FAIRMODE Technical meeting Videoconference 30/09 – 02/10/2020

About 235 participants from 30 countries registered to the technical meeting that was held online (initially planned to take place in Oslo) due to the COVID_19 situation. The meeting was organized in sessions, each dedicated to one of the cross-cutting tasks (CTs) that constitute the current work structure in FAIRMODE. With the exception of "CT3 - forecast indicators" and "CT9 - Robustness of air quality projections", all CTS had a dedicated session attended by 60 to 80 participants. This document summarizes the outcome of the discussions for each of these CTs sessions. All presentations are available on the FAIRMODE web pages.

CT1. Source apportionment (SA) to support air quality management

The discussions in CT1 focused on the open issues mentioned in the fitness-for-purpose SA guide. S. Gilardoni gave an overview of the main issues faced with the source apportionment of organic matter. While the focus of the guidance is now on PM, one aim is to extend it to other compounds, in particular O3 and NO2. A specific sub-session was therefore organized to address the source apportionment of NO2. After brief presentations from A. Kerschbaumer, J. Ferreira, W. Lefebvre and G. Pirovano who provided an overview of their modelling applications, the set-up of a possible NO2 inter-comparison exercise was discussed. The need to address this issue was recognized by all participants and an updated version of the intercomparison exercise document will be shared with the CT1 mailing list by 18 October 2020. A telco will then follow with all interested groups to agree on the precise set-up of the exercise and related deadlines (first half of November 2020). Breakout groups were also formed to discuss the best way to use source apportionment results from different methodologies, especially when those lead to contrasting results. While most of the participants highlighted that tagging could not be used as a stand-alone method but only in complement to brute force impacts, the process to combine these two sources of information still needs further guidance from CT1.

CT2. Towards an extended QA/QC protocol for air quality assessment

As a follow-up of the CEN TC264/WG43 on modelling quality objectives (MQO), the FAIRMODE community identified a need to develop an extended QA/QC protocol to ensure a more comprehensive evaluation of the quality of a modelling application beyond the current pass/fail MQO test. The goal of this session was to discuss the current proposal for the extended QA/QC protocol document (July 2020). This document proposes additional spatial and temporal indicators as well as specific indicators for input data (e.g. emissions). P. Thunis reviewed the chronological steps followed along the years within FAIRMODE as well as the motivations to extend the current MQOs with these additional indicators while L. Tarrason presented the details of the QA/QC proposal. In addition, J. Soares presented an approach based on clustering analysis (and visualization via dendrograms) that could complement the current set of proposed indicators.

Group discussions took place to discuss two points: 1) are the proposed QA/QC indicators general enough to apply to all types of modelling approaches and 2) is the proposed set of QA/QC indicator complete enough? While the usefulness of these additional indicators was confirmed, some clarifications were made. In particular, it was important to secure that the extended QA/QC protocol is NOT mandatory, it is proposed as a complement to the existing MQO with the aim to harmonize the reporting of modelling results and is mostly designed for model users and developers, not policy makers. The proposed indicators will be implemented in the Delta tool (end 2020) and most participants agreed to test them. A user-friendly tool will also be made available to test the "dendrograms" approach.

CT3. Quality control indicators for modelling of air quality forecast

No specific session was organized for this CT but an overview was provided during the final session. This CT aims at providing a specific benchmarking framework for modelled air quality forecasts. 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 (more accurate than a 'persistence model'). Future steps will consist in testing the proposed forecast indicators with additional datasets (in particular CAMS). To support this task, an updated version of DELTA (v.6.0.1) is now available online. A new hackathon will be organized to discuss the results before the next Plenary Meeting in February.

CT4. Microscale air quality modelling

Microscale air quality modelling refers to air quality modelling at high spatial resolution (typically order of meter scale), usually focused on urban environments. Seven groups (Aveiro University, University of West Macedonia, Széchenyi István University, ENEA, RICARDO, VITO and CIEMAT) gave presentations according to a fixed template with the following two questions: 1) how do you derive annual statistics from microscale simulations and 2) Are you interested in an inter-comparison exercise among the different methodologies? The presentations highlighted many different methods to derive the annual statistics and a clear interest in participating in a common exercise. 21 groups indeed expressed their interest to participate with their own modelling system and two different domains were proposed for the inter-comparison: Antwerp (Belgium) and Győr (Hungary). A hackathon will be organized in November to discuss the setup of the exercise with the interested participants.

