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Executive Body for the Convention on Long-range
Transboundary Air Pollution

**Steering Body to the Cooperative Programme for
Monitoring and Evaluation of the Long-range
Transmission of Air Pollutants in Europe**

Working Group on Effects

Second joint session*

Geneva, 13–16 September 2016

Item 5 (a) of the provisional agenda

**Progress in activities of the Cooperative Programme for
Monitoring and Evaluation of the Long-range
Transmission of Air Pollutants in Europe in 2016
and future work: measurements and modelling**

Measurements and modelling

Report of the Task Force on Measurements and Modelling on its seventeenth meeting

Summary

The present document contains the annual report of the Task Force on Measurements and Modelling to the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe, in accordance with the mandate set out in the 2016–2017 workplan for the implementation of the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/133/Add.1). It

* The Executive Body to the Convention agreed that, as of 2015, the Working Group on Effects and the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe should meet jointly, to achieve enhanced integration and cooperation between the Convention's two scientific subsidiary bodies (ECE/EB.AIR/122, para. 47 (b)).



summarizes the discussion at and the outcomes of the Task Force's seventeenth meeting, held from 18 to 20 May 2016 in Utrecht, the Netherlands. The report reflects the status of implementation of the work activities of the Task Force as set out in the Convention's workplan (items 1.1.1.2–1.1.1.4, 1.1.1.7, 1.1.1.21, 1.1.2.1, 1.2.1–1.2.4, 1.3.4, and 1.3.5), and in the informal document submitted to the Executive Body for the Convention at its thirty-fourth session, "Basic and multi-year activities in the 2016–2017 period" (items 1.1.3, 1.1.8 and 1.3.3).

I. Introduction

1. The present report presents the outcomes of the seventeenth meeting of the Task Force on Measurements and Modelling, held from 18 to 20 May 2016 in Utrecht, the Netherlands, including the presentation of activities undertaken since the previous Task Force meeting (Krakow, 5–8 May 2015). It describes progress in the implementation of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) monitoring strategy (ECE/EB.AIR/2009/16/Rev.1), progress in the development of modelling tools and specific ongoing assessments (trends in air pollution; a heavy metals pilot study; field campaign planning; and current and potential collaborative activities with other bodies of the Convention on Long-range Transboundary Air Pollution).

2. Fifty-seven experts from the following Parties to the Convention on Long-range Transboundary Air Pollution attended the meeting: Belarus, Belgium, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Netherlands, Poland, Russian Federation, Slovakia, Spain, Sweden, Switzerland and the United Kingdom of Great Britain and Northern Ireland. Also present were representatives from three of the EMEP centres — the Chemical Coordinating Centre (CCC), the Meteorological Synthesizing Centre-East (MSC-E) and the Meteorological Synthesizing Centre-West (MSC-W) — as well as from the European Environment Agency, the European Commission Joint Research Centre (JRC) and the World Meteorological Organization (WMO).

3. Mr. Augustin Colette (France) and Ms. Oksana Tarasova (WMO) chaired the meeting. They welcomed the participants, presenting the agenda and highlights of the ongoing workplan.

4. An expert from the Netherlands Organisation for Applied Scientific Research — the Dutch non-profit research organization that hosted the meeting — gave a presentation on the activities of the institute in the context of the work of the Convention, highlighting its role in the development of emission inventories and in support of modelling activities.

5. The Chair of the EMEP Steering Body presented an update of EMEP activities, focusing on the mid-term review of the long-term strategy, the finalization of the 2016 Convention assessment report,¹ and cooperation with other bodies within and outside of Convention (e.g., the Arctic Monitoring and Assessment Programme, the Copernicus Atmosphere Monitoring Service and the Aerosols, Clouds, and Trace gases Research InfraStructure Network (ACTRIS)). The revision of the mandates of the task forces and the possibility of defining priority actions and performance indicators were also discussed.

¹ R. Maas and P. Grennfelt, eds., *Towards Cleaner Air: Scientific Assessment Report 2016* (Oslo, 2016). Available from <http://www.unece.org/environmental-policy/conventions/envlrapwelcome/publications.html>.

II. Modelling issues including national contributions

6. Representatives of both MSC-W and MSC-E gave presentations on the development of the EMEP models and available model products in support of the implementation of the Convention's protocols.

