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JOINT EXPERT GROUP MEETING ON DYNAMIC MODELLING

Summary report on the fourth meeting prepared by the organizers

Introduction

1. The fourth meeting of the Joint Expert Group on Dynamic Modelling took place on 5-7 November 2003 in Sitges (Spain). 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).

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2. The meeting was attended by 29 experts from the following Parties to the Convention: Canada, Denmark, Estonia, Finland, Germany, Ireland, Norway, Sweden, Switzerland, United States and United Kingdom. The International Cooperative Programmes (ICPs) on Integrated Monitoring (ICP IM), Modelling and Mapping (ICP M&M), Forests (ICP Forests) and Waters (ICP Waters), as well as the Coordination Center for Effects (CCE at the National Institute for Public Health and the Environment, 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 a member of the secretariat was also present.

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

I. AIMS AND ORGANIZATION OF THE MEETING

4. The objectives of the meeting were to:

- (a) Consider the plan for the forthcoming CCE call for dynamic modelling outputs;
- (b) Review the technical problems encountered in dynamic modelling applications and suggest possible fixes;
- (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) 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 five topics:

- (a) Extrapolation of inputs/outputs, data harmonization;
- (b) Modelling developments, uncertainties and assumptions;
- (c) Links to integrated assessment models;
- (d) Update on biological models;
- (e) Future developments.

II. CONCLUSIONS AND RECOMMENDATIONS

6. The Joint Expert Group agreed on 29 conclusions and recommendations here grouped into four sections.

7.

A. Progress on dynamic modelling

7. The timescale for dynamic modelling in view of the 1999 Gothenburg Protocol's review was noted. If the Protocol were to come into force in 2004, the first dynamic modelling inputs to the review process would be required in 2005 and should be completed by 2007.
8. The Joint Expert Group noted that the Working Group on Strategies and Review had indicated that 2030 and 2050 were likely target years and that 2100 was not favoured as this was considered politically irrelevant. This longer-term target year might, however, be used as a check on consistency with critical loads. The Joint Expert Group agreed that these three target years were appropriate for consideration in the CCE call for data this year.
9. The Joint Expert Group emphasized that only dynamic models in which the amount of nitrogen (N) immobilized converged towards the long-term acceptable (constant) N immobilization, as included in critical load calculations, were consistent with critical loads.
10. All dynamic modelling applications (and derived target load functions) must be shown to be "anchored in reality" through checks against observations. It was difficult to argue for credibility of target load functions based on model runs not checked against the data. This was the responsibility of the modellers.
11. The Joint Expert Group recognized that upscaling from single sites to regions/grid squares was in itself a major task and urged that a common procedure should be used for the target load functions as was currently used for the critical load functions. This might necessitate the collection of new data.
12. The Joint Expert Group agreed that model testing had confirmed that given the same input data, all four models considered suitable for use in the forthcoming CCE call for data (MAGIC, SAFE, SMART, VSD) gave similar outputs.
13. The Joint Expert Group welcomed the inclusion of dynamic modelling in the Canadian Acid Deposition Assessment due to be reported in 2004.
14. In waters, the understanding of biological responses was sufficiently advanced that the time lag for organisms to recover after the chemical criteria was reached could be estimated. The biological recovery was affected by the rate of chemical recovery, by the generation time of the organisms and by stochastic processes.

B. Recommendations relevant to ICPs, EMEP, CIAM and CCE

15. The Joint Expert Group strongly urged EMEP to develop estimates of base cation deposition by grid square over time (e.g. 1860-2000) as these were necessary input data for dynamic modelling.

16. The Joint Expert Group recognized that, in the absence of such historical base cation deposition estimates, for the forthcoming call for dynamic modelling outputs these data would be estimated country by country.

17. The Joint Expert Group urged the Task Force on Integrated Assessment Modelling and CCE to provide estimates of the ratio of NO_x/NH_y in deposition by grid square in the future (2010 to 2100, that is, the period for which target load functions would be calculated). In the absence of such estimates, the Joint Expert Group suggested using the ratio for 2010 as the default for all subsequent years.

