FAIRMODE 11th plenary meeting: Baveno 26-27/02/2018

The meeting was attended by about 90 participants from 25 countries among which 19 Fairmode National Contact Points. The meeting aimed at 1) reviewing the status of work and 2) discussing options for future work. One particular focus of this meeting was the review of the FAIRMODE recommendations in support to the Fitness check of the AAQDs.

P. Thunis highlighted the particular focus of this meeting on guidance/guidelines and on the associated FAIRMODE recommendations. These recommendations support the FAIRMODE "benchmarking – guidance – training" process: In particular, they intend to (1) strengthen the FAIRMODE support to policy, (2) better convey the main FAIRMODE messages and (3) guide the discussions during the technical meetings. They are structured around the following questions: a) purpose (b) fit for purpose (3) application and (4) quality assurance/quality control. Draft recommendations have been circulated before the meeting. After update according to the main outcome of the Baveno meeting, they will be re-circulated for comments (mid-March). This version will serve as input for the discussions during the technical meeting in Tallinn (June 2018).

T. Henrichs (DG ENV) provided an update of the on-going activities regarding the Ambient Air Quality Directives (AAQD). Of particular relevance to FAIRMODE, T. Henrichs detailed the on-going fitness check, a retrospective exercise to assess what has happened and look at what caused change that can be credited to the AAQD. This particular fitness check focus on the period 2008-2018 with 5 evaluation criteria: relevance, coherence, effectiveness, efficiency and EU added value. The exercise will be finalized by autumn 2019, with input from the FAIRMODE network expected during late spring / summer 2018.

The meeting was structured around the five working groups. A summary of the presentations and discussions is given below. All presentations are available on the [FAIRMODE web page](#)s.

WG1-Assessment (S. Janssen, J. Wesseling)

S. Janssen (VITO) reviewed the progress made with respect to the **model quality objectives (MQO)**. An updated version of the guidance document on MQO and benchmarking will soon be available on the FAIRMODE web site. Some of the more technical aspects of the MQO are also being discussed in the CEN TC264/WG43. France recently expressed a concern regarding the work performed in TC264/WG43. The request was to complement the current quality control (QC) objectives on the MQO with additional quality assurance (QA) processes (e.g. auditing of the models, inter-comparison exercises, harmonized guidelines) to test the various elements of the modelling chain (emissions, meteorological input, model…). It was agreed that these additional QA steps would take place within FAIRMODE while the QC would fall in the

frame of TC264/WG43. Some adaptations to both FAIRMODE and CEN TC264/WG43 will need to be implemented to account for these changes.

Related to the MQO, the join publication on "Strengths and weaknesses of the FAIRMODE benchmarking methodology for the evaluation of air quality models" by A. Monteiro et al. has recently been accepted for publication in the Air Quality & Health journal. The publication is available via the FAIRMODE WG1 webpage and a reference will be added in the FAIRMODE Guidance document.

S. Janssen (VITO) provided an overview of the **composite mapping exercise** stressing 1) the steps required to upload new maps (including the use of the JRC QA/QC software to facilitate the maps uploading process and the need to fill-in metadata information). A comparison of local/regional/country maps with EEA-ETC maps is now available on the platform. It was reminded that no maps from the composite mapping will be used for formal reporting purposes.

Most of the updates to the guidance on MQO and benchmarking deal with the **MQO for forecast**. In order to finalize this work, a dedicated 2-days meeting in Ispra will be organized in spring to discuss and test various formulations of the MQO in "real time". On top of the historic contributors to this activity, additional meeting participants (INERIS-CAMS, University of Arhus, University of Brescia, Széchenyi István University, University of Aveiro, UBA Germany, FMI, ENEA) expressed their interest to join the activity, in particular participating at the proposed 2-days workshop.

Computational Fluid Dynamic (CFD) models are increasingly used in the context of the air quality directive but it was noted that they generally require expert skills to be operated. Follow-up discussion with participants involved in this type of CFD modelling will take place in the next few months to understand the relevance of including this type of modelling approach within FAIRMODE. It remains open whether this type of modelling should be addressed within FAIRMODE.

Sensors are also increasingly used in air quality applications. FAIRMODE will continue assessing the possible uses of sensors to support modelling (in particular with respect to assessment purposes and data assimilation). Interest was expressed by Arhus University, University of Aveiro, Atmoterm, FMI, IRCEL and RIVM.

The report on "**spatial representativeness** of air quality monitoring sites", an outcome of the FAIRMODE/AQUILA inter-comparison exercise is now available on the FAIRMODE web site. One of the main recommendations is to start working on common definitions, maybe multiple according to the purpose of use (monitoring design, exposure, model validation…). A discussion took place on whether these definitions should be policy or scientifically driven.

L. Rouil (INERIS) gave an overview of the **CAMS activities** and stressed the need to share the experience gained on forecasting system in a cooperative framework. The evaluation of the analysis and re-analysis with respect to the FAIRMODE MQO is planned for 2018-2019. She also mentioned the large quantity of data that could be useful to feed nested modelling chains in the frame of the ongoing FAIRMODE activities.

