



**Economic and Social
Council**

Distr.
GENERAL

EB.AIR/WG.1/2003/13
2 June 2003

Original: ENGLISH

ECONOMIC COMMISSION FOR EUROPE

**EXECUTIVE BODY FOR THE CONVENTION ON
LONG-RANGE TRANSBOUNDARY AIR POLLUTION**

Working Group on Effects
(Twenty-second session, Geneva, 3-5 September 2003)
Item 6 (a) of the provisional agenda

JOINT EXPERT GROUP MEETING ON DYNAMIC MODELLING

Summary report on the third meeting prepared by the organizers

I. INTRODUCTION

1. The third meeting of the Joint Expert Group on Dynamic Modelling took place under the auspices of the Working Group on Effects. It was organized by the Swedish programme on International and National Abatement Strategies for Transboundary Air Pollution (ASTA programme) in cooperation with the Centre for Ecology and Hydrology (United Kingdom).

2. The meeting took place on 6-8 November 2002 in Sitges (Spain). It was attended by 30 experts from the following Parties to the Convention: Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom. The International Cooperative Programmes (ICPs) on Integrated Monitoring (ICP IM), Modelling and Mapping (ICP M&M), Forests (ICP Forests), Vegetation (ICP Vegetation) and Waters (ICP Waters), as well as the Coordination Center for Effects (CCE at the National Institute of Public Health and the Environment (RIVM), Bilthoven (Netherlands)) and the Centre for Integrated Assessment Modelling (CIAM at the International Institute for Applied Systems Analysis (IIASA), Laxenburg (Austria)) were represented. The Chairman of the Working Group on Effects attended and the Executive Body to the Convention was also represented.

Documents prepared under the auspices or at the request of the Executive Body for the Convention on Long-range Transboundary Air Pollution for GENERAL circulation should be considered provisional unless APPROVED by the Executive Body.

3. The meeting was co-chaired by Mr. Alan Jenkins (United Kingdom) and Mr. Filip Moldan (Sweden).

II. AIMS AND ORGANIZATION OF THE MEETING

4. The objectives of the meeting were to:

- (a) Review model applications on the recovery of soils and waters on a national and European scale, including in the United States and Canada;
- (b) Review progress with the Very Simple Dynamic model (VSD) and its application;
- (c) Review the requirement and options for providing dynamic model outputs to integrated assessment models;
- (d) Establish the current status and an expected timetable with respect to the dynamic modelling of biological systems;
- (e) Assess the plans and outputs of the ICPs with respect to dynamic modelling;
- (f) Prepare plans and a timetable for further activities in dynamic modelling within the framework of the medium-term objectives of the Working Group on Effects.

5. The meeting was conducted in a series of plenary sessions addressing eight topics:

- (a) What are the key dynamic modelling outputs and how to present them?
- (b) How can dynamic modelling assessment be undertaken at a European scale?
- (c) Should soils and waters be assessed separately?
- (d) How can dynamic models link to integrated assessment models?
- (e) Issues of model calibration/evaluation and input data derivation.
- (f) How can model uncertainty be assessed and incorporated?
- (g) What is the current status of dynamic modelling of aquatic biological systems?
- (h) What is the current status of dynamic modelling of terrestrial biological systems?

III. CONCLUSIONS AND RECOMMENDATIONS

6. The Joint Expert Group agreed on 34 conclusions and recommendations here grouped into four sections.

A. Progress on dynamic modelling

7. The Expert Group agreed that at present there were several dynamic models available for soil and water acidification which gave appropriate and reliable outputs for integrated assessment modelling, while dynamic models of nitrogen as a nutrient that could be applied regionally required further development.

8. The Group confirmed two major areas in which dynamic models outputs should be used within the framework of the Convention: (i) to deliver the input for the optimization of further emission reduction targets via integrated assessment modelling; and (ii) to illustrate and communicate the effectiveness of specifically agreed protocols and the work of the Convention more generally.

9. The Group concluded that the dynamic models MAGIC, SAFE, SMART and VSD were available and may be used for assessment of acidification impacts. MAGIC, SMART and SAFE were thoroughly tested against observations and had been demonstrated to capture observed trends through time towards recovery. For nutrient N, the models were not currently available and the medium-term timetable as laid down in EB.AIR/WG.1/2001/5 was not likely to be achieved. The VSD was currently being tested and compared with other model applications in Switzerland and Poland.
10. The Expert Group welcomed the progress on the Dynamic Modelling Manual, which had been revised and extended by CCE, and urged that it should be widely distributed.
11. The Group agreed that 'target load functions' were the principal outputs from dynamic modelling for the integrated assessment modelling. It proposed the definition of target loads as "the deposition at which a pre-defined (chemical or biological) status is reached in the target year and maintained thereafter".
12. The Expert Group pointed out that soil acidity response occurred on a different time scale than the acidity response of waters. Target load functions for soils would, therefore, probably be lower than those for waters at least for several decades in most cases. Rate of response, and hence the target load function, would also be different for different soil parameters (e.g. base cation/Al ratio, % base saturation, pH, etc.).
13. Because of the different time scales of response, soils were effective for setting long-term targets whereas waters were more effective for showing the benefits and differences between emission scenarios on shorter time scales (up to 50 years). The Group recommended, therefore, to keep them separated and maintain the distinction between the target load functions for soils and the target load functions for waters.
14. The Expert Group suggested that within the time and spatial scales chosen for the national dynamic modelling applications, there was a need to ensure that dynamic modelling target load functions were compatible with critical load calculations (i.e. that the dynamic models ran over a very long timescale and so approximated the critical load).
15. The Group further recommended that countries should, in the first instance, use their own best data for dynamic modelling of soils using their choice of model(s), and use the transfer functions given in the Dynamic Modelling Manual only if no alternatives were available.
16. The Expert Group welcomed the announcement from CIAM/CCE that by early 2003 estimates of S, NH_x and NO_y deposition would be made available for the years 1880 to 2030 for each of the EMEP 150 x 150 km grid squares. These deposition values should be used in all dynamic modelling work in response to the calls from CCE. The Group also expressed the need for estimates of base cation deposition.
17. The Group wished that the input data, methods, approaches and results for dynamic modelling could be harmonized as much as possible between the Parties to the Convention to ensure consistency of

the results across Europe. The process of deriving target load functions must be as open, public and transparent as possible.

