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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 (EMEP)

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Working Group on Strategies and Review

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Item 4 of the provisional agenda

INTEGRATED ASSESSMENT MODELLING

Report of the Task Force, prepared by the Chairman of
the Task Force on Integrated Assessment Modelling in collaboration with the secretariat

INTRODUCTION

1. This report describes the results of the thirty-first meeting of the Task Force on Integrated Assessment Modelling, held in Gothenburg on 8-9 December 2005. It includes reports of discussions on the progress in integrated assessment modelling; preparation of model inputs in

view of the entry into force and upcoming review of the Gothenburg Protocol; a workshop on European air pollution policies, held on 5–7 October 2005 in Gothenburg, Sweden; and a workshop on non-technical measures, held back to back with the Task Force on 7–8 December 2005 (a report of this workshop is annexed). The presentations made during the meeting and the reports presented can be accessed on the Internet at www.unece.org/env/tfiam.

2. Thirty-four experts from the following Parties to the Convention attended the meeting of the Task Force: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden and the United Kingdom. Also present were representatives from the International Cooperative Programme (ICP) on Modelling and Mapping, the EMEP Centre for Integrated Assessment Modelling (CIAM), the Expert Group on Techno-economic Issues, the Oil Companies' European Organization for Environment, Health and Safety (CONCAWE) and the European Environmental Bureau (EEB). A member of the UNECE secretariat also attended.

3. Mr. R. Maas (Netherlands) chaired the meeting, which was hosted by the Swedish ASTA programme, the Swedish Environmental Research Institute and the Swedish Environmental Protection Agency.

I. OBJECTIVES AND INTRODUCTORY REMARKS

4. Mr. Maas noted that the meeting's purpose was to review recent progress, effects and technology-based scenarios and to discuss ways to deal with systematic biases and the possibility of including social science perspective in the work.

5. Mr. M. Johansson (UNECE secretariat) outlined the draft conclusions from three recent workshops. He drew attention to the suggestions on possible revised impact pathways for nutrient nitrogen and ozone, which could be considered in the review of the 1999 Gothenburg Protocol that was expected to start in December 2005.

6. Mr. Maas, on behalf of the European Community (EC), reviewed progress in implementing the Clean Air for Europe (CAFE) thematic strategy. The strategy was expected to lead to improvements in health and the environment by 2020, and the benefits were estimated to outweigh abatement costs. The proposal to revise the national emission ceilings directive was expected in the first half of 2007. The Task Force noted that CAFE aimed to bring various reporting requirements into line with the Convention.

7. In the following discussion it was noted that targets for fine particulate matter (PM_{2.5}) were being brought up in policy discussion within the EC, while guidelines were being kept for coarser particulate matter (PM₁₀). CIAM noted that it was continuing its modelling work on PM_{2.5}.

II. SUMMARY OF MAJOR DISCUSSION POINTS

A. Developments in integrated assessment modelling

8. Mr. M. Amann (CIAM) presented the evaluation of CAFE scenarios and outstanding modelling issues. The joint optimization of PM and ozone for health, acidification and eutrophication presented considerable advantages in terms of costs and benefits compared to abating only single environmental problems. The macroeconomic impact assessments considered only the costs of air pollution control, without taking into account positive health and environmental impacts. The Task Force noted the next major steps in model improvement included updating the energy baseline scenarios, improving the modelling methodology for urban background concentrations, the inclusion of the latest critical load data and incorporation of more meteorological years. The GAINS model would explore synergies with greenhouse gas mitigation and include certain non-technical measures (NTM). The Task Force noted that policy scenarios for the EC would be developed in 2006.

9. Mr. Amann presented methodologies for effects-based approaches. These related proposed emission reductions to actual environmental improvements and offered great potential for cost savings. The Task Force noted that the appropriate distribution of impacts and costs among Parties was a genuine policy choice.

