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Executive Body for the Convention on Long-range
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**Steering Body to the Cooperative Programme for
Monitoring and Evaluation of the Long-range
Transmission of Air Pollutants in Europe (EMEP)**

Thirty-sixth session

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Item 7 (d) of the provisional agenda

**Progress in activities in 2012 and future work:
hemispheric air pollution**

Hemispheric transport of air pollution

**Report prepared by the co-Chairs of the Task Force on Hemispheric
Transport of Air Pollution**

Summary

According to its revised mandate from the Executive Body for the Convention on Long-range Transboundary Air Pollution, the Task Force on Hemispheric Transport of Air Pollution under the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) carries out the tasks specified for it in the Convention's workplan and reports thereon to the EMEP Steering Body (ECE/EB.AIR/106/Add.1, decision 2010/1, para. 3).

In line with that mandate, the Task Force continues to build upon the analyses in the *Hemispheric Transport of Air Pollution 2010 (HTAP 2010)*,¹ and to develop and implement a multi-year work plan. The present report sets out the results of recent analyses and the status of the multi-year work plan for the Task Force.

¹ United Nations publication, Sales No. 11.II.E.7, available online from <http://www.htap.org/>.

I. Recent policy-relevant findings

1. Building upon the findings in the *Hemispheric Transport of Air Pollution 2010 (HTAP 2010)*,² participants in the Task Force on Hemispheric Transport of Air Pollution under the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) continue to publish findings and data products based on cooperative analyses organized by the Task Force during the period from 2005 through 2010. Several new publications from the past year are described below.

2. Wild et al.³ further developed a parameterization of the response of regionally averaged annual ozone concentrations to changes in precursor emissions estimated by 14 global chemistry transport models engaged in the HTAP multi-model experiments. The parameterizations are used to apportion surface ozone changes in four regions of the world to changes in:

- (a) emissions of nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), and carbon monoxide (CO) within each region;
- (b) Emissions of NO_x, NMVOC, and CO outside of the region; and
- (c) Global concentrations of methane (CH₄).

Wild et al. use the parameterization to estimate the contribution of each of these three fractions to the observed increase in baseline ozone concentrations from 1960 to the present and to surface ozone trends in the future under the Special Report on Emission Scenarios, 2000, and Representative Concentration Pathways scenarios developed for use by the Intergovernmental Panel on Climate Change. As part of the Task Force's future work, these parameterizations will be updated based on additional modelling studies and will be used to explore the implications of new policy-relevant emission scenarios for 2030.

3. Fry et al.⁴ use the Task Force multi-model experiments to estimate the influence of ozone precursor emissions from four world regions on tropospheric composition and radiative forcing. Fry et al. demonstrate that radiative forcing associated with ozone precursors depends on the location of emissions and that CH₄, CO, and NMVOCs reductions reduce climate forcing better than NO_x reductions.

4. Janssens-Maenhout, et al.⁵ published a report documenting the development of the EDGAR-HTAP emissions dataset⁶ that was first presented in *HTAP 2010*. This global dataset, also referred to as HTAPv1 in the Task Force future workplan, is a mosaic of emissions information developed at the national or regional level for major emission regions of the Northern Hemisphere, with gaps filled using existing global datasets. This HTAPv1 dataset covers the period from 2000 through 2005. In the current Task Force workplan, the mosaic approach is being applied to the development of a common emissions

² United Nations publication, Sales No. 11.II.E.7, available online from <http://www.htap.org/>.

³ O. Wild et al., "Modelling future changes in surface ozone: a parameterized approach", *Atmospheric Chemistry and Physics*, vol. 12, No. 4 (February 2012), pp. 2037–2054.

⁴ M. M. Fry et al., "The influence of ozone precursor emissions from four world regions on tropospheric composition and radiative climate forcing", *Journal of Geophysical Research — Atmospheres*, vol. 117 (April 2012).

⁵ Greet Janssens-Maenhout et al., "EDGAR-HTAP: a harmonized gridded air pollution emission dataset based on national inventories", Joint Research Centre Scientific and Technical Reports, EUR 25229 (Luxembourg: Publications Office of the European Union, 2012). Available from http://edgar.jrc.ec.europa.eu/htap/EDGAR-HTAP_v1_final_jan2012.pdf.

⁶ http://edgar.jrc.ec.europa.eu/national_reported_data/htap.php.

inventory for use in coordinated modeling experiments for the period from 2006 through 2010, referred to as HTAPv2.

5. A number of other publications are in preparation, including analyses of the impacts of intercontinental transport on aerosol direct radiative forcing and of the impacts of climate change on the intercontinental transport of ozone.

II. Status of 2012–2016 workplan

6. The Task Force's 2011 annual report (EB.AIR/GE.1/2011/7) identified the overall objectives, guiding policy-relevant questions, and themes for cooperative activity to be addressed in the Task Force's 2012–2016 workplan, as decided at the seventh annual meeting of the Task Force in Arona, Italy, in June 2011.

