WG2
QA/QC Assessment Applications

Agenda

FAIRMODE Technical, Dublin

8th October 2024

Agenda: first session (Tuesday 8th – 11:00-13:00)

QA/QC of assessment applications – Benchmarking

- 11:00 – 11:10 Welcome and summary of benchmarking exercises in 2024: Discussion issues (Leonor)
- 11:10 – 11:30 Benchmarking exercises – **Focus on Stringency for PM2.5**

  - Experiences from Norway (Bruce) and Belgium (Elke)

- 11:30 – 11:40 Benchmarking exercises – **Focus on minimum number of stations**

  - Experiences from Germany (Stefan), The Netherlands (Joost) and Sweden (Maria)

- 11:40 – 11:45 Benchmarking exercises – **Focus on complementary indicators** (Alexander)
- 11:45 – 11:50 Introduction to the group discussions (Philippe)
- 11:50 – 12:30 **Group discussions (4 groups 2+2 discussion** on (a) stringency and (b) nb stations)
- 12:30 – 12:50 Summary from the discussion - 4 groups (5 min per group)
- 12:50 – 13:00 Way forward (Philippe)

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Agenda second session (Tuesday 8th – 16:30-18:00)

WG2 - QA/QC of assessment applications – Guidance

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- 16:30 – 16:45 Updates and new capabilities of the MQI Mapping tool (Enrico)
- 16:45 – 17:00 Feedback to the draft Modelling Guidance document on MQI and assessment (Alexandra)
- 17:00 – 17:30 Discussion on the Guidance document (Philippe, Leonor)
  - Suggestions on minimum number of stations – links to WG2 guidance
  - Air quality zone focus
  - Updates of guidance by FAIRMODE
- 17:30 – 17:35 Summary of WG2 sessions (Leonor)

WG2 MQI composite mapping exercise

Activities (so far)
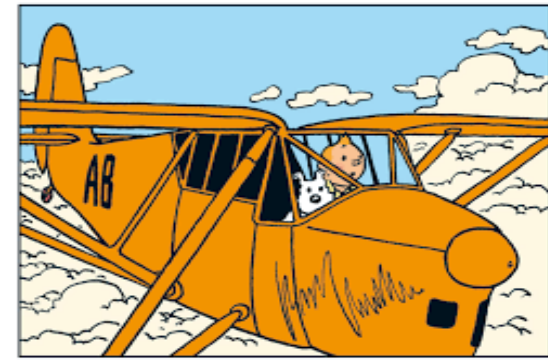
We have hold 2 interpretation webinars in the course of 2024 in addition to the kick-off on April 18th

- ➤ **18th April - Kick-off**

- ➤ **3rd June - First interpretation webinar - Germany**

- ➤ **3rd September - Second interpretation webinar – Norway, Poland and Belgium**

- ➤ **8th October - FAIRMODE Technical meeting**

     Norway, Belgium, Germany, The Netherlands, Sweden and JRC

   **Overview conclusions and next stages**

WG2 composite mapping exercise (so far)

- **Participants so far**: HR, IT, SP, AT, PL, DE (3), CZ (2), DK, SI, FR, SE, NO, IE, PT, BE + Po-Valley, Madrid region,

- **Model spatial resolutions:** from 10 km to 10 meters.

- **Emission information:** Most of deliveries include underlying emissions

- **Data assimilated results**: Those who delivered only data-assimilated results, have delivered raw results as well

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WG2 composite mapping exercise

Proposed questions to be addressed

- Q1 – Is the MQI robust?

- 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 ?

