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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

Fourth joint session

Geneva, 10–14 September 2018

Item 12 (a) of the provisional agenda

**Outreach efforts, information sharing and cooperation
with other organizations and programmes: hemispheric
transport of 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 activities specified in its mandate (ECE/EB.AIR/106/Add.1, decision 2010/1). During the reporting period, it was also tasked with carrying out the activities assigned to it in the 2018-2019 workplan for implementation of the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/140/Add.1, items 1.1.4.1-1.1.4.3, 1.3.2 and 1.3.5) and those set out in the informal document submitted to the Executive Body for the Convention at its thirty-seventh session entitled “Draft revised mandates for scientific task forces and centres under the Convention”. In accordance with the Convention workplan, the Task Force is requested to present an annual report on its work to the EMEP Steering Body. The present report details the progress made by the Task Force since its previous report and provides an overview of upcoming activities through 2018.

I. Progress in implementation of the 2018-2019 workplan

1. 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) is continuing to implement a multi-year plan that was begun in 2012. This plan is outlined on the Task Force website¹ and encompasses activities in six areas: (a) emissions inventories and projections; (b) global and regional modelling of source-receptor relationships; (c) model-to-observation evaluation and process studies; (d) impacts on health, ecosystems and climate change; (e) impacts of climate change on air pollution transport; and (f) data networks and tools.

2. Consistent with guidance provided through the biennial workplans for the Convention on Long-range Transboundary Air Pollution, the work of the Task Force has evolved to focus on two main themes:

(a) **The quantification of global influences on regional air quality.** Through global and regional modelling and model evaluation, this thematic area directly informs the atmospheric and integrated assessment modelling performed at the regional scale by other EMEP bodies. This theme has been the focus of most of the Task Force's activities since 2012 and encompasses items 1.1.4.1, 1.1.4.2, 1.3.2, and 1.3.5 on the 2018-2019 workplan for the implementation of the Convention (ECE/EB.AIR/140/Add.1);

(b) **The evaluation of air pollution control opportunities and their impacts at intercontinental and global levels.** Work under this thematic area is carried out in conjunction with other EMEP and Working Group on Effects bodies and encompasses item 1.1.4.3 on the workplan. Over the course of this two-year period, this theme is expected to become a larger focus of the Task Force's activities.

3. Under item 1.1.4.1, in order to encourage and organize the publication of scientific products from the most recent phase of coordinated experiments ("Hemispheric Transport of Air Pollution (HTAP)2"), the Task Force launched a special issue of the open-access journal, *Atmospheric Chemistry and Physics*, entitled "Global and regional assessment of intercontinental transport of air pollution: results from HTAP,² the Air Quality Model Evaluation International Initiative (AQMEII) and the Model Intercomparison Study-Asia (MICS)".³ The special issue was open to all papers related to the intercontinental transport of air pollution and addressing the following policy-relevant science questions identified by the Task Force:

(a) What fraction of air pollution concentrations or deposition can be attributed to contemporary anthropogenic regional emissions within the region as compared to extra-regional, non-anthropogenic or legacy sources of pollution?

(b) How do these fractions impact on human health, ecosystems and climate change?

(c) How sensitive are regional pollution levels and related impacts to changes in the sources of the various fractions?

(d) How will the various fractions and sensitivities defined above change as a result of expected air pollution abatement efforts or climate change?

¹ See <http://www.htap.org>.

² I.e., the work of the Task Force.

³ F. Dentener and others, eds. See https://www.atmos-chem-phys.net/special_issue390.html

(e) How do the availability, costs and impacts of additional emission abatement options compare across different regions?

4. The period for submissions to the special issue ended in January 2018. As at early June 2018, 29 articles have been published in the special issue and 19 more are under public and peer review through *Atmospheric Chemistry and Physics* discussions. The articles cover a variety of topics, including the development of emissions inventories at the global and regional levels; source-receptor relationships for ozone and aerosols; regional and global model evaluation methodologies and applications; and estimates of impacts on human health, deposition and climate change. The majority of the articles focus on the European, North American or global domain with fewer articles addressing Asia, Africa or the Arctic.

