FAIRMODE Technical meeting Dublin 07-09/10/2024

About 80 participants from 23 countries registered to the technical meeting that was held in Dublin, organized by the Irish EPA. The FAIRMODE meeting was organized in sessions, each dedicated to one of the working groups (WG) that constitute the current work structure in FAIRMODE. WG sessions were run in two parallel sessions. This document summarizes the outcome of the discussions for each of these WG sessions. All presentations are available on the FAIRMODE web pages.

C. Buens (ENV) provided an update of clean air policies in the EU among which (1) the ongoing evaluation of the NECD planned to be finalized by end of 2025; (2) the expected improvements from the revised AAQD and its associated implementing acts. He also provided an update on ongoing processes related to guidance documents (Use of modelling for various application domains under the Ambient Air Quality Directive, and the assurance of relevant data quality objectives for air quality assessments; demonstration of contributions to air pollution attributable to natural sources, demonstration of contributions to re-suspension of particulates following winter-sanding and –salting) and on ongoing requests for standardization (PAH, MQO, sensor, particulate number concentration).

Modelling guidance in support to the Air Quality Directives

S. Janssen (VITO) provided an overview on the current work to develop a technical guidance document on the use of modelling for various application domains under the Ambient Air Quality Directive, and the assurance of relevant data quality objectives for air quality assessments. The main purposes of this document are to (1) define how to apply modelling systems for various application domains under the Ambient Air Quality Directive; (2) provide an overview of a QA/QC protocol with recommendations to harmonize the overall quality of modelling applications; (3) provide criteria to evaluate the overall fitness-for-purpose of modelling applications in the context of the AAQD and (4) to provide specific guidance on the appropriate spatial resolution of models for the various AAQD purposes.

Over the summer a survey was organized to collect feedback from the FAIRMODE and AQUILA communities on the second draft version of the Guidance Document. About 30 responses with detailed feedback have been received. This feedback is currently being analyzed by the drafting team and will be integrated in a new version. For each Chapter some major open issues have been identified. These were open for discussion at the technical meeting. In all WG's there was an open and constructive discussion on the topics. For most of them more clarity was obtained, although full consensus was not always reached. In those cases, the Guidance Document will report on the current views as they stand now within the FAIRMODE community.

Although not addressed with a dedicated section in the guidance, emissions are essential to many modelling aspects. Discussion in WG7 highlighted the need to include specific statements regarding emissions for each air quality modelling application. It was agreed than each Chapter will include a dedicated (sub-)section on emission requirements.

The outcome of survey and the discussions during the Technical Meeting will be reflected in a third version of the Guidance Document. This will be circulated to the Air Quality Expert Group for a final review by beginning of December 2024. A final version of the document is expected for the Spring 2025.

WG1. Source apportionment (SA) to support air quality management

The WG1 sessions focused on three topics: (1) the inter-comparison exercise on EU and local SA tools, (2) feedback to the EU modelling guidance and (3) harmonization of the FAIRMODE, CEN and AAQD guidance related input on SA.

(1) Most of the 9 participating groups to the exercise presented their work. All groups performed interesting comparison of SHERPA, CAMS and local tools, highlighting questions and comments concerning both qualitative and quantitative aspects related to their use. Given the late reception of some participant results, too little time could be dedicated to discussion. An online meeting is planned in November for this purpose.
(2) G. Pirovano highlighted the main feedback received regarding the EU modeling guidance document. Suggestions were made to reduce and simplify the stringency of the theoretical framework, but confirming the need for a fitness-for-purpose analysis to select the proper SA method. The audience also confirmed the suggestion to verify that only the recommendations agreed within FAIRMODE appear in the guidance.
(3) Work is ongoing in CEN regarding the SA protocol. This work will imply the review of the FAIRMODE guidance on SA to be planned in the course of 2025.

P. Thunis presented a new SHERPA-derived product that proposes interactive EU-wide SA maps where the impact of multi-spatial sectorial strategies can be tested and results detailed at grid cell level

WG2. Quality assurance, quality check and fitness for purpose of AQ assessment modelling applications

E. Pisoni presented the updated version of the composite mapping platform (CMP) that now includes a module to produce "best model maps" expressed in terms of Modelling quality indicators, model used as well as grid-cell concentration. Three main aspects of the MQI have been discussed:

(1) The stringency of the MQI (especially PM2.5). One of the next step homework will consist in using the data of the CMP to propose values for the stringency parameters (beta)
(2) The minimum number of stations required to estimate the MQI in a robust manner. Tests will be carried out in two main directions: (a) enlarging the assessment domain and (b) assess the relevance of using a wider time coverage (more years) to cope with missing stations spatially. EU results for additional years should be uploaded in the CMP.
(3) Additional performance indicators (in particular temporal and spatial ones) will be included by the JRC in the CMP.

