FAIRMODE
Forum for air quality modelling in Europe

CT8 – SPATIAL REPRESENTATIVENESS, EXPOSURE & EXCEEDANCE INDICATORS AND NETWORK OPTIMIZATION

STIJN JANSSEN, LEONOR TARRASON

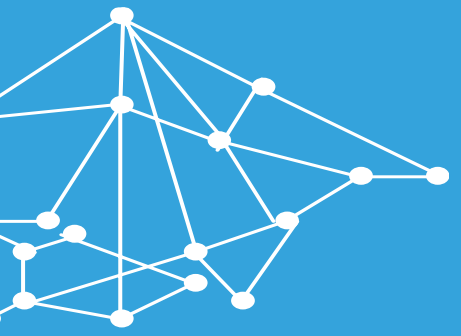
AGENDA

CT8 exercises on Spatial Representativeness and Exceedance Situation Indicators

1. Spatial Representativeness area of monitoring stations

2. Estimation of Exceedance Situation Indicators

3. Monitoring network design evaluation



1. Spatial representativeness area

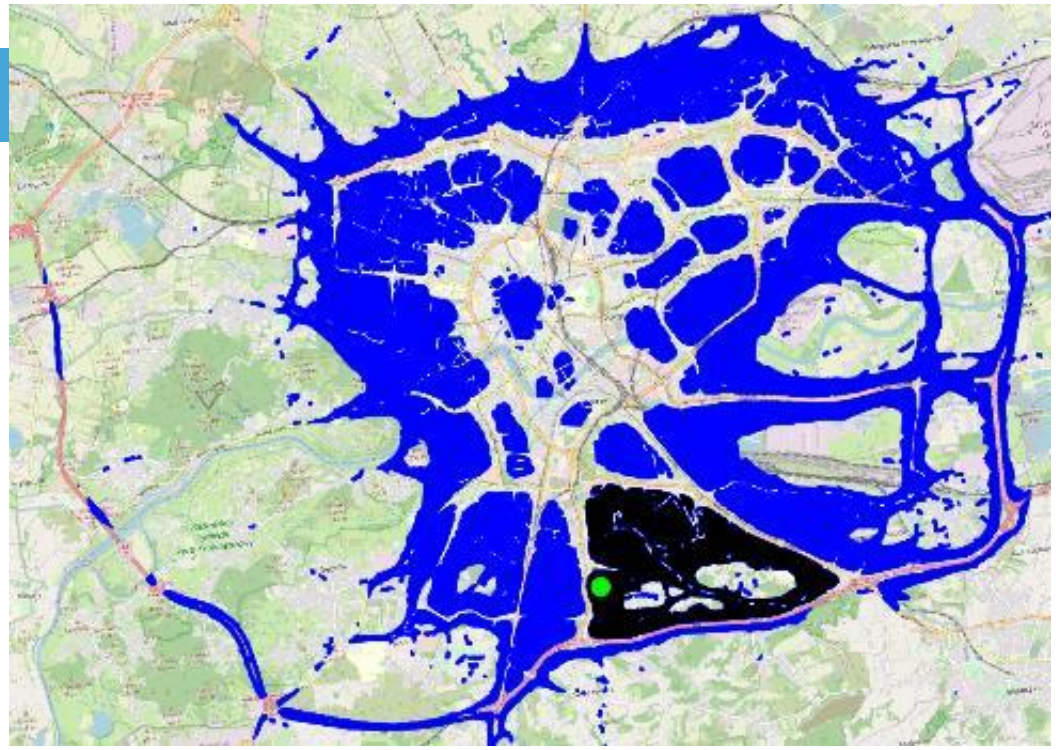
PARTICIPANTS CT8.1

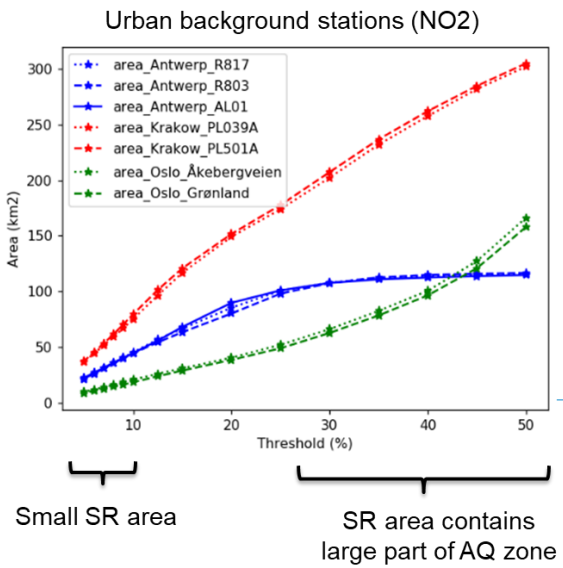
Name	Country/Region
Alexandra Monteiro	Portugal
Bruce Rolstad Denby, Eivind Grøtting Wærsted	Europe
Katrin Zink	Schleswig-Holstein (Northern Germany)
Susanne Bastian, Uwe Wolf, Martina Strakova	Saxony
Fernando Martin	Spain
Grzegorz Jeleniewicz	Poland
Jutta Geiger	North Rhine-Westphalia
Stephan Nordmann	Germany
Antonio Piersanti	Italy
Matthew Ross-Jones	Sweden