- Q4 – How to proceed when models use data-fusion & data assimilation?
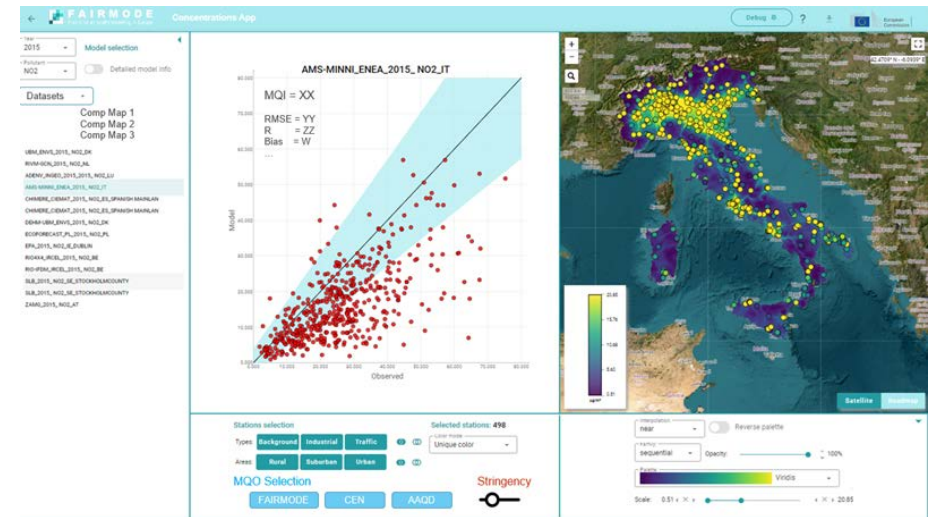
WG2 composite mapping exercise

- The participants at kick-off agreed that the main purpose of the FAIRMODE WG2 – MQI mapping exercise is

  - to build trust on the FAIRMODE MQI on-the-fly mapping tool

  - to further establish the robustness of the MQI formulation

- **We agreed to focus on Q1+Q2+Q3 in 2024 and leave Q4 for 2025**

- We agreed to prepare for Q4 on data assimilation in 2024, for instance by asking for additional metadata

MQI mapping tool development
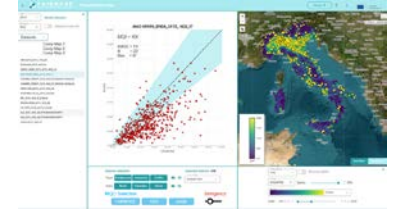
Here follow some useful suggestion for further development of the platform as raised during the meetings

- ❑ Develop the polygon option to Air Quality Zones that are the basis for AAQD reporting.
- ❑ Develop the possibility of adding new air quality monitoring ststions (not EEA) on-the-fly.
- ❑ Develop a map with MQI data as part of the platform.
- ❑ Add spatial resolution information to the metadata given for model description.
- ❑ Add information of the MQI calculation Phyton code in the platform
- ❑ Add the possibility of downloading the plots and cvs data.
- ❑ Add MQI value as part of the information on sampling points/monitoring stations.
- ❑ Add an option to distinguish passive sampler from fixed measurement stations.
- ❑ Add an option for the user to fix the maximum scale on maps.
- ❑ Add an option to reset the map to its full extent.
- ❑ Investigate the possibility to upload non-gridded data to check the MQIs without mapping.

# WG2 composite mapping exercise – Q1

Q1 Is the MQI robust?

1. Choose and document the data and stations you want to use for the MQI analysis

✓ Compare FAIRMODEs on-the-fly MQI with own home calculation

1. 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

2. Report back to us

✓ **trust in the MQI platform**

Q2 - Are the MQI stringent enough and consistent among pollutants?

Based on wrong submission, results still pass the MQO for PM2.5. Should it be so or is the PM25 MQI too flexible?

INERIS (A) PM25 (Traffic=YES)

