



# Economic and Social Council

Distr.: General  
5 August 2015

English only

---

## 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**

**First joint session\***

Geneva, 14–18 September 2015

Item 15 of the provisional agenda

**Progress in activities in 2015 and further development of  
effects-oriented activities**

### **Integrated monitoring of air pollution effects on ecosystems\*\***

**Report by the Programme Coordinating Centre of the International  
Cooperative Programme on Integrated Monitoring of Air Pollution  
Effects on Ecosystems**

#### *Summary*

The present report is being submitted for consideration by the first joint session of 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 in accordance with the request of the Executive Body for the Convention on Long-range Transboundary Air Pollution in the 2014–2015 workplan for the implementation of the Convention (ECE/EB.AIR/122/Add.2, items 1.1.20 and 1.2.2).

---

\* The Executive Body to the Convention agreed that, as of 2015, the Working Group on Effects and the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe should meet jointly, to achieve enhanced integration and cooperation between the Convention's two scientific subsidiary bodies (ECE/EB.AIR/122, para. 47 (b)).

\*\* The present document is being issued without formal editing.



The report of the International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems presents the results of its twenty-third Task Force meeting (Minsk, Belarus, 6–8 May, 2015) and of activities undertaken since its 2014 report and details, in particular, work on the relationships between changes in ground vegetation and exceedances of critical loads of nitrogen and trends in heavy metal concentrations and stores in the catchments.

## I. Introduction

1. The present report of the International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems (ICP Integrated Monitoring) is being submitted for consideration by the Working Group on Effects in accordance with the request of the Executive Body for the Convention on Long-range Transboundary Air Pollution in the 2014–2015 workplan for the implementation of the Convention (ECE/EB.AIR/122/Add.2, items 1.1.20 and 1.2.2). The report presents the results of the activities undertaken between May 2014 and May 2015 and details, in particular, work on the relationships between changes in ground vegetation and exceedances of critical loads of nitrogen and trends in heavy metal concentrations and stores in the catchments.
2. The Programme Task Force is led by Sweden, while the Programme Centre is hosted by the Finnish Environment Institute in Helsinki. The Programme involves some 150 scientists in 16 countries.
3. During the reporting period, ICP Integrated Monitoring held two meetings: the twenty-second Task Force meeting and a scientific workshop (Westport, Ireland, 7–9 May 2014), and the twenty-third Task Force meeting and a scientific workshop (Minsk, Belarus, 6–8 May, 2015).
4. Key topics discussed at the most recent Task Force meeting included the status of the ICP Integrated Monitoring database, reports to be prepared according to the Convention's 2014–2015 workplan, cooperation with other bodies and activities and the future workplan of ICP Integrated Monitoring. The scientific workshop focused on current work on the key scientific topics of the Programme (see section IV below). The minutes of the meetings are available on the ICP Integrated Monitoring website.<sup>1</sup>

## II. Outcomes and deliverables in the reporting period

5. In 2014, ICP Integrated Monitoring produced or contributed to the following reports:
  - (a) The 2014 joint progress report on the activities of the International Coordinated Programmes and the Joint Task Force on the Health Aspects of Air Pollution (ECE/EB.AIR/WG.1/2014/3);
  - (b) Integrated monitoring (the 2014 technical report of ICP Integrated Monitoring to the Working Group on Effects) (ECE/EB.AIR/WG.1/2014/9);
  - (c) *23rd Annual Report 2014* of ICP Integrated Monitoring;<sup>2</sup>
  - (d) A progress report on dynamic vegetation modelling at ICP Integrated Monitoring sites;<sup>3</sup>

---

<sup>1</sup> See [www.syke.fi/nature/icpim](http://www.syke.fi/nature/icpim).

<sup>2</sup> Sirpa Kleemola and Martin Forsius, eds., *23rd Annual Report 2014, Convention on Long-range Transboundary Air Pollution. International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems*, Reports of the Finnish Environment Institute, No. 23 (Helsinki, 2014). Available from <https://helda.helsinki.fi/handle/10138/135815>.

