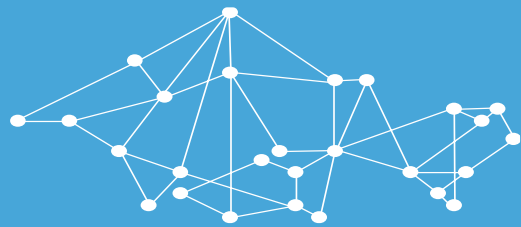




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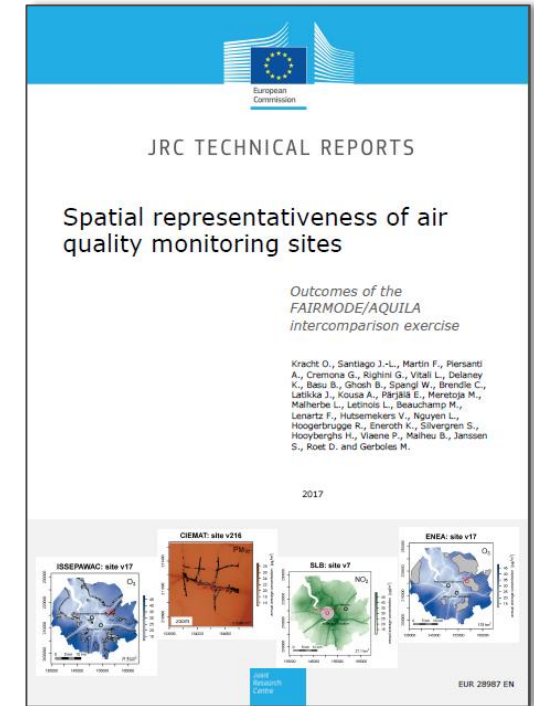
CT8 - SUMMARY EXCEEDANCE MODELLING, EXPOSURE & NETWORK DESIGN

LEONOR TARRASON & STIJN JANSSEN

CT8 - Exposure & exceedance model indicators and network optimization



- ❑ Provide guidance on the assessment of **spatial representativeness** of monitoring stations.
- ❑ Define specific methods to assess the estimation of areas and **population exposed** to exceedances.
- ❑ Provide guidance on **fit-for-purpose** modelling approaches to assess exposure and exceedances indicators.
- ❑ Support the **e-reporting** process in relation to the “Exceedance situation” data type
- ❑ Support **network optimization** for reporting and model validation purposes



CT8 – Technical 2020 session



Presentation of results of sensitivity and feasibility tests of a Tiered approach for:

- Spatial Representativeness
- Exposure and exceedance indicators
- Model validation & network design



Assessing the spatial representativeness (SR) of air quality sampling points –
Sensitivity and feasibility tests for a tiered approach – Interim Report

Service Request 5 under Framework Contract
ENV.C.3/FRA/2017/0012
Specific Contract: 07.0203/2018/793545/SFRA/ENV.C.3
Report for European Commission - DG Environment
Ares (2018) 4920320

ED 11492 | Task 1 Issue number 3 | Date 28/09/20
Ricardo Confidential

Note

The reports from this specific contract are already available from the FAIRMODE webpages, for your review

<https://fairmode.jrc.ec.europa.eu/exposure.html>

A TIERED APPROACH AS FRAMEWORK

	Estimation of surface area in exceedance	Estimation of total resident population in area of exceedance	Estimation of length of road in exceedance	Facilitation of configuration of representative network	Identify sampling points suitable for calibration and validation
Tier 1 Expert Opinion					
Tier 2 Proxy Information					
Tier 3 Geographically explicit, comprehensive fit-for-purpose modelling					
Tier 4 Modelling complemented with dedicated measurements					

