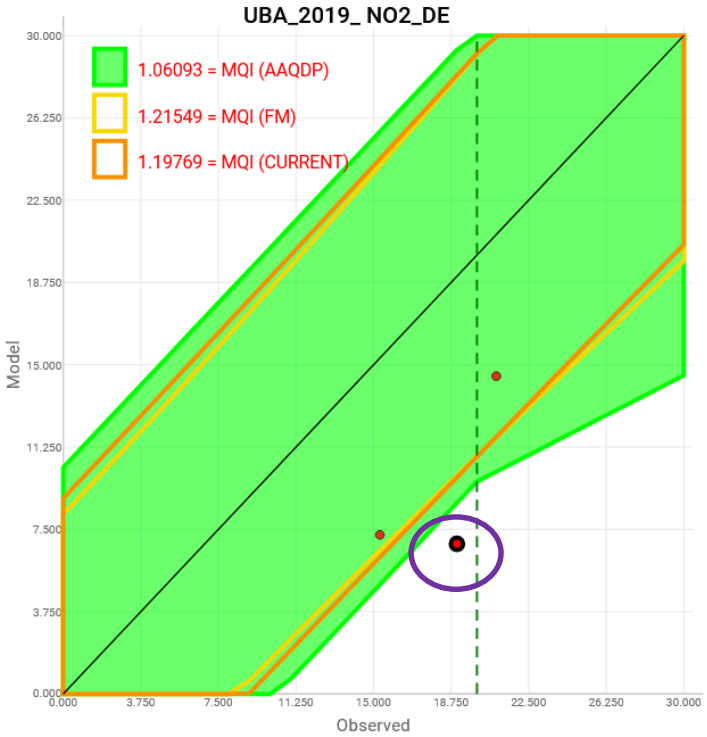
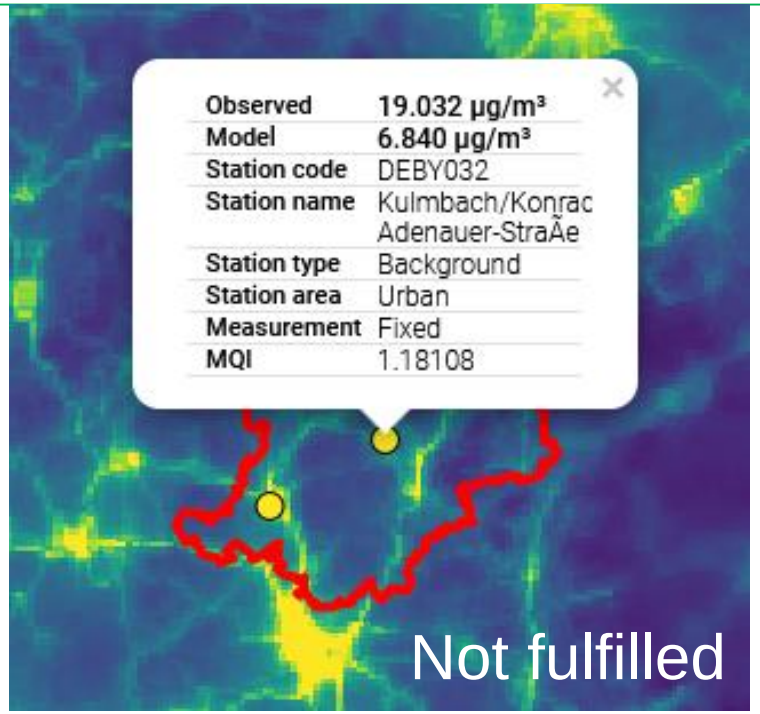
WG2 MQI robustness – Analysis

Robustness test I – MQI with respect to aggregation area (zone level vs. NUTS1)

NO_2 raw model – Oberfranken (DEZDXX0028S)