18. The Group welcomed the initiatives focused on testing the links between dynamic modelling and integrated assessment modelling currently under way in the United Kingdom, Sweden and Switzerland, and urged that the results should be reported at the earliest opportunity.

B. Recommendations to ICPs, EMEP and CIAM

19. The Expert Group recognized the importance of the existing model results and outputs which were already achieved and urged the National Focal Centres (NFCs) and ICP M&M to make full use of these.

20. The Group recommended that ICP Waters should encourage countries with regions of acid sensitive waters to provide critical loads for surface waters and to undertake dynamic modelling assessment.

21. It recommended that ICP IM should continue work on site-specific model applications, aiming at assessing the impacts of deposition scenarios and model uncertainties.

22. All Parties to the Convention should be strongly encouraged to do dynamic modelling. The ICPs were responsible for identifying ways of transferring dynamic modelling expertise and for providing help in general in order to get all countries on board in producing dynamic modelling outputs with maximum regional coverage.

23. The Group found that dynamic models for biological response in surface waters were lacking and urged ICP Waters to promote the development of such models.

24. The Expert Group recognized that terrestrial biology models were available but there was a requirement for the collection of relevant data at a European scale with respect to nutrient N and suggested that there might be a role for ICP Vegetation in this area.

25. Ongoing dynamic modelling for ozone effects on crops and non-forest ecosystems by the BIOSTRESS project would be assessed and used by ICP Vegetation when completed.

26. The Expert Group recommended that, in the call for dynamic modelling outputs in 2004, CCE should specify the target years, the protocol year(s) (i.e. the time to start further emission reduction) and the implementation year(s) (i.e. the time the emission reductions are completed). To this end it requested that CIAM should supply this information to CCE.

27. The Group recommended that ICP M&M should make NFCs aware that CCE would require the target load functions for all sites for which critical loads were reported. There were three categories of sites: (i) where the current deposition was such that the (chemical) criterion was no longer violated and so no target load needed to be reported (i.e. target load = critical load); (ii) where the current deposition was above the target load and the target load was achievable in the specified target year; and (iii) where

the chemical criteria could not be reached by the specified target year (i.e. target load = 0). All cases must be reported to CCE.

28. The Expert Group encouraged ICPs to make full use of monitoring data. Relevant trend data documenting recovery were particularly important for constraining and testing models and giving empirical evidence for the recovery process. ICP IM and ICP Waters should be encouraged to make full use of these data. It recommended that ICP M&M and ICP Forests should continue the testing of VSD. The Group further recommended that European scale databases should be made more easily available via the web.

29. The Expert Group requested EMEP to provide ecosystem-specific deposition data for S, NO_x, NH_y and base cations at its earliest opportunity so that NFCs could complete their dynamic modelling work within the agreed timescale (2004). These data were essential for model application on the European scale.

C. Research needs and development

30. The Group recognized a need for a consistent approach to uncertainty and recommended that the terminology developed by the Intergovernmental Panel on Climate Change to express uncertainty should also be used in the work of the Working Group on Effects.

31. It recognized that uncertainty needed to be estimated at all steps in dynamic modelling, but made clear that this required resources not currently available and would take time. There was a high risk that this work would not be completed in time for use as input to any new protocol.

32. The Group identified six topics on which additional research was urgently needed to increase confidence in dynamic modelling predictions. These were:

- (a) Ecosystem processes governing nitrogen retention and loss and its effects;
- (b) The role of dissolved organic matter in acidification of soils and waters;
- (c) Methods to estimate weathering rates of base cations;
- (d) The effects of global changes on acidifying and eutrophying processes in terrestrial and aquatic ecosystems;
- (e) The effects of land-use change on acidifying and eutrophying processes in terrestrial and aquatic ecosystems;
- (f) The deposition of base cations to terrestrial ecosystems.

33. The Expert Group recognized that the lack of areal representativity of data and upscaling were major contributors to uncertainty in dynamic modelling applications and target load function calculations on a regional scale. Further work comparing grid (mapped) and site-specific approaches to dynamic modelling was required.

34. The Group noted that dynamic modelling work had so far focused mostly on acidity effects, whereas the effects of nitrogen deposition now required more work. In the future a more integrated dynamic modelling approach in which both acidification and eutrophication effects could be incorporated and assessed was required.

35. The Expert Group stressed that recovery did not necessarily mean that the ecosystems would return to their pre-acidification condition.

36. It also expressed the need for an operational definition of biodiversity and urged ICPs to provide such a definition for the respective ecosystem types.

D. General

37. There was a need for further work towards user-friendliness and popularization of the Group's results. The Expert Group recommended the involvement of end-users in the process of designing the best communication techniques.

38. The Group encouraged the dynamic modelling experts and NFCs to promote the use of the outputs from dynamic modelling widely and publicly to increase the wider understanding of the concepts, approach and results.

39. It suggested that progress made and results achieved from dynamic modelling should be presented to the Working Group on Effects in 2003.

40. The Expert Group noted that a further meeting would be useful to discuss progress made and technical problems encountered in the use of dynamic models in the framework of the Convention. The Group agreed that the workshops could be more open and geared towards the work of ICPs.