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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 (EMEP)**

### Thirty-fifth session

Geneva, 5–7 September 2011

Agenda item 6 (c) of the provisional agenda

**Progress in activities in 2011 and future work: emissions**

## **Present state of emission data and stage 3 in-depth review**

### **Report by the Centre on Emissions Inventories and Projections**

#### **Inventories and Projections**

1. The present report reflects progress in emission reporting under the Convention on Long-range Transboundary Air Pollution (Air Convention) in the 2011 reporting round (2009 emission data, including five-yearly reporting of gridded and large point source data not previously reported). It summarizes the main conclusions of the annual review of emission data carried out under the Cooperative Programme for Monitoring and Evaluation of the Long-range Transboundary Transmission of Air Pollutants in Europe (EMEP)<sup>1</sup> in line with item 2.1 of the 2011 work plan of the Convention (ECE/EB.AIR/106/Add.2). Furthermore, the report presents the outcome of the stage 3 in-depth review of national inventories for 2010, the plan for 2011 and a proposed schedule for 2012–2013.

2. The report was prepared by the EMEP Centre on Emissions Inventories and Projections (CEIP)<sup>2</sup> hosted by Austria's Federal Environment Agency (Umweltbundesamt-Vienna, <http://emep-emissions.at>).

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<sup>1</sup> This work is carried out in cooperation with the European Environment Agency and its European Topic Centre on Air and Climate Change.

<sup>2</sup> CEIP was established by the Air Convention's Executive Body at its twenty-fifth session (ECE/EB.AIR/91, para 27 (f)) and began operating on 15 January 2008.

## I. Present state of emission data

3. In 2011, Parties<sup>3</sup> were invited to submit data directly to CEIP, or alternatively to post their data on the European Environment Agency (EEA) central data repository and to inform the United Nations Economic Commission for Europe (UNECE) secretariat about the contents of the data submission by means of a notification form. Most Parties that submitted data also provided the secretariat with the notification form (with the exception of Albania, Azerbaijan, Greece, the Republic of Moldova, the former Yugoslav Republic of Macedonia, Turkey and Ukraine). An up-to-date overview of the data submitted by Parties during the 2011 reporting round is available online at <http://www.ceip.at/submissions-under-clrtap/2011-submissions/>. In addition, the officially reported emission data can be accessed at <http://www.ceip.at/emission-data-webdab/officially-reported-emission-data/>.

4. All inventories submitted by Parties have been tested via RepDab<sup>4</sup> and imported into the central CEIP database. The Guidelines for Reporting Emission Data under the Convention on Long-range Transboundary Air Pollution (hereinafter the Reporting Guidelines) (ECE/EB.AIR/97) and the Methods and Procedures for the Technical Review of Air Pollutant Emission Inventories Reported under the Convention and its Protocols (EB.AIR/GE.1/2007/16) contain background information on the reporting requirements, deadlines and procedures.

5. *Review of inventories.* All data submitted to CEIP have been reviewed. The technical review of inventories is carried out in three stages.<sup>5</sup> Stage 1 is an initial check of submissions for timeliness and completeness. Stage 2 is a synthesis and assessment of all national submissions with respect to consistency and comparability of data with recommendations for data quality improvement. Stage 3 is an in-depth review of selected inventories, by pollutant, country and sector, as discussed below. At each stage of review, Parties have the opportunity to clarify issues and to provide additional information. The process is seen by Parties as valuable for the improvement of their national emission inventories.

6. The findings of the stage 1 review were communicated to the national designated experts through the country-specific “status reports” by 10 March 2011. Countries were given the opportunity to react to the draft reports. The findings from the stage 2 review were included in “synthesis and assessment reports”, which were issued by 23 May 2011. After that date, countries were invited to provide comments and/or resubmissions within four weeks. The main objective of these reports was to assist countries in improving their data for the next reporting round. An overview of the findings for the stage 1 and 2 reviews is summarized in the *CEIP and EEA Technical Review Report 2011* to be made available at <http://www.ceip.at>.

7. *Timeliness.* Forty-three out of the fifty-one Parties to the Convention submitted inventories before 31 May 2011. Thirty-four Parties reported emission data by the due date of 15 February 2011, which is the same as in 2010. Thirteen Parties resubmitted data. No data were provided by three Parties with mandatory reporting obligations: Luxembourg, Iceland and the Russian Federation.

8. In order to further improve the atmospheric monitoring and modelling under the Convention, it is important that complete emission inventories are submitted by countries

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<sup>3</sup> Unless otherwise noted, Parties in this report are considered as Parties to the Convention.

<sup>4</sup> The RepDab tool is available at the CEIP website (<http://www.ceip.at/repdab-check-your-inventory/>).