MQI (FM)= 0.596753

MQI (AQD)= 0.653347

- Need to test the robustness of the MQO formulation with respect to a meaningful level of stringency
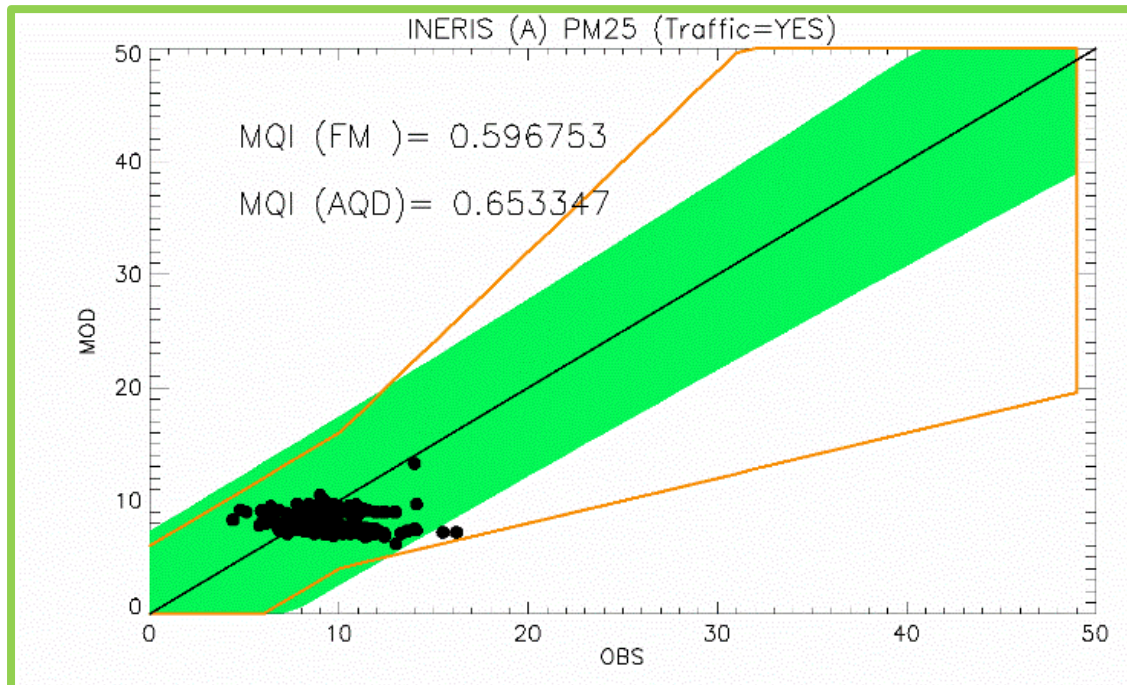
✓ **PM2.5 not stringent enough?**

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Q3 - Does the fail/pass MQO test ensure a valid distinction between Fit vs non-Fit-for-purpose modelling applications ?

- Can the participants identify situation when the modelling applications are not classified as expected in terms of the fail/ pass of the MQO and reflect on the stringency factor.

✓ **PM2.5 not stringent enough?**

For NO2, we would expect the MQO to fail on traffic stations when large resolution modeling is used. Does this always happen?

UBA NO2 (Traffic=YES)

MQI (FM)= 2.08544
MQI (AQD)= 1.56713
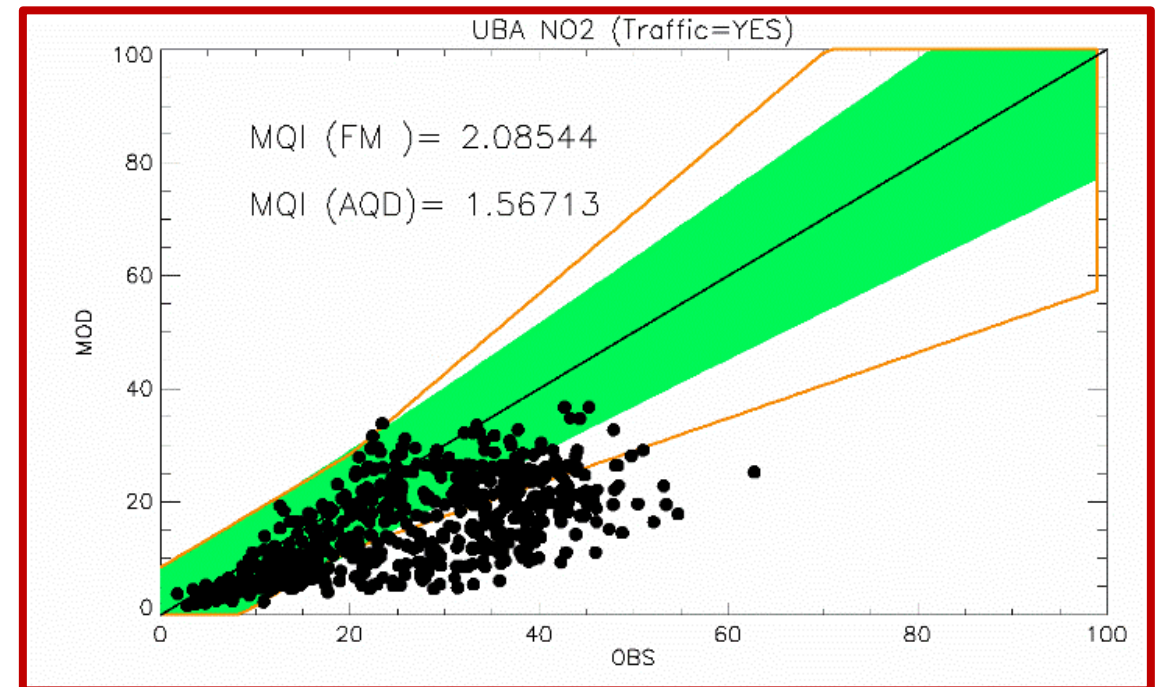
Q3 – New questions arise….

