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Working Group on Effects
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Item 4 of the provisional agenda

DEVELOPING, MODELLING AND MAPPING OF CRITICAL LOADS AND THEIR INPUT DATA

STATUS REPORT ON THE CALL FOR EUROPEAN CRITICAL LOADS ON ACIDIFICATION AND EUTROPHICATION INCLUDING DYNAMIC MODELLING RESULTS FOR ACIDIFICATION

Note prepared by the Coordination Center for Effects (CCE) of the International Cooperative Programme (ICP) on the Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends, with the assistance of the secretariat

Introduction

1. At its seventeenth session in December 1999, the Executive Body of the Convention underlined the importance of dynamic modelling of recovery (ECE/EB.AIR/68, para. 51 (b)) to be able to assess time delays of recovery in regions where critical loads stop being exceeded and time delays of damage in regions where critical loads continue to be exceeded.

2. The International Cooperative Programme (ICP) on Modelling and Mapping presented a status report on its work regarding the results of the first call for European critical loads on acidification and eutrophication including dynamic modelling parameters (EB.AIR/WG.1/2003/10) to the Working Group on Effects at its twenty-second session.

3. The Working Group on Effects, at its twenty-second session, invited the Coordinating Center for Effects (CCE) to issue a call for data on critical loads and dynamic modelling in autumn 2003, stressed the importance of active participation of all Parties in the modelling and mapping activities, and urged Parties to continue their efforts to respond to calls for data (EB.AIR/WG.1/2003/2, para. 37 (f)). It also decided to inform the Executive Body of its need for guidance in selecting target years for dynamic modelling.

4. CCE organized two training sessions (19 May 2003 in Tartu, Estonia, and 13-15 October 2003 in Prague) to familiarize ICP Modelling and Mapping national focal centres (NFCs) further with the use of dynamic models and to encourage them to respond to the call for data. At these training sessions, concepts described in the dynamic modelling manual (Posch et al., 2003) were demonstrated using the VSD, MAGIC and SAFE models.

5. CCE issued the call on 18 November 2003, with a the deadline on 31 March 2004, after consultation with the Joint Expert Group on Dynamic Modelling at its meeting on 5-7 November 2003 in Sitges, Spain. In addition to information provided in the dynamic modelling manual, a detailed instruction document had also been compiled by CCE and distributed to NFCs. It was also made available on the CCE web site (www.rivm.nl/cce).

6. The objective of the call, in accordance to the medium-term work-plan of the Working Group on Effects (EB.AIR/WG.1/2003/2, table), was to produce an updated database on critical loads and dynamic modelling results which could be submitted to the Task Force on Integrated Assessment Modelling.

7. Important dynamic modelling results for possible use by the Task Force on Integrated Assessment Modelling were target loads. A target load was defined as the deposition (path) which ensured recovery by meeting the prescribed chemical criterion for damage or recovery (e.g. the Al-Bc ratio) in a given year and maintaining it thereafter. If they existed at all, the variety of deposition paths, i.e. target loads, might be numerous. Such a deposition path was characterized by three numbers (years): (i) the protocol year; (ii) the implementation year; and (iii) the target year (see annex I).

8. The <u>protocol year</u> for dynamic modelling was the year up to which the deposition path was assumed to be known and could not be changed. This could be the present year or a year in the (near) future for which emission reductions were already agreed. For the protocol year, countries

were requested to use 2010, the year for which the 1999 Gothenburg Protocol and the European Union's National Emission Ceilings Directive were expected to be implemented.

9. The implementation year for dynamic modelling was the year in which all reduction measures to reach the final deposition (the target load) was assumed to be implemented. Between the protocol year and the implementation year deposition was assumed to change linearly (see annex I). After consultation with the Chairmen of ICP Modelling and Mapping, the Working Group on Effects, the Working Group on Strategies and Review and others, 2015 was chosen as a preliminary implementation year.

10. The target year for dynamic modelling was the year in which the chemical criterion (e.g. the Al-Bc ratio) was met (for the first time). Countries were requested to submit target loads for 2030, 2050 and 2100.

11. In addition to information on target loads and target years, NFCs were also requested to ensure consistency between critical loads and dynamic modelling. This implied that each record in the critical load database should contain data that could be used to compute critical loads and to run the dynamic model. However, to maintain important statistical information on the (distribution of the) sensitivity of ecosystems within an EMEP grid cell, NFCs were requested to also include records where only critical loads data were available, i.e. leaving the dynamic modelling parameters blank.