<sup>5</sup> Background information on the technical review process is described in ECE/EB.AIR/GE.1/2009/8.

from which data are currently lacking or insufficient (Armenia, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Turkey and the Russian Federation including the Asian area).<sup>6</sup>

9. *Completeness/pollutants.* Forty-three Parties to the Convention submitted inventories, but not all submissions contained all gases required by the Reporting Guidelines. Forty-two Parties (41 in 2010, 40 in 2009, 38 in 2008, 35 in 2007) reported their 2009 data of main pollutants. Cadmium, mercury and lead emissions were provided by 36 Parties, additional heavy metals by 30, particulate matter (PM) by 35 (34 in 2010, 33 in 2009, 31 in 2008) and priority persistent organic pollutants (POPs) by 37 Parties (34 in 2010). Activity data were reported by 32 Parties (31 in 2010, 16 in 2009).

10. *Completeness/time series.* A number of Parties to the Convention that submitted data in the 2011 reporting round did not provide complete time series in line with the current reporting requirements. Complete time series of the main pollutants in Nomenclature for Reporting (NFR) format for the years 1990–2009, which is the period relevant for the review of the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol), were reported by 21 Parties. Twenty Parties provided complete time series (1990–2009) of the main heavy metals. Eight Parties to protocols (Austria, Denmark, Finland, France, Italy, Slovenia, Spain and the United Kingdom of Great Britain and Northern Ireland) submitted in addition 1980–1989 time series. Twenty-two Parties reported requested time series of PM (2000–2009). Twenty-one Parties provided full time series (at least 1990–2009) of POPs. Thirteen Parties submitted only 2009 data. Trend tables with national total emissions can be downloaded from: <http://www.ceip.at/submissions-under-clrtap/2011-submissions/>.

11. *Projections.* In 2011, 19 Parties (18 in 2010, 20 in 2009, 18 in 2008) submitted emission projections, out of which 14 Parties (10 in 2010, 12 in 2009, 13 in 2008) provided data for 2020 and/or 2030 projections, although such projections should be reported under the Gothenburg Protocol (ratified by 22 Parties).

12. *Documentation.* The number of Informative Inventory Reports (IIRs) submitted (27) is almost the same as in 2010 (28), i.e., 63 per cent of those reporting inventories also reported IIRs in 2011. However, many reports do not follow the IIR template and it is time-consuming, and sometimes impossible, to find the necessary information in them. Therefore, Parties are urged to use the template for the recommended structure of IIRs as contained in annex VI to the revised Reporting Guidelines.<sup>7</sup>

13. *Format.* In 2011, Parties further improved consistency of formats and increased the use of the NFR09 tables. However, a few tables were still submitted with errors. This led to the need for manually editing the submissions by CEIP prior to loading data onto the database. All experts designated by Parties are recommended to use RepDab to check their emission data prior to its submission.

14. *Emissions per capita/emissions per gross domestic product (GDP).*<sup>8</sup> These indicators<sup>9</sup> were calculated for all Parties which submitted national total emissions of main pollutants, PM, heavy metals and POPs by using information on populations and GDP available in the World Bank database. The results are presented in the form of graphs and

<sup>6</sup> A graph showing Parties' timeliness in reporting to the Convention in 2011 is available at <http://www.ceip.at>

<sup>7</sup> In particular, according the Reporting Guidelines, Parties should submit IIR in one of the official UNECE languages (English, French and Russian).

<sup>8</sup> This information is available at [http://www.ceip.at/fileadmin/inhalte/emep/pdf/2011/Emissions\\_per\\_capita\\_GDP\\_2011.pdf](http://www.ceip.at/fileadmin/inhalte/emep/pdf/2011/Emissions_per_capita_GDP_2011.pdf).

<sup>9</sup> Inclusion of these new tests was recommended by the Task Force expert panel on review.

tables, which were made available to all Parties and EMEP centres. Outliers could indicate differences in national economies but might also show inconsistencies in trends or inconsistencies between Parties. This type of information provides reviewers with an indicator of potential problems when checking national inventories during stage 3 reviews.

15. *Access to the information.* Detailed information on timeliness, completeness, consistency, transparency, recalculations, key category analyses and inventory comparisons are published in individual country reports (stage 1 and 2) on the CEIP website (<http://www.ceip.at/review-process/review-2011/review-results-2011/>). In addition, CEIP, in cooperation with EEA, will be producing an annual inventory overview covering the results of the stage 1 and 2 reviews in a technical report, *Inventory review 2011*.

16. *Implementation.* CEIP provides detailed information on an annual basis to the Convention's Implementation Committee on how the Parties to the Convention Protocols fulfil their reporting obligations. CEIP assessed the issue of compliance/non-compliance of Parties to the Protocols and provided the corresponding overview tables to the UNECE secretariat by 21 March 2011.

