



SR5: Assessing the spatial representativeness of air quality sampling points (ENV.C.3/FRA/2017/0012)

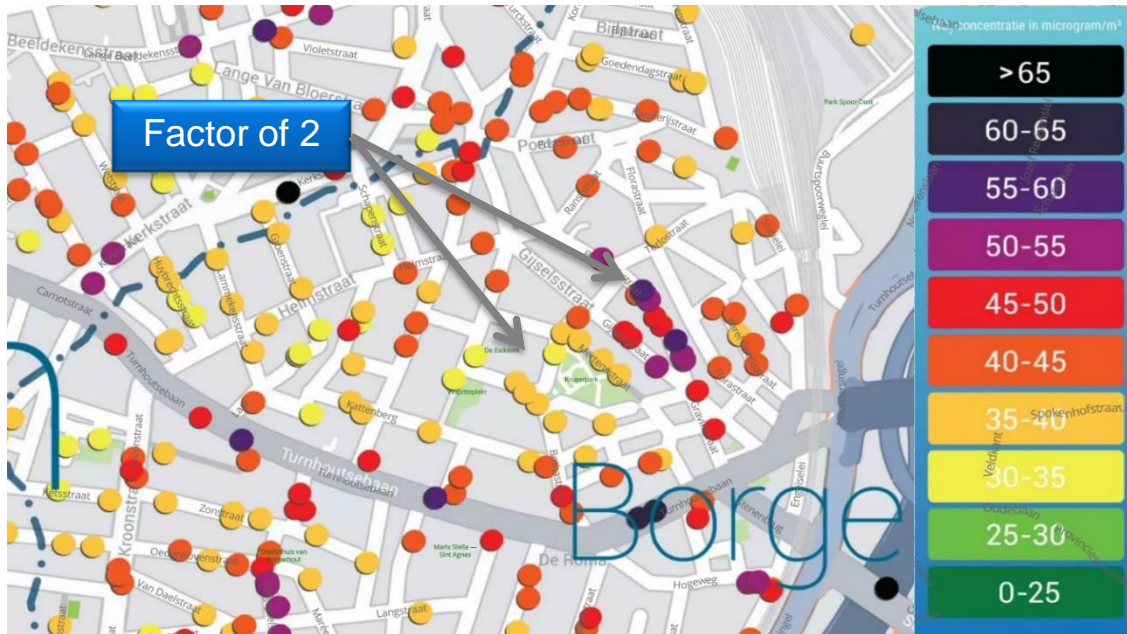
Reporting metadata and the current classification of sampling points

Joana Soares, on behalf of the team

IPR technical meeting 5-6.11.2019

Spatial representativeness – key to reporting under Ambient Air Quality Directive (AAQD)

- Spatial extent for which AQ metric conforms to a given similarity criterion
- Spatial variability ?
- <https://curieuzeneuzen.be/>



Why is it relevant?



- **In-situ monitoring** used (mostly) for reporting **compliance** with limit values in the Air Quality Directive
 - There is a sampling point classification defined as “urban”, “rural”, “suburban” which does not translate into an explicit geographical area nor provide a comprehensive view of the spatial distribution of AQ around the sampling point.
- **In-situ monitoring** used (mostly) for **assessment** of the Air Quality situation and evaluation of the health and ecosystem impacts - which necessarily requires an understanding of the spatial representativeness of the sampling points

Requirements in **IPR** include

- Reporting the area of representativeness (D)
- Evaluation of relevant emissions (D)
- Evaluation of local and regional dispersion conditions (D)
- Evaluation of exposure and health impact assessment (G)

What is In-situ monitoring used for?

- ✓ Determine compliance with AQ limit values and trace progress towards environmental targets
- ✓ Estimate of the surface area where the level was above the environmental objective
- ✓ Estimate of the length of road where the level was above the environmental objective
- ✓ Estimate of the total resident population in the exceedance area
- ✓ Carry out model calibration and validation
- ✓ To address all requirements above, the monitoring network needs to provide representative information

Reporting compliance

Exposure calculations

Model calibration and validation

Optimisation of monitoring network – Hot spots identification

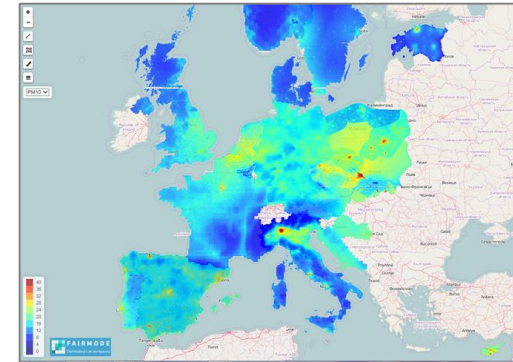
Requirements in IPR (e-Reporting)