<sup>3</sup> M. Holmberg, "Progress report on dynamic vegetation modelling at ICP IM sites" in Sirpa Kleemola and Martin Forsius, eds., *23rd Annual Report 2014*, pp. 24–35.

- (e) A report on sulphur and nitrogen input-output budgets at ICP Integrated Monitoring sites in Europe in 1990–2012;<sup>4</sup>
  - (f) A scientific paper on the changes in ground vegetation as a response to the exceedance of critical loads of nitrogen.<sup>5</sup>
6. The main results of the activities carried out are:
- (a) ICP Integrated Monitoring prepared a contribution to the Trends Report of the Working Group on Effects, to be presented at the next session of the Executive Body;
  - (b) Parameters measured at ICP Integrated Monitoring sites and documented in the ICP Integrated Monitoring Programme Manual were included in the draft text of the revised National Emission Ceilings Directive<sup>6</sup> (annex V on monitoring requirements), which is being updated as part of the European Union (EU) Clean Air Policy Package;
  - (c) A scientific paper based on ICP Integrated Monitoring activities was published during the reporting period,<sup>5</sup> providing quality control for the work undertaken and disseminating the information to a wider scientific community.

### **III. Expected outcomes and deliverables over the next period and in the longer term**

7. In the second half of 2015 and in 2016, ICP Integrated Monitoring is going to contribute to or produce the following deliverables indicated in the 2014–2015 workplan and deliverables foreseen in the 2016–2017 workplan:
- (a) The 2015 joint progress report on policy-relevant scientific findings (ECE/EB.AIR/GE.1/2015/3–ECE/EB.AIR/WG.1/2015/3);
  - (b) A scientific paper on mass balances and indicators for sulphur and nitrogen in catchments (2014–2015 workplan item 1.2.2, in 2015);
  - (c) The twenty-fourth annual ICP Integrated Monitoring report (covering activities in 2014–2015);
  - (d) A report on dynamic responses to vegetation changes in relation to nitrogen (workplan item 1.3.12, in 2016);
  - (e) A report on long-term trends in effects of sulphur and nitrogen (workplan item 1.1.20, in 2016);
  - (f) The twenty-fifth annual ICP Integrated Monitoring report (covering activities in 2015–2016).

---

<sup>4</sup> Jussi Vuorenmaa and others, “Sulphur and nitrogen input-output budgets at ICP Integrated Monitoring sites in Europe”, in Sirpa Kleemola and Martin Forsius, eds., *23rd Annual Report 2014*, pp. 28–35.

<sup>5</sup> Dirnböck, T., Grandin, U., Bernhardt-Römermann, M., Beudert, B., Canullo, R., Forsius, M., Grabner, M.-T., Holmberg, M., Kleemola, S., Lundin, L., Mirtl, M., Neumann, M., Pompei, E., Salemaa, M., Starlinger, F., Staszewski, T., Uzieblo, A.K. 2014. Forest floor vegetation response to nitrogen deposition in Europe. *Global Change Biology* 20: 429-440.

<sup>6</sup> Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants.

#### **IV. Cooperation with other groups, task forces or subsidiary bodies, notably with regard to synergies and possible joint approaches or activities**

8. ICP Integrated Monitoring has established useful collaboration with the following bodies under the Working Group on Effects: the International Cooperative Programme (ICP) on Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends (on critical load calculations); the Joint Expert Group on Dynamic Modelling (on changes in biodiversity); the ICP on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes (ICP Waters); and the ICP on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests; on long-term trends calculations on effects indicators). ICP Integrated Monitoring also uses emission scenario data of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP). A joint Task Force meeting and scientific workshop with the ICP on Assessment and Monitoring of the Effects of Air Pollution on Rivers and Lakes is planned for 2016.