CT5. Best practices for local/regional air quality management

The objective of this CT is to produce guidelines on air quality management practices, in particular to explain how to proceed from specific abatement measures, to evaluate consequent emissions and then concentrations. The structure of the document will be based on key challenges collected from local, regional or national authorities. A. Eisold, C. Nagl, M. Ross-Jones, K. Eneroth, V. Assimakopoulou and E. Turrini presented possible challenges to be included in the guidelines. Break-out sessions were useful to collect additional 'key challenges' and look for volunteers. The discussion resulted in the following outcome: 1) need to focus on long-term but also short term approaches; 2) both soft and hard measures

should be assessed; 3) need to propose simplified fit-for-purpose approaches to tackle the challenges. Some participants also expressed the wish to extend the initial scope of the guidelines to topics like exposure modelling, exceedances, co-benefits of air quality and climate measures, to economic measures or on the synergies with other policies (e.g. NEC). A telco is planned in November to discuss the follow-up steps, with the view of having the introduction of the guidelines ready by the next plenary meeting, and a first draft document by the following technical meeting.

CT6. Near-real time assessment with sensors

The main objectives of this session were to discuss the feedback received on the CT6 work plan and in particular on the proposed concept of inter-comparison exercise on sensor/model integration. S. van Ratingen and S. Janssen provided details on the development of a benchmark / test set for PM2.5 and NO2, respectively. L. Mocek reviewed the lessons learned from the Sensor Community network. After specific feedback (user needs, potential output…) on the proposed exercises from V. Rodrigues, S. Hellebust and A. Novakova, the discussion opened on the setup and goals of the benchmark(s).

The exercise consists in generating data sets with artificial/synthetic sensor data both for PM2.5 (500-1000 low-cost sensors distributed in a "large region") and for NO2 (25-50 relatively low-cost sensors distributed in a "city"). The objectives for the benchmark are to develop/test/compare methods to 1) select which sensors in the data sets to use for every hour; 2) to obtain best estimates for "calibrated"/ "corrected" sensor data and 3) to combine cleaned/calibrated sensor data with other info/model data (Data Fusion and/or Data Assimilation). During the discussion, it became clear that there is some concern if synthetic data can sufficiently reproduce the variability of "real" sensor data.

Several organisations and persons expressed interest in hand-on participation in performing the benchmarks. The next steps will consist in updating the benchmarks (2020 Oct-Dec) and organize a hackathon (2021 Feb-Mar). Practical work on the benchmarks is foreseen in 2021 Jan-Sep, with feedback at the next FAIRMODE Technical meeting in fall of 2021.

CT7. Compilation of urban scale emission inventories

Two sessions were organized for this CT. The first dedicated to benchmarking activities for new sectors (off-road) and the second to present a series of high-resolution emission compilation systems that are being developed at national level for AQ modelling purposes (UK, Germany and Norway), the evolution of the current best practice guidance document for the transport sector and elaborate recommendations on metadata (in relation to the composite mapping platform).

Session 1: The main "key challenge" for compiling emission from the off-road sector is the large diversity of emission categories which entails multiple challenges in terms of data compilation, spatial and temporal distributions, emission factors or on the characterization of the emission processes. From the discussion, it was recommended to include in the guidance document specific guidelines for each subsector (construction and agriculture machinery, recreational boats, shipping). The EMEP/EEA guidelines will serve as starting point for identifying which aspects need to be improved (with a focus on the data needs

at local level). The session was supported by presentations of A. Monteiro (shipping), M. Guevara (recreational boat emissions), S. Fameli (shipping), S. Lopez-Aparicio (construction sites), S. Nordmann (off-road) and B. Conlan (off-road). Several FAIRMODE participants were identified as contributors to the key challenges that were discussed.