- Member states are required to report on spatial representativeness at various dataflows in e-Reporting (<https://rod.eionet.europa.eu/instruments/650>)
 - **Dataflow B** : Information on zones and agglomerations (Article 6)
 - **Dataflow D** : Information on the assessment methods (Articles 8 and 9) – fixed and indicative measurements
 - Evaluation of representativeness (Decision 2011/850/EU, ANNEX II - (D))
 - Classification of stations/area's/network design
 - **Dataflow G** : Information on the attainment of environmental objectives (Article 12)
 - Area of exceedance
 - Number of people exposed
 - Attribution to natural sources & resuspension
 - Attainment of the PM_{2,5} exposure concentration obligation
 - The information made available shall be coherent with the zone delimitation made available pursuant to Article 6 for the same calendar year and the aggregated validated assessment data made available pursuant to Article 11.

DG-ENV Project on Station Representativeness (SR)

- Task 1 : Draft **recommendations** for assessing SR for specified assessment needs in the context of **monitoring**, **modelling** and **reporting**.
- Task 2: Collate air quality and air emission information necessary to support determination of station representativeness in the **composite mapping platform** developed under FAIRMODE
- Task 3: Carry out an initial assessment of application in Member States of the criteria for selecting **traffic and industrial sites** – as basis for further dialogue and recommendations to facilitate a harmonised application of station representativeness methods throughout the European Union



Station Representativeness (SR): Task 1



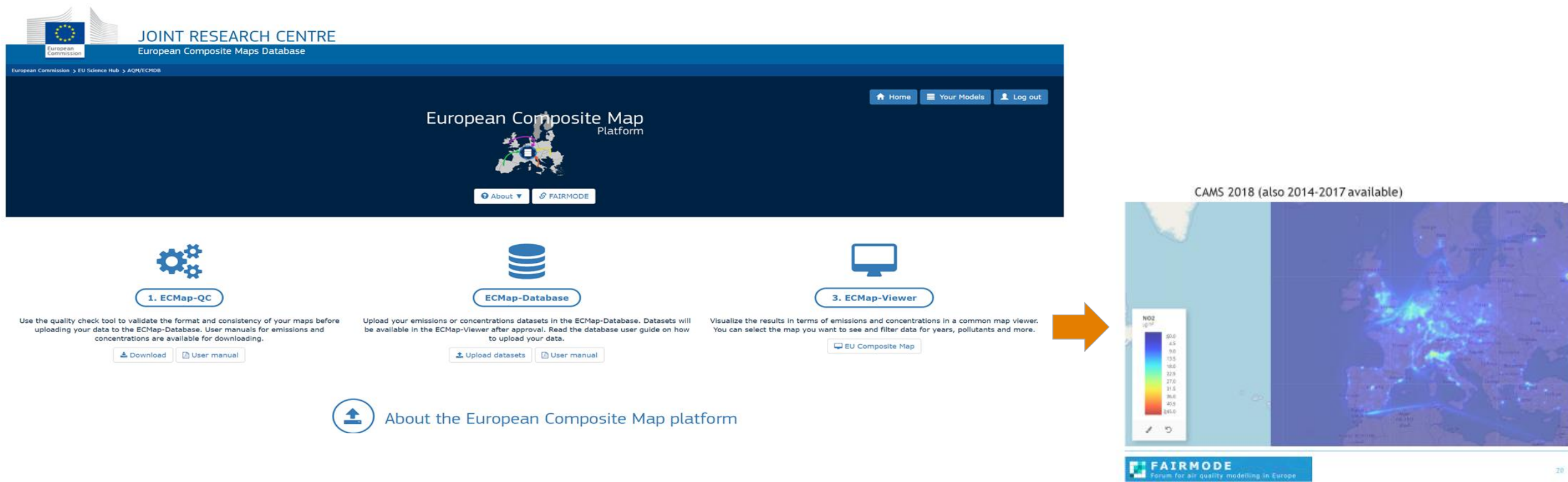
- Draft **recommendations** for assessing SR for specified assessment needs in the context of **monitoring, modelling** and **reporting**.
- A **tiered approach** is proposed:

Level	Methods yielding “area” of representativeness	Methods yielding a station classification
Tier 1	Expert judgement of SR area	Expert judgement & classification by network managers
Tier 2	Adding some form of geospatial complexity via GIS data	Supervised / unsupervised learning - based methods based on AQ monitoring data, e.g. Joly-Peuch and GIS data
Tier 3	Using detailed air quality modelling capable of resolving the spatio-temporal pattern	Methods including information on predominant emission sources (e.g. recommendation by SCREAM) and modelling data
Tier 4	Tier 3 complemented with dedicated dense measurement campaigns to fully capture spatio-temporal variability	n/a

- Recognize limitations in member states resources
- Fitness for purpose of models in model-based methodologies
- Engage with the AQUILA & FAIRMODE communities

Station Representativeness (SR): Task 2

- Collate air quality and air emission information necessary to support determination of **SR** in the **composite mapping platform** developed under FAIRMODE



Station Representativeness (SR): Task 3

- Assessment of the criteria applied by Member States for selecting **traffic and industrial sites** – as basis for further dialogue and recommendations to facilitate a harmonised application of station representativeness methods throughout the European Union

Objectives

- **Evaluate the quality of the existing sampling point classification** of ‘traffic-oriented sites’ and ‘industrial sites’ in a comprehensive overview.
- Investigate the achievement of the macro and microscale siting criteria in Annex III of the AAQD in terms of the existing documentation of methodologies used for sampling point classification and assess where and why the application in Member States of the criteria for selecting ‘traffic-oriented sites’ and ‘industrial sites’ differs.
- Provide recommendations to facilitate a harmonized application of sampling point selection criteria throughout the European Union.

Status of work

- ✓ On-line questionnaire on existing guidance on sampling point classification
- ✓ GIS tool to evaluate macroscale and microscale siting in Annex III, B 1 (b) and C
- ✓ Metadata evaluation of 2017 data in the dataflow D
- ✓ Clustering analysis of reported air concentration data from sampling points

On-line questionnaire on sampling point classification



Questionnaire on the Selection of Air Quality Sampling Points

Ricardo, NILU and Vito are currently carrying out a project on "Assessing the spatial representativeness of air quality sampling points" for the European Commission, DG Environment (specific contract number 070203/2018/793545/SFRA/ENV.C.3, under Framework Contract number ENV.C.3/FRA/2017/0012). As part of the work, the project team is to assess how the criteria for selecting sampling points of the Ambient Air Quality Directives (2008/50/EC and 2004/107/EC) are applied in Member States.

The current questionnaire on the Selection of Air Quality Sampling points is **not intended to check compliance** with the Ambient Air Quality Directives. The **information** you provide to answer this questionnaire will **only** be used for the **specific purpose** of this project to **better understand the different methods** employed among Member States for siting sampling points and monitoring stations under European legislation.

The questionnaire focuses on two types of monitoring stations, namely 'traffic-oriented' and 'industrial'. Based on your answers and a separate evaluation of the data reported to the European Environment Agency on station sites, the project team will provide an overview of current (documented) methodologies used for sampling point classification and assess where and why the application in Member States of the criteria for selecting 'traffic-oriented sites' and 'industrial sites' differs.

Ultimately, the responses to this questionnaire will allow the project team to make **recommendations** on what type of **guidance** and data would be necessary to facilitate the harmonised application of siting criteria throughout the European Union.

*Contact information

Country name

Would you be willing to respond to a bilateral interview on the siting methods in your country?
If yes, please add your email below.