Doreen Schneider, Christiane Lutz-Holzhauer	Baden-Württemberg
Bianca Patrizia Andreini, Chiara Collaveri, Francesca Calastrini, Caterina Busillo, Francesca Guarnieri	Toscany
Andreas Kerschbaumer	Berlin
Bonafè Giovanni	Friuli Venezia Giulia
Michele Stortini, Roberta Amorati	Emila Romagna
Alicia Gressent	France
Kristina Eneroth	Stockholm County
Vasiliki Assimakopoulou, Kyriaki-Maria Fameli	Athens

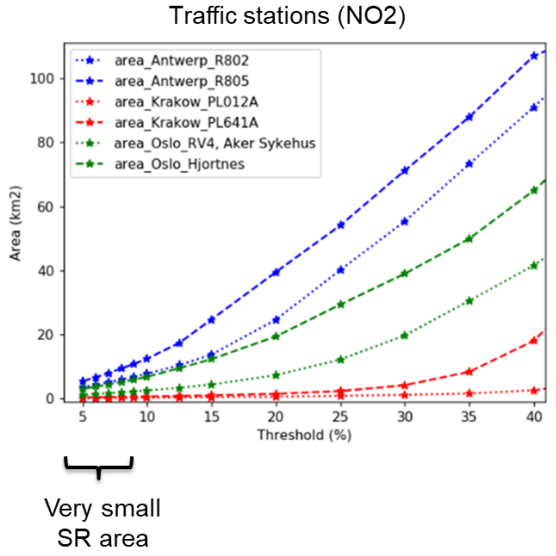
SUGGESTION FOR A SR DEFINITION

- Discontiguous SR area
- Similarity criterion: annual mean concentrations
- Threshold value: 20% with absolute cutoff for low concentrations
- Limit SR area to the IPR AQ zone
- NO_2, $PM_{10}/(PM_{2.5})$, O_3

→ Use modelled concentrations at station location (assuming bias is small → fit-for-purpose model)



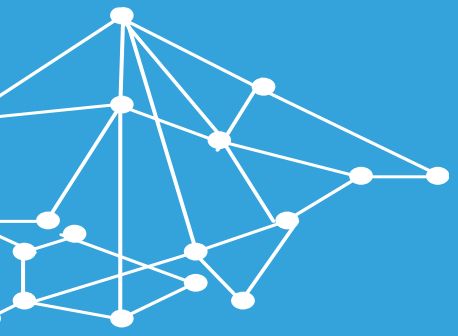




CT8.1 EXERCISE

Test the Spatial Representativeness recipe on more data sets and provide input for FAIRMODE Recommendations

