

# FAIRMODE Technical meeting

## Aveiro (Portugal) 24-25/06/2015

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The meeting was attended by 82 participants from 20 EU Member States and was held in parallel working group sessions (see Agenda). The summary below is structured according to these WG sessions. Action points and associated deadlines are highlighted in bold.

### 1. WG1: Assessment

WG1 was attended in average by 35-40 participants.

#### ○ **Guidance on Model Quality Objectives (MQO) & Benchmarking**

The [guidance document on MQO and benchmarking](#) is available on the Fairmode web site. It summarizes all previous works on the subject, lists key remaining issues (e.g. spatial representativeness, data assimilation...) and includes a “best practice” section to which 8 groups contributed so far. The outline of the updated version of the guidance document (V1.1) has been presented (S. Janssen). This guidance is intended as a living document, with the expectation that remaining issues will progressively be solved during technical meetings and be promoted to the “mature” part of the guidance document, while new issues will emerge with time. Document’s updates will be made in close collaboration with the forthcoming CEN TC264/WG43 on this topic. The focus of this session was on the remaining open issues. Some of these were addressed in ad-hoc sessions (e.g. modeling and monitoring, spatial representativeness) and their outcome is detailed here below. Presentations in this session included : (1) Performance criteria for exceedance values (E. Trimpeneers); (2) Consistency between yearly and hourly/daily MQO (J. Wesseling) and (3) links between MQO and data availability (75 vs. 90% thresholds) (E. Trimpeneers). Delta tool updates, mostly related to robustness, increased user’s friendliness and installation process have also been introduced to the participants (P. Thunis).

#### **Follow-up actions**

- 1) RIVM and JRC to work on the review of the yearly uncertainty derivation (Sep. 2015)**
- 2) JRC and VITO to review guidance and propose an updated version (Oct 2015)**
- 3) RIVM to test updated yearly formulations and (VITO, other?) to check consistency between hourly and yearly benchmarking approach (Dec. 2015)**
- 4) JRC and IRCEL to propose and test updated formulation for exceedance indicators (Dec. 2015)**
- 5) U. Aveiro to take the lead in drafting a publication on the basis of the collected benchmarking examples (Feb 2016).**

#### ○ **Composite mapping exercise**

A proposal was made and discussed in Baveno to re-launch an exercise similar to the ETC pilot exercise on EU mapping (2013) within Fairmode. The goal of the activity is to allow for a process of further harmonization of mapping practices in different Member States. Further, it is expected that this activity

may result in a set of guidance steps on how to evaluate and proceed for mapping purposes under EU legislation. The technical difficulties that will emerge from this activity (e.g. country border effects, model differences, input data inconsistencies, interpolation between different reporting grids...) are known and have been acknowledged by the entire community. These are very relevant to the Fairmode harmonization activities, as it potentially will lead to improved national AQ mapping and to an increased consistency among MS methodologies. The call for interest launched in spring received considerable interest: 28 positive contributions from 18 countries, among which 15 arising from national contact points. The requirements for the supporting IT infrastructure (e.g. download/upload facilities, visualization options...) have been discussed as well as the timing of the exercise. The degree of openness/accessibility of the results (Fairmode community, data providers...) as well as I/O format details still remains to be further discussed and agreed upon.

It is important to note that this exercise will be decoupled from the formal compliance checking process although it might provide guidelines to facilitate e-reporting in the future.

To support the composite mapping exercise, the JRC showed a prototype of a centralized database for DELTA datasets and presented some initial metadata information (model short description, contact point, reference year...) accompanying each model application. This database is intended as a support to further harmonize benchmarking practices by allowing data exchanges among participants and meaningful comparisons with their own datasets. This DELTA database is also proposed in support to the composite mapping exercise. Participants to the composite exercise will be asked to provide (if possible) their DELTA dataset in addition to their maps to allow further investigations.