Main feedback: Need for guidance

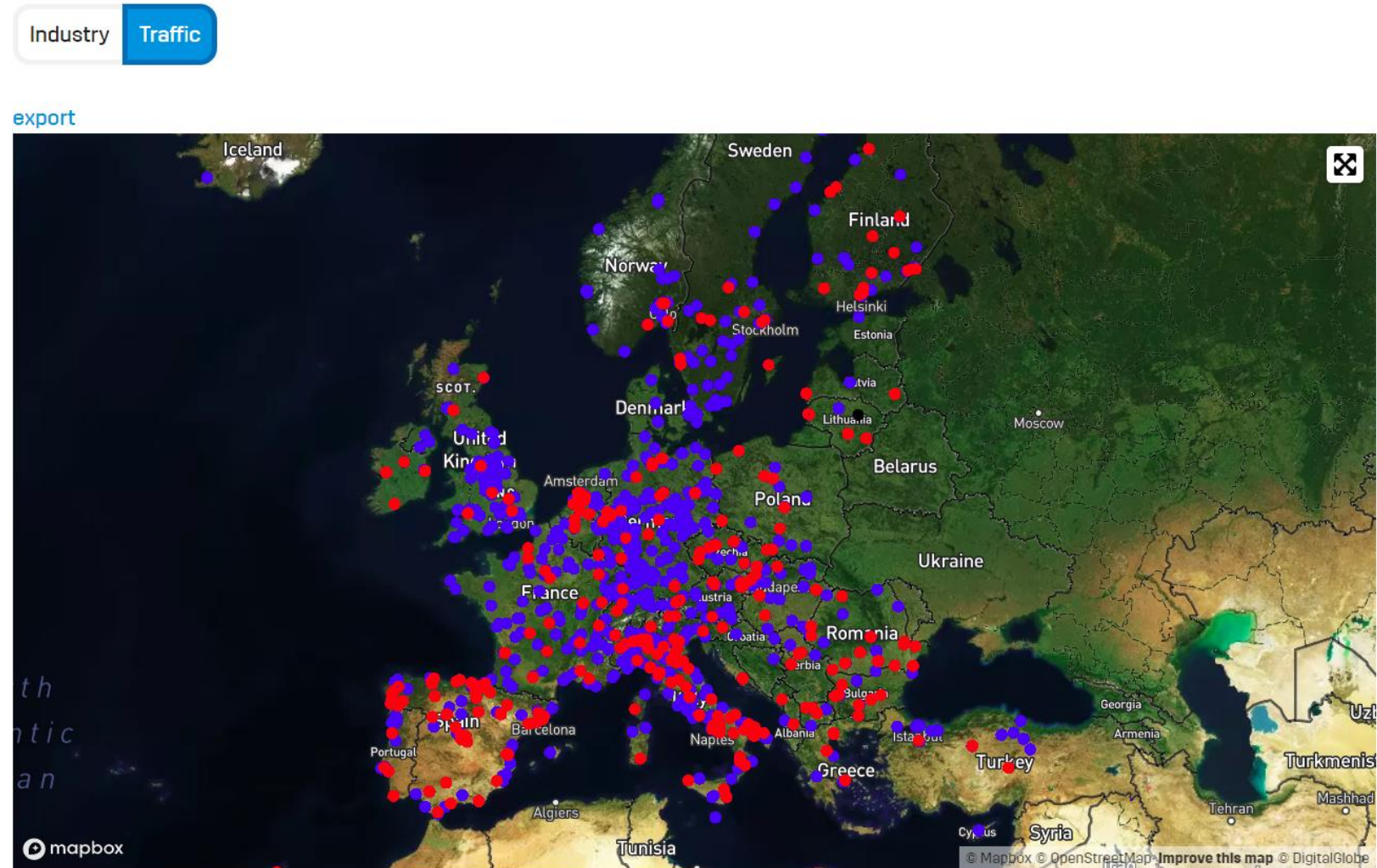
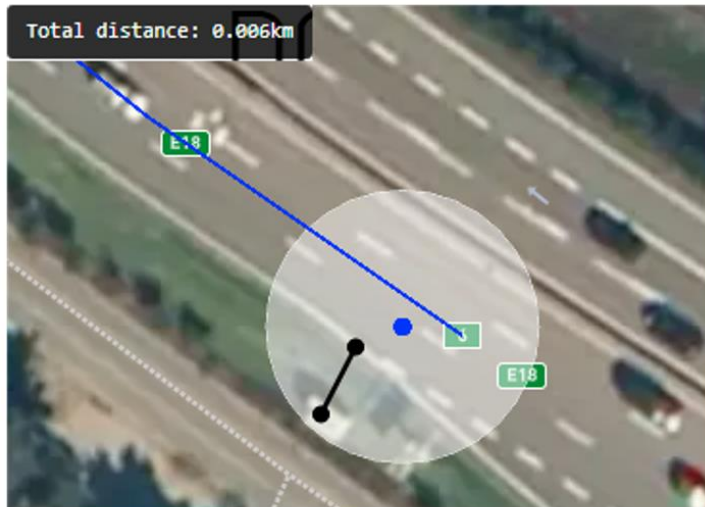
30 responses by 21.06.2019 – 25 countries

Main conclusions so far

- **Siting Criteria:** AAQD as basis – 10 countries have additional guidance – only 4 have provided links (FR, FI, SE, LV*)
- **Representative area:** 63% claims information available but 40% does not use it for exposure calculations
- **Emissions:** 83% has available information but 66% does not use it link it to sampling points
- **Dispersion situation:** 66% has access to information but 77% does not have a methodology to link it to the IPR

Status GIS tool – Annex III B 1 (c) (macroscale) and C (microscale)