10. For CAFE, scaling the gap in terms of environmental effects between 2000 and the no-effect levels was found not to be a useful starting point for negotiations because (a) there was no evidence for no-effect thresholds for health impacts from particulate matter, and (b) if the same percentage was used for gap closure targets for all countries, there was little scope for relative improvements in less polluted countries at the margins of the European Union (EU) area (e.g. countries like Cyprus and Finland that are strongly influenced by sources outside the EU). At the same time, this situation would not trigger further measures in regions with high pollution load beyond what would be achieved through implementation of current legislation. Raising targets for such "binding" countries from the outset in the optimization was not considered a useful starting point for negotiations. As a pragmatic approach, it was decided within CAFE to scale the gap between the impact indicators calculated for a baseline scenario in 2020 and the maximum technically feasible reductions (MTFR) scenario in that same year. The advantages were that all countries could improve between 0% and 100% on this scale and that comparable gap closure percentages would result in comparable marginal costs. The disadvantage was that quantification of each end of the scale (that is, the baseline scenario in 2020 and the MTFR) was rather arbitrary and could be changed for strategic reasons. The Task Force noted that the ends of the scale might change if new NTMs were incorporated into the modelling.

11. The Task Force agreed that the differences between the two above-mentioned approaches should be communicated to the International Cooperative Programme (ICP) on Modelling and Mapping, the Working Group on Effects and the Working Group on Strategies and Review.

CIAM was requested to continue to present the effects of emission control strategies both in terms of the protected ecosystem area and also as accumulated exceedance at the country level, as the reduction of accumulated exceedance does not always lead to a proportional reduction in the area exceeded. The Task Force encouraged the effects programmes to discuss the different impact indicators and paths for reducing impacts in relation to the development of alternative emission reduction scenarios (see EB.AIR/WG.5/R.24/Rev.1, paras. 2 and 8).

12. Ms. H. ApSimon (United Kingdom) commented on differences between the gap closure approach used in recent analyses for the EC and that used in developing the 1999 Gothenburg Protocol. The latter set intermediate targets aimed at directly closing the gap between the situation in the base year (where emissions and their spatial distribution within countries were known) and critical loads. In the EC analyses, target loads were interpolated between different levels of ambition represented by a scenario for expected changes under current legislation and that of a MTRF scenario. Both projections included additional modelling assumptions and uncertainties compared with the base year. This approach was less directly dependent on critical loads in those sensitive areas where critical loads were exceeded, and this could result in more demanding targets in countries where large commitments were already made under current legislation. The Task Force noted the need to examine the effects of the different gap closure approaches on binding grid cells, and their influence on the emission ceilings derived from integrated assessment modelling.

13. Mr. M. Posch (Netherlands) of the Coordination Centre for Effects (CCE) of ICP Modelling and Mapping presented the recent developments in critical loads modelling, in particular the new data sets on critical loads of acidification, eutrophication and heavy metals, and dynamic modelling results (target loads) for acidification. The new EMEP 50 x 50 km² grid and ecosystem-specific depositions involved a significantly larger amount of data than the earlier assessment on the 150 x 150 km² grid. The CCE had developed a new linearization methodology between emissions and average accumulated exceedance, which had been incorporated into the RAINS model to calculate impacts, *inter alia*, for the CAFE assessment. The Task Force noted that target loads (based on targets for recovery times for acidification) could be used in addition to critical loads to assess alternative emission reduction scenarios.

B. Other integrated assessment modelling activities

14. Ms. N. Allemand (France) presented the work of the Expert Group on Techno-economic Issues to improve the relevant RAINS input data. New synopsis sheets on the cement, glass and petroleum industries had been sent out for comments. Priority areas for work in the immediate future were agreed with CIAM, including small combustion plants and emerging technologies.

15. Mr. Amann stressed that the Expert Group had done a lot of work and reminded the Task Force that all finalized data had already been incorporated into the RAINS model. "Emerging technologies" should include a realistic assessment of all technology options that could be on the

market in 2020. Inclusion in RAINS required information on technical efficiency, costs and possible penetration rates. The Task Force noted that the Chair of the Expert Group would set up a meeting with CIAM, the Expert Group, the EC, the Institute for Prospective Technological Studies and some industry experts to make plans for supporting this work.

16. Mr. S. Reis (Germany) described the work on the EU integrated project INTARESE, which aimed to develop an integrated approach to assessment and communication of risks from environmental stressors. The Task Force invited the project to ensure that the methodologies used and the results were communicated to Convention bodies.