7. A representative of MSC-E presented the recent developments in heavy metals and persistent organic pollutant modelling, in particular for national-scale case studies, trend assessments and transition to the new spatial grid. MSC-E was collaborating with the Working Group on Effects to provide additional measurements for the verifications of the model output. A list of priority actions for cooperation with the Centre on Emission Inventories and Projections to improve emission handling in MSC-E models was also presented, as well as the involvement of the Centre in developing the Global EMEP Multi-Media Modelling System (GLEMOS) and its use for a number of international activities, including the global assessment of mercury pollution. That work was being done in collaboration with the Arctic Monitoring and Assessment Programme, the United Nations Environment Programme and its Minamata Convention on Mercury and Stockholm Convention on Persistent Organic Pollutants, and the Baltic Marine Environment Protection Commission. Additional focus was given to urban-scale benzo(a)pyrene modelling. A case study had been performed for the city of Prague, which highlighted the issues of constraining the temporal variability of benzo(a)pyrene emissions using multi-parameter regression and the need for specific downscaling of the EMEP model at the urban scale. It was commented that regression modelling might not be the best approach for urban-scale modelling, as it did not include the effects of meteorology and in particular the role of the planetary boundary layer in the formation of pollution episodes.

8. A representative of MSC-E presented a country-specific lead pollution assessment with fine spatial resolution for Belarus. The country had been provided with detailed information about lead levels, including spatial distribution, source-receptor relationships, the contribution of source categories and large point sources, the pollution of cities, etc. The sensitivity analysis showed that the modelling results depended not only on the total emission value in the country, but also on its spatial distribution. Moreover, it was indicated that national heavy metal emissions in the countries of Eastern Europe, the Caucasus and Central Asia might be underestimated, and further efforts of the EMEP Centres, national experts and the Task Force on Emission Inventories and Projections were needed to analyse heavy metal emissions in those countries. The evaluation of the quality of national monitoring data in accordance with procedures accepted under EMEP was appreciated. In order to further understand the origin of atmospheric heavy metal pollution in the countries of Eastern Europe, the Caucasus and Central Asia, similar studies could be initiated for other pollutants (e.g., particulate matter) and in other countries (e.g., Poland, the Russian Federation, Ukraine). The first steps in the preparation of a case study devoted to cadmium in Poland were also presented, as well as a comparison with the model developed in the United Kingdom through a case study on heavy metal assessment presented by an expert from the United Kingdom.

9. The presentations were followed by a general discussion about the contribution of long-range transport to urban-scale heavy metal pollution and the need to liaise further with the Centre on Emission Inventories and Projections on the outcome of national case studies on uncertainties in national emission estimates.

10. A representative of MSC-W reported on urban-scale modelling through downscaling of the MSC-W model using a coupling between the regional model and a Gaussian dispersion kernel. Such coupling allowed a better comparison with local-scale

measurements, although it was limited to non-reactive species. A preliminary estimation of the effective radiative forcing resulting from the implementation of the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone was also presented.

11. An expert from Belarus presented the work on the assessment of uncertainty in volatile organic compounds emissions in the country. An expert from Italy presented results of the work on the attribution of the role of meteorology/circulation type in variations of the levels of particles with an aerodynamic diameter equal to or less than 10 micrometres (PM_{10}). She also compared the levels of PM_{10} concentration at the twin sites and concluded that at the rural site the elevated concentrations of particulate matter (PM) were connected with secondary aerosol production, while at the urban site the elevations were driven by primary emissions. An expert from Croatia presented a validation of the EMEP/MSC-W model using the DeltaTool developed by JRC, highlighting the versatility and comprehensiveness of the approach. An expert from the Netherlands presented a national-scale hybrid regional and local modelling approach to improve the comparison with in situ data. He concluded that, depending on the component (primary or secondary), the comparison was better either with the Lagrangian or Eulerian approaches. An expert from the United Kingdom presented an intercomparison of chemical mechanisms of ozone formation, demonstrating the important spread in model behaviour if the simplified schemes were used. Another expert from the United Kingdom presented a model analysis of intense PM episodes, highlighting the contribution of desert dust.