#### **Follow-up actions**

- 1) VITO and JRC to develop and set-up a pilot supporting IT infrastructure (Dec 2015)**
- 2) JRC to collect datasets to populate the DELTA database (Dec 2015)**
- 3) VITO (and JRC) to coordinate participants contributions (Map data, if possible Benchmarking report, Delta datasets and emission datasets) and produce first composite map (Feb 2016)**

#### **○ Modeling and Monitoring**

The discussions focused on the available methodologies to evaluate model applications when monitoring data are assimilated. In particular the methodology proposed by U. Brescia during the previous technical meeting in Oslo, based on a Monte Carlo analysis, has been tested by three groups (VITO, U. Aveiro and CERC) and was shown to have little added value to the simpler but contested “leave one out” approach. In the latter monitoring data are assimilated to model results at all locations, with the exception of the one under evaluation.

#### **Follow-up actions**

- 1) U. Aveiro to further test the sensitivity and added value of the Monte-Carlo approach and update the “MQO and benchmarking” guidance document accordingly (Dec. 2015).**

## ○ Spatial representativeness

With a view of harmonization in this field, the idea of performing an inter-comparison exercise of different spatial representativeness methods had been launched in Baveno, as a joined effort within FAIRMODE and AQUILA. The exercise shall be executed by different groups, but on the same shared dataset.

JRC and CIEMAT presented the results of the survey to assess the feasibility of performing such an inter-comparison exercise. More than 20 groups showed their interest to participate so far, with methodologies ranging from simple (e.g. based on proxy data) to complex (e.g. Large eddy simulation). Further preparations related to the common dataset are foreseen to be conducted until December 2015, based on participants input. It is envisioned to start the actual inter-comparison exercise and to circulate the shared datasets by spring 2016.

O. Kracht presented a methodology to detect abnormal values in the Airbase dataset, based on variography. This technique as well as the performed data analysis can be very useful to modelers as they allow to better understanding of their model results.

### **Follow-up actions**

- 1) JRC to make available the country reports with detected anomalies (Sept 2015)**
- 2) JRC to further prepare the common inter-comparison dataset on the basis of participants needs (Dec 2015)**

## ○ Forecasting

This cross-cutting activity currently aims at providing a specific assessment of air quality forecasts. Efforts have been put on the development of indicators that provide information about the capability of the forecasting system to detect/anticipate regulatory threshold exceedances and to check its ability to provide more accurate forecasts than a persistence model. A series of presentation (INERIS, CERC, U. Aveiro, VITO) illustrated the current strengths and weaknesses of the proposed approach on practical applications. Among them the sensitivity of the results to the current uncertainty input parameter (tolerance margin) was shown to be important while the persistent model benchmark was shown to be more challenging to beat in rural than in urban locations. Proposals to improve the current approach have been made and the participants of this cross-cutting activity were asked to summarize their findings and come up with a concrete proposal.

### **Follow-up actions**

- 1) CERC to summarize the outcome of the discussion and detail the proposed options to further improve the forecast MQO indicators (Aug 2015).**
- 2) JRC to implement the proposed options (Sep 2015)**
- 3) Participants to test the new formulation on own dataset (Feb 2016)**
- 4) INERIS to apply the new formulation on MACC available datasets (Feb 2016)**

## 2. WG2: Emissions

WG2 was attended in average by 20 participants

### ○ Urban Emission Benchmarking

One of the main objectives of WG2 for the period 2014-2016 is to develop, test and document a benchmarking tool for emission data. The tool was ready for initial testing earlier this year and two publications describing the methodological framework were distributed to all participants prior to the Technical meeting. In the current version of the JRC [emission benchmarking tool](#), 3 top-down (TD) emission data sets from different providers (EC4MACS, TNO-MACC-II and JRC) can be compared with local bottom-up (BU) datasets originating from various cities, regions and countries.