17. Ms. I. D'Elia (Italy) described the case study on the effects of national sea traffic emissions on air pollutant concentrations over land, that was carried out by the Italian Agency for New Technologies, Energy and the Environment (ENEA) using an integrated national model MINNI. It was estimated that the effect of emissions from Italian sea traffic would increase sulphur deposition and PM_{2.5} concentration levels significantly in the future.

18. Ms. G. Lövblad (Sweden) presented work on checking activity levels and emission and cost input data from Sweden to the RAINS model. She emphasized the need to exchange experiences with other Parties regarding the checking of input data and to develop guidance for checking. The Task Force noted the recommendation to explore possibilities to harmonize and simplify the various definitions of emission categories across different reporting systems, including the nomenclature for reporting and the sectoral split in integrated assessment modelling. The Task Force also agreed proposals for a workshop on emission projections to be planned with the Task Force on Emission Inventories and Projections in autumn 2006, which could provide a means to discuss the links between national data and the RAINS model.

C. Results from workshops

19. The Task Force discussed the workshop on non-technical measures organized by the Swedish ASTA programme that was held in Gothenburg on 7–8 December 2005 prior to the Task Force meeting (see annex). The workshop had identified several structural measures that could increase the potential for further environmental improvement. Measures that were difficult to include in integrated assessment models, such as behavioural changes and local solutions in the agricultural and traffic sectors, could still be of great importance. Parties should be encouraged to incorporate existing policies in these areas into their (regionalized) emission projections.

20. The workshop had noted the inclusion of measures in models was impeded in particular by difficulties in calculating costs (e.g. for behavioural changes, such as using cars less, or using smaller cars or lower speeds). Improved description of utility and welfare changes was needed to describe the impact of consumer preferences.

21. The workshop suggested further studies on the linkage between measures and instruments, as well as the incorporation of models for special sectors such as energy demand and supply, traffic and agriculture, on both national and European scales. An integrated approach would be required to include synergies with climate policy (including emissions trading), transport policy, agricultural policy and policies for water quality and nature conservation.

22. The Task Force adopted the main conclusions and recommendations of the workshop on non-technical measures (annex).

23. Mr. P. Grennfelt (Sweden) outlined the results of the workshop "Toward Robust European Air Pollution Policies" of the Swedish ASTA programme and the EU project ACCENT, held on 5-7 October 2005 in Gothenburg, Sweden. He highlighted as a key success factor in all international environmental negotiations the formation of trust between the scientific and policy communities. The workshop had identified the following possible main roles and challenges for the social sciences:

- (a) Playing a role in the early phase when problems were identified, agendas formulated and organizations formed. Social sciences could contribute to the problem-framing process and could advise on ways to design a negotiation process;
- (b) Helping to learn from experiences;
- (c) Contributing to the analysis and implementation of behavioural changes;
- (d) Facilitating more formal involvement and interaction between ongoing social science research and air pollution policy development.

24. The workshop outcome would be presented to the twenty-third session of the Executive Body and a report would be published. The Task Force noted that the need for an expert group for social science issues and a lead country could be considered.

III. FURTHER WORK

25. The Task Force discussed and agreed on its future activities, as reflected in the draft workplan of EMEP for 2006 (EB.AIR/GE.1/2005/10/Rev.1).

26. The Task Force agreed to its amended draft 2006 workplan:

- (a) Develop and review baseline scenarios covering all Parties to the Convention within the geographical scope of EMEP, for the review of the 1999 Gothenburg Protocol (CIAM, Parties); organize a workshop on the improvement of national emission projections in autumn 2006 in collaboration with the Task Force on Emission Inventories and Projections;
- (b) Carry out an analysis of uncertainties and biases (CIAM, Parties);

- (c) Explore options for target setting on environmental endpoints in integrated assessment models and analyse the robustness of alternative emission reduction scenarios (Task Force, CIAM);
- (d) Develop methods for including dynamic ecosystem modelling and modelling of the nitrogen cycle in integrated assessment modelling (CCE, CIAM);
- (e) Identify the systematic differences in costs and effects of abatement strategies based on regional, national and urban/local-scale models (Task Force);
- (f) Examine the effects of changes in hemispheric background pollution on integrated assessment modelling results in Europe, in particular updating input for northern hemispheric modelling (Parties, EMEP Meteorological Synthesizing Centre – West (MSC-W), CIAM, Task Force on Hemispheric Transport of Air Pollution);
- (g) Evaluate the cost-effectiveness of measures to reduce regional air pollutants, taking into account linkages with climate change policy (CIAM);
- (h) Evaluate sectoral trends and maximum feasible emission reductions, taking into account non-technical measures, new emerging technologies and abatement of ships emissions (CIAM, MSC-W); and
- (i) Hold the thirty-second meeting of the Task Force on 17–19 May 2006 in Rome. A thirty-third meeting could be held later in 2006 if appropriate.

