1. This report describes the results of the eighth meeting of the Joint Expert Group on Dynamic Modelling held from 24 to 26 October 2007 in Sitges, Spain, presented here in accordance with the Convention’s 2008 workplan (ECE/EB.AIR/91/Add.2, item 3.9 (g)) approved by the Executive Body at its twenty-fifth session.

2. Twenty-four experts from the following Parties to the Convention on Long-range Transboundary Air Pollution attended the meeting: Austria, Canada, Denmark, Finland, Germany, Ireland, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland and the United States of America. The International Cooperative
Programme (ICP) on Integrated Monitoring, ICP Modelling and Mapping and ICP Waters, the Coordination Centre for Effects (CCE, at the Netherlands Environmental Assessment Agency) and the EMEP (Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants) Centre for Integrated Assessment Modelling (CIAM, at the International Institute for Applied Systems Analysis (IIASA)) were represented. A member of the UNECE secretariat also attended.

3. The meeting was co-chaired by Mr. A. Jenkins (United Kingdom) and Mr. F. Moldan (Sweden). It was organized by the Centre for Ecology and Hydrology (United Kingdom) and the Swedish Clean Air Research Programme (SCARP).

I. AIMS AND ORGANIZATION

4. The objectives of the Joint Expert Group meeting were to:

(a) Consider lessons learned from the 2006/2007 data on dynamic modelling submitted by the national focal centres (NFCs) of ICP Modelling and Mapping to CCE, and other national modelling activities;
(b) Consider these lessons in the light of the proposals for the 2007/2008 call for data by CCE to NFCs of ICP Modelling and Mapping;
(c) Consider the monitoring within the Working Group on Effects as a proposal to contribute to the revision of the National Emission Ceilings (NEC) Directive of the European Union;
(d) Review progress on recent dynamic model developments, in particular with respect to nutrient nitrogen (N) impacts on terrestrial ecosystems;
(e) Assess strategies to incorporate climate change in dynamic models;
(f) Assess the robustness of modelled air pollution impacts;
(g) Consider strategy and workplan items for 2009.

5. These objectives related directly to the workplan items in the Convention’s 2007 workplan (ECE/EB.AIR/WG.1/2007/4/Rev.1).

II. CONCLUSIONS AND RECOMMENDATIONS

A. Experience from the 2006/2007 data submission to the Coordination Centre for Effects

6. The Joint Expert Group acknowledged the efforts made by CCE to analyse national data submissions in response to the call for data sent out to NFCs of ICP Modelling and Mapping. The Group noted that this analysis indicated that empirical and modelled critical loads for
nutrient N did not compare well in all cases. This might be explained by differences in the ecosystem effects they addressed. Compatibility between the approaches should, however, be sought by NFCs. In this respect, NFCs were urged to consider the submitted data and to thoroughly investigate any apparent anomalies.

7. The Group agreed that the voluntary call for data by CCE in 2006/2007 was successful in generating the required dynamic modelling outputs. The conceptual framework for using dynamic modelling output by interpolating between scenarios had performed well. The experience gained would contribute to formulating the next call.

8. The Group confirmed that reliable and consistent observations from ecosystem monitoring activity were essential to underpin critical loads and dynamic modelling activities. Comparison between modelled and observed data should be undertaken at site and regional scales by NFCs and reported widely. Such comparisons would also help in assessing the robustness of the dynamic modelling outputs.

9. In undertaking this comparison, it should be remembered that the dynamic modelling strategies currently in use generally relied on aggregated or lumped input data. They should not be directly compared to point measurements but to comparably aggregated data.

10. The Group agreed that the development of the MAGIC model library approach for Norway and Sweden, which identifies analogue model runs for sampled lakes, provided an effective tool for addressing the dynamic modelling requirements of the CCE call for data. This had been successfully tested in Norway and Sweden. The development of this approach should be continued.

B. Consideration of the 2007/2008 call for data by the Coordination Centre for Effects

11. The Group agreed that the detailed requirements of the 2007/2008 call for data were appropriate. The exception was that the Task Force of ICP Modelling and Mapping and CCE had been encouraged to also consider further scenarios to more adequately account for future emission reduction strategies.

12. The Group urged ICP Modelling and Mapping to encourage more NFCs to submit dynamic modelling output and to submit more data on surface waters.
C. Monitoring proposal in support of the revision of the National Emission Ceilings Directive

13. The Joint Expert Group generally supported the proposed key mandatory indicators, which were proposed to the European Community to support the revision of the NEC Directive. However, the Group emphasized that to fully assess the outcome of current EU decisions and to support future strategies regarding air pollution legislation, biological parameters (e.g. fish density, species composition of ground vegetation, tree condition) were essential.