- Make use of your existing modelling results
- Apply the recipe to delineate an SR area for a number of “interesting” stations in your country (rural, urban background, traffic, industrial)
- *Optional: perform your own sensitivity analysis on threshold values, contiguity, similarity criterion, lower cut-off, station type*
- *Optional: Compare these SR areas to results of other SR assessment methodologies used in your region/country*
- Discuss findings during the next Technical Meeting in October 2021
- Provide input for FAIRMODE Recommendations in 2022



2. Exceedance situation indicators

PARTICIPANTS CT8.2

Name	Country/Region
Alexandra Monteiro	Portugal
Bruce Rolstad Denby, Eivind Grøtting Wærsted	Europe
Katrin Zink	Schleswig-Holstein (Northern Germany)
Susanne Bastian, Uwe Wolf, Martina Strakova	Saxony
Grzegorz Jeleniewicz	Poland
Stephan Nordmann	Germany
Jutta Geiger	North Rhine-Westphalia
Matthew Ross-Jones	Sweden
Elke Trimpeneers	Belgium
Sebastian Scheinhardt, Christiane Lutz-Holzhauer	Baden-Württemberg
Alicia Gressent	France

EXCEEDANCE SITUATION INDICATORS

IPR – Data flow G: Information on the attainment of environmental objectives

Where environmental objectives have been exceeded, estimates of the total area, population and road length exposed to levels above the environmental objective shall be reported for each zone as a whole. Associated geometry information (GIS data) shall also be provided. References to the assessment methods observing the exceedances shall also be given e.g. the fixed or indicative measurements, modelling or objective estimation used. Assessment methods are reported within Data flow D.

EXCEEDANCE SITUATION INDICATORS

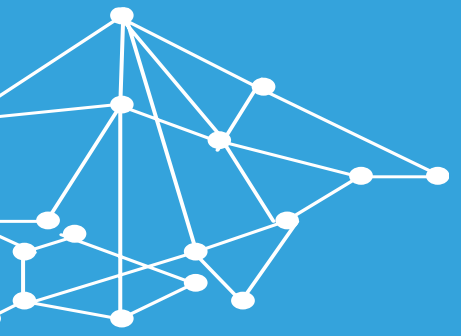
- Lessons learnt:
  - Indicators are very sensitive to (minor) changes in the methodology, input data and model / method uncertainty
  - *(Relevance of some of the indicators is questioned)*
  - More guidance needed to harmonize these indicators over different Member States, regions, AQ zones

EXCEEDANCE SITUATION INDICATORS

Proposal for the CT8 exercise

- Review how the exceedance situation indicators are currently assessed and reported under the e-Reporting in your region/country
  - What type of methodologies are used?
  - What type of input data is used for population exposure, road length in exceedance…?
- Analyse what problems are encountered in this process
- Identify concrete options for improvement

- Discuss the findings for your region/country during a CT8 hackathon (Summer 2021) → what timing is feasible? September?
- Provide input for a FAIRMODE Guidance document