- Is the MQI robust to with number of monitoring stations ? How is MQI affected by the choice of aggregation area ?

- Can the MQI provide information on the fitness for purpose of the model based on annual values only? Is there a need for additional indicators

✓Number of stations? ✓Additional indicators?

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WG2 – MQO and composite mapping

Break-out groups

Fairmode technical meeting, Oct 2024

Break-out group 1: Stringency of the MQO

Background: The yearly MQO for PM2.5 is in general to easy to fulfill. The solution is to adapt the value of the stringency parameter (β)

1. Which test could we design to identify a more appropriate value for β?

2. Is the composite platform suitable to carry on this (these) test(s)?

3. If not, which improvements to the composite mapping platform would you suggest or which alternative?

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Break-out group 2: too few stations…What to do?

Background: Analysis suggest 10 as a minimum number of stations to run the MQO. Enlarging the modelling domain to include more stations can lead to different results in terms of MQO. MQO for air quality zones sometimes differ from MQO at larger scale (e.g. NUTS2 or NUTS1).

1. Which test(s) could we design to build a protocol detailing how to act in case of few stations?

2. Is the composite platform suitable to carry on this (these) test(s)?

3. If not, which improvements to the composite mapping platform would you suggest or which alternative?

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Agenda

- Break out groups discussion: 11:50 – 12:30 (4 groups)

- Re-convene: group summary   12:30 – 12:50 (5' per group)

- Discussion & conclusions: 12:50 – 13:00

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WG2 Guidance

Agenda second session (Tuesday 8th – 16:30-18:00)

WG2 - QA/QC of assessment applications – Guidance

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Feedback to the draft technical guidance document

Chapter 3 – "Assessment"

Alexandra Monteiro

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Mininum number of stations

- When less than 10 monitoring stations exist in the zone

  Guidance: "Solutions to adapt to having too few stations and/or to reach this minimum number are currently being discussed in the scope of FAIRMODE and CEN. In the future, this minimum number should be fixed in terms of pollutants and type of measurements to reflect the level of uncertainty and variability. This information would be part of future guidance documents on this subject."

 **Q1: What to do if there aren't enough stations?**

  Q2: Is the minimum number of stations related to domain extension? To station types? To AQ zones?

Mininum number of stations

- When less than 10 monitoring stations exist in the zone

Q1: What to do if there aren't enough stations?