12. Information on the deposition history was available from EMEP Lagrangian modelling results (Schöpp et al., 2003).

I. RESULTS OF THE CALL FOR DATA

13. The results of the call for data were presented at the fourteenth CCE workshop and twentieth meeting of the Task Force of the ICP on Modelling and Mapping. These meetings were held back to back on 14-28 May 2004 at the International Institute of Applied Systems Analysis in Laxenburg, Austria, at the invitation of the Federal Ministry of the Environment of Austria. National reports and a synthesized analysis on a European scale were published in the CCE progress report (Hettelingh et al., 2004).

14. Sixteen countries submitted updated data on critical loads of acidity and of nutrient nitrogen. European maps of critical loads protecting 95% of the ecosystem area in each grid cell are shown in annex II. The European background database was used to compute and map critical loads for ecosystems in countries that had not submitted data.

15. Eleven countries also submitted the requested dynamic modelling results.

16. Switzerland reported that it needed more time to prepare a representative set of dynamic modelling data. Belgium, the Czech Republic, Denmark, Norway and Sweden indicated that they were unable to finalize their response to the call for data in time.

17. Many countries indicated that their submitted dynamic modelling data should only be used in integrated assessment for testing purposes while emphasizing that a follow-up call for data at the end of 2004 should be considered.

18. The results were based on (historic) depositions of acidifying compounds computed with the EMEP Lagrangian model on 150 km x 150 km grid cells. Therefore, the results were likely to be different when depositions computed with the Eulerian model on a 50 km x 50 km became available for dynamic modelling.

19. The results (summarized in annex III), gave an overview of the ecosystem area for each country (column 1) for which critical loads of acidity (column 2) and critical loads of nutrient nitrogen (last column) were available. The latest available submission of critical loads was used for countries that did not submit data in 2004. Information is also provided (column 3) on the percentage of a country's ecosystem area for which dynamic modelling results (target loads) have been submitted.

20. Eight out of eleven countries were able to compute target loads for 100% of the ecosystem area. For other countries a subset of the ecosystem area was used for dynamic modelling. Furthermore, the percentage of the ecosystem area for which the chemical criterion was no longer violated when the emissions of the protocol year were kept constant between 2010 and 2030 (column 4) and 2050 (column 7) is shown. In principle this percentage should be larger in 2050 than in 2030.

21. A relatively low percentage of the ecosystem area could recover with target loads lower than critical loads in 2030 (column 5) or 2050 (column 8). The percentage of the ecosystem area where submitted target loads for 2030 and 2050 were infeasible are provided in columns 6 and 9, respectively.

II. CONCLUSIONS AND RECOMMENDATIONS

22. The revised European critical load database, including NFC data submissions in 2004, could now be considered for use in integrated assessment modelling.

23. The European database of target loads was compiled using a limited set of national contributions. The ecosystem area for which target loads had been submitted were derived by NFCs using information on (historic) depositions of acidifying compounds computed with the EMEP Lagrangian model on 150 km x 150 km grid cells. It was recommended that NFCs should be able to use depositions of acidifying compounds computed with the EMEP Eulerian model on 50 km x 50 km grid cells.

24. The response to the call for dynamic modelling data revealed that the task facing NFCs was complex.

25. An analysis of the submitted data on dynamic modelling parameters (target loads) by CCE pointed out a number of inconsistencies. These were presented and documented in the CCE progress report 2004 and they required further attention by ICP Modelling and Mapping.

26. Several NFC representatives indicated the need for more time and requested that a follow-up call for data should be considered in autumn 2004.

27. The use in integrated assessment of target loads submitted by NFCs or derived from the European background database should be considered for testing purposes only.

III. CONTINUED WORK UNDER THE MEDIUM-TERM WORK-PLAN

28. The further development of appropriate interfaces between dynamic modelling and integrated assessment would continue to be of ongoing concern in the collaboration between ICP Modelling and Mapping, other ICPs, the Meteorological Synthesizing Centre - West, the Centre for Integrated Assessment Modelling and the Joint Expert Group on Dynamic Modelling.

29. When available, EMEP Eulerian model results needed to be reflected in the deposition history required for dynamic modelling. This implied that NFCs should be able to apply updated deposition data.

