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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**

**Sixth joint session**

Geneva, 14–18 September 2020

Item 3 of the provisional agenda

**Progress in activities in 2020 and further development of effects-oriented activities**

### 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 sixth joint session, in accordance with both the 2020–2021 workplan for the implementation of the Convention (ECE/EB.AIR/144/Add.2) 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).<sup>1</sup>

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-sixth meeting of the ICP Modelling and Mapping Task Force and centres (online, 21–23 April 2020). The meeting was organized by Ms. Alice James Casas (France) – Chair of ICP Modelling and Mapping – in close collaboration with the Coordination Centre for Effects and the new Centre for Dynamic Modelling.

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<sup>1</sup> Available at [www.unece.org/env/lrtap/executivebody/eb\\_decision.html](http://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<sup>2</sup> and the Centre for Dynamic Modelling – 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 more than 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.<sup>3</sup>

## II. Progress in modelling and mapping activities

3. The thirty-sixth meeting of the ICP Modelling and Mapping Task Force and centres was organized as a web conference following the introduction of travel restrictions due to the coronavirus disease (COVID-19) pandemic (online, 21–23 April 2020, afternoons) and was therefore condensed in terms of contributions and time.
4. Sixty-three delegates from the following 22 Parties participated in the meeting: Austria; Belgium; Bulgaria; Canada; China; Czechia; Denmark; Finland; France; Germany; Hungary; Italy; Malta; Netherlands; Norway; Portugal; Russian Federation; Spain; Sweden; Switzerland; United Kingdom of Great Britain and Northern Ireland; and United States of America. Representatives of 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); and the Centre for Integrated Assessment Modelling.
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.<sup>4</sup>
6. The objectives of the meeting included:

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<sup>2</sup> See [www.umweltbundesamt.de/en/cce](http://www.umweltbundesamt.de/en/cce).

<sup>3</sup> 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.

<sup>4</sup> See [www.umweltbundesamt.de/en/meetings-workshops-0?parent=69334](http://www.umweltbundesamt.de/en/meetings-workshops-0?parent=69334).

- (a) Presentation of the current organization of the Task Force, the Coordination Centre for Effects and the new Centre for Dynamic Modelling under ICP Modelling and Mapping;
- (b) Presentation of the current status of work of the Coordination Centre for Effects on updating and revising the European background database;
- (c) 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 and empirical critical loads further to the responses of national focal centres to the call for data 2019–2021 communicated in November 2019;
- (d) Presentation of the current status of work of the Coordination Centre for Effects in collaboration with other bodies on the review and revision of the empirical critical loads process launched in 2019;
- (e) Presentation of the current status of work of the new Centre for Dynamic Modelling under ICP Modelling and Mapping;
- (f) Sharing new knowledge on critical loads established through (field) experiments and modelling by the national focal centres and other expert groups;
- (g) Discussion on future revision of the revised long-term strategy of the effects-oriented activities.<sup>5</sup>

### **III. Relevant items of the 2019–2020 workplan**

#### **A. Development of existing information technology infrastructure and software to guarantee an operational Coordination Centre for Effects, and revision of the existing European background database**

7. In order to guarantee a fully operational Coordination Centre for Effects, the existing information technology infrastructure and software at the German Environment Agency was adapted in 2019; for example, through the provision of necessary storage capacity and web space, in order to ensure that data handling and communication tasks could be performed. The Coordination Centre for Effects contracted Wageningen Environmental Research and former members of the former Coordination Centre for Effects to rebuild, update and document the European background database on critical loads<sup>6</sup> through a contracting period running through 2019 and 2020. The work consists of data compilation and assessment (derivation of critical loads parameters for eutrophication and acidification, as well as consolidation of data in a geodatabase), calculation of steady-state critical loads for eutrophication and acidification for terrestrial ecosystems (including data import and preparation, development of calculation framework and calculation of simple mass balance critical loads). The status of this work and the future tasks were presented during the thirty-sixth meeting of the ICP Modelling and Mapping Task Force and its two centres.

#### **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 that is as scientifically sound as possible, steady-state and empirical critical loads need to be updated regularly. 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-sixth meeting of the ICP Modelling and Mapping

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<sup>5</sup> Available at [www.unece.org/fileadmin/DAM/env/documents/2012/EB/Informal\\_document\\_no\\_18\\_Revised\\_Long-term\\_Strategy\\_of\\_the\\_effects-oriented\\_activities\\_clean\\_text.pdf](http://www.unece.org/fileadmin/DAM/env/documents/2012/EB/Informal_document_no_18_Revised_Long-term_Strategy_of_the_effects-oriented_activities_clean_text.pdf).

<sup>6</sup> The European background database on critical loads has been used in the past for countries not having submitted national critical load data to the Coordination Centre for Effects.

Task Force and centres was held, the call for data 2020–2021 had allowed for the provision of update reports for five Parties for steady-state critical loads (Belgium (Flanders), Canada, Norway, Switzerland and the United Kingdom of Great Britain and Northern Ireland) and the provision of update reports for seven Parties for empirical critical loads (Austria, Belgium (Flanders), Canada, Ireland, Norway, Switzerland and the United Kingdom of Great Britain and Northern Ireland). The critical loads for acidification and eutrophication will be updated accordingly in the European critical load database by the Coordination Centre for Effects.