During this technical meeting, participant experiences in 9 cities/areas (Oslo, Stavanger, Bergen, Stockholm, Madrid, Porto, Lisbon, UK and Cuba) were presented and discussed: Oslo, Stavanger and Bergen (S. López-Aparicio), Stockholm (K. Eneroth), Madrid and UK (M. Vedrenne), Porto and Lisbon (H. Martins) and Cuba (A. Clappier). The meeting was very useful to compile an initial feedback on the capabilities of the tool. Generally, participants were satisfied with the possibilities that the tool offers to test the consistency of detailed bottom-up emission inventories with those compiled for regulatory purposes at local, national and European scale. The feedback from the participants is summarized in Annex 1, where proposed follow-up actions are also listed. The main feedback was on: 1) the access to the tool on the webpages of FAIRMODE, 2) the need for supporting information on the Top-down emission inventories and to include a user guide, 3) the need for better mapping of the correspondences between bottom-up and top-down inventories and 4) additional functionalities of the JRC tool. During the discussion, it was announced that a new version of the TNO-MACC inventory (the MACC-III version) will be made available by TNO for comparison in the benchmarking tool. The idea is to include the new data set as a fourth TD inventory in the existing tool. The new webpages for WG2, the revised JRC emission delta tool with the corrections requested during the technical meeting and the additional TNO\_MACC-III TD inventory will all be circulated to the WG2 participants in September 2015, together with a simplified user guide developed by NILU. Further work until the next plenary meeting was agreed to focus on the mapping of sectors and the testing of the tool with the aim of a common publication.

#### Mapping sectors Team

A mapping working group or “mapping sectors team” was identified consisting of NILU, TNO, University of Aveiro and ATMOTERM. The team is to propose good ways of mapping between the existing top-down SNAP sectors and the sector allocation used in the bottom-up local/regional activities. This task has high priority as it has been identified as one of the key obstacles for interpretation in the comparison of TD with BU inventories. In addition, the team needs to identify means for a meaningful comparison of shipping emission since the current correspondence with SNAP8 is not useful. An additional sector to work with is industrial emissions and the team is to identify means for meaningful use of the diamond diagram for such emissions.

#### Planned publication on the usefulness of the JRC emission delta tool (lessons learnt)

Participants at WG2 were encouraged to keep testing the JRC delta tool in order to identify a series of “lessons learnt”. The goal is to gather experiences on the use of the benchmarking tool and compile this in a common publication. The initial tests have shown problems with VOCs in TNO\_MACC-II/EC4MACS in Stockholm and inconsistencies in S9 in TNO\_MACC-II for Porto and Lisbon. It is desirable to go further in the comparison of TD and BU inventories. A number of WG2 participants agreed to work with the JRC delta tool and identify more examples of improvement of TD inventories and of the BU inventories.

#### **Follow-up actions**

- 1) TNO to release and make available the TNO\_MACC-III inventory in the benchmarking tool (July 2015)**
- 2) JRC, NILU and BSC to improve web-page design and access to benchmarking tools (Aug 2015)**
- 3) JRC to update the emission benchmarking tool and include the TNO\_MACC-III inventory and supporting information from TNO and INERIS on the TD inventories (Sep 2015)**
- 4) NILU to distribute updated tool version with a simplified user’s guide to all WG2 participants (Sept 2015).**
- 5) NILU, TNO, U. Aveiro and ATMOTERM to produce a mapping document to support comparison between TD and BU (Dec 2015)**
- 6) WG2 Participants to further test the tool with the TNO\_MACC-III inventory (Feb 2016) with the goal of a common publication**

#### **○ Guidance on best practices in urban traffic emission compilation**

WG2 also focuses on the compilation of good practices for urban emission compilation, with focus on mobile exhaust sources. This work includes the identification of best available data sources and methods, identification of methodologies to understand emission processes and the comparison of emission factors. BSC and NILU are currently drafting a document with best practices (potentially reaching TIER 4) for urban mobile emissions. M. Guevara presented the current alternative practices for urban traffic emission compilation during the technical meeting and L. Tarrason lead the discussion to map current practices. It was agreed that the questions addressed during the technical meeting should be systematized as a questionnaire and circulated to all participants in order to map current BU inventory practices and the main problems with current practices. The group recommended the creation of a working group to test and evaluate use of Emission factor models (namely HBEFA vs COPERT) and investigate further links to ERMES. CERC and University of Coimbra representatives were interested to join this group.

