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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

Working Group on Effects

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Item 9 (c) of the provisional agenda
Progress in activities and workplan for 2024–2025 of effects-oriented activities : critical loads and other issues related to modelling and mapping

Modelling and mapping

Report by the Task Force on Modelling and Mapping, the Coordination Centre for Effects and the Centre for Dynamic Modelling

Summary

The present report is being submitted for consideration by the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe and the Working Group on Effects at their ninth joint session, in accordance with both the 2022–2023 workplan for the implementation of the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/148/Add.1, workplan items 1.1.1.19, 1.1.1.20, 1.1.1.21, 1.1.1.22, 1.1.1.23 and 1.1.1.24) and the revised mandate for the International Cooperative Programme on Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trend (Executive Body decision 2019/20[1]).

The present report includes a review of the implementation of the workplan activities undertaken by the International Cooperative Programme on Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends (ICP Modelling and Mapping) and a summary of the discussion and conclusions reached at the thirty-ninth meeting of the ICP Modelling and Mapping Task Force and centres (Prague, Czech Republic, 28–30 March 2023). The meeting was hosted by the Czech Geological Survey which organized the meeting jointly with the Chair of ICP Modelling and Mapping Task Force, the Coordination Centre for Effects and the Centre for Dynamic Modelling.

[1] Available at www.unece.org/env/lrtap/executivebody/eb_decision.html.

I. Introduction

1. The International Cooperative Programme on Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends (ICP Modelling and Mapping) is a scientific programme of the Working Group on Effects under the United Nations Economic Commission for Europe (ECE) Convention on Long-range Transboundary Air Pollution. France is the lead country of the ICP Modelling and Mapping Task Force. Germany and Sweden are the lead countries of, respectively, the Coordination Centre for Effects[2] and the Centre for Dynamic Modelling[3] – the two ICP Modelling and Mapping programme centres. The Task Force, the Coordination Centre for Effects and the Centre for Dynamic Modelling are hosted by, respectively, the French National Institute for Industrial Environment and Risks, the German Environment Agency and the Swedish Environmental Research Institute.

2. Representatives of 30 Parties to the Convention participate in the activities of ICP Modelling and Mapping. ICP Modelling and Mapping national focal centres help to compile and maintain the database of critical loads for acidification and eutrophication and carry out research regarding novel thresholds for impacts on plant species diversity. ICP Modelling and Mapping results are also used by the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) Task Force on Integrated Assessment Modelling, in collaboration with the Meteorological Synthesizing Centre-West, the Meteorological Synthesizing Centre-East and the Centre for Integrated Assessment Modelling. ICP Modelling and Mapping collaborates with all the international cooperative programmes under the Convention and with the Joint Task Force on the Health Aspects of Air Pollution.[4]

II. Progress in modelling and mapping activities

3. The thirty-ninth meeting of the ICP Modelling and Mapping Task Force and centres was hosted by the Czech Geological Survey which organized the meeting jointly with the Chair of ICP Modelling and Mapping Task Force, the Coordination Centre for Effects and the Centre for Dynamic Modelling.

4. Fifty-two delegates from the following 17 Parties participated in the meeting (in-person or online attendance): Austria, Bulgaria, Canada, Czech Republic, Germany, Ireland, Italy, Montenegro, Norway, Portugal, Russia, Spain, Sweden, Switzerland, The Netherlands, United Kingdom, United States of America. A representative of China also attended the meeting. Representatives of the UNECE Secretariat and the following Convention intergovernmental bodies, expert groups and scientific centres were present: the Bureau of the Working Group on Effects; the Coordination Centre for Effects; the Centre for Dynamic Modelling; the International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests); the International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems (ICP Integrated Monitoring); the International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops (ICP Vegetation); the International Cooperative Programme on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes (ICP Waters). Representatives of the Convention on Biological Diversity were also present.

5. ICP Modelling and Mapping Task Force decisions were reviewed by the participants during the meeting. Presentations are available at the Coordination Centre for Effects website.[5]

6. The objectives of the meeting included:

[2] See www.umweltbundesamt.de/en/cce.
[3] See https://www.ivl.se/projektwebbar/centre-for-dynamic-modelling.html
[4] The Joint Task Force on the Health Aspects of Air Pollution is a joint body of the World Health Organization European Centre for Environment and Health and the Executive Body for the Convention on Long-range Transboundary Air Pollution.
[5] See www.umweltbundesamt.de/en/meetings-workshops-0?parent=69334.