7. Following the Arona meeting, the Task Force organized a set of three planning teams to collect and organize further input from the expert community concerning the Task Force's future workplan. The planning teams, which were organized around different themes of work, met by teleconference four times during October and November 2011. These teleconferences helped the Task Force co-Chairs, Mr. Frank Dentener (European Union) and Mr. Terry Keating (United States of America) prepare the agenda for the Task Force's eighth annual meeting.

8. The Task Force's eight annual meeting was held in Pasadena, California, United States, from 1 to 3 February 2012. The meeting was hosted by the United States Environmental Protection Agency and National Aeronautics and Space Administration. The meeting was held in conjunction with a meeting of the Atmospheric Chemistry & Climate Initiative Model Intercomparison Project (ACCMIP). The meeting was attended in person by more than 85 experts from Belgium, China, Croatia, the Czech Republic, France, Germany, India, Italy, Japan, Mexico, the Netherlands, Spain, Switzerland, Thailand, the United Kingdom of Great Britain and Northern Ireland and the United States. Representatives from the Meteorological Synthesizing Centre-East (MSC-E), the Meteorological Synthesizing Centre-West (MSC-W), the Chemical Coordinating Centre (CCC), the Centre for Integrated Assessment Modelling (CIAM), the European Commission's Joint Research Centre (JRC), and the secretariat of the United Nations Economic Commission for Europe Convention on Long-range Transboundary Air Pollution (of which EMEP is a subsidiary body) also attended. In addition, the presentations were broadcast live via the Internet and 26 additional experts participated remotely during one or more sessions. The presentation materials from the meeting are accessible online.⁷

9. The main objective of the 2012 annual meeting was to further elaborate the 2012–2016 workplan. The Task Force agreed to:

(a) Priorities for cooperative simulation experiments and model-to-observation comparisons for the years 2006 through 2010, with the highest priority assigned to 2010, which will serve as a benchmark for comparisons;

(b) Coordinate global simulation experiments with planned regional simulation experiments under the Air Quality Model Evaluation International Initiative (AQMEII) and the Model Intercomparison Study-Asia (MICS-Asia) to create "nested" analyses;

(c) An approach for developing common global emissions inventories for 2006 through 2010, following a process similar to that used for the HTAP 2000–2005 inventory. The 2006–2010 inventory will be developed as a mosaic compiled from the EDGARv4.2

⁷ The materials are accessible from www.htap.org.

global inventory,⁸ the AQMEII inventories for Europe and North America, and the MICS-Asia inventory for South, Central, and Eastern Asia;

(d) Explore future policy-relevant scenarios for 2030, at least initially, using the parameterizations of intercontinental source-receptor relationships that were reported in *HTAP 2010*, based on simulations for 2001 and which will be updated based on the 2006–2010 simulations.

10. The Task Force also took note of developments in a wide range of related international scientific efforts and identified ways to coordinate with and leverage those efforts in the future workplan. Furthermore, the Task Force took note of the potential for future cooperative efforts with an emerging air pollution programme under the North-East Asian Subregional Programme for Environmental Cooperation of the Subregional Office for East and North-East Asia of the United Nations Economic and Social Commission for Asia and the Pacific, which encompasses China, the Democratic People's Republic of Korea, Japan, Mongolia, the Republic of Korea and the Russian Federation.

11. Since the annual meeting, the co-Chairs have been working to organize the workplan into discrete work packages and to identify work package leaders, deliverables and schedules. The current version of the workplan is divided into six themes and 35 work packages. These themes and work packages are listed in the box below.

**Task Force on Hemispheric Transport of Air Pollution 2012–2016
workplan themes and work packages**

1. Emissions and projections
 - 1.1 HTAP harmonized emissions database 2006–2010
 - 1.2 2030 baseline emissions scenarios and control options
2. Source apportionment and source/receptor (S/R) analysis
 - 2.1 Common set of source and receptor regions
 - 2.2 Specification of simulation experiments
 - 2.3 Generate boundary conditions for regional simulations
 - 2.4 Coordination of base and sensitivity simulations
 - 2.5 Parameterization of S/R relationships
 - 2.6 Comparison of S/R and source attribution methods
3. Model-observation evaluation and process analysis
 - 3.1 Inflow conditions influencing air quality over Europe
 - 3.2 Inflow processes influencing air quality over western North America
 - 3.3 Coordination with analysis activities of AQMEII
 - 3.4 Coordination with analysis activities of MICS-Asia
 - 3.5 Coordination with analysis activities of the Aerosol Comparisons between Observations and Models (AeroCom) project

⁸ <http://edgar.jrc.ec.europa.eu/overview.php?v=42>.