#### **Follow-up actions**

- 1) WG2 chairs to circulate current practice questionnaire on urban traffic emission compilation (Oct 2015)**
- 2) WG2 participants to respond to questionnaire (Nov 2015)**
- 3) WG2 chairs to finalize best practice document (Dec 2015)**

## ○ Cross-cutting activities

In the framework of the CCA2 (Monitoring & modeling) J. Ferreira (University of Aveiro) presented a review of studies focused on the estimation of urban traffic emissions using air quality monitored data. This methodology can be applied to: (i) estimate traffic emissions for areas where detailed activity data is not available or (ii) improve and validate emissions estimated using traffic emission models. During the discussion, the City of Stockholm Environment & Health Administration explained that they used this type of approach to improve resuspension emission factors. Under CCA3, F. Meleux (INERIS) presented different approaches in which the use of satellite data is applied for improving emissions from biomass burning, agriculture and volcanoes. The importance of [Semi-Volatile Organic Compounds](#) (SVOC) in wood combustion and the need of considering these compounds in the PM emission factors were also highlighted. Finally, the discussion focused on how bottom-up inventories could be used to improve the spatial distribution of top-down inventories. The main concern of this approach is that harmonization between the two inventories (e.g. same emission sources considered) is mandatory in order to apply it. For the WG2 & WG3 common session see summary under the minutes of WG3.

## 3. WG3: Source apportionment

WG3 was attended by an average of 25-30 participants

### ○ Inter-comparison exercise (IE)

Inter-comparison exercises aim at evaluating the performance of SA methods to be used in air quality management. The 3<sup>rd</sup> European wide SA inter-comparison involves, for the first time, receptor oriented (RM) and source oriented models (CTM) allowing not only comparisons within each type of methodology but also cross checks. The overall concept and time framework was illustrated by C. Belis (JRC). O. Favez (INERIS) presented the dataset of speciated PM and ancillary data that will be used for the RM part of the exercise. J. Kuenen (TNO) described the new TNO-MACC-III emission inventory with fuel detail that will be used for the inter-comparison. G. Pirovano (RSE) presented the outline of the CTM inter-comparison developed in collaboration with M. Pay (BSC) and M. Reizer (WUT). The main topics were the definition of the domains, the input data (boundary conditions, meteorological fields, emission inventory) the simulation time windows, the emission activities to track and the areas. M. Pay (BSC) presented an hypothesis of output data format. At present, 15 groups using RMs and 6 groups using CTMs expressed the interest to participate.

#### Follow-up actions

- 1) RSE, BSC, WUT to finalize the document with the IE outline (Jul 2015).
- 2) WUT to prepare meteorological fields (Jul 2015)
- 3) INERIS to provide additional PM measures and MACC global reanalysis (Jul 015)
- 4) JRC to announce IE and distributes of input data for RMs and CTM (Jul - Aug 2015).
- 5) All participants to send expression of interest (Jul - Aug 2015)
- 6) BSC to organize centralized model performance evaluation (Set 2015)

### ○ Performance indicators and guidelines

C. Belis (JRC) presented the methodology developed in the previous inter-comparison exercises to evaluate the performance and uncertainty of source apportionment model output. The method will be used, with the necessary adjustments, for the next inter-comparison because it is flexible enough to be applied to both RMs and CTMs. Considering the performance of SA models is the topic of the recently created CEN/TC 264 WG 44, the structure and types of deliverable were discussed. Advantages and disadvantages of a standard or technical specification were commented. WG3 expressed satisfaction for the creation of the new CEN group and 6 experts declared their interest to join it. G. Pirovano (RSE) presented a proposal for the revision of the existing SA guidelines on receptor oriented models (RMs) which aims at extending the technical advice to source oriented models (CTMs). The proposal is structured in three sections: introduction, technical protocol and comparison between receptor and source oriented models.

#### **Follow-up actions**

- 1) JRC to circulate paper with the new assessment methodology (Sep - Oct 2015)**
- 2) Participants to send comments about the new guidance (Nov - Dec 2015)**

### ○ SPECIEUROPE – Joint session WG2-WG3

SPECIEUROPE is a centralized repository of European PM source profiles which are essential for the identification and quantification of air pollution sources. PM source profiles are also very useful for air quality modelling application to split PM emissions available in official inventories into model chemical species. The architecture and main features of the database were described in a presentation by D. Pernigotti (JRC, delivered by C. Belis). At present, the database contains 209 profiles. Three quarters of the data derive from measurements of the PM composition at the source and the rest are factor profiles deriving from SA studies. The most abundant categories are Traffic (including exhaust and road dust), industrial, biomass burning and dust. A number of statistical tests based on cluster and bootstrap analysis to assess the homogeneity of the profiles were presented. The database was welcome by the two WGs and participants expressed their availability to contribute when new or previous research becomes available. WG2 members expressed their interest in detailed information about source time trends and geographical distribution of sources for urban scale modelling. They will further elaborate a proposal on how the SPECIEU data can be used by emission experts in their work and will set up a list of requirements to secure the usefulness of the data for emission related work. This will be presented in the next Plenary meeting. Other proposals were: to include indoor source profiles (M. Almeida, IST), to extend the statistical analysis to SPECIATE, to compare SPECIEUROPE with emission inventories.