14. The Group concluded specifically that:

(a) Acid neutralizing capacity leaching was a further mandatory variable regarding soil acidification;
(b) Ratios should not be requested, but rather the individual variables from which the ratio could be calculated;
(c) Ammonium should be reported along with nitrate (NO₃);
(d) Collection of supporting indicators was strongly recommended.

15. The Group concluded that the effects monitoring of the Convention could be substantially improved by making further use of national efforts outside the Convention. For example, ICPs could enhance their activities by acting as coordinators for the integration of existing national surveys.

D. Progress on dynamic model development and model chains

16. The Joint Expert Group acknowledged the significant progress made in developing model chains, which linked emissions of atmospheric pollutants to terrestrial biodiversity targets. It noted, in particular, that:

(a) Species niche models had been completed in the United Kingdom for a significant fraction of the plant flora, incorporating abiotic and climate variables and their interaction;
(b) Critical thresholds for soil pH, NO₃, carbon-nitrogen (C/N) ratio, etc. had been identified for several species and vegetation types in the Netherlands;
(c) Response functions for acidity, N, moisture and temperature had been derived for 43 plant species groups in Sweden and 73 groups in Switzerland. Critical loads based on ecological impacts could be assessed against confounding influences of climate change and land management;
(d) Guidelines for critical load calculations for nutrient N for terrestrial ecosystems had been developed in Sweden, using vegetation community composition as the biological indicator.
17. The Group agreed that the process for developing biodiversity-relevant indicators and damage thresholds for terrestrial ecosystems was now in place. Progress was good and national discussions with conservation agencies had commenced. This would enable targets for nutrient N to be defined. The indicators proposed should now be discussed within the task forces of the appropriate ICPs. Prototype models were now available for testing.

18. The Group recognized that in order to develop a realistic capability for modelling climate change impacts on species, data sets describing model input parameters as well as state variables, should be combined across national boundaries.

19. The Group acknowledged the need to include feedbacks on ecosystem function due to species composition change.

20. The Group concluded that N emission reductions beyond those agreed under the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone were very likely (with probability p=90%) required to prevent further change in vegetation composition. However, it was agreed that with respect to species composition, it was very likely not possible to return to pre-industrial conditions.

E. Incorporating climate change in dynamic models

21. The Group concluded that climate change would almost certainly (p=99%) drive ecosystem changes which would occur regardless of future atmospheric deposition.

22. This would also mean that the pre-industrial (reference condition) status of ecosystems was almost certainly not achievable in all locations due to climate change (p=99%). Dynamic models should be used to determine the long-term effects of air pollution that were superimposed on changes driven by climate and land management.

23. The Group concluded that the impact of climate change on the stability of soil C and N pools remained uncertain. In this respect, continued and possibly increased monitoring was required. Further ecosystem scale experiments should also be encouraged.

24. The Group agreed with the decision not to consider future climate change in the 2007/08 call for data. If climate change is to be included in future calls for data – and the Group agreed that this was necessary – guidance must be provided from the Intergovernmental Panel on Climate Change regarding which climate model and scenario should be used.
F. Robustness of modelled air pollution impacts

25. The Group supported the preliminary assessment of robustness assigned by the Co-Chairs to the conclusions from the meeting in 2006 and subsequently reported at the twenty-sixth session of the Working Group on Effects.

G. General issues

26. The Group noted the desire for improved communication at all levels and in particular with the Working Group on Strategies and Review. In this respect, the needs remained for communication and for further clear illustrations of impacts of emission reductions over time.

27. The Group emphasized the need for members of the community concerned with dynamic modelling of ecosystem effects to be involved in the earliest stages of the newly proposed initiative on reactive N.

28. The Group noted that the United States and Canada were closely involved in the development and application of dynamic modelling. Cooperation could be further strengthened through increased communication with experts in the United States and through the critical loads ad hoc subcommittee.

29. The Group agreed on the following workplan items for 2009:

   (a) Discussion of the results of the 2007/2008 call for data by CCE made to the NFCs of ICP Modelling and Mapping;
   (b) An update of progress in dynamic modelling of N as a nutrient in terrestrial systems, interactions between climate change and air pollution, biological response and terrestrial C sequestration;
   (c) A contribution of dynamic modelling to the revision of the Gothenburg Protocol.

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