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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 (EMEP)

Thirtieth session
Geneva, 4–6 September 2006
Items 4 (a) to (e) of the provisional agenda

MEASUREMENTS AND MODELLING

Progress report by the Co-Chairs of
the Task Force on Measurements and Modelling in collaboration with the secretariat

INTRODUCTION

1. This report presents the results of the seventh meeting of the Task Force on Measurements and Modelling, held in Helsinki from 10 to 12 May 2006. The Task Force discussed in particular the implementation of the EMEP Monitoring Strategy and Measurement Programme 2004–2009, the need for information on finer scales, model validation, analysis of uncertainties and source-receptor modelling. Minutes and presentations are available at www.nilu.no/projects/ccc/tfmm/index.html.

2. Experts from the following Parties to the Convention participated in the meeting: Austria, Belarus, Bulgaria, Canada, Croatia, the Czech Republic, Denmark, France, Germany, Hungary,

Ireland, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Spain, Sweden, Switzerland, the United Kingdom and the European Community (EC). Also present were representatives from the Chemical Coordinating Centre (CCC), the Meteorological Synthesizing Centres – East and West (MSC-E, MSC-W) of EMEP, the World Meteorological Organization (WMO) and the European Community's Joint Research Centre (JRC), as well as a member of the secretariat.

3. Mr. D. Derwent (United Kingdom) and Ms. L. Jalkanen (WMO) co-chaired the meeting. The meeting was hosted by the Finnish Meteorological Institute.

I. IMPLEMENTATION OF THE MONITORING STRATEGY

4. In accordance with the workplan for the implementation of the Convention (item 2.2), the Task Force discussed the national implementation of the monitoring strategy.

5. Mr. Kjetil Torseth (CCC) presented details of the new sites being established in the countries of Eastern Europe, Caucasus and Central Asia (EECCA). These sites would provide a much-needed eastward extension of the EMEP monitoring network. Huge activity was required to produce the methodologies for Level 3 parameters. At Level 1, few countries could provide data on gas-/particle-resolved nitrogen chemistry, black carbon, persistent organic pollutants (POPs) and mercury. Attention was drawn to a passive sampling campaign planned for POPs.

6. Attention was drawn to the current status of monitoring in the Arctic. Meteorological analyses had revealed that Europe was the main source of atmospheric pollutants entering the Arctic through fast low-level transport over Scandinavia and Siberia in winter. Additional background stations were required for air and precipitation monitoring in the North American Arctic and air monitoring in Russia.

7. The Task Force discussed a modification to the EMEP filter pack system for base cations, sulphur and nitrogen compounds, presented by a Swedish expert. The modified filter pack sampled the PM₁₀ fraction of the particles and gave the PM₁₀ mass. Comparisons showed that the old filter pack also sampled particles larger than PM₁₀.

8. The Task Force was informed of one new EMEP site which would become operational in autumn 2006 and was located at Aucencorth Moss (United Kingdom), and of the locations and instrumentation that had been selected for five new EMEP sites in Ireland (Malin Head, Oak Park, Carnsore Point, Glenn Veagh and Wexford).

9. The Task Force:

(a) Welcomed the support given by CCC to Parties in the implementation of the EMEP monitoring strategy and recognized that without a full commitment from Parties, the monitoring data required to improve the EMEP modelling would not arrive in time to support the activities underpinning the review of the Gothenburg Protocol; and

(b) Recommended, with regard to the operation of EMEP filter packs, that CCC be encouraged to request separate reporting of the gaseous and aerosol components in addition to the sums of total inorganic nitrate (TIN) and total inorganic ammonia (TIA), that the reporting forms be amended to allow separate reporting and that such gas/particle data be flagged accordingly.

II. MODELLING OF POPs AND HEAVY METALS

10. The Task Force noted the Workshop on the Review of the EMEP MSC-E Models on Heavy Metals and POPs, held in Moscow in October 2005 (ECE/EB.AIR/2006/4).

11. Experts from MSC-E described further development of the model in response to the recommendations of the workshop with regard to re-suspension processes for heavy metals, the use of the European Centre for Medium-range Weather Forecasts (ECMWF) data and the extension of the modelling to second-priority heavy metals, as well as to the refinement of the physico-chemical data used, degradation processes on particles and the evaluation of new POPs.

12. The Task Force agreed that further work was needed on improving national emission inventories for POPs and heavy metals, the vertical and temporal resolution of meteorological data; extending scale of mercury model to global; and moving to ECMWF meteorological data. It also agreed that further scientific investigations with regard to the extension of the models should focus on the development of emission algorithms for re-suspension and volatilization; the potential influence of climate change; and dry deposition processes to forests.