QUALIFICATION OF THE TIERED APPROACHES FOR DIFFERENT APPLICATIONS

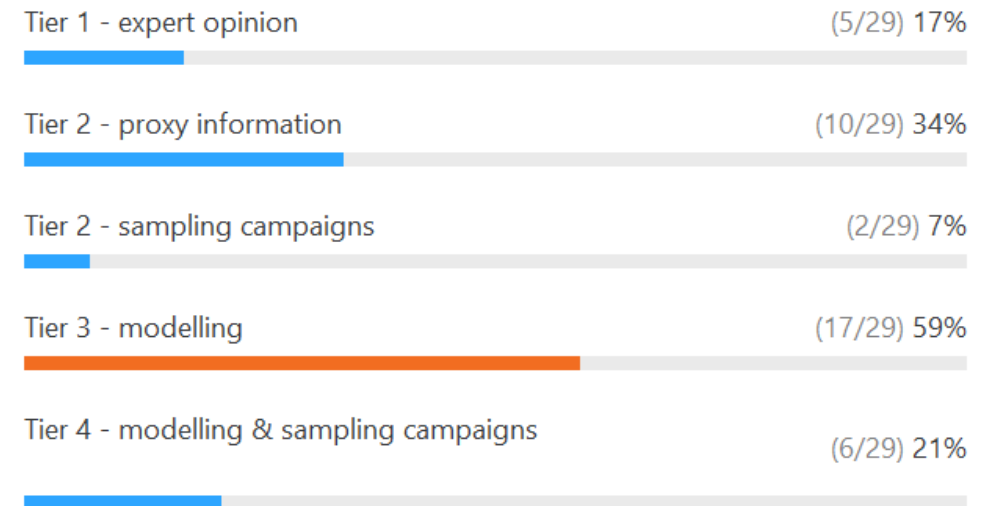
		SR area of sampling points (based on annual mean concentrations)	Exceedance Situation indicators (area, no. of people, road length)	Design of monitoring network	Sampling points for model calibration and validation
Tier 1	Expert Opinion	<ul style="list-style-type: none"> Only for (urban) background sampling points Not recommended for traffic sampling points Unclear for industrial sampling points 	<ul style="list-style-type: none"> Not recommended 	<ul style="list-style-type: none"> Significant gaps related to the evaluation of "representative area" of sampling points 	<ul style="list-style-type: none"> Significant gaps related to the evaluation of "representative area" of sampling points
	Proxy Information	<ul style="list-style-type: none"> Only for (urban) background sampling points Not for traffic sampling points Unclear for industrial sampling points 	<ul style="list-style-type: none"> Not recommended 	<ul style="list-style-type: none"> Screening methods for sampling point classification Clustering methodology - Use of dendrograms to identify redundancies and outliers 	<ul style="list-style-type: none"> Screening method for sampling classification Clustering methodology - Use of dendrograms to identify redundancies and outliers
Tier 2	Sampling campaigns	<ul style="list-style-type: none"> For all sampling points, if the campaign is well-designed and contains enough sampling locations 	<ul style="list-style-type: none"> Can be used for number of people exposed to exceedances, if the campaign is well-designed and contains enough sampling locations Unclear for other indicators due to an absence of available methods. 	<ul style="list-style-type: none"> Can be effective to support screening methods depending on design of the campaign 	<ul style="list-style-type: none"> Can be effective to support screening methods depending on design of the campaign
	Geographically explicit, comprehensive fit-for-purpose modelling	<ul style="list-style-type: none"> For all sampling points, if the model is fit-for-purpose 	<ul style="list-style-type: none"> For all indicators, but sensitive to methodologies and model errors 	<ul style="list-style-type: none"> Hierarchical clustering - SR clusters can be used to identify network redundancies and gaps (-) Data demanding (hourly data in high resolution) (+) Can support spatial representativeness analysis for purposes beyond monitoring design 	<ul style="list-style-type: none"> Clustering methodology - provides additional evaluation of temporal variability (+) Use of dendrograms to QA/QC model performance
Tier 4	Modelling complemented with dedicated measurements	<ul style="list-style-type: none"> For all sampling points, if the methodology is fit-for-purpose 	<ul style="list-style-type: none"> For all indicators, but sensitive to methodologies and model errors 	<ul style="list-style-type: none"> Can be useful when combined methodology is fit-for-purpose 	<ul style="list-style-type: none"> Can be useful when combined methodology is fit-for-purpose

Block I - Tiered approach

Responses from FAIRMODE

- Does the proposed Tiered structure cover current practices of SR assessment?
 - General support to the Tiered approach
 - Tier 4 applications (model & measurements) can be further described
- Are there any current practices not included in the proposed Tiered structure?
 - Good coverage but consider the use of machine learning approaches
- Are fit-for-purpose models (Tier 3) best suited to estimate SR and exceedance situation indicators?
 - Yes, given they are “fit-for-purpose”!
 - But there is also room for Tier 1 & 2 (e.g. expert judgement)
- What barriers are foreseen for application of the SR assessment methods identified?
 - Currently there are few MS using models for reporting
 - Having a “fit-for-purpose” model → FAIRMODE to provide guidance and criteria
 - There is need for better guidance on use of models for these applications