(a) Presentation of the current status of work of the Coordination Centre for Effects in collaboration with the Task Force on the revision of the databases of steady-state critical loads further to the responses of national focal centres to the call for data 2023 and further to the revision of empirical critical loads of nitrogen;

(b) Presentation of the current status of work of the Coordination Centre for Effects on the update of the European receptor map used for the calculation of the critical loads for terrestrial ecosystems throughout Europe;

(c) Presentation of the current status of work of the Coordination Centre for Effects on the review of critical limits used in the simple mass balance model;

(d) Presentation of the current status of work of the Coordination Centre for Effects on the review of critical levels for ammonia;

(e) Presentation of the current status of work of the Centre for Dynamic Modelling and feedback from the expert workshop on carbon-nitrogen interactions;

(f) Presentation and endorsement by the ICP Modelling and Mapping community of the Mapping Manual updates following recent work achieved by ICP Materials, following the recent publication of the revised empirical critical loads of nitrogen;

(g) Discussion on the possibility to build actions towards outreach activities under ICP Modelling and Mapping and the Working Group on Effects.

III. Relevant items of the 2022–2023 workplan

A. Update of critical loads databases according to new knowledge

7. Critical loads and the calculation of their exceedances are dedicated instruments for assessing possible impacts of air pollution on ecosystems. In order to target an assessment that is as scientifically sound as possible, steady-state and empirical critical loads need to be updated regularly.

8. The Coordination Centre for Effects published the report on the Review and revision of empirical critical loads of nitrogen for Europe in 2022. With this report empirical critical loads of nitrogen have been updated for the fourth time since 1992. The report reflects the results of an international cooperative process, coordinated by the Coordination Centre for Effects between 2020 and 2022, to which a total of 43 authors, representing ICP Forests, ICP Integrated Monitoring, ICP Modelling & Mapping, ICP Waters and ICP Vegetation, contributed with their scientific expertise. The review was finalised with an UNECE CCE expert workshop in Berne in October 2021, hosted by the Swiss Federal Office for the Environment (BAFU). The updated list of empirical critical loads of nitrogen contains critical loads values for 51 different European ecosystems. There was enough evidence to take up 9 new ecosystems in the list of sensitive receptors and adapt the values for 36 receptors. Most of the revised values have been lowered considering latest scientific findings. Further to this revision, the dedicated chapters of the Manual on methodologies and criteria for Modelling and Mapping Critical Loads and Levels and Air Pollution Effects, Risks and Trends have been updated by the Coordination Centre for Effects.

9. The call for data is an important instrument in attaining this goal and is achieved by continued collaboration between the Coordination Centre for Effects and national focal centres. At the time the thirty-ninth meeting of the ICP Modelling and Mapping Task Force and centres was held, the call for data 2023 sent for gathering reports from countries having updated their critical loads in accordance with the recently revised empirical critical loads was ongoing. The critical loads for acidification and eutrophication will be updated accordingly in the European critical loads database by the Coordination Centre for Effects.

10. A project aiming to review whether currently used critical limits for critical load calculations of acidification and eutrophication needs to be updated based on recent findings from scientific literature is currently carried out by the Coordination Centre for Effects together with UBA Wien (Austria). In order to gather expertise on the topic, a workshop was

held in December 2022. Part of this project is to elaborate how alterations in critical limits would affect critical loads on a Pan-European scale. A report of these activities is going to be published in 2023. Another recent project coordinated by the ICP Modelling & Mapping German national focal centre, the sensitivity of simple mass balance critical loads on German Level II Plots is assessed towards climate dependent parameters such as soil water leaching rate, temperature and weathering rate of base cations. A report is in preparation and its publication is expected early 2024.

11. The review of the critical levels for ammonia was included in the 2022–2023 workplan (ECE/EB.AIR/148/Add.1, item 1.1.1.22) after it was considered that a substantial amount of new data and scientific papers had become available since the publication of the most recent update. These new data have been discussed in a workshop organised by the Coordination Centre for Effects in Dessau in March 2022. The proceedings and main results of the workshop were published in a report[6]. Updates were transferred to the Mapping Manual and approved by experts at ICP Vegetation 2023 online meeting (13 February 2023) and the ICP Modelling & Mapping meeting in Prague (Czech Republic) on 30 March 2023. The draft revised chapter 3.2.3 on Ammonia Critical levels of the Mapping Manual will be presented at the 9th Joint EMEP SB/WGE meeting for approval.