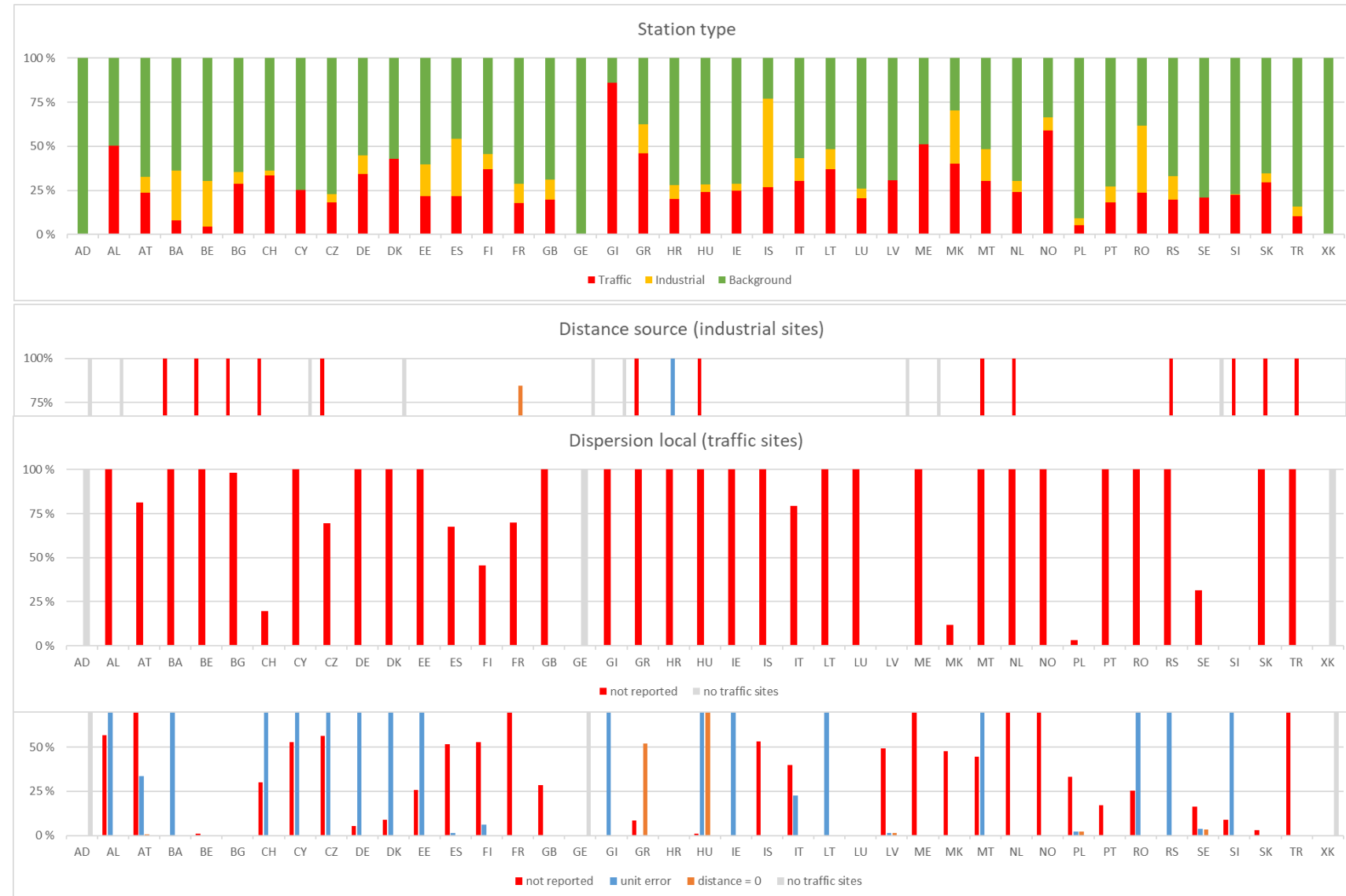
- Reveals possible siting errors related to **metadata reporting** (geographical coordinates)
- Needs further development



