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Economic Commission for Europe

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

Tenth joint session

Geneva, 9–13 September 2024

Item 4 (b) 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 tenth joint session, in accordance with both the 2024–2025 workplan for the implementation of the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/154/Add.1¹, workplan items 1.1.1.20, 1.1.1.21, 1.1.1.22, 1.1.1.23, 1.1.1.24 and 1.1.1.25) 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 2019/20²).

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 fortieth meeting of the ICP Modelling and Mapping Task Force and the Coordination Centre for Effects (Oslo, Norway, 23–25 April 2024). The meeting was jointly organized by the Chair of ICP Modelling and Mapping Task Force, the Coordination Centre for Effects and the Norwegian Institute for Water Research, the latter hosting the meeting in Oslo (Norway).

¹ Available at <https://unece.org/sites/default/files/2024-05/Advance%20Report%20Add.1.pdf>

² 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 Effects³ and the Centre for Dynamic Modelling⁴ – 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 22 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.⁵

II. Progress in modelling and mapping activities

3. The fortieth meeting of the ICP Modelling and Mapping Task Force and the Coordination Centre for Effects was hosted by the Norwegian Institute for Water Research, in the Norwegian Environment Agency's office in Oslo (Norway), with the support of the Norwegian Ministry of Climate and Environment and the Norwegian Environment Agency. The meeting was jointly organized by the Chair of ICP Modelling and Mapping Task Force, the Coordination Centre for Effects and the Norwegian Institute for Water Research.

4. Forty delegates from the following 18 Parties participated in the meeting (in-person or online attendance): Austria, Bulgaria, Czech Republic, Denmark, Finland, Germany, Ireland, Italy, Norway, Poland, Russia, Spain, Sweden, Switzerland, the Netherlands, the United Kingdom of Great Britain and Northern Ireland, the 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 Chair of the Working Group on Strategies and Reviews, the Chair 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, Monitoring of the Effects of Air Pollution on Rivers and Lakes (ICP Waters), the Meteorological Synthesizing Centre – West (MSC-W) and the Centre for Integrated Assessment Modelling (CIAM).

³ See www.umweltbundesamt.de/en/cce.

⁴ See <https://www.ivl.se/projektwebbar/centre-for-dynamic-modelling.html>

⁵ 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. 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.⁶
6. The objectives of the meeting included:
- (a) 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 and the EECCA countries;
 - (b) Presentation of the current status of work of the Coordination Centre for Effects with regard to empirical critical loads including the collaboration with the Task Force on the responses of national focal centres to the call for data 2023 on the national application of empirical critical loads of nitrogen and the application of empirical critical load data done by CCE with the updated receptor map;
 - (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 CCE on the application of Critical Levels for ammonia with the updated receptor map or the European domain of the Convention (including EECCA region);
 - (e) Presentation of the current status of work of the Centre for Dynamic Modelling and announcement of an expert workshop on dynamic modelling indicators to be included in the upcoming call for data and possible contributions of the Centre for Dynamic Modelling to the Gothenburg Protocol revision;
 - (f) Presentation and endorsement by the ICP Modelling and Mapping community of the action plan towards contribution of the ICP Modelling and Mapping to the Gothenburg revision process, including the timeline for the next call for data launched for this purpose;
 - (g) Discussion on the possibility to build actions towards a better consideration of critical loads for aquatic ecosystems under ICP Modelling and Mapping activities.

III. Relevant items of the 2024–2025 workplan

A. Update of the European receptor map

7. In 2023, the Coordination Centre for Effects coordinated and finalised the update of the harmonized land cover map used for the modelling of the air quality and for the calculation of the critical loads for terrestrial ecosystems. The updated map, ready for use throughout European regions of the Convention was also extended to Eastern Europe Caucasus and Central Asia (EECCA). Across these regions, this database provides the distribution of more than 200 different ecosystem types on European Nature Information System (EUNIS) level 3. The map can be provided to National Focal Centres (NFCs) for their national purposes upon request to the Coordination Centre for Effects. The documentation of the detailed results of this work was published in 2023⁷. 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.

B. Update of critical loads databases according to new knowledge

8. 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

⁶ See www.umweltbundesamt.de/en/meetings-workshops-0?parent=69334.

⁷ <https://www.umweltbundesamt.de/publikationen/creation-of-a-harmonized-land-cover-map-as-an>

that is as scientifically sound as possible, steady-state and empirical critical loads need to be updated regularly.

9. In 2024, following the recent update of empirical Critical Loads for nitrogen in 2022, the Coordination Centre for Effects (CCE) provided a stable UNECE-wide approach to attribute this empirical critical load data to UNECE ecosystems. The resulting map was elaborated by interlinking empirical Critical Loads for more than 50 different ecosystems with the updated receptor map. The preliminary data was made available to the Centre for Integrated Assessment Modelling for their scenario assessments on risks for biodiversity.