WG3. Quality control indicators for AQ forecasts

WG3 was organized around two main sessions: (1) feedback on the Hackathon (May 2024): main discussion points and proposal for the next steps and (2) feedback to the draft technical guidance document (Chapter 6). In the first session, a report of the results of the Hackathon of 8th May 2024 was presented, with feedbacks provided by users on the new version of Delta-Tool with the AQUILA/CEN parameters. Discussion on the performance indicators have been developed to provide additional information about the capability of the forecasting system to detect/anticipate regulatory threshold exceedances and to check its ability to provide accurate forecasts. It was concluded that as the set of indicators is quite large and interpretation not always straightforward, it is also important to distinguish the use of indicators for expert evaluation from the use for communication to stakeholders. In addition to the comparison with the persistence model, discussions stressed the need to develop efficient indicators for exceedance detection. This is indeed one of the clear requirement under the revised AAQD (discussed also in Session 2).The next steps will include the test of the various indicators and their level of acceptability. The CAMS 2021 data will be used to work on range of acceptability for various indicators and identify best practices.

WG4. Microscale assessment

The WG4 sessions were organized around three main topics: (1) Guidelines Document on Microscale Modelling, (2) cross-cutting activity with WG6/WG2 regarding the minimum number of monitoring points required to validate micro-scale applications, and (3) the status of the WG4 activities and next steps.

(1) The Guidelines Document on Microscale Modelling draft was written in the last months. During September a questionnaire about the contents of this draft was send to the WG4 members. During the first WG4 session (October 7th) the responses to the General and Terminological questions were discussed, along with some of the specific questions (requirements of the type of information to be

provided by the models, requirements on emissions data). The general opinion is mostly good but some relevant questions were raised (other pollutants or emission sources, model uncertainty, estimates of percentiles, etc). It was agreed a definition of the microscale air quality models, which was the selected name for the type of models used for urban hot-spots. It was agreed that the pending specific questions will be discussed during a hackathon to be celebrated before December 15th.

(2) Results of a cross-cutting activity with WG6 (but of interest for WG2) regarding the minimum number of monitoring points required to validate micro-scale applications were shown in the second session (October 9th). Presentations of RIVM and CIEMAT were made for the case of the passive samplers of the Antwerp domain used in the intercomparison exercise (IE) of the WG4. The RIVM approach, based on the probability that the models comply with the MQO, showed that at least 10 sampler sites are required for a robust evaluation. However, the study of CIEMAT (based on how many samplers we need to obtain similar values of validation statistics -R, MFB, MFE and TARGET- as the case of using the whole set of samplers data) was around 20 samplers. We concluded that for a robust evaluation, the MQO is not sufficient as a single pass/fail test for a full validation and a generalization to other datasets and statistics is necessary.

(3) Status of the WG4 activities with respect RoadMap and Next steps were discussed during the session of October 9th. The RoadMap activities are being carried out on time. The more relevant pending questions/topics were set out:

- Investigating the generalization of the conclusions of the Antwerp Intercomparison Exercise (for other domains or urban structures, other meteorological conditions, etc)
- How to compute the percentiles besides annual concentration averages from model simulations?
- How to estimate the model uncertainties? How many stations do we need for a proper validation at microscale?

(4) Additionally, the need for a new IE was highlighted, but it is to go on the work with Antwerp case. Several candidates for the new IE were proposed (Gyor, Madrid, Dublin, Rotterdam). The selection of the final city will be discussed in the next hackathon before December 15th.

WG5. Planning

One of the main challenges regarding air quality planning is the bias correction, i.e. how to correct the modelled projection for the bias between the reference case and the observations. A discussion session was organized around 4 questions: Q1 - Is a bias correction needed in future projections? Q2 - Are there recommendations for a relative or absolute bias? Q2bis: Do we need a source apportionment to refine the bias correction? Is this realistic in practices? - Q3: What can be recommended for the extrapolation of the bias at station locations towards a full map? - Q4: What would be a good benchmark strategy to validate the bias projection approach? The next steps will consist in developing a desktop exercise to test various concepts for bias corrections. This exercise will provide further input for the development of a workplan for a dynamic evaluation and recommendations about best practices for bias projections.