#### **V. Strengthening the involvement of countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia in the work under the Convention**

9. The twenty-third ICP Integrated Monitoring Task Force meeting and scientific workshop was held in Minsk on 6–8 May 2015.

#### **VI. Scientific and technical cooperation activities with relevant international bodies**

10. In terms of cooperation with international bodies, ICP Integrated Monitoring collaborates closely with the European Long-Term Ecosystem Research (LTER) network<sup>7</sup> and many of the sites are common to both bodies. The European Long-Term Ecosystem and socio-ecological Research Infrastructure project (eLTER) received funding from the EU Horizon 2020 programme<sup>8</sup> and started in June 2015.

#### **VII. Highlights of the scientific findings: policy-relevant issues**

11. The following findings of ICP Integrated Monitoring are of particular scientific relevance:

(a) Chronic nitrogen (N) deposition poses a threat to biodiversity as a result of eutrophication of sensitive ecosystems. Excess N may favour a few plant species causing competitive exclusion and, in the long run, loss of less competitive species. Long-term monitoring data from 28 forest sites of ICP Integrated Monitoring and ICP Forests were used to analyse temporal trends in species cover and diversity.<sup>9</sup> So far there has been no unequivocal evidence that nitrogen deposition is a broad-scale driver behind the

---

<sup>7</sup> See [www.lter-europe.net](http://www.lter-europe.net).

<sup>8</sup> See <http://ec.europa.eu/programmes/horizon2020/>.

<sup>9</sup> See T. Dirnböck and others, “Forest floor vegetation response to nitrogen deposition in Europe”.

eutrophication signal in forest plant communities, as it is in other ecosystems such as grasslands;

(b) The study showed that the cover of plant species that prefer nutrient-poor soils (oligotrophic species) decreased the more the measured N deposition exceeded the empirical critical load for eutrophication effects. It was also concluded that the cover of nitrogen-sensitive plant species has decreased in European forest ecosystems, but diversity, in terms of species numbers, is still not affected by airborne N deposition. The observed response was the first detection of an N deposition effect on vascular plants of forest floor vegetation in a European-wide long-term monitoring data set;

(c) The study also indicated that estimated critical loads are very useful to describe the sensitivity of forest floor vegetation to N deposition. The use of critical load exceedances is particularly suitable to revealing the eutrophication signal of N deposition. It is superior to N deposition alone, which ignores the differences in sensitivity between ecosystems;

(d) Metals in soil and runoff are to a large degree dependent on long-term and long-range atmospheric transport, and the main priority in international studies has been on mercury (Hg), lead (Pb) and cadmium (Cd). Data reported to the ICP Integrated Monitoring Programme Centre were used for the evaluation of temporal changes and trends of heavy metals in soil and runoff at ICP Integrated Monitoring sites across Europe. A detailed analysis was in addition conducted for Swedish sites;<sup>10</sup>

(e) The trends in soil Pb and Cd concentrations in the forest floor showed decreases meaning that deposited elements now are transferred to deeper soil layers. Accumulation is still ongoing considering the total soil profile. Mercury is increasing in the forest floor with hazardous effects on biological activity and providing extended possibilities for methylation and releases to surface waters. Mercury is also transferred to deeper soil layers with ongoing accumulation and connected impacts. The trends in stream water concentrations of heavy metals — Cd, Pb and Hg — indicated small releases to surface waters of metals stored in the soils.

## VIII. Publications

12. For a full list of ICP Integrated Monitoring publications and references for the present report, please visit the ICP Integrated Monitoring website.<sup>11</sup>

---

<sup>10</sup> Åkerblom S. and Lundin, L. (2015). Progress report on heavy metal trends at ICP IM sites. In: ICP IM Annual Report 2015. Reports of the Finnish Environment Institute, Finnish Environment Institute, Helsinki (in press).

<sup>11</sup> See [www.syke.fi/nature/icpim](http://www.syke.fi/nature/icpim).