3. Monitoring network design evaluation

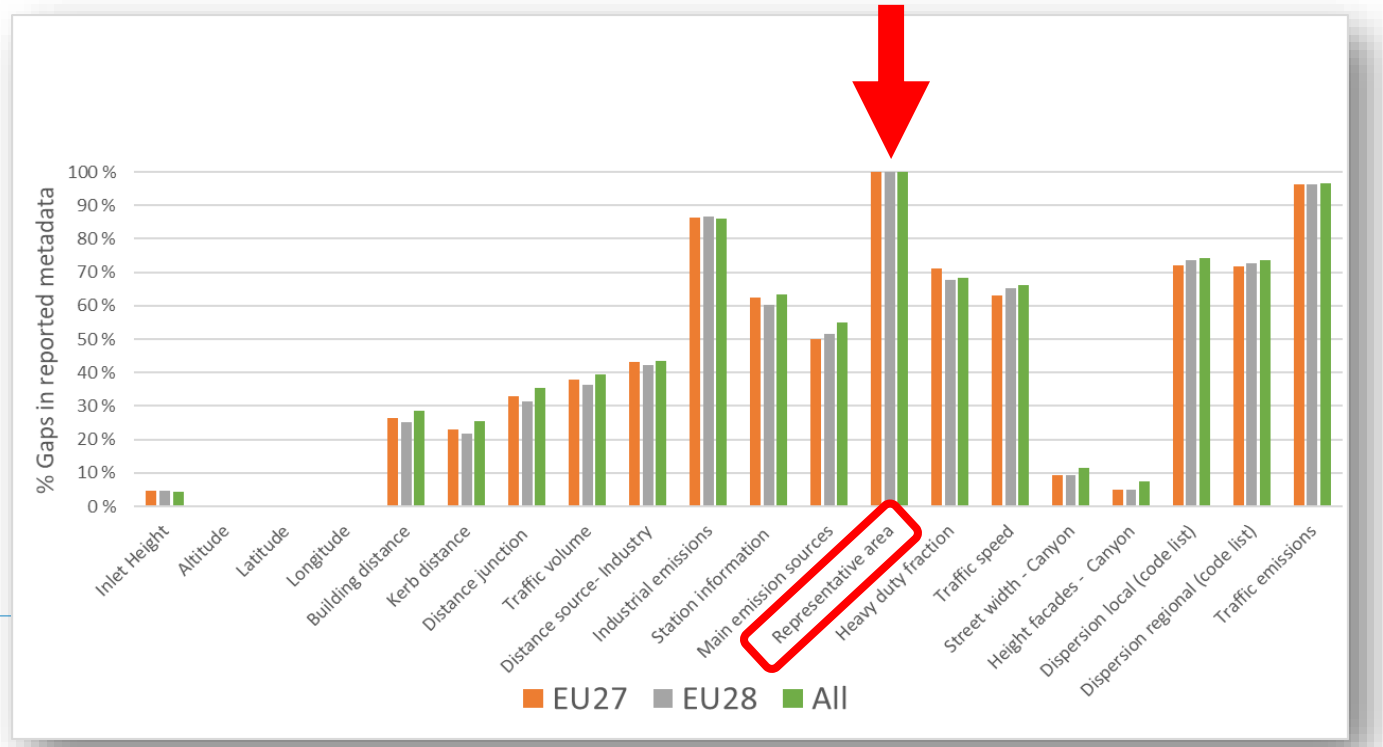
PARTICIPANTS CT8.3

Name	Country/Region
Alexandra Monteiro	Portugal
Katrin Zink	Schleswig-Holstein (Northern Germany)
Susanne Bastian, Uwe Wolf, Martina Strakova	Saxony
Fernando Martin	Spain
Grzegorz Jeleniewicz	Poland
Stephan Nordmann	Germany
Jutta Geiger	North Rhine-Westphalia
Matthew Ross-Jones	Sweden
Tina zur Heiden, Christiane Lutz-Holzhauer	Baden-Württemberg
Alicia Gressent	France
Vasiliki Assimakopoulou, Kyriaki-Maria Fameli	Athens

» Assessment of Spatial Representativeness:

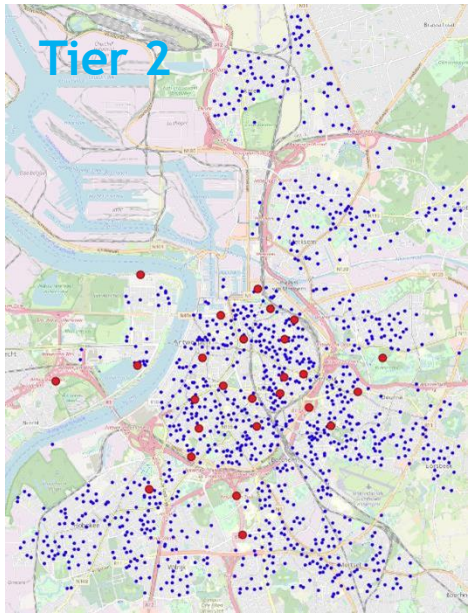
→No consensus in the scientific community about SR definition and methods

