

Task Force on Emission Inventories and Projections

Emissions of condensable and semi-volatile organic particulate matter

Summary of TFEIP background paper

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Scope



TFEIP TASK FORCE ON EMISSION INVENTORIES & PROJECTIONS

Background paper: Emissions of condensable and semi-volatile organic particulate matter

Joint workshop of the Task Forces on Emission Inventories and Projections (TFEIP), and Measurements and Modelling (TFMM)

Identifying the issue

Over recent years, it has become clear that there are often very high discrepancies in particulate matter (PM) emission factors (EF) used in certain countries to estimate PM from a range of sources e.g. residential combustion. One of the reasons for the differences in the PM EFs is that they have been derived from different measurement techniques:

- some EFs ('filterable') do not include the condensable fraction of PM, and instead allow estimation of just the 'primary' PM emitted from a source.
- some EFs include both the 'primary' and condensable fraction of PM (the latter being PM subsequently formed after the emissions of certain precursor gaseous species cool in the flue gas),

EFs for these respective approaches can differ by up to a factor of 5¹.

The different approaches being used by Parties lead to two immediate challenges:

- i. Inconsistent methods are being applied by Parties under the Convention which can affect compliance with the future national reduction commitments for PM_{2.5} under the 2012 amended Gothenburg Protocol. More specifically, those Parties that include the condensable fraction of PM may be at a relative disadvantage.
- ii. The air quality modelling community under EMEP (TFMM/MS-CW) use the reported emissions data to estimate air quality concentrations and impacts. They do not separately estimate condensables, resulting in underestimates where countries do not include them in their reporting.

These issues have previously been highlighted by various groups working under the Convention, including e.g.:

- The TFEIP at its 2014 workshop on residential/commercial combustion (and NRMM),
- The EMEP/TFMM air quality community, see e.g. Chapter 6 'Problematic emissions - particles or gases?' of the 2015 EMEP Status report²;
- FIAM/CIAM when trying to reconcile the different national approaches with emissions calculated in the GAINS integrated assessment model. This has also effectively meant national reduction commitments have not always been made on the same technical basis for Parties.

The issue is further complicated by the fact that the term "PM" is broadly used by different technical communities under the Convention, with no indication of which PM components are included.

¹ van der Gon, et al (2015). <http://www.atmoschem-phys.net/15/6503/2015/>

² http://emep.int/publi/reports/2015/EMEP_Status_Report_1_2015.pdf

- Identifying the issue
- On-going activities under the Convention
- Objectives of the workshop
 - short term options
 - longer-term options
- Agreeing on next steps

Identifying the issue

- It is clear there are often very high differences between countries in PM emission factors (EF) used to estimate emissions from a range of sources e.g. residential combustion.
- One of the reasons for the differences in the PM EFs is that they have been derived from different measurement techniques:
 - some EFs ('filterable') do not include the condensable fraction of PM, and instead estimate just 'primary' PM emitted from a source.
 - some EFs include both the 'primary' and 'condensable' fraction of PM
- Different 'languages' and terminologies used across the emission and AQ technical communities

Key documents: Decision 2012/3

Implications: The different approaches being used by Parties lead to some immediate challenges:

- i. Inconsistent methods are being applied by countries which may affect future compliance with emission ceilings. Parties that include the condensable fraction of PM may be at a relative disadvantage (higher reported PM emissions).
- ii. The AQ modelling community under EMEP use our reported emissions data to estimate AQ concentrations and impacts. They do not separately estimate condensables, resulting in underestimates where countries do not include them in their reporting.
- iii. GAINS baseline (2005) contains a mix of the two approaches in order to correctly approximate the reported national data

On-going activities under the Convention

- i. Review of the PM EFs included in the EMEP/EEA Guidebook, to establish whether the various PM EFs provided include the condensable fraction or not.
- ii. TFMM technical position paper identifies, from the AQ perspective, the additional information on semi-volatile organic compounds needed to improve current AQ model performance.
- iii. Today's joint TFEIP and TFMM workshop is a first step to address the issue with a view to:
 - increasing understanding of the technical issues and
 - moving towards solutions that may improve the consistency of information being generated under the Convention.

Objectives of today's workshop

1. Identifying where research is needed, to address e.g.:

- poor reliability of PM/VOC emission factors (regardless if including condensables or not);
- lack of reliable data about the speciation of VOCs and PM;
- lack of information about the distribution of organic compounds between volatility bins.

2. Identifying potential short- and long-term solutions for emission inventory reporting and the associated implications of each (costs, time required)

Possible options (?)

Short-term options

- Parties should report whether they included condensables for specific sources such as domestic heating in their PM emissions or not.
 - Is this adequately described in the IIRs?
- How best to incorporate latest measurements into the Guidebook (eg from Nordic project)

Possible longer-term options (?)

Option 1: Parties harmonise reporting to ensure PM emissions *include* condensables.

Impact: for certain Parties an adjustment of 2020 emission reduction obligations may be required)

Option 2 – Parties harmonise reporting to ensure PM emissions *exclude* condensables.

(Impact: for certain Parties an adjustment of emission reduction obligations would be required. TFMM will need to develop routines to include condensables in atmospheric models (comparable to routines for effective stack height).

Option 3 ‘Compromise option?’: require reporting of PM emissions excluding condensables, but to add periodic reporting (perhaps every 4 years) of the condensable component.

Or Parties use a consistent mix of approaches for different sectors.