No traffic stations – 3 SPOs





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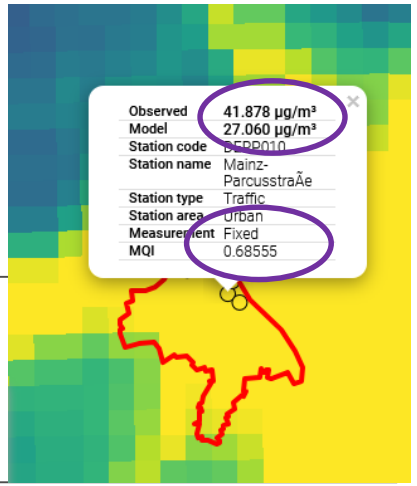
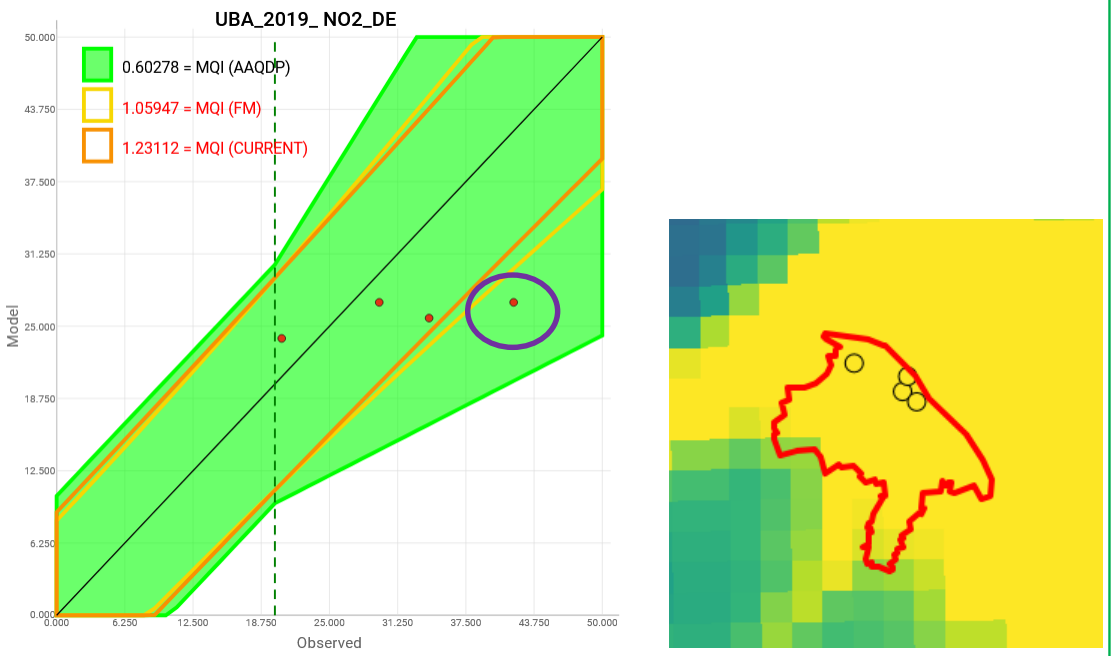
WG2 MQI robustness – Analysis



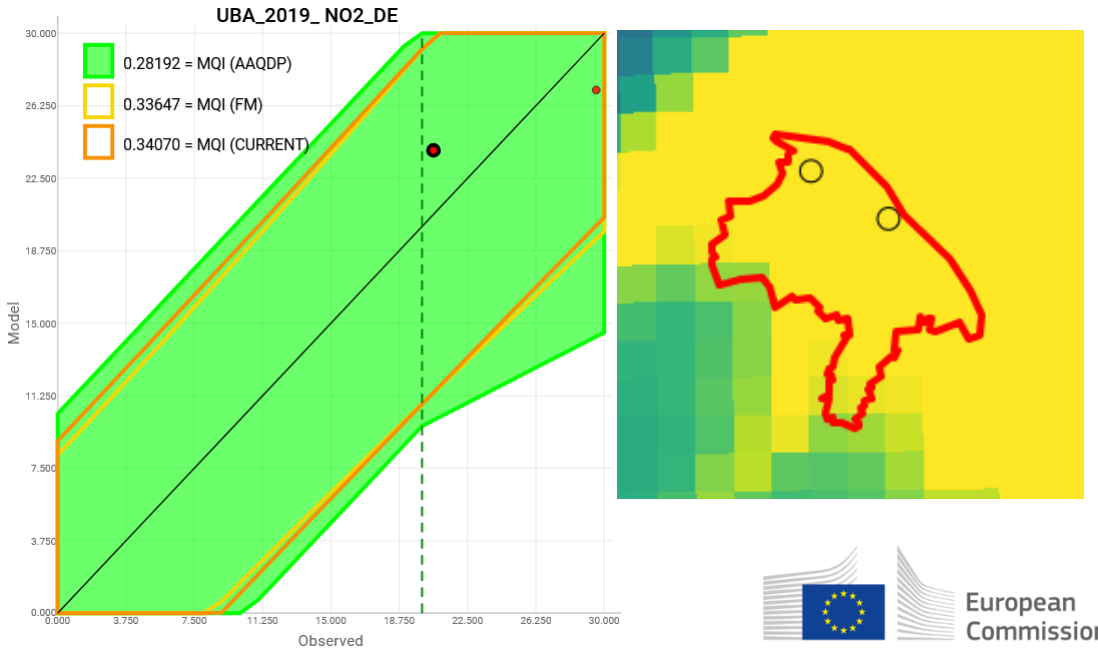
Robustness test I – MQI with respect to aggregation area (zone level vs. NUTS1)

NO_2 raw model – Mainz (DEZKXX0006S)



NO_2 raw model – Mainz (DEZKXX0006S)

No traffic stations



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WG2 Questions & suggestions

- Is the MQI stringent enough?
  - MQI (AAQD) fulfilled for many NO_2 AQ zones (agglomeration, bigger cities) even considering traffic sites (even for non-assimilated 2x2km² model results, see examples)
  - But, MQI for NUTS1 not fulfilled (see Bavaria example) → mainly due to measurements in suburban / urban background in smaller cities and rural areas
  - Geographical extent may influence the MQI result → fulfilled on zone level but not fulfilled on NUTS1 (Bavaria example) or other way around
  - Mainz example
    - DERP010: 41.8 µg/m³ measured conc vs. 27 µg/m³ modelled conc → 36 % deviation between model and measurement
    - But MQI 0.68555 → is the MQI stringent enough?
    - Article 8.3 / 8.5 (AAQD) → use further model applications to “detect” further exceedances