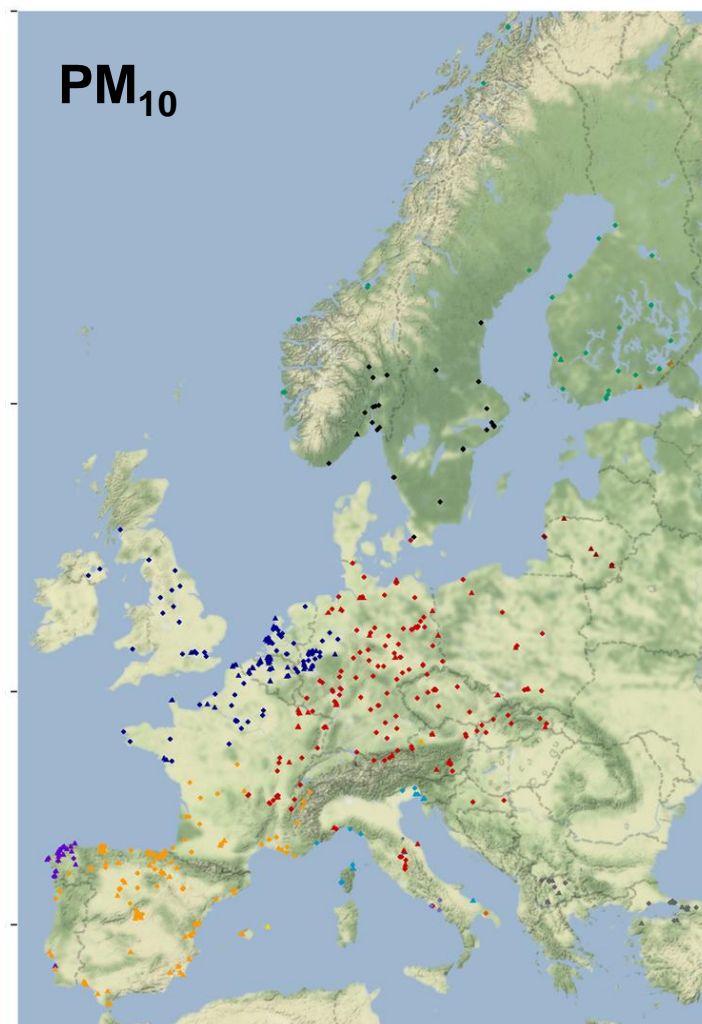
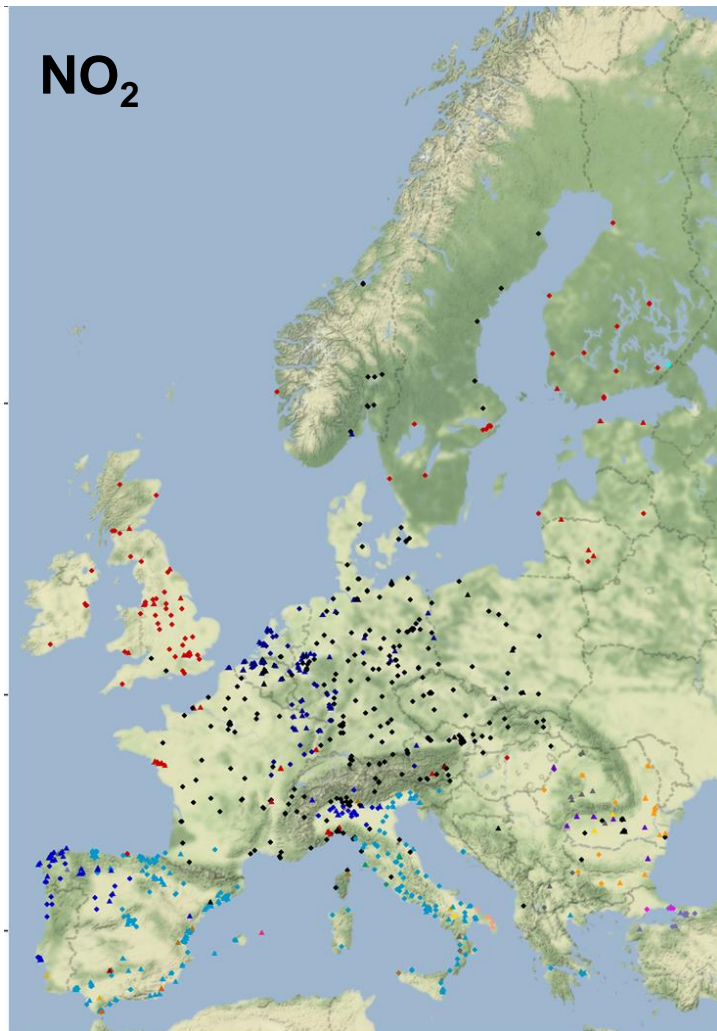
Metadata analysis – Data flow D

2017 reported metadata

- Relevant metadata from dataflow D
- It seems to be a decoupling between the reporting of metadata and actual data
- Scarce metadata reporting / Missing metadata
- Inconsistencies in the units reports
- Lacking data on local disperion



Cluster analysis of air concentration data



The reported air quality data is consistent across Europe

Clustering differences associated to emission and climatology aspects rather than differences in sampling point classification