12. An expert from Spain gave a presentation with a focus on ozone episodes. Focus on such episodes allowed a better understanding of model behaviour and performance, while the definition of the episodes depended on the choice of metrics. He demonstrated that episodes had both regional and local components, and the actions targeting local emissions could help with the air quality only when the local component was dominant.

13. An expert from France gave a presentation about condensable emissions and their handling in models, where important uncertainties remained, especially for the traffic and residential (wood burning) activity sectors. For wood burning, the issue was demonstrated in the EMEP Status Report 1/2015.² A case study for France would be initiated by the Task Force in order to quantify the issue for the traffic sector. A joint working group with the Task Force on Emission Inventories and Projections had been set up and had met in Zagreb on 16 May 2016.

14. The presentations were followed by a general discussion on the need to further document present-day model capabilities in simulating ozone production and to put that in the context of the related work within the Convention over the past 20 years. The discussions also touched on the role of condensables in improving PM modelling. Aspects of urban-scale modelling were also highlighted, and a group of experts interested in twin sites observations and modelling was established. Climate impacts of air quality policies were also further discussed. The major issue with the current modelling tool was the fact that peak concentrations were poorly reproduced. Models required further validation over the sea, while the observational database was limited to a number of cruise measurements. The need for better analysis of the already available model data was also highlighted.

² *Transboundary particulate matter, photo-oxidants, acidifying and eutrophying components*, available from http://emep.int/publ/common_publications.html#2015.

III. Implementation of the monitoring strategy and national contributions

15. A representative of CCC gave a presentation on the status and perspective of the EMEP monitoring network. Data quality objectives for heavy metals were 20 years old and needed revision. Measurement quality was also not improving as expected, and a workshop would be convened by CCC in fall 2016 to address that issue with the Parties. Registration for that workshop remained open. A repetition of the 2006 persistent organic pollutant passive measurement campaign was planned in the summer of 2016, with the confirmed interest of 93 sites in 39 countries. CCC was proposing a new, more complete, reporting template (accompanied by an automated verification tool), which would require some time investment by Parties to implement, but would offer substantive gains over the long run for both data submission and incorporation in the EBAS database and reporting system.³ The new database made it possible to link the data in the database with the performance of the laboratory in the inter-laboratory comparison. The new template stemmed from the move of the Global Atmosphere Watch World Data Centre on Reactive Gases to the Norwegian Institute for Air Research, which hosted CCC, so that relevant observations collected at EMEP sites could now be submitted simultaneously to both the Global Atmosphere Watch and EMEP databases. Collaboration with other programmes, such as the Arctic Monitoring and Assessment Programme, the Copernicus Atmosphere Monitoring Service and the Research Centre for Toxic Compounds in the Environment, was also presented.

16. An expert from Spain presented a concept note about the relevance of EMEP measurements in assessing the contribution of long-range transboundary air pollution to urban air pollution. For that purpose, measurements performed at EMEP sites could be twinned with urban monitors and observatories. Various methodological strategies were presented as well as a few possible pairs of sites in various Parties. A call for data and volunteers was formulated, as well as a proposal for modellers to join the analysis. The topic was likely to become an important Task Force activity until 2017 because of the growing interest in the health impacts of air pollution and the fact that, as stated in the 2016 Convention assessment report, “because transboundary sources are often major contributors to urban pollution, many European cities will be unable to meet [World Health Organization] guideline levels for air pollutants through local action alone”.⁴

17. An expert from the United Kingdom presented an update on measurement techniques for reduced and oxidized nitrogen, and offered participants the possibility to engage in an intercomparison exercise. A representative of WMO detailed the outcome of a Global Atmosphere Watch workshop devoted to the nitrogen cycle, and an expert from Switzerland presented innovative analyses of PM filtering for the purpose of source apportionment. An expert from JRC presented the results of an intercomparison of carbonaceous aerosols, emphasizing that there were low cost opportunities to improve the quality of total and elemental carbon measurements. The JRC expert concluded that optical methods became exponentially poor while moving to low concentration values and that required improved calibration strategies.

18. An expert from Norway, speaking on behalf of an expert from France, outlined the potential for linkages between EMEP and ACTRIS, including with regard to the siting of ACTRIS measurements that occurred at a subset of EMEP and Global Atmosphere Watch

³ See <http://ebas.nilu.no/>.