Session 2: The suggestions to improve the best practice guidance document for the transport sector were agreed. Issues regarding the air temperature dependence (cold-start emissions and diesel NOx dependence) and the spatial distribution of the emissions when performing downscaling approaches will be addressed but non-exhaust sources will not. It was also agreed that the best practice should be determined by the purpose of emissions, (AQ assessment, forecasting, planning), and it was suggested to establish connections between this guidance and the CT4 (microscale modelling) work. The proposed new structure and comments received will be used to update the document and distribute it to the FAIRMODE community for feedbacks. It has been proposed to make information on metadata mandatory when uploading emission inventories into the composite platform, although it is important to agree on a common terminology. The discussion also focused on the use of harmonized decision trees to help comparing the metadata from different emission inventories. These decision trees were seen as positive although the risk is that they may not fit all inventories and be too rigid. The proposed decision trees for the road transport sector and residential combustion will be distributed to the FAIRMODE community for feedbacks. The JRC and VITO will then implement them in the emission composite platform. The session was supported with presentations of S. Feigenspan (Gridding Emission Tool), B. Conlan (DUKEMS systems in the UK, S. Randall (Norwegian national database for fine scale emissions), M. Guevara (best practice guidance for the transport sector) and L. Tarrason (composite mapping system and metadata requests).

CT8. Exposure & exceedance indicators and network optimization

This CT session focused on the presentation of results of sensitivity and feasibility tests of a Tiered approach for 1) spatial representativeness (SR); 2) exposure and exceedance indicators and 3) model validation & network design.

For spatial representativeness, the outcome of the breakout sessions was an overall support to the Tiered approach that seem to cover most of current practices. The main points raised during the discussion were:

- The main barriers faced to apply the recommended approaches are related to the limited use of models for reporting but also to the difficulty of having “fit-for-purpose” modelling (FAIRMODE is asked to provide improved guidance and criteria on the matter).
- The recommended discontiguous approach for the definition of the SR areas was well accepted but more testing in other cities is required.
- Given the complexity of SR assessment, it seems viable to focus first on annual average concentrations as the most simple and transparent similarity criterion for SR, but percentiles would be a useful complement.
- There was general agreement on the use of a 20% threshold value but more evidence (including tests on other pollutants) must be gathered before agreeing on a common threshold value to increase the comparability of the definition of SR over Europe.

More guidance is generally required to calculate exceedance and exposure indicators (e.g. which type of road network to use). Street canyons are seen as relevant for population exposure but Member States are lacking resources to include them in their assessment.

Network design: The proposed clustering method was seen as bringing added value to support network design and contribute to better evaluation of exposure and exceedance situation indicators using Tier 1 and 2 approaches. It might also be useful to support the placing of new stations, avoid redundancies in the network and/or detect outliers. The clustering approach was also seen as a possible approach to complement the model evaluation, although further testing is needed.

The reports detailing the above three items are available on the CT8 FAIRMODE pages and comments are welcome before October 30. The final reports, incorporating FAIRMODE comments, will be available by end of 2020. It is envisaged that an intercomparison exercise about SR assessment and exposure and exceedance estimation will be performed by testing applications in different EU cities & regions. An (on-line) system to test clustering approaches for model validation and network design will be developed and an exercise for model validation and network design yet needs to be discussed.

CT9. Effectiveness and robustness of air quality projections

This CT is dedicated to the assessment of the robustness of air quality projections. In practice, this assessment consists in analyzing the sensitivity of the model responses to emission reductions scenarios, when input data (emissions, meteorology…) or the model itself are changed. A. Monteiro detailed the status of the proposed benchmarking platform (document circulated to the Fairmode community during summer). The comparison of model responses is performed for a wide set of cities in Europe (mostly EU capitals), addresses PM, NO_2 and O_3 and includes both episodes and yearly averages responses. The platform is currently set-up and running with a few simulation results included, together with a visualization tool already prepared. Local modelling results are expected to be uploaded by the end of 2020. Several groups expressed their intention to perform simulations and an online meeting dedicated to CT9 work is planned in the course of November, to explore the first set of results.

Next meeting

The next plenary meeting will take place in Brussels, on 1-2 March 2021.