- 3.6 Coordination of model evaluation analyses with IGAC/SPARC⁹ hindcast of ozone and precursors
- 3.7 Coordination of model evaluation analyses with POLMIP¹⁰
- 3.8 Global ozone and other air quality relevant surface concentrations
- 3.9 Model evaluation using satellite observations
- 3.10 Coordination of model evaluation analyses with the Global Mercury Observation System (GMOS)¹¹
- 3.11 Model evaluation of persistent organic pollutants simulations
- 4. Assessment of health, ecosystem, and climate impacts
 - 4.1 Assessment of hemispheric scale pollution on human health
 - 4.2 Assessment of hemispheric scale pollution on ecosystems
 - 4.3 Assessment of hemispheric scale pollution on climate
- 5. Assessment of impacts of climate change on hemispheric pollution
 - 5.1 Analysis of Future Scenario (Climate and Emissions) simulations
 - 5.2 Analysis of related studies on impacts of climate change
- 6. Expanding the data network and analysis tools
 - 6.1 HTAP website, wiki, and listservs
 - 6.2 Naming conventions and metadata coordination
 - 6.3 Forschungszentrum Jülich modelling archive and HTAP wiki
 - 6.4 AeroCom modelling database and analysis tools¹²
 - 6.5 EBAS¹³-HTAP observations archive
 - 6.6 Aircraft Data for Atmospheric Modeling (ADAM) database
 - 6.7 Access to satellite observations
 - 6.8 HTAP emissions and projections at the Community Initiative for Emissions Research and Applications (CIERA) and the Emissions of Atmospheric Compounds and Compilation of Ancillary Data (ECCAD) project
 - 6.9 ENSEMBLE
 - 6.10 Expanding the community network
 - 6.11 Coordination of visualization and analysis tool development

⁹ <http://www.igacproject.org/node/47>.

¹⁰ <http://dataportal.ucar.edu/metadata/acd/software/polmip/>.

¹¹ <http://www.gmos.eu/>.

¹² <http://aerocom.met.no/database.html>.

¹³ EBAS is a database hosting observation data of atmospheric chemical composition and physical properties. More information is available from <http://ebas.nilu.no/>.

12. Once leaders are identified for each work package, the co-Chairs will publish the draft of the detailed workplan on the Task Force website (www.htap.org). The details of the workplan and the schedule for deliverables will continue to evolve as work package leaders engage with Task Force participants to define and implement specific tasks. The status and products of each work package will be documented and made available through the website.

III. Activities during the remainder of 2012

13. During the remainder of 2012, the Task Force's activities will focus on preparing for a new round of cooperative modelling experiments. The activities will include:

(a) Continued analyses of the information collected in *HTAP 2010* and the multi-model experiments conducted for the years 2001 and 2004 (including work package 3.1);

(b) Development of HTAPv2 emissions mosaic for the period from 2006 to 2010 (work package 1.1);

(c) Specification of the inputs and outputs for new cooperative experiments (work packages 2.1, 2.2 and 2.3);

(d) Documentation of available data processing, visualization, and analysis tools available to support model-observation comparisons (work package 6.11);

(e) Development of 2030 emission scenarios for analysis of policy response to intercontinental transport (work package 1.2).

14. To further the development of 2030 emission scenarios, the Task Force, in coordination with CIAM, the Task Force, and other groups, is planning a focused workshop to be held at the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria, from 8 to 10 October 2012. The workshop will review a set of scenarios developed by IIASA using energy projections from the International Energy Agency and the Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model. Discussions will focus on the assumptions related to the technical feasibility and effectiveness of emission control measures in a number of key emission sectors. The size of available meeting space will limit attendance at the workshop; however, the presentations will be broadcast live via the Internet, allowing broader participation in the workshop. The results of the workshop will be published in a report in 2013.

IV. Activities in 2013

15. The Task Force's 2013 annual meeting will take place in Geneva in February or March. The meeting will be held at the World Meteorological Organization (WMO) in conjunction with the 2013 WMO Global Atmospheric Watch Conference. In addition to reviewing the status of the workplan, the meeting will include a discussion of model evaluation methods, the status of observational databases and data analysis tools to support model evaluation activities, and the identification of priorities for information infrastructure investments.

16. Reports on the results and methodology for the 2006–2010 emissions inventory mosaic (work package 1.1) and for the 2030 emissions scenarios (work package 1.2) are expected to be published in the first half of 2013.

17. In the first half of 2013, initial results should be available from the new multi-model simulations and analyses for the 2006–2010 period (work packages 2.1 through 3.11).

18. The Task Force will organize a workshop on the methods for assessing the health, ecosystem and climate impacts of regional and transported air pollution. The co-Chairs will explore the potential for holding the workshop in the second half of 2013 in Pune, India, in cooperation with the Working Group on Effects and similar expert groups from the Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia, the Acid Deposition Monitoring Network in East Asia and the Atmospheric Brown Cloud-Asia programmes.