The second session addressed the challenge of keeping local and regional/national/EU plans consistent among each other. It was clear that governance over various levels is key to harmonize these processes. Discussions also highlighted the need of providing further guidance on modelling for air quality planning

and of providing recommendations for standard EU data set on future "official" emissions and boundary/background conditions such as a current Clean Air Outlook 3 (CAO3) data set.

In a third session, some remaining open issues in the Guidance Document were discussed. These included various options to deal with meteorological variability in Air Quality Plans and the new AAQD request to assess a worst/best case scenario in the planning process.

WG6. Sensors and data-fusion

After a first inter-exercise dedicated to the calibration of sensors, WG6 is now organizing an inter-comparison exercise on sensor/model integration. The first session was dedicated to review the overall benchmark exercise set-up and to the participants' contributions to the exercise (INERIS, MEtNo, ISSeP, CERC and VITO) while the second session focused on a first comparison of preliminary results. The plan is to further analyse the results, in particular in terms of shorter time periods (i.e. interesting episodes) and identify metrics that are appropriate for the comparison. The plan is to finalize this exercise by mid-2025 with a potential peer-review publication.

WG7. Compilation of high resolution emission inventories

One of the focuses of WG7 activities is to benchmark and create an emission dashboard (EU, bottom-up national and local inventories) to monitor progress and identify inconsistencies among inventories. The emission benchmarking exercises had a positive momentum from 2023 to 2024 supported by the benchmarking tool developed by JRC, preparation of guiding material, and organization of two Webinars. Different teams (Germany, Slovenia, Poland, EDGAR, Belgium, Madrid, Portugal, Catalonia and Norway) contributed to improve the tool and identify progress needs for local and regional emission inventories. During the technical meeting, it was noted that the benchmarking tool needs usability improvements, particularly in the use of abbreviations and data uploading. In addition, it was suggested to add the option to download results, and make modifications related to data aggregation at NUTs/FUA levels. Two solutions were proposed: 1) include or exclude partial grids when aggregating at NUTs/FUA level, or 2) use gridded emissions instead of aggregated emissions.

Apart from following-up on improving and discussing potential modifications to improve the tool, additional activities will be pursued to keep/increase momentum in WG7. These will include (a) a Focus to move from identifying inconsistency to solve them and show the impact of the improvement; (b) Design/identify specific questions to address using the benchmarking tool; (c) Evaluate/design potential activities in collaboration with other WGs (e.g., composite mapping with MQI); (d) Evaluate how to outreach other emission communities than FAIRMODE CAMS.

WG8. Monitoring design, spatial representativeness (SRA) and associated exceedance situation indicators

Activities in this working group bridge the use of models and measurements for reporting assessment and exceedances of limit values under the AAQDs. Much of the work is also relevant for colleagues at the

AQUILA network. The sessions were organized around the following topics: (1) the elaboration of guidance on the determination of spatial representativeness for monitoring sites; (2) the evaluation practices to support monitoring network design to evaluate the current AQ monitoring networks; (3) exceedance situation indicators and the joint CAMS-FAIRMODE evaluation of the use of CAMS natural dust of the products for reporting exceedances under the AAQD.

Regarding (1), plans are to update the current WG8 guidance document by the next plenary meeting. This updated version will include a discussion of the key criteria and open issues as well as country experiences. A new exercise to test alternative geographical limits of SRA and source-related criteria is planned for December/January.

Regarding (2), the MoNET guidance will be finalized by the next plenary meeting. New exercises will be started to assess how the clustering of model data can (a) support the estimate of the SRA in a city and (b) serve to define air quality zones.

Regarding (3), a FAIRMODE summary document will be finalized by December 2024 with a potential extension to a peer-review publication. A link will be established with the on-going revision of the guidance to discount natural source contributions to exceedances.

AOB

- The next plenary meeting will take in Prague on 5th and 6th March 2025.
- The FAIRMODE SG will meet early November to discuss the forum's feedback to the NEC directive consultation, regarding a better alignment on emissions and projections
- E. Pisoni will take over the FAIRMODE chair, after the Dublin technical meeting