17. *Gridded data and large point source (LPS) data.* Gridded data are part of the quinquennial reporting obligation, and as such were not officially due in 2011. Nevertheless, five Parties submitted gridded data and five Parties submitted LPS data. These data were checked with respect to their format, internal consistency and completeness.

18. *Gridded data for modellers.* CEIP prepared data sets of the main pollutants (sulphur dioxide (SO<sub>2</sub>), nitrogen oxide (NO<sub>x</sub>), carbon monoxide (CO), non-methane volatile organic compounds (NMVOC), ammonia (NH<sub>3</sub>), PM, coarse PM (PM<sub>coarse</sub>) and fine PM (PM<sub>2.5</sub>)) for modellers based on the gridding system developed by the Meteorological Synthesizing Centre-West (MSC-W). Furthermore, CEIP prepared gridded<sup>10</sup> data for three heavy metals (mercury (Hg), lead (Pb), cadmium (Cd)) and POPs such as dioxins and furans (PCDD/PCDF), hexachlorobenzene (HCB) and benzo[a]pyrene (BaP). Gap-filled and gridded 2009 emission data for modellers were distributed to all EMEP centres by 15 April 2011 and have been publicly accessible since 30 June 2011 at <http://www.ceip.at/emission-data-webdab/emissions-as-used-in-emep-models/>.

19. *Update of historical gridded data.* To provide modellers with historic data consistent with the latest data reported by Parties, CEIP developed a software ("RG tool")<sup>11</sup> for re-gridding historical years for SO<sub>2</sub>, NO<sub>x</sub>, CO, NMVOC, NH<sub>3</sub>, PM<sub>coarse</sub> and PM<sub>2.5</sub>, using the same distribution pattern as in that particular year. In 2011 the years 2000–2004 were re-gridded using the RG tool to keep the distribution of these years and the years 2005–2008 were re-gridded using the same distribution as for 2009. An adapted version of the RG tool was also used for the gridding of 2009 emissions<sup>12</sup> of heavy metals and POPs (dioxin and furans, HCB and BaP)

20. *New gridding system.* To improve the quality of environmental assessment, modellers require gridded emissions in finer resolution (0.2° x 0.2° or even 0.1° x 0.1°) in geographical coordinates and a more detailed sector split (NFR codes for Gridded and LPS data (GNFR) categories). This will increase the volume of processed data by one order of

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<sup>10</sup> Gridding and gap-filling of heavy metals and POPs was performed only on national total levels.

<sup>11</sup> The RG tool was developed in 2010 to re-grid main pollutants and PM on the Selected Nomenclature for reporting of Air Pollutants (SNAP) 11 sector level. It is a tool for distributing resubmitted emissions using the given spatial distribution of the particular year.

<sup>12</sup> For the grid update of heavy metals and POPs, CEIP used the latest available reported gridded national totals as a distribution pattern to distribute emissions reported for 2009.

magnitude. There has been an ongoing discussion about further modifications to the EMEP grid during the last few years, and currently a paper regarding considerations for changing the EMEP grid is being drafted and discussed by the EMEP centres. Considering the available resources, the implementation of a new EMEP grid will definitely require more than one year.

## II. Stage 3 in-depth review

21. The stage 3 review is an in-depth review of inventories from selected Parties, by pollutant, country and sector. The stage 3 in-depth review is conducted by an expert review team (ERT) that meets once a year in a centralized location to review the inventories of up to 10 Parties. The purpose is to complement the Reporting Guidelines in supporting Parties in compiling and submitting high quality inventories, to assess whether Parties are meeting their obligations under the protocols, and to increase confidence in the data used for air pollution modelling. The aim is to conduct a stage 3 review for every Party<sup>13</sup> at least once in a five-year period. This objective requires an in-depth review of about 10 Parties every year. Resources for the reviews come from the ERT, the reviewed Parties and CEIP.

22. As defined in the Methods and Procedures for the Technical Review of Air Pollutant Emission Inventories, submission of an IIR is a prerequisite for a Party to be selected for the stage 3 in-depth review. The purpose of the IIR is to transparently document the submitted data, providing an explanation of methods used, relevant activity data, key assumptions and the reasons for trends and changes therein.

23. Nineteen Parties<sup>14</sup> (Austria, Czech Republic, Denmark, European Union (EU), Finland, France, Germany, Greece, Italy, Ireland, Kazakhstan, Latvia, Norway, Netherlands, Sweden, Serbia, Switzerland, the former Yugoslav Republic of Macedonia and United Kingdom) accepted the invitation from the Convention secretariat for Parties to nominate expert reviewers for the ERT. These Parties nominated a total of 58 inventory experts to the roster. The nominated experts are suitably qualified to review all emission sectors and general inventory issues (good practice, uncertainties, quality assurance/quality control, etc.).