30. ICP Modelling and Mapping sought guidance from the Working Group on Effects on whether a follow-up call for critical loads data and dynamic modelling results could be considered within the 2004-2005 scope of the medium-term work-plan.

References

Hettelingh, J.-P., Posch M., Slootweg J. (eds) (2004), Critical loads and dynamic modelling in Europe: CCE Progress Report 2004. Also available on www.rivm.nl/cce.

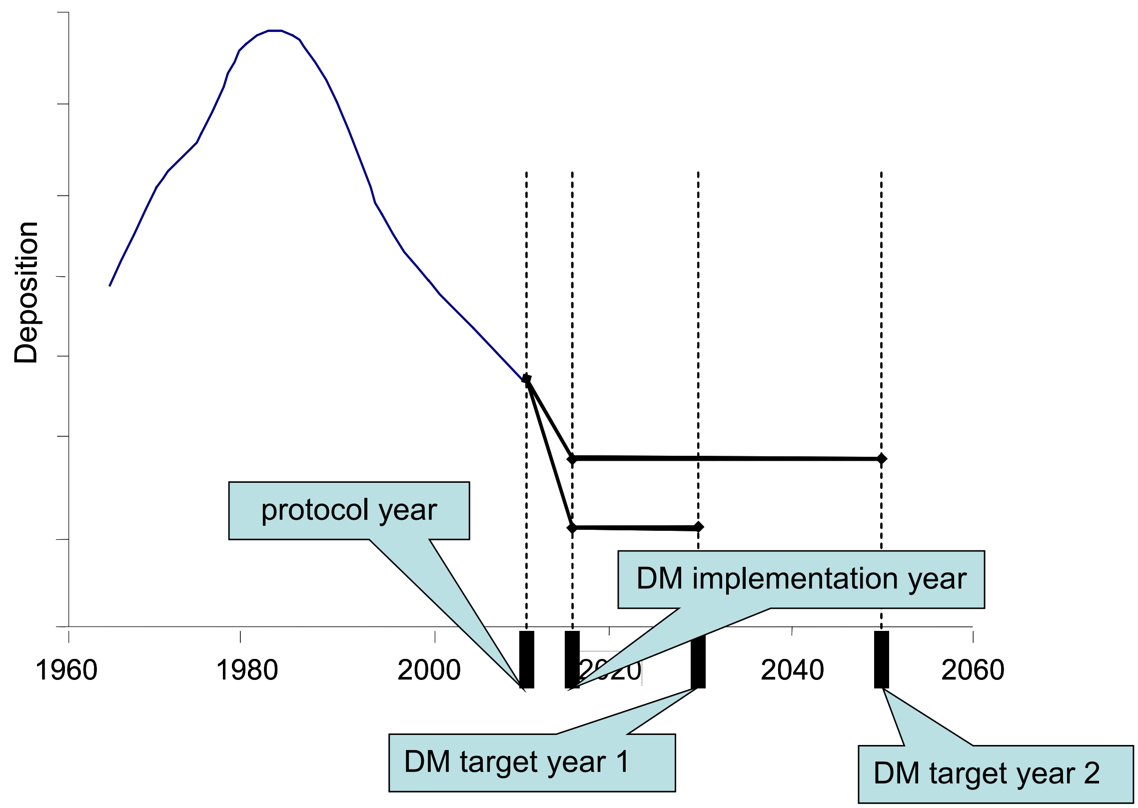
Posch, M., Hettelingh, J.-P., Slootweg J. (2003) *Manual for Dynamic Modelling of Soil Response to Atmospheric Deposition*, RIVM report 259101012/2003, also available on www.rivm.nl/cce.

Schöpp W., Posch M., Mylona S., Johansson M. (2003): Long-term development of acid deposition (1880-2030) in sensitive freshwater regions in Europe. Hydrol Earth Syst Sci 7, 436–446.

Note: The references have been reproduced as received by the secretariat.