A. González Ortiz (EEA) gave an overview of the updates regarding the **e-reporting** process. One proposal has been discussed and agreed to include a "xml" functionality within the DELTA tool to attach model quality information to the e-Reporting process. The establishment of a link from the CDR towards the composite mapping platform (so that all data submitted in the CDR can be used in the FAIRMODE exercise) is yet to be developed due to lack of resources.

Recommendations

The proposed WG1 recommendations are:

1. To use the MQO to assess if a model application is good enough for assessment purposes.
2. Any modelling application should be able to meaningfully reproduce what is observed in ambient atmosphere, regardless of the spatial scale and within the tolerance margins of the MQO.

Most of the discussions focused on the second recommendations, which should be re-formulated to better specify the purpose(s). It should in particular distinguish the use of models for the practical air quality management point of view from their more formal use as complementary information in the context of the IPR.

WG2-Emissions (L. Tarrason, M. Guevara)

L. Tarrason (NILU) gave an overview of the on-going WG 2 activities related to the **composite mapping platform**. Currently the Copernicus TNO-MACC-III, the EMEP 2015 at 0.1x0.1 and the JRC inventories have been uploaded as top-down (TD) with a focus on the domestic heating and traffic sectors. Most of the pilot cities/regions bottom-up (BU) emission maps can now be compared with these TD estimates. The comparison of TD inventories as well as the comparison between BU and TD revealed many issues that now need to be understood and possibly solved. The main challenge is to initiate and mantain a dialogue between both communities (BU and TD) that will guarantee permanent improvements. L. Tarrason summarized the main outcome of this first comparison into steps to follow and messages/requests directed to Copernicus, JRC and EMEP-TFEIP.

M. Guevara (BSC) reviewed the work performed within WG2 on the emissions **uncertainties associated to the different sectors of activity**, with a view of prioritizing the next working steps. Although these uncertainties are the lowest for the traffic sectors, many issues have been identified that need follow-up action (re-suspension, urban proxies for spatial disaggregation, new methods based on "big data"…). For residential wood combustion, spatial proxies and PM emission factors remain too important issues that result in significant uncertainties. The spatial allocation of industrial emissions related to Large and Medium Combustion Plants remains the largest source of uncertainties, which requires at first the review of the current E-PRTR database and the definition of better industrial land use categories. Finally, M. Guevara pointed the need of refined temporal profiles for NH3 agriculture and of speciation profile for NMVOC emissions from the solvent's sector both of them presenting a large contribution to fine particles in urban environments.

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S. Lopes-Aparicio (NILU) illustrated the main challenges to improve emission inventories with the example of **residential wood burning** in Norway. She showed how different methodological approaches (based on local vs. top-down information) could lead to important differences in terms of emission estimates. The key message is that emission inventories need to be developed according to methods that represent accurately the physical process of the emissions of interest.

L. Rouil (INERIS) gave an overview of the **CAMS activities** in the field of emission inventories. She stressed the following points as possible items for collaboration with FAIRMODE: (1) test the new regional/global emission inventories using the FAIRMODE WG2 tools; (2) provide feedback that can be used to improve the CAMS_81 developments; (3) trigger the discussion around the temporal characterisation of regional emission inventories and (4) network with EMEP/NECD reporting which focuses on «official» data elaborated by the national experts. M. Guevara presented some of the ongoing works and first results of to the development of new global temporal profiles within CAMS_81.

L. Tarrason stressed the importance of improving the currently available **guidance** (i.e. EMEP/EEA emission inventory guidebook, guidance to support the reporting of National Air Pollution Control Programmes under the NEC directive) with local information on urban emissions. During the discussion, participants agreed that FAIRMODE was a relevant network to provide this information (see recommendations below).

Recommendations:

The proposed WG2 recommendations are:

1. Specify the requirements on the (urban) emission data to be used as input for air quality assessments
2. Contribute to the current EMEP/EEA emission inventory Guidebook to include guidance on urban emission compilation
3. Promote benchmarking activities in FAIRMODE as a system to study the quality of emission data used as input in air quality assessments.

These recommendations were supported by all participants although the practical process, especially for recommendation (2) needs to be established and discussed further.

WG3-Source apportionment (C. Belis, G. Pirovano)

C. Belis (JRC) reported on the main outcomes of the WG3 **inter-comparison exercise** (IE) and highlighted the differences between tagged species, receptor models and brute force approaches. The lessons learned in the inter-comparison are been incorporated in the WG3 technical guide on SA model applications. Future steps will consist in better delineate the cases where brute force and tagged species approaches can be used. He also presented a series of possible applications of source apportionment in support to air quality management.