The competent authorities are in charge of validating the modelling results if the minimum number of stations is not reached for validation.
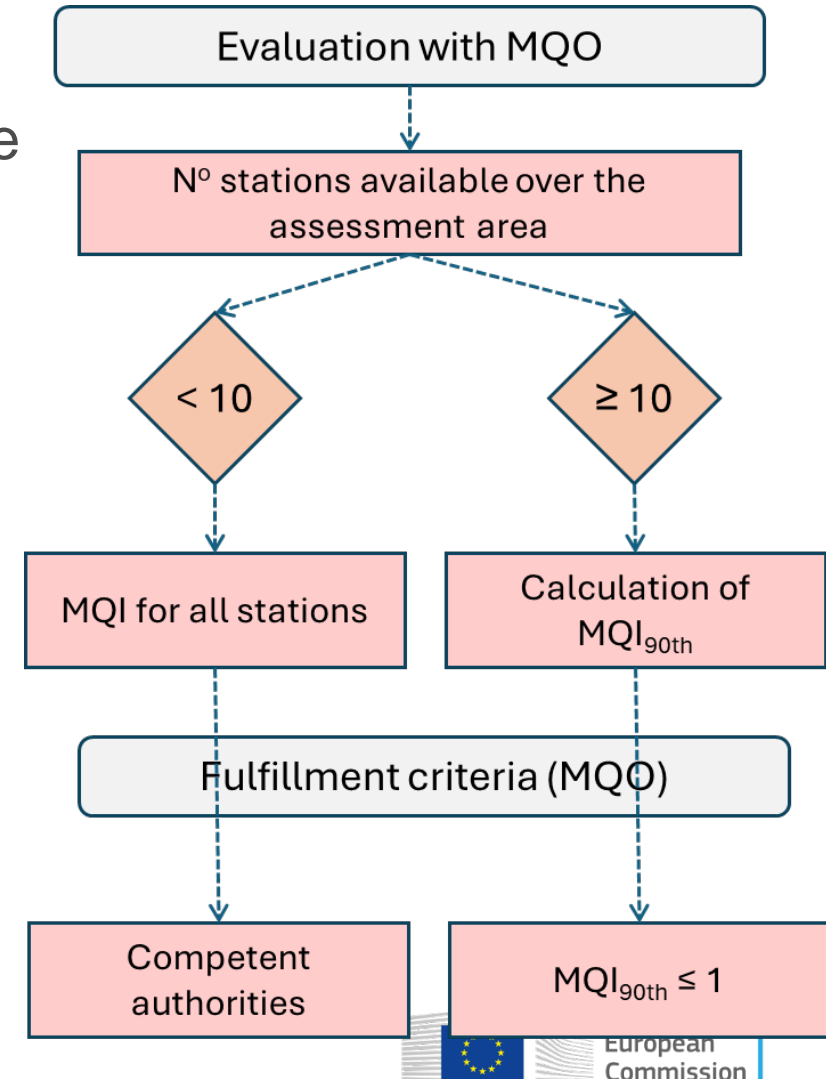
2. Fit-for-purpose modelling

- How to evaluate short-tem modelling

p40: "*For the temporal scale, the AAQD is specific, and fit-for-purpose modelling systems should be able to reproduce the relevant long term (annual)* **or short term (percentile) indicators set by the AAQD…**"

p40: "**Short-term modelling is not only reflected by percentile values, but also by, for example, the number of days with an exceedance**, *which is much harder to reproduce (model) than percentiles*"

A: "*For the temporal scale, the AAQD is specific, and fit-for-purpose modelling systems should be able to reproduce the relevant long term (annual) or short term (percentile* **or number of exceedances**) *indicators set by the AAQD…*"

2. Fit-for-purpose modelling

- Capturing hotpots with regional modelling

p41: "*A modelling system used to support the assessment process in a rural environment may rely on a regional scale model (i.e. coarser resolution) and does not require a high resolution component.* **Emission data over the region of interest should be analysed to exclude potential local hotspots (e.g. highways, industrial sites) that might be underestimated by the regional modelling system**. *This procedure should avoid that local hotspots are not captured by the modelling system and guarantee that a regional scale model with a coarser resolution is still fit for the purpose.*"

p41: *I don't understand why emission local hotspots should be excluded for assessing air quality in a rural environment with a regional scale model. The risk is that emissions from the hot spot will be dispersed over the entire model grid instead of being concentrated at the emission site. The associated concentrations in the grid in question will therefore be an average: probably lower if compared with measurements that could be made at the hotspot, and higher when moving away from it. But this seems fairer to me than completely eliminating emissions from the hotspot.*

A:

3. "Leave one out"

p45§3: "the out of sampling is used to validate the "method" rather than the "results", as all stations can be used for the ultimate product one the method is considered stable enough
This same procedure will also be unfeasible for a large number of stations."
A: No, whenever you need to evaluate models with data assimilation, this procedure should/has to be applied. Each model application is a study case.

P45: "The authors state that the iterative "leave one out" process is too time-consuming for advanced assimilation algorithms. However, this same procedure will also be unfeasible for a large number of stations."
A: We can add this exception also:
"For some data assimilation algorithms (4DVAR, Ensemble Kalman filter) and excessive number of stations (>?), the iterative process described above is too complex and/or too time consuming. In these cases, an alternative approach has to be followed. It is recommended to:
1. Use a subset of the observational data for the data assimilation purposes;
2. Using the other subset of the observational data for the MQO evaluation."