WG2 Questions & suggestions

- Shall we calculate the MQI for each single air quality zone? Or shall we do it on NUTS1 level due to the number of SPOs?
- Shall we use all stations (including traffic / industry) if the number of SPOs is < 10? (2x2km² model results vs. traffic stations) → please be clear in the guidance
  - Please consider CEN-approach (WG43) → responsible authority can apply further methods for model validation tests (based on national standards)
- Worst case “one SPO” for validation:
  - Model result maybe rejected because MQI > 1 (in one grid cell); Model result maybe accepted because MQI < 1 (in one grid cell)
- $PM_{2.5}$ “always” fulfilled? → further checks for other pollutants and regions necessary

WG2 Future practice of modelling in Germany

- Model activities will be done in each federal state (different approaches for background, traffic; different models)
- Combination of model scales (rural background, urban background, microscale for areas of interest) necessary

Thank-you

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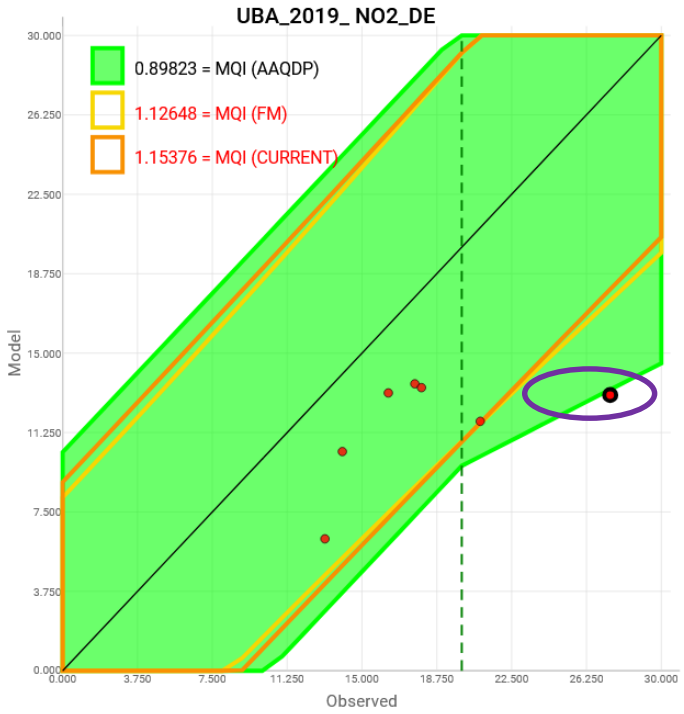
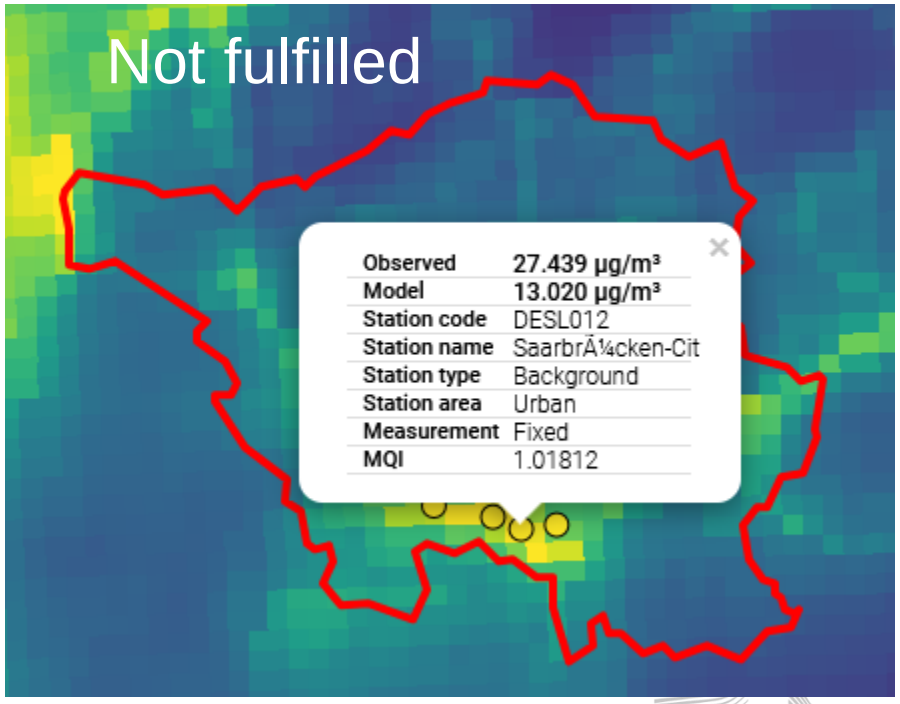
WG2 MQI robustness – Analysis

Robustness test I – MQI with respect to aggregation area (zone level vs. NUTS1)

NO2 raw model – NUTS1 (Saarland) – 7 SPOs

No traffic stations





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