⁴ R. Maas and P. Grennfelt, eds., *Towards Cleaner Air*, p. ii (key finding No. 5).

stations and the calibration strategy that was centralized in ACTRIS and offered for a fee to participants, as well as the way forward to formalize the collaboration with EMEP. An expert from Germany presented the differences in data reporting through ACTRIS and EMEP with a focus on metadata information and detection limit handling. It was emphasized that through the new EBAS reporting system data could be labelled simultaneously with the ACTRIS, EMEP and Global Atmosphere Watch identifications.

19. An expert from Switzerland presented a new offline filter technique to measure PM chemical composition and determine organic aerosol sources using an Aerosol Chemical Speciation Monitor. The approach relied on a centralized analysis of filters that would be provided by CCC and distributed throughout the network and would therefore offer a relevant addition in the characterization of aerosol compared with Aerosol Chemical Speciation Monitor instruments that were operated mainly in Western Europe. That approach might include urban-rural station pairs as well. The expert would elaborate a more specific proposal to be considered in the fall during the workshop on data quality issues.

20. Another expert from Switzerland presented an alternative concept for a potential field campaign that would help reduce uncertainties in black carbon measurements. The issue was considered mostly of interest for radiative forcing assessment and climate studies and was assigned a lower priority.

IV. Trends in air pollution over the 1990–2012 period

21. A co-Chair of the Task Force presented the main findings of the trends report, *Air Pollution Trends in the EMEP region between 1990 and 2012*,⁵ and announced its publication in May 2016. Dissemination of the report was encouraged to publicize the findings of the report and also to showcase the value of the EMEP network in addressing important policy questions.

22. An expert from France presented the concept and status of the Eurodelta-trend multimodel exercise.⁶ An expert from Italy presented the analysis of modelling results that could be performed using the DeltaTrendTool. Another tool to visualize trends in optical properties of aerosols designed in the framework of ACTRIS and currently used by the Aerosol Comparisons between Observations and Models (AeroCom)⁷ community was presented by a Norwegian expert. It would be made available to the broader modelling community. Trends in secondary inorganic aerosols were summarized by an expert from the Netherlands, who presented a comparison between observations and simulations by three models. She concluded that a multi-model approach should be used for trend analysis. A representative of MSC-W presented trends in PM for several periods. She highlighted the general underestimation of PM₁₀ trend by models in comparison with observations. An expert from Spain presented wet and dry deposition trends. A novel approach in temporal decomposition of model errors was presented by a representative of JRC, while a representative of MSC-W presented a trend visualization tool.

⁵ Augustin Colette and others, EMEP/CCC report 1–2016 (Kjeller, Norway, Norwegian Institute for Air Research, 2016). Available from <http://www.unece.org/environmental-policy/conventions/envlrapwelcome/publications.html>.

⁶ See <http://www.psi.ch/lac/eurodelta3>.

⁷ See <http://aerocom.met.no/Welcome.html>.

23. An expert from Switzerland outlined a statistical approach in time series decomposition for ozone trend assessment. An expert from Sweden introduced a model analysis to decompose the main drivers of ozone trends in Sweden. An expert from Italy presented a retrospective analysis of air quality over northern Italy.

V. Conclusions and way forward

24. A co-Chair of the Task Force detailed the potential role of the Task Force in strengthening the links between EMEP and the Working Group on Effects, as pointed out in the Convention workplan. Volunteers were identified to set up a contact group between the two communities for both measurement and modelling activities.

25. A co-Chair of the Task Force described a proposal to formulate an updated mandate for the Task Force. Parties made comments and a revised proposal, taking those comments into account, was prepared for forwarding to the EMEP Steering Body.

26. The Task Force co-Chairs concluded the workshop highlighting current and potential future flagship projects. For the forthcoming year, an important part of the work would be devoted to condensable emission handling and the added value of twin urban/rural sites for the assessment of the contribution of long-range transboundary air pollution to urban air pollution for both the main pollutants, heavy metals and persistent organic pollutants.

27. The representative of the Czech Republic offered to host the eighteenth meeting of the Task Force in Prague in the first two weeks of May 2017.