G. Pirovano (ERSE) gave an overview of currently available approaches to estimate the **spatial contributions to pollution** (e.g. city vs. regional vs. transboundary). The incremental approach, the coupled receptor model – lagrangian modelling approach or the source-oriented approach are three options currently available but they are all subject to different working assumptions. One of the points of discussion was the relevance of organizing a specific exercise to compare/validate these methodologies. A final decision is expected after a more detailed debate during the next technical meeting.

M. Mircea (ENEA) presented the outline of the draft **guidelines** document that includes CTM models in addition to the update of the existing one on receptor models. A number of discussion topics were shared with the audience and contributions from the Fairmode Community was elicited.

L. Rouil (INERIS) gave an overview of the **CAMS activities** in the field of source apportionment. She described the two related CAMS products: (1) the green scenario toolbox focusing on the impact of emission reduction scenarios and (2) the analysis of the contribution of local versus external sources to background air pollution level in the cities. The data collected in the frame of these two exercises could be useful to the FAIRMODE community and their interpretation in the light of the FAIRMODE recommendations is a possible collaborative area.

Recommendations

The proposed WG3 recommendations are:

1. to accomplish source apportionment applying the Fairmode source apportionment technical guide and to prefer methodologies that have been tested with the Fairmode performance assessment methods for source apportionment applications.
2. The application of the Lenschow or incremental approach is not recommended unless it can be demonstrated that a) the contribution of sources to the regional background and the urban background levels are comparable and b) the city emissions do not contribute significantly to the regional background level.
3. Use widely recognised classification of emission sources at the macro sector level (NFR-UNECE aggregation for gridding).

During the discussion, the participants welcomed the new knowledge proposed by FAIRMODE to understand the implications of using source apportionment to support air quality planning. Time is however necessary to mature this knowledge and more guidance should be developed in this field to further clarify the role of source apportionment in a planning context (in particular to support e-reporting). Since source apportionment is explicitly mentioned in the directive (IPR), it was stressed that the modelling community is to make a decision about the stringency of the source apportionment definition bearing in mind the need of a proper applicability of each method in different contexts and providing guidance to support its use.

WG4-Planning (A. Monteiro, A. Clappier)

P. Thunis (JRC) focused his presentation on the question: "**Are all methodologies suited to support air quality planning**?" With simple examples, he highlighted the large differences between different methodologies to estimate the contributions of activity sectors and/or spatial **scales** (e.g. city vs. country) to the pollutant concentration at one given location. The three methodologies described include the incremental approach (or Lenschow), source apportionment and CTM-based scenario analysis. The consequences of these differences in terms of e-reporting but more generally in terms of planning applications led to the WG4 recommendations (see below).

A. Monteiro (U. Aveiro) focused her presentation on the question: "**Should we care about model diversity to support air quality planning?**" She illustrated with a few examples the differences observed in terms of responses to air quality plans among different models for given cities/regions. The discussions stressed the difficulty to assess and understand the reasons behind these differences. WG4 will draft a plan for an inter-comparison exercise to tackle these issues. This draft plan will be discussed at the next technical meeting.

Recommendations

Given their purpose: provide information of direct relevance to assess the potential impacts of air quality plans, the proposed WG4 recommendations are:

1. The incremental approach is not recommended, unless the validity of the underlying assumptions has been assessed.
2. For primary pollutants, source apportionment is fit for the purpose but for secondary pollutants, it is not recommended (only those for which linearity is not a valid assumption).
3. Scenario analysis based approaches are recommended but with an assessment of the associated non-linearities to provide information on their range of applicability.

The focus of the discussion was on the implications of these recommendations on the IPR and took place together with WG3.

WG5: AQ management practices: Pilot exercise (E. Pisoni, C. Guerreiro)

E. Pisoni and C. Guerreiro gave a summary of the morning workshop dedicated to the pilot cities/regions. This working group is a transversal activity aiming at improving air quality management practices. The ten contributing pilots reported on their experiences with the benchmarking of their emission inventories. The analysis performed by the pilots led to the identification of inconstancies that now need to be analysed further within WG2. The main recommendation arising from this first work on the emissions is that there is a need to promote a dialogue between BU and TD communities with the aim of learning from and complementing each other. The FAIRMODE tools can be instrumental for this discussion. There is also a need for guidance to compiling BU inventories. One of the objectives of this transversal activity is also to receive feedback from the pilots to improve the tools, guidance… proposed by FAIRMODE. This feedback was clearly expressed with requests to improve the documentation, increase the reviewing process, better explain the underlying assumptions, provide additional guidance... The outcome of this first phase focusing on emissions will be summarized in a common publication. The workshop was also an

opportunity to detail the next steps that will take place within WG1 with the participation to the composite mapping exercise and the evaluation of the modelling through the MQO. Some of the pilot regions/cities will explore additional options for forecast or CFD modelling.

A.O.B

The next technical meeting will be organized in Talinn, Estonia (26-28/06/2018) by the Estonian Environmental research Centre (Estonia). Contact: Erik Teinemaa

The technical meeting will be organized back-to-back with a 1 day TFIAM workshop dedicated to the "health impacts of local measures"