Preliminary conclusions

- Consistent and complete air quality data
- Reporting of metadata seems decoupled from the air quality data reporting (different communities responsible for compiling metadata and providing AQ data)
- Incomplete and inconsistent metadata reporting
- General need for guidance on sampling point classification –
 - Further need to understand spatial representativeness and variability around sampling points
 - Further need to link SR to exposure and dispersion calculations
 - ➔ Requires guidance on spatial representativeness (Task 1)

Next Steps

- ✓ Writing of draft report already initiated for the four activities in Task 3
- ✓ On-going evaluation and analysis of the results
- ✓ **Interaction with Member States**
 - 18-19th September – Nordic Referece Laboratory Meeting in Oslo – presentation of the questionnaire results - understanding needs for Guidance in Tier 1 – FI, SE
 - 2-3th October – AQUILA meeting in Vienna
 - 7-9th October – FAIRMODE meeting in Madrid – presentation of main conclusions on station classification – needs to link to modelling
 - 5-7th November – IPR meeting in Copenhagen – presentation of metadata results – understanding metadata reporting as seen by MS in reporting community

Need to combine measurements and models



- The current reporting under AAQD is primarily based on monitoring data
- General need for guidance on the spatial and temporal representativeness of monitoring stations
- Current effort to provide such guidance (Task 1) needs the support of the FAIRMODE & AQUILA Communities that can help with
 - Evaluation of methodologies proposed under the tiered approach
 - Evaluation of the feasibility of the proposed methodologies to be applicable by the MS

There seems to be a need for further interaction between the AQUILA, FAIRMODE and the IPR reporting community to combine both model and measurements to improve assessment reports

- Are the FAIRMODE & AQUILA Communities currently involved in the e-reporting under **data flow D** (station classification, representative area) in your country ?
- Are the FAIRMODE & AQUILA Communities currently involved in the e-reporting under **data flow G** (exposure calculations) in your country?

- Do these conclusions reflect to a certain extent the current situation as you understand it?
- Do you have any comments or advice as to where we could focus in the continuation of the work?
- What recommendations would you make to the community/Commission to help improve the situation and improve **the current IPR?**

**PLEASE ADD YOUR NAME AND EMAIL TO THE
CIRCULATED LIST IF YOU ARE WILLING TO HELP US VIA
A BILATERAL INTERVIEW**

Thank you for your attention

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EXTRA SLIDES

Macroscale and microscale siting criteria

Macroscale and microscale siting criteria

*1. Do you have advisory guidance in place to determine the siting of sampling points/stations in your monitoring network?

- ☐ YES
☐ NO

If yes, please provide a link to such guidance

*2. Do you have a compliance-checking system in place in your country to determine the achievement of the macro- and microscale siting criteria in Annex III of the AAQD of your monitoring network?

- ☐ YES
☐ NO

If yes, please indicate which institution is in charge of the compliance-checking system





*3. How does your country check that the kerb-distance for traffic stations/sampling points is according to the requirements in the Directive (less than 10m)?

*4. How does your country check that for industrial stations/sampling points the measurements taken at the sites are representative for an area of 250 m x 250 m (as required by the Directive)?

*5. How often do you revise the compliance with siting criteria of your monitoring network?

*6. When was the last time you checked the compliance with the directive macro- and micro-scaling criteria for traffic-oriented and industrial stations/sampling points?

Macroscale and microscale siting criteria

Macroscale and microscale siting criteria			
1. Do you have advisory guidance in place to determine the siting of sampling points/stations in your monitoring network?			
		Answers	Ratio
YES		15	50,0 %
NO		15	50,0 %
No Answer		0	0,0 %
2. Do you have a compliance–checking system in place in your country to determine the achievement of the macro- and microscale siting criteria in Annex III of the AAQD of your monitoring network?			
		Answers	Ratio
YES		20	66,7 %
NO		10	33,3 %
No Answer		0	0,0 %

FI, FR, SE, LV* have updated guides

Representative area

Representative Area

*«Representative area» describes the spatial extent of the area of representativeness for a monitoring station/sampling point using geometry features.

7. Is information on the representative area of sampling points/monitoring stations available to you?

- ☐ YES
- ☐ NO

If yes, do you use this representative area to assess population exposure and areas in exceedance of limit values?

- ☐ YES
- ☐ NO

Please provide a link to the methodology used to determine representative area of sampling points/monitoring stations

If no, what are in your opinion the main barriers for the availability of information on site representative area in your country?



between 1 and 6 choices

- ☐ Capacity-related barriers
- ☐ Coordination barriers
- ☐ Lack of guidance and definition from the European Commission
- ☐ Lack of guidance and definition from national administration
- ☐ Data access issues
- ☐ Other




Please specify the main barriers

Representative area





3. Is information on the representative area of sampling points/monitoring stations available to you?

		Answers	Ratio
YES		19	63,3 %
NO		11	36,7 %
No Answer		0	0,0 %

If yes, do you use this representative area to assess population exposure and areas in exceedance of limit values?