9. The review and revision of the empirical critical loads for nitrogen was included in the 2020–2021 workplan (ECE/EB.AIR/144/Add.2, item 1.1.1.14) 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.<sup>7</sup> A preliminary literature review by the Thünen Institute (Germany) – led for the Coordination Centre for Effects – was presented as the first step in that process during the thirty-sixth meeting of the ICP Modelling and Mapping Task Force and centres. A provisional schedule of the process for the coming years was also presented. This process will consist of collating and assessing new relevant information from studies on the impacts of nitrogen on semi-natural ecosystems. This work is organized in work packages, relying on the in-kind contributions of Parties to provide resources in the form of the work of scientific experts in the field. The review process will also be subject to external review before a consensus is reached on the revised values. Further to the collation and assessment of new data, 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*<sup>8</sup> will be updated by the same experts. The schedule announced aims at providing draft conclusions and a final report for, respectively, the seventh (September 2021) and the eighth (September 2022) joint sessions of the Steering Body to EMEP and the Working Group on Effects.

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

10. The new Centre for Dynamic Modelling is mandated to develop methods focusing on dynamic modelling and developing suitable indicators of biodiversity using dynamic modelling. As a complement to steady-state models (such as are commonly used for calculating critical loads) the dynamic models add the dimension of time to the calculations, i.e. they provide not only the end-point of calculation of an ecosystem at steady state but also the trajectory of how this end-point will be reached. Dynamic models can calculate and visualize possible future development under different scenarios, as well as historical development that resulted in the current observed situation. Working with these models allows for the integration, interpretation and packaging of theoretical knowledge with results from experiments and monitoring and in that way benefits from the work of several ICPs and of EMEP. One outstanding goal for the modelling community is the development of indicators and methods to set critical loads for nitrogen as a nutrient based on biodiversity. One of the key activities of the Centre for Dynamic Modelling is to promote and lead this work and progress in this regard was presented by several Parties at the thirty-sixth meeting of the ICP Modelling and Mapping Task Force and centres.

### **D. Collaboration between ICP Modelling and Mapping and other bodies of the Convention**

11. The thirty-sixth meeting of the ICP Modelling and Mapping Task Force and centres was organized and held in close collaboration with the Coordination Centre for Effects and the Centre for Dynamic Modelling. To build up a cooperation network within the

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<sup>7</sup> Rolands Bobbink and Jean-Paul Hettelingh, eds., *Review and Revision of Empirical Critical Loads and Dose-response Relationships, Proceedings of an Expert Workshop, Noordwijkerhout, 23–25 June 2010* (National Institute for Public Health and the Environment of the Netherlands, 2011).

<sup>8</sup> Till Spranger and others, eds. (Berlin, German Federal Environmental Agency, 2004).

Convention, the Coordination Centre for Effects held bilateral meetings with the Meteorological Synthesizing Centre-West (Oslo, 5 November 2019) and with the Centre for Integrated Assessment Modelling (online, 19 June 2020). The Coordination Centre for Effects also organized the kick-off meeting of the empirical critical loads review and revision process (online, 15 and 16 June 2020). The Chair of ICP Modelling and Mapping and representatives of both the Coordination Centre for Effects and the Centre for Dynamic Modelling, attended remotely the EMEP Steering Body and Working Group on Effects Extended Bureaux Meeting (online, 23–26 March 2020) and the Task Force meetings of ICP Waters (online, 11 and 12 May 2020), ICP Integrated Monitoring (online, 13 and 14 May 2020), and ICP Forests (online, 11 and 12 June 2020).

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

12. The purpose of the common Working Group on Effects website<sup>9</sup> is to provide a common entry point to which all the parts of the Working Group on Effects are linked. It does not replace the individual ICP 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 thirty-sixth meeting of the Task Force**

13. The update of the European background database by the Coordination Centre for Effects should be continued and achieved.

14. The review and revision of empirical critical loads on nitrogen should be continued following the organization (work packages) presented during the thirty-sixth meeting of the ICP Modelling and Mapping Task Force and centres and the organization and schedule were further discussed and decided between the contributors during the kick-off meeting organized by the Coordination Centre for Effects in June 2020.

15. The Coordination Centre for Effects will inform the national focal centres of substantial updates of the items mentioned in paragraphs 13 and 14 above. It will also provide more precise documentation on the technical details of the data requirements for the current call for data.

16. The revision of the revised long-term strategy of the effects-oriented activities should consider the need to:

- (a) Improve assessment of ammonia effects via both the implementation of critical levels of ammonia and the better linking of air quality and biodiversity monitoring;
- (b) Give non-forest ecosystems – home to a large part of sensitive species – a more prominent role in future monitoring and modelling activities;
- (c) Continue progress on considering critical loads for heavy metals;
- (d) Link biogeochemical change to species changes, recalled as an important issue to progress on, possibly with tools such as target loads;
- (e) Include all habitat types for biodiversity, with improved harmonization between countries or/and on the European scale; and

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<sup>9</sup> See [www.unece-wge.org/](http://www.unece-wge.org/).

(f) Enhance communication building on ICP Modelling and Mapping experts capacity, via training sessions but also leaned towards policy (within the Convention framework, but also exchanging with the European Union on the National Emission Ceiling Directive,<sup>10</sup> the Habitats Directive<sup>11</sup> and the European Environment Agency).

17. The further development and consolidation of acidification and eutrophication critical loads should be continued, as should the development of critical loads using dynamic modelling concepts.

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<sup>10</sup> Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC, *Official Journal of the European Union*, L 344 (2016), pp. 1–31

<sup>11</sup> Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, *Official Journal of the European Communities*, L 206 (1992), pp. 7–50.