Next steps

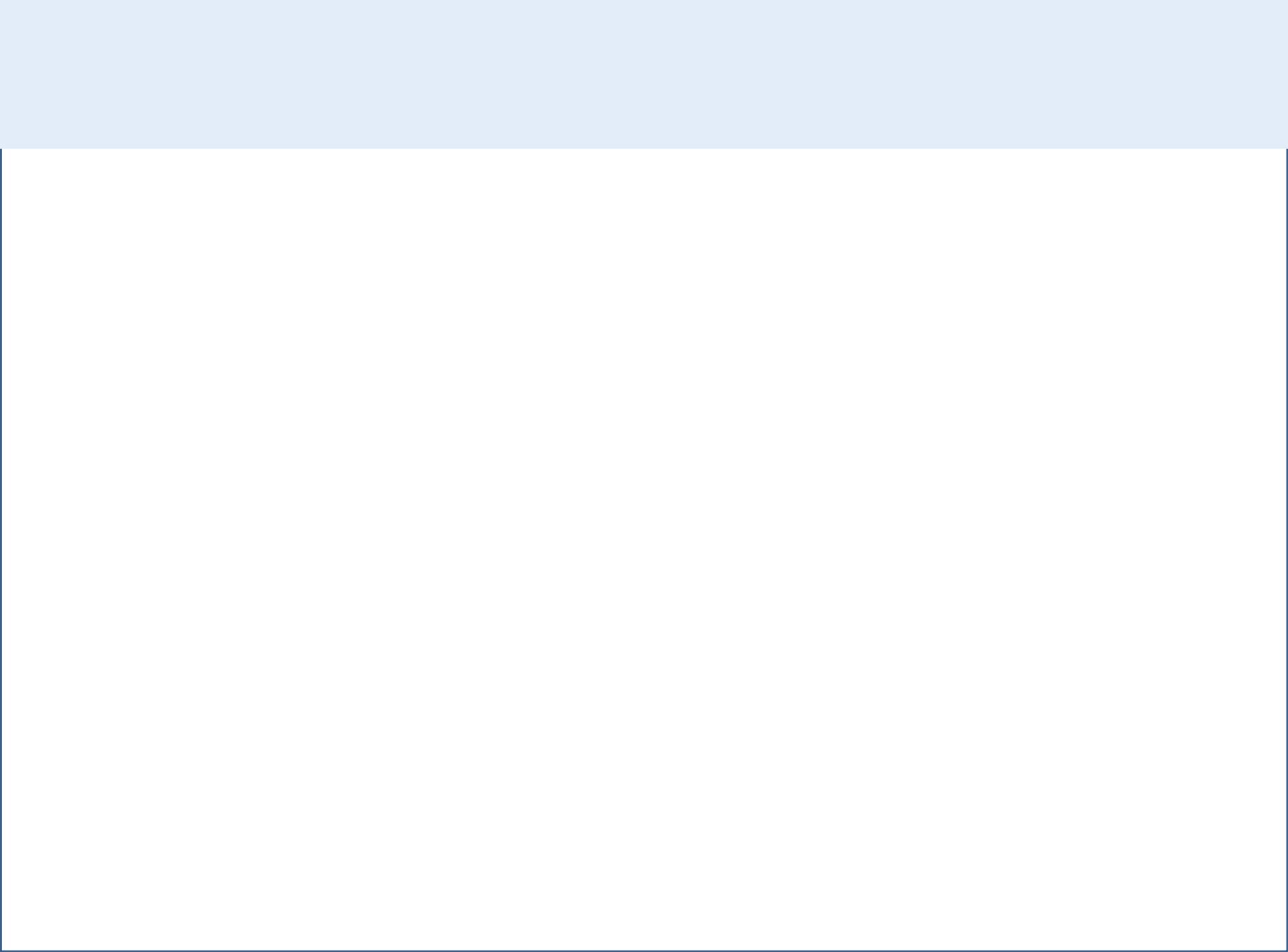
The TFEIP has been instructed to report back to the EMEP Steering Body (Sept 2016) on this issue

What we need to aim for:

- Develop an overall plan/timeline for addressing the issue;
- Propose short-term actions and some longer-term goals;

Next session (after coffee)

- What can practically be delivered in the short-term?
- What long-term goals are we aiming for?
- Need to align with CEN standards for emission measurements. But what about differing national standards?
- Practically feasibility of obtaining any additional measurements, speciation data etc.?



Discussion points

- Opinions on the options presented in the TFEIP background paper?
 - Short term:
 - should all Parties report whether they included condensables for specific sources such as domestic heating?
E.g. residential – national method incl condensable, Guidebook value etc.?
(But for many GB factors we don't know what they are?!)
 - How should this information be reported?
 - Report EFs being used (CEIP prioritised Questionnaire)
 - Guidance document, explaining issue and the proposed longer-term solutions.

Discussion points

- Opinions on the options presented in the TFEIP background paper?
Long term:
 - Aim for reporting total (filterable + condensables) for all(?) sources)
 - Or only filterable for all sources?
 - Or agree on one method per sector to be followed by all countries?
 - Memo items?

What are the challenges standardising EFs in the Guidebook (problems with consistency with national measurement standards?)
- General aim of reporting filterable plus condensables¹ (challenging for country specific EFs)
- Research – Better understand how the OM component might be estimated

• ¹ To be precisely defined

Discussion points

- For the Guidebook:
 - Should we delete Tier 1 for small combustion in the Guidebook?
 - What other changes needed?
- What exact/additional information might it be helpful for modellers to receive from each country (voluntary)
- TFMM participants – is what is being discussed useful for you?
- What are the key knowledge gaps?
- Who needs to do what and when?
- Tier 1, 1.5 – Add in appliance information (regional defaults)... C and I panel to lead
- Resource challenges and implications.