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ECONOMIC COMMISSION FOR EUROPE

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)  
(Twenty-seventh session, Geneva, 8-10 September 2003)

**VALIDATION AND EVALUATION OF  
AIR EMISSION INVENTORIES**

Summary report by the organizing committee in collaboration with the secretariat

**Introduction**

1. In accordance with the work-plan for the implementation of the Convention (ECE/EB.AIR/75, item 2.1) and at the invitation of the Government of Sweden, a workshop on validation and evaluation of air emission inventories was held in Gothenburg on 14-16 October 2002. A list of the presentations and abstracts of selected presentations are available at [www.validationworkshop.ivl.se](http://www.validationworkshop.ivl.se).
2. The workshop was attended by experts from the following Parties: Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States of America and the European Community.

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3. Representatives from the Commission for Environmental Cooperation of North America, the European Commission's Joint Research Centre, the European Environment Agency (EEA), the secretariat of the Convention on Long-range Transboundary Air Pollution, the Centre for Integrated Assessment Modelling (CIAM), the Meteorological Synthesizing Centres East and West (MSC-East and West), the secretariat of the United Nations Framework Convention on Climate Change, and the French-German Institute for Environmental Research (IFARE) also participated.
4. A representative of the European Council of the Paint, Printing Ink and Artists' Colours Industry (CEPE) also attended
5. Mr. Mike Woodfield (United Kingdom) served as Chairperson and Mr. Andre Jol (EEA) as Vice-Chairperson.
6. The workshop was organized by the Swedish Methodology for Environmental Data which is comprised of the Swedish Environmental Research Institute (IVL), the Swedish Meteorological and Hydrological Institute and Statistics Sweden, on behalf of the Swedish ASTA Research Programme (International and national abatement strategies for transboundary air pollution), in collaboration with the Swedish Environmental Protection Agency, the Nordic Council of Ministers, the National Swedish Road Administration and the Swedish Energy Agency, in the framework of the Convention's Task Force on Emission Inventories and Projections and the Clean Air For Europe (CAFE) programme of the European Commission.

## **I. OBJECTIVES OF THE WORKSHOP**

7. The overall aim of the workshop was to examine critically the means of assuring the quality of air emission inventory data that form the basis for review and future revision of international agreements, e.g. the 1999 Gothenburg Protocol and EC directives for transboundary air pollutants, and for assessing the compliance with existing agreements. The specific objectives of the workshop were to:
  - (a) Gather international and national expertise on air emission inventories (AIEs) and to explore ways to assure and improve the quality of AEI data;
  - (b) Review the state of the art as regards various independent methods to evaluate AEI data at the local, national and international levels, and to examine case studies of these;
  - (c) Bridge the gap between scientific work and conventional AEI work in order to integrate more effectively research results in daily inventory estimates;

(d) Make recommendations for harmonized methodologies and identify future research needs within the field of AEI validation in order to achieve more comparable, transparent and quality-assured AEI data.

## **II. IMPROVING THE QUALITY OF EMISSION DATA**

8. Mr. Peringe Grennfelt (Sweden) opened the workshop, welcoming participants on behalf of ASTA/IVL and the EMEP Steering Body's Bureau. The workshop was very timely, since quality assurance, transparency and traceability were increasingly leading concepts in the production of environmental data. Mr. Harald Dovland (Norway), Chairman of the Executive Body, emphasized the importance of AEIs in several work areas under the Convention. Significant progress had been achieved in improving the quality of the emission data, though further efforts were required, including strengthened cooperation with other international organizations and/or conventions.

### **A. Current status of reporting**

9. Mr. M. Woodfield gave an overview of the current status of emissions reporting under the Convention and summarized its review and assessment needs, noting that the revised Guidelines for Estimating and Reporting Emissions Data had been adopted by the EMEP Steering Body, which would provide the necessary guidance to Parties for fulfilling their reporting obligations. The Task Force on Emission Inventories and Projections would take a more flexible, project-oriented approach to its future work. The Task Force had decided, at its previous meeting (6-8 May 2002, Cordoba, Spain) that its work would be targeted more toward scientific review and assessment of reported emission inventory data. Other speakers underlined the importance of quality assurance and uncertainties, and stressed the need for gap analysis of current inventories, both from the perspective of compliance with reporting obligations, as well as for modelling.

### **B. Development, evaluation and verification of air emission inventories**

10. Mr. Rainer Friedrich (Germany) spoke on the development, evaluation and verification of AEIs and AEI tools, underlining the importance of ongoing scientific research on uncertainty assessment and the development and application of various verification methods to improve the quality of AEIs. As regards uncertainty assessment, major improvements had been made in recent years to assess statistical errors. However, these were limited by unknown uncertainties in input data and the inability to detect systematic errors. Verification experiments might help to get a better picture of the magnitude of systematic errors, and progress in this field had been made in recent years, particularly in the road transport sector, e.g. tunnel and open motorway studies. However, further experiments were needed for sectors other than transport and for source agglomerations, cities, etc.

11. There was also a need to define better the necessary accuracy and resolution of emission data by sensitivity analysis with chemical transformation models and to provide better emission data to atmospheric modellers. The most important gaps and weaknesses in present emission data generation were: biogenic/agricultural emissions of nitrogen oxides (NO<sub>x</sub>), non-methane volatile organic compounds (NMVOC), ammonia (NH<sub>3</sub>), pesticides and biogenic aerosol; solvent emissions in general and composition of VOC emissions; emissions from road transport, particularly heavy-duty, high-emitter and foreign vehicles; emissions from the off-road sector including handling of petrol and leisure boats; particulate matter (PM) emissions, including heavy metals and persistent organic pollutants (POPs); and, updates for large emission sources.