10. In 2023, the CCE of the ICP Modelling and Mapping also finalised the review and revision of Critical Levels for Ammonia following a literature review and the organisation of a workshop. A report of this review was published by CCE in a report⁸. In summary the existing concentration levels to protect vegetation from harmful ammonia concentration were confirmed. As a follow-up to this activity the CCE presented an approach of linking the updated levels with the new receptor map, to provide a basis for future risk assessment. The resulting UNECE-wide database was deemed relevant for the inclusion in the revision of the Gothenburg Protocol. With the help of interested national focal centers, this activity will be finalised until early 2025 and the data will be delivered to the Centre for Integrated Assessment Modelling (CIAM) for optimization calculations.

11. The call for data is an important instrument towards the update of critical loads databases according to new knowledge. It is achieved by continued collaboration between the Coordination Centre for Effects and national focal centres. At the time the fortieth meeting of the ICP Modelling and Mapping Task Force and the Coordination Centre for Effects was held, national focal centres presented their work on national application of empirical critical loads. Further, an upcoming call for data was already foreseen for the period 2024–2025 aiming to get national focal centres latest confirmation on critical load data for the inclusion of national data in the European critical load database used for the revision of the Gothenburg Protocol. The call will give national focal centres the option to include the most up-to-date national SMB critical loads for acidification and eutrophication for terrestrial and aquatic ecosystems, or to confirm the reported empirical critical loads for the support of the Gothenburg Protocol revision process.

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

12. The Centre for Dynamic Modelling activities are related to preparing the dynamic modelling part of the upcoming call for data 2024 – 2025, according to workplan items 1.1.1.20 and 1.1.1.21. Participants to the fortieth meeting of the ICP Modelling and Mapping Task Force and the Coordination Centre for Effects were invited to the Centre for Dynamic Modelling workshop on this theme which will be held in Copenhagen in August 26 – 28, 2024. The key objective of the workshop is to discuss Dynamic Modelling of biodiversity change indicators for integration in a next call for data.

13. The Centre for Dynamic Modelling has scenario analysis (often referred to as “ex-post analysis” in the Convention context) as an agenda item at its workshop in August 2024. The role played by models in this effort apply to biodiversity modelling related to nitrogen, but equally to aquatic biodiversity linked primarily to acidification, choice of damage indicators and critical limits.

D. Development of effects-oriented scientific work towards support in the revision process of the Gothenburg protocol

14. The current UNECE wide dataset of empirical Critical Loads is expected to reflect risks for biodiversity through air pollution in a relevant way. This is because the exceedance of empirical Critical Loads in many cases is associated with observed shifts in species

⁸ <https://www.umweltbundesamt.de/publikationen/review-of-internationally-proposed-critical-levels>

abundance and reduction or disappearance of indicator species. The updated and improved data including the Coordination Centre for Effects data, the Centre for Dynamic Modelling data and national focal centers data will be delivered to the Centre for Integrated Assessment Modelling (CIAM) for optimization calculations in 2025 and thus contribute to the effects-based approach of the Convention and the policy recommendations of the Gothenburg Protocol revision process. The main aim of this work is to address one of the negotiation items within the Gothenburg Protocol revision work consisting in identifying “overarching, collective risk-based target(s) to reduce harmful effects to health and to ecosystems, including biodiversity loss in ECE region”.

E Development and maintenance of the common Working Group on Effects website

15. The purpose of the common Working Group on Effects website⁹ 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.

IV. Recommendations and other outcomes of the fortieth meeting of the Task Force

16. 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.

17. 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. with critical load assessments, dynamic modelling of ecosystem recovery, and evaluation of interactions between air pollution, climate change, nitrogen fluxes and other stress factors for biodiversity.

18. The ICP Modelling and Mapping asks the Working Group on Effects for approval of a new call for data at its tenth joint session with the EMEP Steering Body, in order to support the current revision process of the Gothenburg Protocol. This call for data aims at updating national Steady State/SMB Critical Loads for terrestrial and freshwater ecosystems in combination with empirical Critical Loads and submitting new data following definition of dynamic modelling indicators for the protection of biodiversity. If approved, the countries will be encouraged by the ICP Modelling and Mapping to submit their most up-to-date national data following the instructions which will be communicated by the ICP Modelling and Mapping. National focal centres shall respond to the call in advance to the Task Force’s forty-first meeting (2025) and to the seventh joint session of EMEP Steering Body and the Working Group on Effects (September 2025).

⁹ See www.unece-wge.org/.