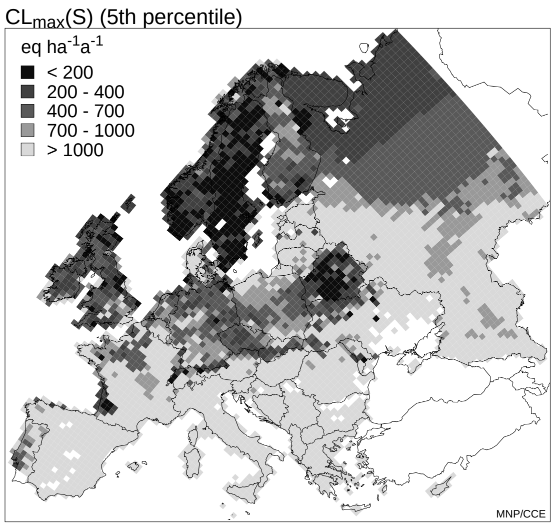
Annex I

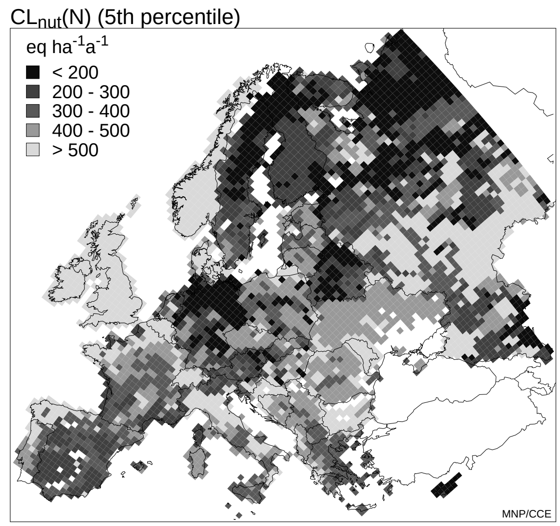
Schematic representation of deposition paths leading to target loads by dynamic modelling (DM), characterized by three key years: (i) the year up to which the (historic) deposition is fixed (protocol year); (ii) the year in which the emission reductions leading to a target load are implemented (DM implementation year); and (iii) the years in which the chemical criterion is to be achieved (DM target years)



Annex II

European maps of the 5th percentile critical load of acidification (left) and the 5th percentile critical load of nutrient nitrogen





Annex III

Overview of the response to the call for European critical loads on acidification and eutrophication including dynamic modelling parameters (target loads).

	CLaci km2	TLFs %	2030 TL=PL	2030 TL<CL	2030 n.f.	2050 TL=PL	2050 TL<CL	2050 n.f.	CLnut km2
AT*	37572	100.0	96.4	3.4	0.1	96.6	3.3	0.1	37572
BE	7282	-	-	-	-	-	-	-	7282
BG*	48345	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48345
BY*	103366	-	-	-	-	-	-	-	103366
CH*	11238	-	-	-	-	-	-	-	21866
CY*	4534	-	-	-	-	-	-	-	4534
CZ	18272	-	-	-	-	-	-	-	18272
DE*	105745	61.8	48.1	12.2	1.5	48.3	12.3	1.2	105745
DK*	3149	-	-	-	-	-	-	-	3149
EE	21450	-	-	-	-	-	-	-	22411
ES	85225	-	-	-	-	-	-	-	85225
FI*	266830	-	-	-	-	-	-	-	240403
FR*	180102	100.0	97.4	2.6	0.0	97.5	2.5	0.0	180102
GB*	77674	0.8	0.7	0.1	0.0	0.5	0.2	0.0	74206
HR	6931	-	-	-	-	-	-	-	7009
HU*	10448	100.0	100.0	0.0	0.0	100.0	0.0	0.0	10448
IE	8936	-	-	-	-	-	-	-	8936
IT*	119854	100.0	100.0	0.0	0.0	100.0	0.0	0.0	119854
MD	11985	-	-	-	-	-	-	-	11985
NL*	7583	100.0	64.5	13.5	22.0	64.5	13.6	21.9	4623
NO*	453087	19.9	11.2	8.4	0.3	11.2	8.4	0.3	226631
PL*	88383	100.0	88.1	11.9	0.0	88.2	11.8	0.0	88383
RU	3517136	-	-	-	-	-	-	-	3517136
SE*	395101	63.8	52.7	8.7	2.4	53.1	8.8	1.9	182223
SK	19227	-	-	-	-	-	-	-	19227

* Revised data submitted in 2004.

Acronyms: CLaci = CL = critical load of acidification; TLFs = target load fucntions; TL = target load; PL = present load; CLnut = critical load of nutrient nitrogen, n.f. = not feasible.