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

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Item 6 (d) of the provisional agenda

**Progress in activities in 2013 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

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 its mandate and in the workplan for its parent body, the Convention on Long-range Transboundary Air Pollution, and reports thereon to the EMEP Steering Body (ECE/EB.AIR/106/Add.1, decision 2010/1, annex, para. 3; ECE/EB.AIR/109/Add.2, item 2.4).

In line with its mandate, the Task Force continues to develop and implement a multi-year workplan to improve scientific understanding of the intercontinental transport of air pollution in the Northern Hemisphere and to evaluate the availability of mitigation strategies inside and outside the geographic scope of the Convention. The present report sets out the results of recent analyses and the status of the multi-year workplan for the Task Force.

I. Recent policy-relevant findings

1. Building upon the findings in the *Hemispheric Transport of Air Pollution 2010* (HTAP 2010),¹ 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 2005–2010. Several new publications from the past year are described below.

2. Doherty et al.² examined the impact of climate change on intercontinental source-receptor relationships for ozone using three coupled climate-chemistry models simulating meteorological conditions representative of 2000 and 2095 under the SRES A2 emissions scenario.³ Consistent with previous studies, Doherty et al. found that climate change leads to decreases of annual mean surface ozone across much of the world, but increases in ozone in the most polluted regions. The extent of this ozone “climate penalty” in polluted regions was highly variable across the three models. All three models, however, show areas within Europe where more than 20 per cent additional emission reductions will be needed to offset the effects of climate change and maintain annual ozone concentrations at present levels.

3. Yu et al.⁴ used the HTAP multi-model experiments to evaluate the impacts of intercontinental transport of aerosols on aerosol optical depth (AOD) and direct radiative forcing. Using the results of nine global models, they found that intercontinental transport accounts for 11±5 per cent of AOD and 31±9 per cent of direct radiative forcing on an annual, continental basis, with the remaining fraction attributed to emissions sources within a given region.

4. Gusev et al.⁵ published a summary of the Task Force’s findings on intercontinental transport of persistent organic pollutants. Gusev et al. also describe the benefits of an integrated, multi-pollutant approach to the study of intercontinental transport, bringing together information from the monitoring and modelling of ozone and fine particle transport with information about persistent organic pollutants and mercury transport.

II. Progress of 2012–2016 workplan

5. The Task Force is continuing to develop and implement its 2012–2016 workplan, which is outlined on the Task Force website (<http://www.htap.org>). The workplan is divided into 35 work packages organized into six thematic areas: (1) emissions inventories and projections; (2) global and regional modelling of source receptor relationships; (3) model to observation evaluation and process studies; (4) impacts on health, ecosystems, and climate change; (5) impacts of climate change on air pollution transport; and (6) data network and tools.

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

² R. Doherty et al., “Impacts of climate change on surface ozone and intercontinental ozone pollution: a multi-model study”, *Journal of Geophysical Research: Atmospheres*, vol. 118, No. 9 (16 May 2013), pp. 3744–3763.

³ See <http://www.narccap.ucar.edu/about/emissions.html>.

⁴ Yu, H., et al. (2013), “A multimodel assessment of the influence of regional anthropogenic emission reductions on aerosol direct radiative forcing and the role of intercontinental transport”, *Journal of Geophysical Research: Atmospheres*, vol. 118, No. 2 (27 January 2013), pp. 700–720.

⁵ Gusev et al. (2012). “Intercontinental transport of persistent organic pollutants: a review of key findings and recommendations of the task force on hemispheric transport of air pollutants and directions for future research”, *Atmospheric Pollution Research*, vol. 3 (2012), pp. 463–465.

6. Under Theme 1 (emissions inventories and projections), the Task Force, in collaboration with the Task Force on Integrated Assessment Modelling and the Centre for Integrated Assessment Modelling, organized a workshop on global emissions scenarios. The workshop was held 8 to 10 October 2012 at the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria. Dr. F. Dentener (European Commission, co-Chair of the Task Force on Hemispheric Transport of Air Pollution) and Dr. Rob Maas (Netherlands, co-Chair of the Task Force on Integrated Assessment Modelling) chaired the meeting. Dr. Terry Keating (United States Environmental Protection Agency, co-Chair of the Task Force) Thirty-five experts from 15 countries attended the workshop and 15 additional experts participated via web conferencing.⁶

7. The goal of the workshop was to begin the development and analysis of explicit global air pollution emissions and control scenarios for use by the Task Force and other efforts. The primary objectives of the workshop were to:

(a) Review the underlying assumptions in three benchmark emission scenarios for the 2010–2030 period developed by IIASA using the Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model with funding from the International Energy Agency:

(i) Current Legislation (CLE), which will contain assumptions on further implementation of policies in the next decade or so;

(ii) No Further Control (NFC), in which economic activity is allowed to evolve but emission control policies remain at 2010 levels;

(iii) Maximum Feasible Reduction (MFR);

(b) Identify recommended modifications to the CLE, NFC, and MFR scenarios that can be made quickly and should be made based on the workshop consensus, and that would lead to a first set of HTAP scenarios to be used in the coming year;

(c) Identify alternative assumptions about (or uncertainty ranges for) the parameterization of the policies (including penetration of measures and potential for future abatement) and the lifetime and real life performance of technologies identified in the MFR scenario, distinguishing between technological and institutional constraints. These alternative assumptions (or uncertainty ranges) should be explored and elaborated further over the next year — leading to an updated view on plausible future scenarios and the main drivers of uncertainties;

(d) Identify uncertainties that should be addressed as part of a longer-term research effort.