#### **Follow-up actions**

- 1) Participants to submit new profiles under the SPECIEUROPE format (Oct - Nov 2015)**
- 2) JRC to publish a new release of the database (Dec 2015).**
- 3) IST to explore the feasibility of creating a section for indoor sources (Dec 2015)**
- 4) NILU, BSC (WG2) to present a proposal how SPECIEU can contribute to WG2 activities (Feb 2016)**

### ○ **Connected projects/activities**

Prevot (PSI) presented the developments on SA of fine PM with spectroscopic instruments (AMS / ACSM): Ongoing phenomenology of ACSM, SoFi ME2 tool for source apportionment (constrained analyses), Offline AMS analyses. E. Diapouli (DEMOKRITOS) presented the outcome of ACCEPT and AIRUSE LIFE projects: tool to evaluate the effects of control measures, air pollution mitigation measures for southern European countries with main focus on biomass burning, industrial emissions, traffic and natural sources.

#### **Follow-up actions**

- 1) JRC to test the SA performance indicators using the ACSM intercomparison dataset (Oct 2015).**
- 2) JRC and DEMOKRITOS to discuss possible follow up of the LIFE projects (Dic 2015)**

### ○ **Capacity building/training**

A general agreement on the opportunity to develop capacity building tasks to disseminate the guidelines and showcase best practices was expressed by participants.

Training courses on SA targeted to European users were proposed. Summer school is a formula that has already been successfully applied (IAS, PSI). In addition, closer collaboration with IAEA for Regional Training Courses is to be explored.

#### **Follow-up actions**

- 3) JRC and IST to contact IAEA project officer to discuss common training activities (Oct 2015).**
- 4) All participants to explore financial opportunities (e.g. Marie Skłodowska-Curie, COST actions)**

## 4. WG4: Planning

WG4 was attended by an average of 10-15 participants

Planning is a new WG within FAIRMODE and is therefore not at the same level advancement as the other three working groups. The main aim of this WG is to propose a protocol to assess the performance of models used in scenario mode. Following the outcome of the previous technical meeting, steps have been made to simplify the methodology and supporting analysis tool. After providing a brief overview of the methodology, examples of applications based on the EMEP results (Belgium, Spain, Italy, Germany and UK), AURORA (Belgium) and AERIS (Spain) models have been presented. An application of the methodology to the MACC green scenarios has also been presented and showed the potential of the approach to highlight city specificities in terms of responses to emission policy options. The proposed indicators deliver information on local/regional/national potentials for reductions in terms of activity sectors and/or pollutants and a clear link to source apportionment has been identified. Suggestions to include common sessions between WG3 and WG4 during the next technical meeting to foster interactions were made

### Follow-up actions

- 1) VITO and JRC to publish presented analysis (Dec 2015)
- 2) JRC and U. Strasbourg to submit a workplan for possible WG3-WG4 interactions (Feb 2016)

## 5. Common topics

### ○ e-Reporting

A brief overview regarding e-reporting has been provided at start of the meeting while specific discussions also took place in WG3 (source apportionment). In WG3 C. Belis presented the progress in the implementation of e-reporting with particular emphasis on the plans and programs (P&P) databases where the role of source apportionment appears pivotal. The recommendations of WG3 were presented and discussed with MS during the Pilot meetings organized by the EEA. The need for flexibility and modifications indicated in the recommendations was backed by MS comments. In order to support MS to implement IPR, WG3 identified a number of aspects connected with SA that deserve clarification (e.g. definition and classification of source categories). Due to the complexity of the matter a proper discussion is required to evaluate the different options opening the door for widely accepted solutions. WG3 proposes to draft a short position paper to: a) point out areas that require clarification, b) evaluate pros and cons of the different options, and c) propose solutions at different possible levels and time frameworks.