		Answers	Ratio
YES		10	33,3 %
NO		12	40,0 %
No Answer		8	26,7 %

If no, what are in your opinion the main barriers for the availability of information on site representative area in your country?

		Answers	Ratio
Capacity-related barriers		10	33,3 %
Coordination barriers		0	0,0 %
Lack of guidance and definition from the European Commission		17	56,7 %
Lack of guidance and definition from national administration		5	16,7 %
Data access issues		3	10,0 %
Other		5	16,7 %
No Answer		6	20,0 %

Relevant emissions

Relevant Emissions

*8. Is information on relevant emission sources affecting pollutant concentrations at the sampling point/monitoring station available to you?

- ☐ YES
- ☐ NO

If yes, which information do you rely upon to determine the emissions with predominant influence on pollutant concentrations at the sampling point/monitoring station?

If no, what are in your opinion the main barriers for the availability of information on emission sources affecting sampling points/monitoring stations in your country?

between 1 and 6 choices

- ☐ Capacity-related barriers
- ☐ Coordination barriers
- ☐ Lack of guidance and definition from the European Commission
- ☐ Lack of guidance and definition from national administration
- ☐ Data access issues
- ☐ Other

Please specify the main barriers

*9. Do you have a common countrywide methodology to identify what emissions predominantly influence pollutant concentrations at sampling point/monitoring stations?

- ☐ YES
- ☐ NO

Please provide a link to the methodology used to determine the relevant emissions influencing the sampling points/monitoring stations

Relevant emissions

Relevant Emissions

8. Is information on relevant emission sources affecting pollutant concentrations at the sampling point/monitoring station available to you?

	Answers	Ratio
YES	25	83,3 %
NO	5	16,7 %
No Answer	0	0,0 %

If no, what are in your opinion the main barriers for the availability of information on emission sources affecting sampling points/monitoring stations in your country?

	Answers	Ratio
Capacity-related barriers	5	16,7 %
Coordination barriers	2	6,7 %
Lack of guidance and definition from the European Commission	3	10,0 %
Lack of guidance and definition from national administration	1	3,3 %
Data access issues	4	13,3 %
Other	2	6,7 %
No Answer	20	66,7 %

9. Do you have a common countrywide methodology to identify what emissions predominantly influence pollutant concentrations at sampling point/monitoring stations?

	Answers	Ratio
YES	10	33,3 %
NO	20	66,7 %
No Answer	0	0,0 %

Dispersion situation

Dispersion situation

*10. Is information on the dispersion situation of sampling points/monitoring stations available to you?

- ☐ YES
☐ NO

If yes, does your country have a guidance system and identified methodology to report on the dispersion situation relevant for the representative area of specific sampling points/monitoring stations?

If no, what are in your opinion the main barriers for the availability of information on dispersion situation at sampling points/ monitoring stations in your country?

between 1 and 6 choices

- ☐ Capacity-related barriers
☐ Coordination barriers
☐ Lack of guidance and definition from the European Commission
☐ Lack of guidance and definition from national administration
☐ Data access issues
☐ Other

Please specify the main barriers

*11. Do you have a common methodology to characterize local and regional dispersion choosing from the code list in the IPR user guide?

- ☐ YES
☐ NO

Please provide a link to the methodology applied

Additional remarks

12. If you have any additional comments on the siting of sampling points and monitoring stations under European legislation, please let us know here.

Dispersion situation

Dispersion situation

10. Is information on the dispersion situation of sampling points/monitoring stations available to you?

	Answers	Ratio
YES	20	66,7 %
NO	10	33,3 %
No Answer	0	0,0 %

If no, what are in your opinion the main barriers for the availability of information on dispersion situation at sampling points/ monitoring stations in your country?

	Answers	Ratio
Capacity-related barriers	8	26,7 %
Coordination barriers	1	3,3 %
Lack of guidance and definition from the European Commission	7	23,3 %
Lack of guidance and definition from national administration	2	6,7 %
Data access issues	3	10,0 %
Other	2	6,7 %
No Answer	15	50,0 %

11. Do you have a common methodology to characterize local and regional dispersion choosing from the code list in the IPR user guide?

	Answers	Ratio
YES	7	23,3 %
NO	23	76,7 %
No Answer	0	0,0 %