18. The Joint Expert Group urged the Task Force on Integrated Assessment Modelling to provide information on how the target load information would be used in the integrated assessment process. In particular, the Joint Expert Group requested guidance as to how the absence of data ("white" squares) or target load function unfeasible ("black" squares) would be handled.

19. The Joint Expert Group recommended that the national focal centres (NFCs) of ICP Modelling and Mapping should collect new data where necessary to calculate target load functions for grid squares with little or no existing data. This was especially important for grid squares with acidification damage and critical load exceedance for the year 2010. There was a risk that if no target load functions were reported for such squares ("white" squares), damage to ecosystems in these would not be fully considered in the integrated assessment modelling and negotiation process.

20. The Joint Expert Group urged NFCs and relevant ICPs to conduct and coordinate sensitivity analyses and scenario studies to quantify uncertainties due to potential climate change.

21. The Joint Expert Group recommended to CCE that, for its first call for data, target load calculations should be made assuming no climate change in the future. The Joint Expert Group noted that such an assumption was consistent with the procedures and models used by the Task Force on Integrated Assessment Modelling and EMEP.

22. The Joint Expert Group recommended that CCE should use (or develop, if necessary) an unambiguous terminology, consistent with that used by the Working Group on Effects and the

Executive Body, to denote the various years and to denote "non-achievement" of target loads rather than "exceedance". Exceedance of a target load had a different implication than exceedance of a critical load. Exceedance of a critical load indicated that the ecosystem continued to suffer damage whereas exceedance of a target load might imply that recovery would not be achieved in the target year but would be delayed.

23. The Joint Expert Group urged ICP Forests to make estimates of time lags for biological recovery in forest ecosystems.

24. The Joint Expert Group requested estimates of deposition of sulphur (S) and N for each grid square (1860-2010) to be made available, preferably on the Internet.

25. The Joint Expert Group recommended that the forthcoming substantive report of the Working Group on Effects should include information on dynamic modelling.

26. The Joint Expert Group recommended that CCE should coordinate a scenario analysis of effects on waters and soils given (i) the implementation of the 1999 Gothenburg Protocol and (ii) no further reduction from 2000 deposition (that is, business as usual). The model outputs required for this should be specified in the call for data.

C. Research needs and development

27. The Group emphasized that further research was needed to understand ecosystem nitrogen processes, in particular controls on N retention and release. It was further recognized that N as a nutrient required careful consideration and that an integrated approach to the assessment of acidity and eutrophication was desirable.

28. The Joint Expert Group considered that individual countries should incorporate the most appropriate representation of N dynamics within their dynamic modelling and that subsequent harmonization of approaches would occur in the future.

29. The Joint Expert Group urged more research on the interaction between climate change effects and acidification and eutrophication processes, including sensitivity studies of potential scenarios. To this end, it welcomed the new European-Commission-funded Integrated Project "Euro-limpacs", part of the sixth Framework Programme of the Directorate General Research.

30. The Joint Expert Group highlighted that although the present focus of biological modelling was on individual indicator species, in future it might be important to move towards broader ecosystem indices of biodiversity or community dynamics/functioning.

31. Given the importance of carbon cycling for the biogeochemistry of heavy metals and persistent organic pollutants, the Joint Expert Group held that a greater understanding of organic matter dynamics was required.

D. General

32. The Joint Expert Group welcomed the production of a second special issue on the outputs of the RECOVER:2010 project focusing on predicting the recovery of acidified waters in Europe and Canada and urged that the information should be considered within the work of the Convention.

33. The Joint Expert Group gratefully accepted as help in kind the report on dynamic modelling prepared by the Nordic countries (Nordic Council of Ministers).

34. The Joint Expert Group recognized the substantive contribution of ICP Modelling and Mapping to highlighting the need for extending dynamic modelling to other Parties to the Convention through the organization of dynamic modelling workshops.

35. The Joint Expert Group noted that a further meeting in 2004 would be useful and most timely given the scheduling of the CCE call for dynamic modelling data and, in particular, to review and assess the use of target load functions.