Overall The JRC proposes to summarize the various supports made so far towards e-reporting in a common “recommendations” document. These supports include (1) the general survey directed to the National Contact Points (presented in Baveno); (2) the technical support document (results from the technical Fairmode WG on e-reporting); (3) the Feedback on IPR and source apportionment and (4) the outcome of the Baveno 2015 meeting discussions.

Fairmode has also a key role for the future development of guidelines in view of facilitating future e-reporting. The composite mapping exercise is seen as one essential step in this direction. Moreover, Fairmode will continue to actively contributing in the Pilot meetings organized by EEA in collaboration with DGENV to streamline the P&P datasets and to address the questions and comments from MS.

#### **Follow-up actions**

- 1) JRC to keep contacts on behalf of FAIRMODE with DGENV and EEA to provide scientific support for the implementation of e-reporting**
- 2) All participants to comment and contribute to the draft recommendation summary by JRC (Oct 2015)**
- 3) All WG3 participants to comment and contribute to the draft position paper initialized by JRC (Oct 2015)**

#### **○ Standardization**

A status of the CEN process has been given. Two working groups

- CEN/TC 264/WG 43 "Model quality objectives: Ambient air – Definition and use of model quality objectives for air quality model applications (WG 43) - Convener:
- CEN/TC 264/WG 44 "Source apportionment: Ambient air – Methodology for the assessment of the performance of source apportionment model applications (WG 44) - Convener: Claudio Belis (JRC)

have been voted and approved, together with the nomination of their chairs, Cristina Guerreiro (NILU) and Claudio Belis (JRC), respectively. A call for experts has been launched and Fairmode experts were invited to contact their CEN national organization to ensure participation in the two working groups. Keeping close collaboration between the starting CEN WG and Fairmode were stressed to be very important.

The first meetings are planned in Düsseldorf (Germany) on 13/14 October (WG 43) and 14/15 October 2015 (WG 44).

#### **Follow-up actions**

- 1) Participants interested in joining WG44 and WG43 to contact their CEN national members (July - Aug 2015).**
- 2) Nominated participants to join first CEN meetings in Düsseldorf (13 - 15 October 2015)**

**Annex 1.** Feedback on the emission benchmarking tool from participants at the Technical FAIRMODE meeting in Aveiro.

FEEDBACK – Main issue	Proposed corrective action
<p><b>WEB page</b></p> <ul style="list-style-type: none"> <li>- Improve access to the tool</li> <li>- Add links to supporting information (see below)</li> </ul>	<p>Revised webpage – NILU+BSC + JRC</p>
<p><b>NEED FOR SUPPORTING INFORMATION</b></p> <ul style="list-style-type: none"> <li>- Include a User Manual with images as simple cook-book</li> <li>- Add DETAILED information on the TD inventories and contacts</li> <li>- Add links to guideline publications on the use of the tool</li> </ul>	<p>NILU + BSC</p> <p>TNO + INERIS</p> <p>JRC</p>
<p><b>MAP SNAP CORRESPONDANCES</b></p> <ul style="list-style-type: none"> <li>- Main sources of problems for interpretation of TD vs BU</li> <li>- Map the conversion from NFR to SNAP Make the mapping information available in the web</li> <li>- <b>SHIPPING EMISSIONS</b> The correspondence with SNAP8 is not useful So the mapping team needs to identify means for a meaningful comparison</li> <li>- <b>INDUSTRIAL EMISSIONS</b> Identify means for meaningful use of the diamond diagram when we do not have A*EF</li> </ul>	<p>Mapping team (to report in Baveno 2016)</p> <p>NILU+ TNO+ UAveiro+ ATMOTERM</p> <p>Susana (NO), Jeroen (NL), Joana (PT), Agniewska (PL)</p>
<p><b>REVISION OF THE TOOL</b></p> <ul style="list-style-type: none"> <li>- Filter out division by too small numbers (Ratios diagram)</li> <li>- Check division of exhaust and non-exhaust sources</li> <li>- <b>Introduce ADDITIONAL VISUALISATION</b> Make available the Shape files for the are used in TD and BU Emission maps for the data provided - requires additional information provided</li> </ul>	<p>JRC</p>