### **C. Review of emissions data to meet policy needs**

12. Mr. Andre Jol discussed AEIs from the perspective of European Union policy-making, namely the importance of developing a process and procedures for verifying and assessing the quality of submissions and the completeness of the inventory. Ms. Vigdis Vestreng (MSC-West) presented a draft proposal on procedures for the verification and quality control of submissions to the Convention. The participants discussed the time frame for finalizing and implementing these procedures (including initial assessment of completeness by the secretariat and quality control by MSC-West) and recommended further work on the proposal, to incorporate the compliance aspect of reporting and to set out a clear schedule for implementation, based on the input of the Task Force and with a possible start for the 2004 reporting round.

### **D. Future needs in AEI**

13. Ms. Kristin Rypdal (Norway) spoke about future needs in AEI, including good practice, harmonization and standardization. There had been a focus on aspects of inventory quality for more than 10 years, which had gradually improved the quality of reporting. Several examples of systematic implementation of good practice were presented. There was still, however, much further to go to meet standards of good practice in all countries. Improved methodologies and implementation of more detailed methodologies could make emission estimates more accurate, but inventory uncertainties would remain high in future (in particular for pollutants other than SO<sub>2</sub>). Researchers and the measurement community would help to improve the estimation methodologies through the provision of better emission factors, new methods and verification. It was important to have a close dialogue with users of inventory data in order to prioritize future efforts. Many inventories lacked transparency, as national inventory reports with descriptions of methodologies were not always submitted with the data. Reviews of inventories could increase quality, though the types of reviews undertaken by the United Nations Framework Convention on Climate Change were very resource-intensive.

### III. CONCLUSIONS AND RECOMMENDATIONS

14. On the basis of improved knowledge and the observed degree of uncertainty in AEIs, the participants recognized the need for the development of an inventory review and improvement programme, to be evaluated in 2004. They recommended:

- (a) The establishment of an effective review and evaluation process and procedures;
- (b) Continuous improvement of inventories;
- (c) The encouragement and use of scientific research;
- (d) Making the best use of resources;
- (e) Enhanced communication/interface between inventory compilers and users.

These recommendations are further explained below.

#### A. Establishment of an effective review and evaluation process

15. There was a need to undertake a review process, including a system of checking and gap-filling and the preparation of national inventory reports. In addition, it was recommended that the Task Force's expert panel on verification and projections should develop procedures for the review of inventories, taking account of the proposals by MSC-West to carry out a pilot assessment of bias and data gaps and inconsistencies in early 2003, and to develop these procedures further in 2004. Further harmonization with the reporting and review process of the United Nations Framework Convention on Climate Change was also recommended.

#### B. Continuous improvement of inventories

16. The importance of making use of measurement data of high quality (using standardized methods), including data collected for regulatory and scientific purposes and identifying and propagating good practice and uncertainty management was stressed. A process of mutual learning should be developed, for example through review processes, workshops, etc. It was recommended that all Parties should make use of measurement and good practice, and that an ad hoc group, in cooperation with the Joint Research Centre, should further develop these proposals, taking into account the National Systems Guidelines by the United Nations Framework Convention on Climate Change.

#### C. Encouragement and use of scientific research

17. In order to verify and improve the quality of emission statistics, data and trends using

measurements, experiments and modelling, increased collaboration (through the management of the Task Force meeting) was recommended between inventory compilers and the scientific community. Improved cooperation would enhance access to international research programmes and solicit funding for relevant research. It was also recommended that research programmes, wherever possible, should provide information to improve the EMEP/CORINAIR Emissions Inventory Guidebook.

#### **D. Making the best use of resources**

18. Through priority-setting, using key source criteria and user requirements, the participants identified a number of areas of high uncertainty, including: biogenic (NMVOC), geogenic (NO<sub>x</sub>) and agricultural (NH<sub>3</sub>) emissions; emissions from solvent use; off-road mobile engines; PM emissions from construction, industrial processes, diffuse emissions, road dust suspension, content and size distribution, biomass burning; heavy metals and POPs; re-emissions of mercury and POPs; efficiency of control technologies, including altitude effects; temporal resolution, taking into account meteorological conditions (emissions during hot or cold episodes); and abatement techniques. It was recommended that Parties should take better account of stakeholder data, including industrial data, for key sources. The Task Force should develop and review a list of priority areas.

#### **E. Enhanced communication between inventory compilers and users**

19. The Task Force should raise the profile of inventories (and associated tools and systems), requesting user feedback from bodies under the Convention (including the Implementation Committee), and improving cooperation with the scientific community and liaison with the CAFE programme. This would promote the use of inventories in the analysis of the effectiveness of policies and measures, clarify the criteria for non-compliance with protocols, and assist integrated assessment and other modelling.

### **IV. FOLLOW-UP WORK**

20. At the request of the EMEP Steering Body's Bureau at its meeting of 6 November 2002, a follow-up meeting to the workshop was convened on 18 December 2002 in Brussels to explore means for establishing a comprehensive inventory improvement programme. The results of this meeting were transmitted to the Bureau of the Steering Body at its meeting on 26-28 February 2003. Based on the results of the 2003 reporting round, the EMEP Steering Body may wish to make a detailed proposal for consideration by the Task Force on Emission Inventories and Projections at its joint meeting with the European Environment Information and Observation Network (EIONET), scheduled to take place on 22-24 September 2003, in Warsaw.