1. What Tier approach do you use for the estimation of SR & exceedance situation indicators. (Multiple choice)

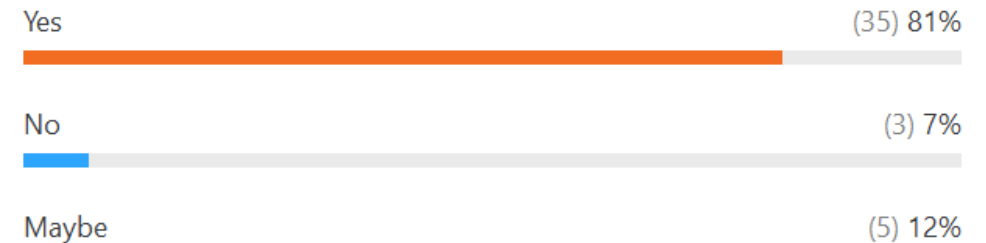


Block II - Exposure and Exceedance calculations (a)

Responses from FAIRMODE

- Given the sensitivity to input data and methodological choices, it is necessary to increase the robustness and comparability of exceedance calculations.
 - More guidance required to calculate these indicators (e.g. street canyons)
- Is there scope to meaningfully include street canyons in the calculation of concentrations above the limit values?
 - Yes, relevant for population exposure
 - More guidance required on how to calculate the indicator
 - But... Member States are lacking resources to include street canyons

1. Are street canyons important for population exposure?



2. Do you take street canyons into account in your assessment process?



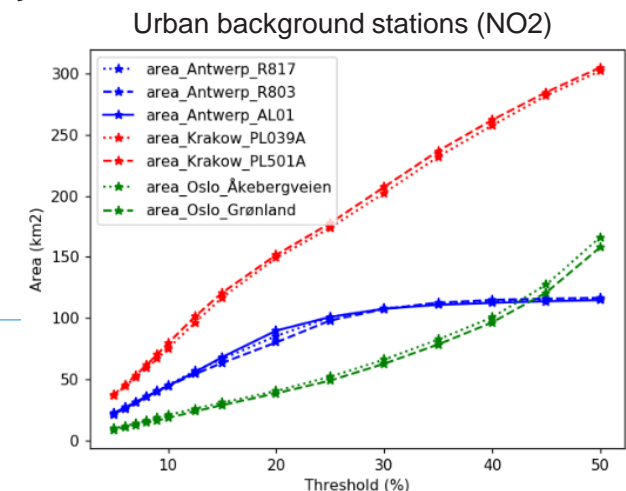
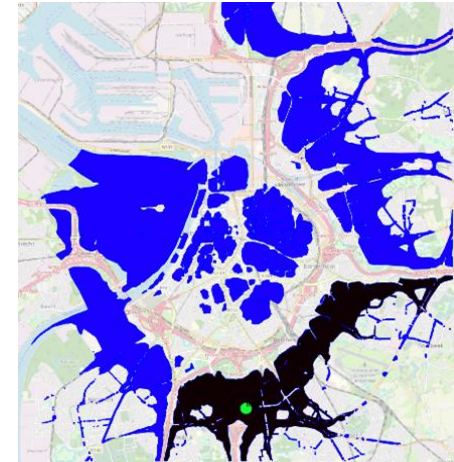
Block III - Spatial Representativeness

Responses from FAIRMODE

- Is it viable to adopt the recommended **discontiguous** approach for the definition of the SR areas?
 - Yes, logic approach to link monitoring data to IPR indicators for the entire AQ zone
 - But what about context? How to deal with the same concentrations for different reasons?
 - More testing in other cities is required

- Given the complexity of SR assessment, is it viable to focus first on **annual average** concentrations as the most simple and transparent similarity criterion for SR?
 - Yes, start with annual averages but there is also a need for percentiles

- Is it viable to adopt a common threshold value of 20% to increase the comparability of the definition of SR over Europe?
 - Yes, but recommended to gather more evidence
 - The SR threshold might depend on pollutant, background level,...
 - Cutoff for low concentration?