5. The Co-Chairs are working on a summary of the main findings of the articles in the special issue. As discussed in their previous annual report, the results of the HTAP2 experiments are generally consistent with the findings of the HTAP1 experiments, which were conducted for the year 2001 and reported in the Task Force's 2010 assessment report.⁴ The HTAP2 results show similar ranges of inter-model differences and generally similar patterns of source-receptor relationships. However, new insights regarding the contribution of source categories and regions that were not previously considered may emerge from further analysis.

6. A robust finding in the new results is that regional model estimates of ozone concentrations are sensitive to the boundary conditions used to estimate transport of ozone into the regional domain in the free troposphere (i.e. above the mixed layer). Such boundary conditions are often estimated using global models. Thus, future model evaluation and intercomparison efforts may focus on the ability of global models to estimate free troposphere ozone levels near continental boundaries and on the ability of regional models to estimate vertical mixing between the free troposphere and planetary boundary (mixed) layer.

7. Under item 1.1.4.3, the University of Colorado, Boulder, with funding from the United States Environmental Protection Agency and in collaboration with the European Commission's Joint Research Centre, has continued to incorporate the HTAP2 experiment results into the Centre's web-based FASST Scenario Screening Tool (FASST).⁵ The resulting tool is expected to allow users to explore global air pollution scenarios and their impacts, drawing on the average and range of the HTAP2 results. As the HTAP2 version of the tool is being developed, the potential for a more modular, open-source code ("openFASST") that will allow greater flexibility in selecting data sources and algorithms is being explored.

II. Activities during the remainder of 2018

8. During the remainder of 2018, the Task Force expects to:

⁴ See *Hemispheric Transport of Air Pollution 2010: Executive Summary* (ECE/EB.AIR/2010/10 and Corr.1 and 2) and the four related reports: *Hemispheric Transport of Air Pollution 2010, Part A: Ozone and Particulate Matter*, Air Pollution Studies No. 17 (United Nations publication, Sales No. E.11.II.E.7); *Hemispheric Transport of Air Pollution 2010, Part B: Mercury*, Air Pollution Studies No. 18 (United Nations publication, Sales No. E.11.II.E.8); *Hemispheric Transport of Air Pollution 2010, Part C: Persistent Organic Pollutants*, Air Pollution Studies No. 19 (United Nations publication, Sales No. E.11.II.E.9); and *Hemispheric Transport of Air Pollution 2010, Part D: Answers to Policy-Relevant Science Questions*, Air Pollution Studies No. 20 (United Nations publication, Sales No. E.11.II.E.10), note 5).

⁵ See <http://tm5-fasst.jrc.ec.europa.eu/>.

- (a) Summarize policy-relevant results from the articles in the special issue of *Atmospheric Chemistry and Physics* (item 1.1.4.1);
- (b) Make progress in developing an openFASST tool that will allow Convention experts to explore the implications of the HTAP2 results for future global emissions scenarios and their associated impacts (item 1.1.4.3).

III. Activities in 2019

- 9. Efforts to launch an assessment of sectoral opportunities for the mitigation of intercontinental transport under item 1.1.4.3, originally planned for 2018, have largely been extended into 2019. This work is expected to build on the work of the EMEP Meteorological Synthesizing Centre West (MSC-W) on the contribution of international shipping emissions to ozone in Europe and on the work of the Task Force on Integrated Assessment Modelling on future global emissions scenarios and control opportunities.
 - 10. The Task Force will work with the Meteorological Synthesizing Centre East, MSC-W, the Task Force on Measurements and Modelling, the World Meteorological Organization Global Atmosphere Watch and AQMEII to organize a workshop on global deposition issues: next steps under items 1.1.4.1 and 1.1.4.2.
 - 11. It will also emphasize outreach to and collaboration with other bodies under the Convention and with other international forums in the hope that the data and tools that it has developed can inform the evaluation of future air pollution control efforts (items 1.3.2 and 1.3.5).
 - 12. To the extent that resources allow, the Task Force will continue to pursue cooperative model intercomparison and evaluation efforts at the regional and global levels, building on its relationship with AQMEII and MICS. Future efforts in this area are likely to focus on the evaluation of deposition and other atmosphere-surface exchange processes.
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