8. The workshop participants recommended a series of “quick fixes” for the initial IIASA scenarios and identified a list of issues to be addressed over the longer term. Data and documentation for a revised initial version of the three scenarios are expected to be made available to the Task Force in the first half of 2013. When the benchmark scenario data is made publicly available, the Task Force expects to distribute it widely and to stimulate a discussion about alternative scenarios between the benchmarks that should be explored further.

9. The Task Force’s ninth annual meeting was held from 20 to 22 March 2013 in Geneva, Switzerland, at World Meteorological Organization (WMO) headquarters, in conjunction with the Global Atmospheric Watch (GAW) Programme 2013 Conference. More than 70 experts attended the meeting in person and approximately 40 experts

⁶ Presentations materials and a workshop summary are available via <http://www.htap.org>.

participated remotely via web conferencing. Altogether, experts from approximately 24 countries participated.

10. The annual meeting began with a joint session with the GAW Conference to discuss the status of the data infrastructure that supports atmospheric research and its relation to broader efforts under the Group on Earth Observations and the development of the Global Earth Observations System of Systems. This discussion highlighted the Task Force's ongoing work under Theme 6 (data network and tools) and identified some opportunities for coordination with WMO data management activities.

11. The second and third day of the meeting focused on the design of the planned multi-model experiments for 2006 through 2010 and related analyses under Theme 2 (global and regional modelling) and 3 (model to observation evaluation). As a result of the discussion, the Task Force decided to limit the future modelling experiments to 2008–2010, dropping simulations for 2006 and 2007. The participants also discussed whether emission perturbation experiments should focus on the response to changes in individual pollutants or to the changes in emissions from individual sectors. Participants expressed interest in both methods, so both options were left open for further consideration. Candidate global models were identified for producing boundary conditions for regional models once the global emissions data sets are available.

12. The schedule for further work was updated to account for a delay in the availability of the global emissions inventories for 2008 and 2010. Development of the emissions mosaics for 2008 and 2010 is proceeding and the model-ready emissions inventories are expected to be available in July 2013. Global modelling will begin as soon as possible following the data release. Regional modelling experiments are expected to begin in September and October.

13. Following up on the discussion at the annual meeting, the Task Force co-Chairs circulated a survey for participating experts to record their interest in specific experiments and analyses. Links to the survey form can be found on the Task Force website and compiled results will be posted there as well.

14. Via web conferencing, the Task Force co-Chairs made presentations on the workplan and schedule to meetings of the Task Force on Integrated Assessment Modelling (22 April 2013) and the Task Force on Measurements and Modelling (7 May 2013). A Task Force member from the United Kingdom of Great Britain and Northern Ireland, a work package leader under Theme 4 (impacts on health, ecosystems, and climate change), made a presentation on behalf of the Task Force to the International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops under the Working Group on Effects. These presentations and subsequent discussions have led to the identification of synergies between the work of the various bodies and opportunities for greater coordination.

15. In preparation for the informal Council meeting of the European Union environment ministers, the Irish Presidency organized a preparatory air science policy meeting in Dublin. The Task Force co-Chairs delivered a talk on "Hemispheric Ozone and Cooperation".

III. Activities during the remainder of 2013

16. During the remainder of 2013, the Task Force's activities will focus on initiating the 2008 and 2010 cooperative modelling experiments. The activities will include:

- (a) Release of the HTAPv2 emissions mosaic for 2008 and 2010 (work package 1.1);
- (b) Specification of the inputs and outputs for new cooperative experiments (work packages 2.1, 2.2 and 2.3);
- (c) Documentation of available data processing, visualization and analysis tools available to support model-observation comparisons (work package 6.11);
- (d) Release of the initial benchmark 2030 emission scenarios for analysis of policy response to intercontinental transport (work package 1.2).

17. The Task Force is planning to organize a workshop to discuss initial global and regional modelling results on 5 and 6 December 2013. The workshop will take place in San Francisco, United States of America, several days before the beginning of the American Geophysical Union's fall meeting. The workshop will be hosted by the United States Environmental Protection Agency's regional office.

IV. Activities in 2014

18. The Task Force will hold an annual meeting in the second quarter of 2014, although a date and location have not yet been set.

19. In the first half of 2014, results from the ensemble of global and regional modelling experiments for 2008 and 2010 (Theme 2) are expected to be available. Cooperative work will focus on updating the intercontinental source-receptor parameterizations (Theme 2), evaluating the model simulations using various types of observations (Theme 3), developing alternative control scenarios (Theme 1) and initiating assessments of the impacts of future control strategies (Theme 4).

20. By the end of 2014, the co-Chairs expect to produce a short report summarizing policy-relevant messages emerging from the analysis regarding the importance of intercontinental transport and the availability of mitigation measures.

21. The Task Force continues to explore the potential for a workshop on the methods for assessing the health, ecosystem and climate impacts of regional and transported air pollution in 2014. The co-Chairs have suggested the potential for holding the workshop 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. The co-Chairs continue to search for the necessary financial resources to organize such a meeting.