IV. CONCLUSIONS AND RECOMMENDATIONS

27. In addition to the points noted by the Task Force during its discussions as indicated above, the Task Force agreed on the following conclusions and recommendations:

- (a) Start preparations to explore the ozone flux methods in integrated assessment modelling, and call for necessary input data and material from the EMEP/MS-CW and effects bodies, including those needed for quantified uncertainty assessment;
- (b) Communicate ways to design optimized scenarios to Convention bodies (the Working Group on Strategies and Review, ICP Modelling and Mapping, the Working Group on Effects);
- (c) Explore the potential use of target loads in integrated assessment modelling; and
- (d) Explore lessons to be learned from the comparison of national and RAINS projections and organize a workshop together with the Task Force on Emission Inventories and Projections.

Annex

Workshop on the Importance of Non-Technical Measures for Reductions in Emissions of Air Pollutants and How to Consider These Measures in Integrated Assessment Modelling

1. The workshop on the importance of non-technical measures (NTM) for reductions in emissions of air pollutants and how to consider these measures in integrated assessment modelling took place on 7–8 December 2005 in Gothenburg, Sweden. It was organized by the Swedish ASTA programme.
2. The workshop was attended by 46 experts from the following Parties to the Convention: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden and the United Kingdom. Representatives from the EMEP Centre for Integrated Assessment Modelling (CIAM), the European Commission's Joint Research Centre, the European Confederation of Iron and Steel Industries (EUROFER), the Union of the Electricity Organization (EURELECTRIC), the European Auto Manufacturers Association (ACEA) and the European Environmental Bureau (EEB) participated. A member of the UNECE secretariat also attended.
3. Ms. Anne Engleryd welcomed participants on behalf of Sweden.
4. The workshop did not agree what types of measures would qualify as NTMs. It considered all types of non-end-of-pipe measures, such as behavioural changes, spatial measures, and structural changes such as input substitution and efficiency improvements.
5. The workshop noted structural changes, behavioural changes, and local and spatial measures could be partly taken into account in projections and integrated assessment modelling, but the costs could not always be estimated. Therefore, these measures could not always be part of an optimization procedure; they could sometimes be part of sensitivity analyses. Although some NTMs such as monitoring, information and enforcement could not be modelled at all, they were considered important elements of policy strategies.
6. The workshop agreed national and regional policies for improving the quality of local environments should be included in national projections and should be better communicated to other parties. Consistency with national reporting on climate policy was deemed important.
7. A clearer view was called for on the possibilities of using energy, traffic and agricultural models to estimate costs and effects of NTMs both at the national and European levels. Specialized workshops were suggested to support this approach and to highlight ways of calculating welfare costs to include sector-specific models on shipping, aviation and buildings.

8. The workshop considered an integrated view of agricultural nitrogen projections would be needed to take into account obligations under the 1999 Gothenburg Protocol of the Convention, the national emission ceilings directive, the nitrate directive, the framework directive for water and the habitat directive of the EU. Other policies identified to influence nitrogen projections were the international pollution prevention and control directive and the reform of the EU's common agricultural policy. Nitrogen projections should also include impacts on soil productivity changes and climate change.

9. Further research was recommended on:

- (a) Valuation of time, freedom and comfort in order to model personal preferences and behavioural changes and a consensus on ways to estimate their costs and effects in integrated assessment modelling;
- (b) Assessment of the costs of local and further EU-wide measures for agriculture;
- (c) Impacts of local measures on the effectiveness of national policies;
- (d) Effects of subsidies and other economic instruments (e.g. the reduction of subsidies affecting fuel types which are not environmentally friendly);
- (e) Assessment of the impact of emission trading schemes for carbon dioxide that would shift emissions across Europe, using global, local and sector-specific models, and in particular evaluating the links between local and global models.