13. The Task Force supported the workshop's conclusion that the MSC-E Heavy Metals model was suitable for evaluating the long-range transboundary transport and deposition of heavy metals in Europe, while recognizing the significant difficulties that remained with official emission data and the significant uncertainties with regard to the chemistry and heavy metals deposition. It endorsed the conclusions of the workshop that, within the limitations of current understanding of the fate and behaviour of POPs in the environment, the MSC-E POPs model represented the state-of-the-art science and was adequate for evaluating the contribution of long-range transport to the environmental impacts caused by POPs.

14. The Task Force recognized the importance of the preparatory work for the model review carried out by MSC-E and welcomed the steps taken by it to improve the models following up the recommendations of the workshop with regard to re-suspension process for heavy metals, the use of ECMWF data, second-priority heavy metals, POPs physico-chemical data, degradation processes on particles and evaluations of new POPs. It expressed the need for closer cooperation between EMEP and the Working Group on Effects in investigating the re-suspension of heavy metals, in particular with regard to information on heavy metal accumulation in soil and other compartments, dynamical redistribution between the surface and subsoil layers, and availability for the wind erosion, noting the usefulness of the information on heavy metal re-suspension for evaluating critical load exceedances.

15. Attention was drawn to activities on heavy metals emission inventories within the ESPREME project, and in particular on mercury speciation and release of heavy metals to agricultural soils. It was highlighted that there were differences between the official lead emissions and those from ESPREME due to missing source categories in the former.

16. The Task Force noted the progress achieved under the ESPREME project on the mass closure problem for some important heavy metals and stressed that a solution to this problem would support the application of an effects-based integrated assessment approach in controlling heavy metals emissions (to be undertaken by ESPREME), while recognizing the current lack of general agreement on the feasibility of such an approach for heavy metals.

III. MONITORING AND MODELLING OF ELEMENTAL AND ORGANIC CARBON

17. The Task Force discussed the status of elemental carbon (EC) and organic carbon (OC) monitoring within EMEP, which was described by an expert from CCC. He emphasized that interpreting the results was difficult as they were obtained using various sampling approaches and analytical instrumentation.

18. The Task Force took note of the investigations carried out at the Joint Research Centre (JRC) into sampling and measurement protocols for carbonaceous aerosols. Positive and negative artifacts were described. The need for any protocol to be able to detect pure OC as OC and EC as EC was stressed. At present there was no standardized method available that solved all the sampling and measurement problems for EC and OC.

19. The experts present made recommendations that would constitute an interim method for EC/OC monitoring within EMEP until a final standard method could be defined.

20. The Task Force discussed progress with modelling OC within the Unified EMEP model at MSC-W, noting that the model underestimated black carbon (BC) and OC, particularly during wintertime. It was concluded that OC modelling was still in its infancy and that model descriptions were highly sensitive to assumptions. Further measurements of OC were required before modelling results could be considered adequate.

21. An expert from MSC-W addressed the question of why the Unified model underestimated the EC fraction of PM₁₀. It was concluded that biomass burning was not widespread enough to account for the underestimation. Uncertainties in the long-range transport and deposition of EC were large, but not large enough to account for the observed model underestimation. It was thought likely that the underestimation of road transport emissions was the main cause of the model underestimation of EC. Also, off-road sources had yet to be considered, and these might also be underestimated.

22. The Task Force welcomed the progress made at MSC-W in the modelling of elemental and organic carbon within the EMEP Unified model. Progress with EC modelling has focused on missing emission sources such as biomass burning, uncertainties in atmospheric transport and uncertainties in the major anthropogenic sources such as domestic combustion and road transport. Empirically based parametrizations have been implemented to describe the formation of anthropogenic and biogenic secondary organic aerosols.

23. The Task Force recognized that considerable uncertainties remained regarding EC/OC modelling and that improved emission inventories were urgently required for EC and primary organic matter. OC model development was currently hindered by the lack of adequate and comprehensive measurement data, and this also required further urgent activity within EMEP.

24. The Task Force requested that CCC and JRC Ispra experts on EC/OC measurements jointly develop a pragmatic interim strategy for sampling and analysis for implementation within EMEP. This strategy will be circulated within the Task Force community for agreement in time for the EMEP Steering Body session in September 2006.

IV. PARTICULATE MATTER ASSESSMENT REPORT

25. Mr. Derwent informed the Task Force of the discussions held within the EMEP Bureau concerning the proposed particulate matter (PM) assessment report. This report would focus on mass closure for PM based on the standard analytical tools available nationally. The report would comprise two parts: Part A would contain an EMEP-wide assessment and Part B a compilation of national contributions. The Task Force expressed support for these proposals, and experts agreed to nominate contact points to help with national assessments.