→Lack of guidance for reporting by Member States under the IPR



SPATIAL REPRESENTATIVENESS OF MONITORING STATIONS

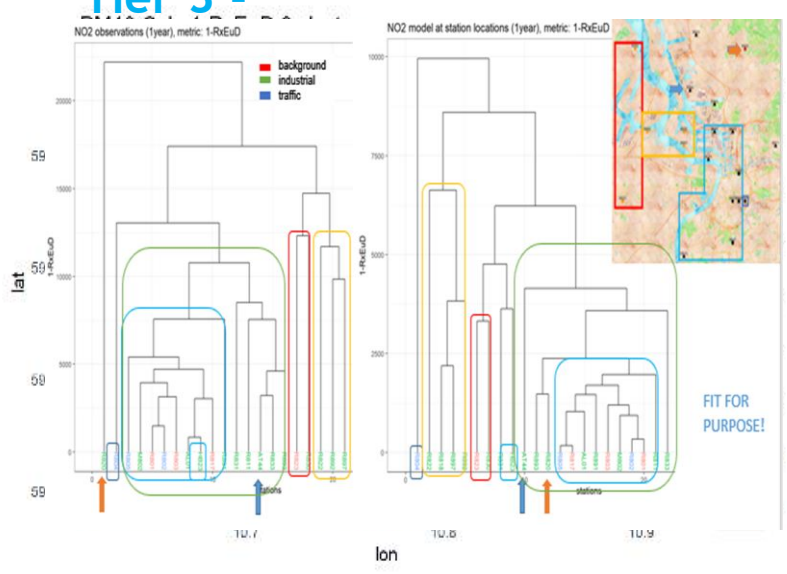
- Proposed exercise to evaluate current monitoring design data
  - Value of Tier 2 approaches and Monitoring Campaigns
  - Value of Tier 3 co-operation by FAIRMODE, AQUILA and EEA



Sampling campaigns - microsensor deployment - can be useful to

- Identify “hot-spots”
- Characterize spatial representativeness of existing networks
- Enhance the number of observations for model validation

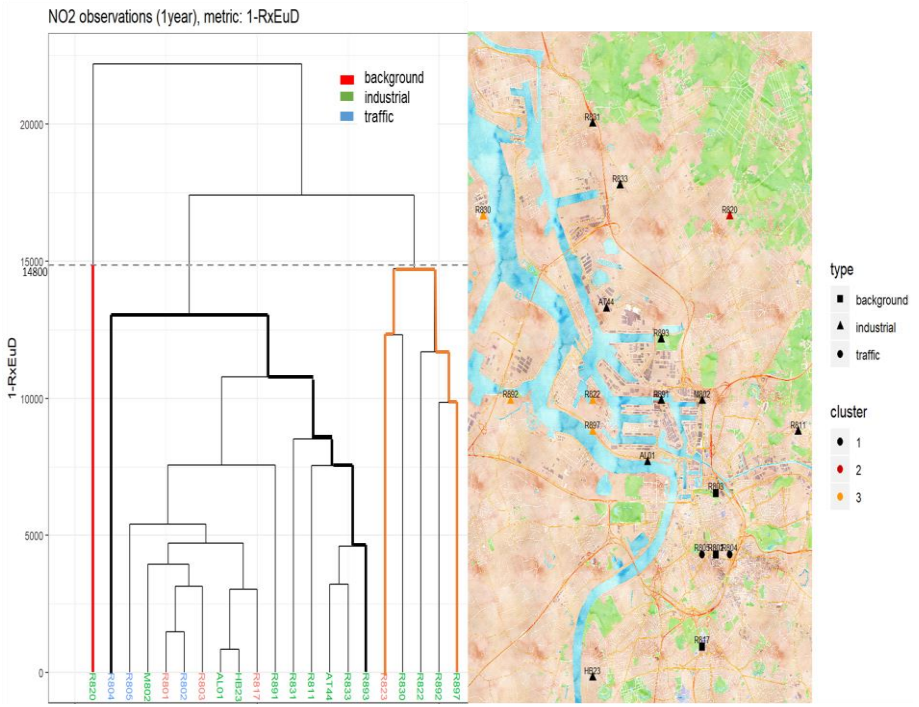
Tier 3 -



Tier 3 approaches

Clusters of similarity to identify possible gaps in the monitoring network and support further monitoring network design