FAIRMODE

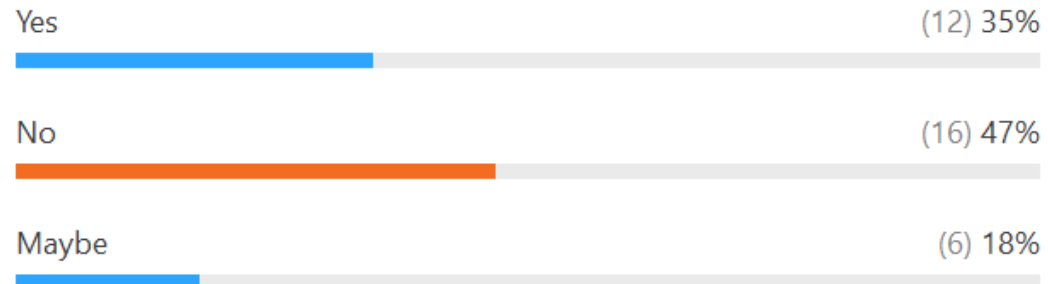
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Block III - Spatial Representativeness

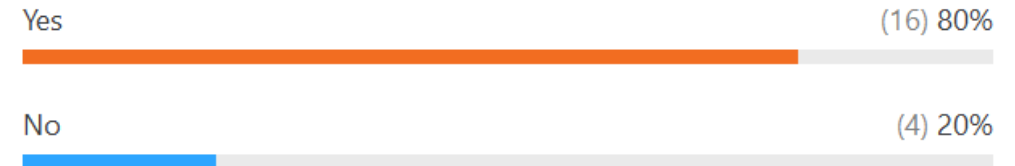
1. Do you prefer a contiguous or a discontinuous approach?



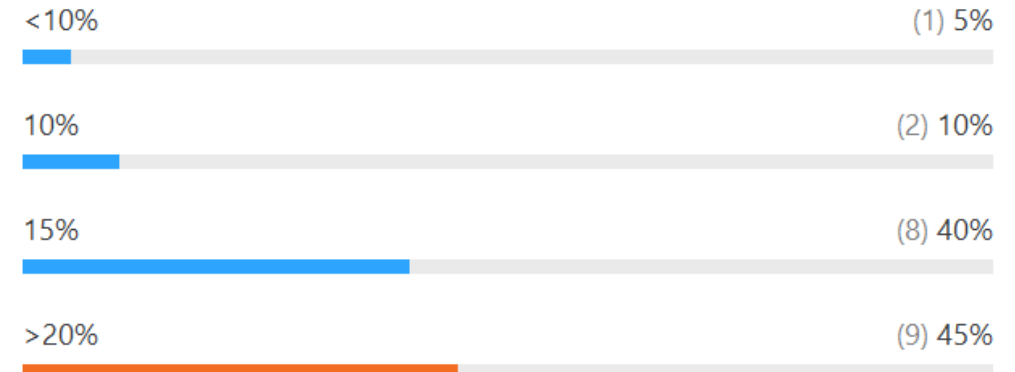
1. Did the evidence we presented change your mind? From contiguous to discontinuous?



1. Following the information presented to you agree that 20% is an appropriate threshold?



2. If not what do you believe would be a more appropriate threshold?



Block III - Network design and Model validation

Responses from FAIRMODE

- Could the proposed clustering method bring added value to support network design and contribute to better evaluation of exposure and exceedance situation indicators using Tier 1 and 2 approaches?
 - Yes, clustering technique is valuable also for understanding:
 - Where to place new stations
 - Redundancies in the network
 - Outlier detection
 - To support Tier 1 and Tier 2 approaches in the exceedance and exposure calculations
 - AQ zones/regions with limited stations remain a problem
 - Positive experience with similar technique in the past in Lisbon & Madrid.

- Could the proposed clustering method be used as an additional modelling quality performance test?
 - Yes, comparison of measured/modelled clusters brings added value but should be further tested in other locations.
 - Other approaches may be relevant (e.g. CAMS data stratification)
 - Extension to NO_x and PM components?



CT8 - NEXT STEPS

- Interim reports on «Assessing the spatial representativeness of air quality sampling points» circulated for detailed review by FAIRMODE CT8 participants by 23rd October
 - Revision of Interim reports based on FAIRMODE comments by end of 2020
- FAIRMODE intercomparison exercise about SR assessment and exposure and exceedance estimation → test applications in different EU cities & regions
- Development of an (on-line) system to test clustering approaches for model validation and network design
- Identification of a FAIRMODE intercomparison exercise for model validation and network design



The reports are available at
<https://fairmode.jrc.ec.europa.eu/exposure.html>