26. The Task Force agreed that the PM assessment report should address the following questions:

- (a) Are there significant differences in the PM climate across Europe?
- (b) To what extent is PM a transboundary problem?
- (c) How well do we understand the major PM components and their origins?
- (d) How important are natural PM sources?
- (e) To what extent do sources outside of Europe contribute to European PM?
- (f) How important is regional PM for urban PM levels?
- (g) How well can we link sources to observed PM levels using atmospheric models?
- (h) How large are the uncertainties in PM measurements and model predictions?
- (i) What improvements are required in PM monitoring, modelling and basic scientific understanding for the assessment of health and climate impacts of PM?

27. It agreed to hold a workshop to review the national assessments and compile a first draft of the EMEP-wide assessment in November 2006. The first draft of the assessment report would be reviewed at the eighth meeting of the Task Force in spring 2007 and presented to the EMEP Steering Body in September 2007.

V. URBAN FINE-SCALE MODELLING OF PARTICULATE MATTER AND OZONE

28. Mr. Derwent informed the Task Force of the discussions held within the EMEP Bureau concerning the fine-scale modelling of urban PM and ozone. The Task Force was of the view that there was a wealth of national experience on this issue that could be brought into the framework of integrated assessment modelling. This could be used to form a bridge between the regional modelling from MSC-W and the urban fine-scale modelling required for health assessments regarding PM and ozone. The Task Force welcomed the suggestion of the EMEP Bureau to hold a joint workshop with the Task Force on Integrated Assessment Modelling on urban fine-scale ozone and PM modelling in October 2006.

29. The Task Force agreed that such a workshop should address the following questions: (a) Are there robust monitoring data for estimating the urban increment for fine PM and ozone in different parts of Europe, and, if so, what do these data tell us? (b) What are the main factors influencing the urban increments of PM and ozone in national studies?

VI. EMISSION INVENTORIES FOR POPs AND HEAVY METALS

30. Mr. Derwent informed the Task Force of the discussions held within the EMEP Bureau on the uncertainties in official and expert emission inventories of heavy metals and POPs that had surfaced during the review of the MSC-E models. The modelled data for heavy metals were on average significantly lower than the observed data. In particular, there were uncertainties concerning the emission data for heavy metals. There was still scientific uncertainty regarding the cause of these discrepancies, and further work on this issue was needed, in close collaboration between the Task Force and the Task Force on Emission Inventories and Projections. The Task Force welcomed the suggestion to hold a joint workshop with the Task Force on Emission Inventories and Projections on uncertainties in emission inventories during 2007 and discussed some possible questions to be addressed at the workshop.

VII. AIR QUALITY FORECASTING AND DATA ASSIMILATION

31. The Task Force noted the activities carried out on air quality forecasting and data assimilation. It recognized that both approaches could lead to significant long-term improvements in model performance. By analogy with meteorological modelling, data assimilation would eventually become an integral part of air quality assessment. The Task Force agreed to maintain a watching brief on air quality forecasting and data assimilation to see what advantages they could bring to EMEP modelling in the long term.

VIII. FURTHER WORK

32. The Task Force requested that the following items be reflected in the 2006 workplan of the EMEP Steering Body:

- (a) PM assessment report
- (b) Urban fine-scale modelling
- (c) Evaluation of the CITY-DELTA modelling
- (d) Source-receptor relationships from the EMEP Unified model

33. The Task Force also requested that the concepts of air quality forecasting and data assimilation be considered for the longer-term 2008 workplan.

34. The Task Force agreed to hold its eighth meeting in spring 2007 and proposed the following items for its agenda:

- (a) The draft PM assessment report

- (b) The urban fine-scale modelling workshop report
- (c) Results from CITY-DELTA 3
- (d) Results from EURO-DELTA
- (e) Progress reports on fine-scale deposition modelling
- (f) Report on activities of the Task Force on Hemispheric Transport of Air Pollution
- (g) Results from the intensive measurement campaigns
- (h) European activities with Models-3/CMAQ

35. It further agreed to hold:

- (a) A workshop on the PM assessment report on 29 November – 1 December 2006 in Paris;
- (b) A workshop on urban fine-scale modelling with the Task Force on Integrated Assessment Modelling in October 2006 in Vienna;
- (c) A joint workshop with the Task Force on Emission Inventories and Projections on uncertainties in emission inventories; and
- (d) A joint workshop with the Expert Group on Ammonia in December 2006 in Edinburgh (United Kingdom).