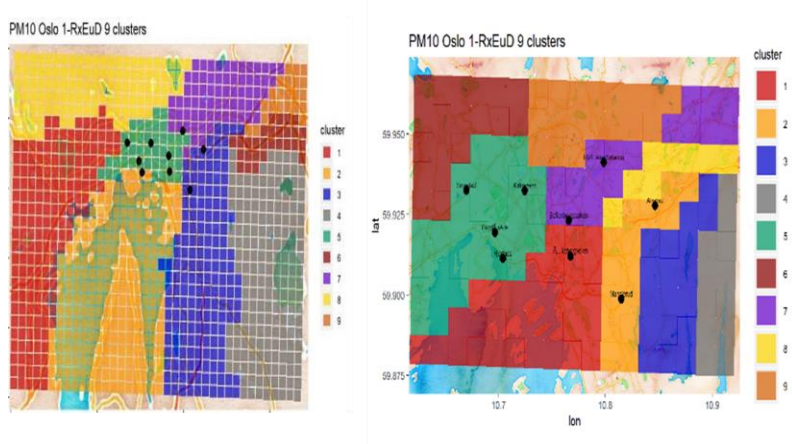
Monitoring Design
Feasibility of Clustering approaches



NO_2 - Antwerp.

Tier 2

- The clustering approach can be used to identify sampling points with similar behaviour
- Allows identification of redundancies in the network
- Allows identification of “outliers” in the clustering analysis
- It is not an excluding exercise but a screening approach to identify different behaviours that need to be further investigated.
- Useful for monitoring design as well as for model validation
- **Focus of a joint AQUILA-FAIRMODE exercise - CT8**



SR Clusters for PM_{10} in Oslo in 2015.The position of the monitoring sampling points are given as black dots.

Tier 3

- Used for **in combination with modelling data, c**lusters of similarity can be used to identify an optimal configuration of the monitoring network in urban areas

Test the suitability of the current monitoring network - Common FAIRMODE & EEA & AQUILA exercise

- The Composite Mapping Platform could be extended for monitoring design purposes and add a useful instrument to foster interaction between experts, increase transparency and support the QA/QC processes of reporting
- Add monitoring station information to the Composite Mapping Platform

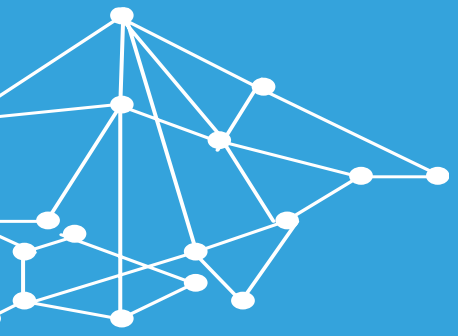
- Use the proposed clustering method to test model validation and support network design in a selected group of cities
  - Make use of your existing modelling results
  - Use the clustering approach – dendrograms

Common FAIRMODE CT8 & EEA & AQUILA exercise

First stage: provide following information via email by 4th June

- Identify contact person
- Select component
  - NO_2
  - PM_{10}
- Identify city area (same as for the other 2 exercises but with additional requirements)
  - Minimun number of fixed monitoring stations
    - Available monitoring campaign
    - Or available fine scale modelling results
- Identify clustering approaches
  - SR5 clustering approach to be available from FAIRMODE webpage
  - National statistical alternative
- Select evaluation approach using the clustering method
  - Tier 2 (just using measurement data)
  - Tier 3 (in combination with models)

- 4.06.2021 - First stage: Participants
- 01.09.2021 - Second stage: Data submission during summer
- 1.12.2021 - Third stage – Evaluation of monitoring design in Q3 2021



Background information

RECENT DG-ENV SERVICE CONTRACT

- Assessing the spatial representativeness of air quality sampling points
- Finalized in December 2020
- Outcome discussed with a large number of stakeholders (AQEG, FAIRMODE, AQUILA, EIONET…)
- Provides a set of recommendation to be further tested by FAIRMODE and AQUILA