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Thank-you

Monday 07/10		
08:30 – 09:00	Arrival – Registration	
09:00 - 09:15	Opening (Irish EPA, JRC)	
09:15 - 09:35	Introduction to the guidance on air quality modelling	
09:35 - 11:05	**Monit. Design, Spat. Rep. and Exceed indicators (WG8)** • Discussion on the feedback received relating to spatial representativeness in the draft technical guidance document • Overview of written contributions received and plan for elaboration of a new FAIRMODE document collating experiences from testing the SR methodology • Discussion on remaining open issues	**Source apportionment (WG1)** • Exercise on comparison/complementarity of EU and local SA tools (restitution of results) • Presentation of interactive source apportionment maps at EU scale (JRC)
Coffee break		
11:30 – 13:00	**Monit. Design, Spat. Rep. and Exceed indicators (WG8)** • Feedback on the draft guidance document on the use of the MoNET tool • Feedback to the draft technical guidance document (exceedances)	**Sensors and data-fusion (WG6)** • Presentation of general status of WG6 benchmark on data fusion. • First results obtained by several participants.
Lunch break		
14:00-16:00	**Source apportionment (WG1)** • Feedback to the draft technical guidance document • CEN TS, FAIRMODE, AAQD guidance: harmonization needed?	**Microscale assessment (WG4)** • Discussion on the preparation of a recommendation/guidance document and the review of feedback from WG4 members
Coffee Break		
16:30-18:00	**Monit. Design, Spat. Rep. and Exceed indicators (WG8)** • CAMS-FAIRMODE Natural Dust Exercise • Feedback to the draft technical guidance document	**QA/QC indicators for AQ forecast (WG3)** • Feedback on the Hackathon (May 2024): main discussion points and future challenges

Tuesday 08/10		
09:00 - 10:30	**Planning (WG5)** • Bias projections: overview current practices, benchmarking based on a dynamic hind cast validation, towards best practices	**High resolution emission inventories (WG7)** • Introduction and general update of the emission benchmarking exercises • WG7 benchmarking exercise: participant's contributions
	Coffee break	
11:00 – 13:00	**QA/QC of AQ assessment applications (WG2)** MQO composite mapping exercise • Participant's feedbacks • Break out groups • Conclusions and next steps	**Sensors and data-fusion (WG6)** • Summary first results data fusion benchmark • Discussion on comparison methods for data fusion results
	Lunch break	
14:00-16:00	**High resolution emission inventories (WG7)** • WG7 benchmarking exercise: participant's contributions (cont) • Conclusions/summary of the exercise and next steps	**QA/QC indicators for AQ forecast (WG3)** • Feedback to the draft technical guidance document • Using DeltaTool to assess the performance of ARPAE probabilistic forecast model (R. Amorati) • Future challenges and proposal for the next steps (A. Piersanti, A. Monteiro)
	Coffee Break	
16:30-18:00	**QA/QC of AQ assessment applications (WG2)** • Feedback to the draft technical guidance document • Update on the Composite Mapping interface	**Planning (WG5)** • Review Planning chapter in the draft Technical Guidance Document • Open issues for planning: • Assessment of uncertainty in AQ Plans, • Exc. situation Indicators as final check for the effectiveness of an AQ Plan • Meteorology in AQ planning

Wednesday 09/10

09:00 - 10:30	**Planning (WG5)** • Integration of local AQ Plans in EU/national/regional AQ Plans	**Microscale assessment (WG4)** • Cross-cutting activity with WG6 about how many samplers' data are needed for validation of microscale model applications estimating the long-term average concentrations in urban areas. • Discussion on next steps (new activities or exercises)
	Coffee break	
11:00 – 11:50	**AQ guidance on modelling: conclusive remarks** **WGs' action plans**	
11:50 - 12:00	**Close of the meeting**	

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Attendance: 10 years trend

Country	Value
IT	
IE	
ES	6
NL	6
PL	6
EU	5
BE	5
FR	4
NO	4
AT	3
CZ	2
DE	2
HR	2
MT	2
UK	2
SE	2
SI	1
RO	1
FI	1
CY	1
SK	1
PT	1
DK	1