B. Update of the European receptor map

12. For the calculation of the critical loads for terrestrial ecosystems throughout Europe, but also for the modelling of the air quality, an up-to-date harmonized land cover map is necessary. This map currently used within the framework of the Convention was nearly 15 years old and based on even older underlying datasets. Therefore, revision was urgently needed. This update was coordinated by the Coordination Centre for Effects in the framework of a project financed by the German Environment Agency. Within the project the updating was combined with a spatial extension to Eastern Europe, Caucasus, and Central Asia (EECCA). The updated harmonized European Land Cover Map complies with the Level 3 classes of the EUNIS Habitat Classification Scheme as much as possible and uses as much as possible different up-to-date spatial data. Publication of the detailed results of this work is upcoming in 2023. Further implementation of soil and forest growth data for the calculation of CL within the background database including EECCA region is part of the Coordination Centre for Effects tasks for next workplan 2024 – 2025.

C. Development of effects-oriented scientific work with a focus on dynamic modelling

13. Ongoing dynamic modelling work within the Working Group on Effects has been mapped through a series of interviews between CDM and the individual ICPs. Interactions between air pollution and climate change has been identified as one of the most important areas which are policy relevant and could be addressed by dynamic models. In modelling the effects of air pollution on ecosystems, including modelling of nitrogen effects and modelling of impacts on biodiversity, the interactions between carbon and nitrogen represent a clear and important overlap where modellers could and should be providing an input to both policies. An expert workshop on carbon-nitrogen interactions has been organised back-to-back with the thirty-ninth meeting of the ICP Modelling and Mapping Task Force and centres (Prague, Czech Republic, 28 March 2023). Apart from further work on effects of nitrogen deposition on ecosystems and interaction of air pollution and climate change, modelling biodiversity change, and modelling of impacts on soils has been identified as the most important areas of work. The meeting also stressed the importance of observational data from monitoring and from ecosystem experiments for model applications and development. The modelling activities undertaken by the individual ICPs has been reflected in the new structure of the common WGE website, presented at the Joint Meeting of the Extended Bureaux of

[6] https://www.umweltbundesamt.de/publikationen/review-of-internationally-proposed-critical-levels

EMEP Steering Body and the Extended Bureaux of the WGE in April 2023 in Uppsala (Sweden).

D. Development and maintenance of the common Working Group on Effects website

14. The purpose of the common Working Group on Effects website[7] is to provide a common entry point to which all the parts of the Working Group on Effects are linked. It does not replace or duplicate the individual ICPs' websites but provides meta information on their existence and indicates what kind of data and results are to be found where. The common entry point has primarily been developed for users outside the Convention to facilitate an easy overview of the conceptual framework and of the Working Group on Effects work as a whole. The web page has been created over the past two years by a small group consisting of the representatives of ICP Forests, the Bureau of the Working Group on Effects and the former Joint Expert Group on Dynamic Modelling. The further development of the common web page is currently managed by the Centre for Dynamic Modelling and ongoing through the current workplan 2022 – 2023.

IV. Recommendations and other outcomes of the thirty-ninth meeting of the Task Force

15. The update of the steady-state critical loads according to reports submitted by national focal centres should be continued and communicated in the next Coordination Centre for Effects status report.

16. The revised empirical critical loads of nitrogen published by the Coordination Centre for Effects should be considered as far as possible within works implying the use of critical loads at national level.

17. The parties of the 9th Joint EMEP/WGE meeting are asked to approve the suggested changes and the update of the Mapping Manual in its draft revised chapter 3.2.3 on Ammonia Critical levels.

18. The ICP Modelling and Mapping Task Force and centres will continue to contribute actively to the work ongoing on acidification and eutrophication critical loads and their exceedances under the effects-oriented activities of the Convention by:

(a) Calculating critical loads exceedance for European countries which will be based on the data submitted by the national focal centres within the calls for data, as well as on the updated background database for countries that have not provided new critical loads data;

(b) Contributing to the use of new scientific findings on environmental and health effects assessments, e.g. impact of critical loads, dynamic modelling of ecosystem recovery, interactions between air pollution, climate change, nitrogen fluxes and other stress factors for biodiversity.

[7] See www.unece-wge.org/.