### A. 2008 and 2009 stage 3 in-depth review

24. The 2008 stage 3 in-depth review took place at EEA in Copenhagen (6–10 October 2008) and covered four volunteering Parties: France, Norway, Portugal and Sweden. The results can be accessed at <http://www.ceip.at/review-process/review-2008/>.

25. The 2009 stage 3 in-depth review took place at EEA in Copenhagen (22–26 June 2009) and covered 10 Parties approved by the Executive Body Bureau: Belgium, Bulgaria, Denmark, Hungary, Finland, Ireland, Latvia, Lithuania, Poland and Spain. The country reports can be accessed at <http://www.ceip.at/review-process/review-2009/>.

<sup>13</sup> Participation of the United States of America and Canada in the inventory in-depth review process is to be discussed.

<sup>14</sup> Eleven Parties nominated inventory experts to the roster before 2009 and an additional four Parties nominated experts in 2010.

## **B. 2010 stage 3 in-depth review**

26. The 2010 stage 3 in-depth review took place at EEA in Copenhagen (21–25 June 2010) and covered 10 Parties approved by the Executive Body Bureau: Austria, Cyprus, Germany, Italy, Netherlands, Romania, Russian Federation, Slovakia, Switzerland and United Kingdom. Fifteen experts from 11 countries (one each from Austria, the Czech Republic and the EU; three from France; two from Germany; and one each from Ireland, Italy, Kazakhstan, the Netherlands, Norway, Switzerland and the United Kingdom) in two ERTs<sup>15</sup> reviewed the inventories of the selected Parties. Review results can be accessed at <http://www.ceip.at/review-process/review-2010/>.

27. Both prior to and during the 2010 stage 3 in-depth review meeting, the ERTs identified a number of questions, which were subsequently communicated to Parties. CEIP prepared and distributed technical materials to the ERTs in advance of the stage 3 in-depth review. In cooperation with the EEA European Topic Centre on Air and Climate Change (ETC-ACC), CEIP developed templates for review reports, review transcripts and guidelines for reviewers to ensure a consistent approach. The 2008, 2009 and 2010 reviews indicated that the review guidelines and templates used by the ERTs generally provided a good basis for review and enabled a consistent approach to be taken across countries. Before the 2011 review, the templates will be updated where relevant to be consistent with the Convention's Reporting Guidelines. CEIP also undertakes responsibility for communication with the Parties. Good communication between the ERTs and the Parties is considered critical for the success of the process.

## **C. 2011 stage 3 in-depth review, plans for 2012–2013**

28. The 2011 stage 3 in-depth review is planned for 27 June–1 July 2011 at EEA in Copenhagen. Ten countries (Belarus, Croatia, Czech Republic, Estonia, Greece, Iceland, Luxembourg, Slovenia, the former Yugoslav Republic of Macedonia and Ukraine) will be reviewed. Eighteen experts plus two trainees from 13 Parties (three each from the EU, France and Germany; and one each from Ireland, Italy, Kazakhstan, Latvia, the Netherlands, Norway, Serbia, Switzerland, the former Yugoslav Republic of Macedonia and the United Kingdom) accepted the invitation to the centralized review 2011.

29. It is estimated that members of the ERT dedicate around 10–15 days for preparation, participation in the week-long stage 3 in-depth review meeting and follow-up activities, including finalizing the review reports.

30. *Review 2012–2013.* The table below presents a proposed schedule for stage 3 in-depth reviews of Parties for the period 2012–2013 for consideration by the EMEP Steering Body at its thirty-fifth session (5–7 September 2011) and for subsequent submission to the Convention's Executive Body at its twenty-ninth session (12–16 December 2011). Most of the Parties planned for the 2012 and 2013 review did not submit sufficient information, which significantly limits the possibility of checking the quality of their inventories.

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<sup>15</sup> One expert review team can review up to five Parties.

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### Proposed Time schedule<sup>16</sup> for future stage 3 in-depth reviews of Parties

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2012	Georgia*, European Union, Kyrgyzstan*, Kazakhstan**, Liechtenstein*, Serbia*, Malta, Republic of Moldova*, Monaco and Turkey*
2013	Albania*, Armenia**, Azerbaijan*, Bosnia and Herzegovina**, Montenegro*, France, Norway, Portugal and Sweden

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\* Party that did not submit complete inventory and/or did not submit an IIR in the 2008, 2009 and 2010 reporting rounds.

\*\* Party submitted neither inventory data nor an IIR in the last three reporting rounds.

## III. Conclusions

### A. Status of reporting

31. *Timeliness.* In 2011, there was a minimal increase (from 42 to 43) in submission of reporting data by the Parties as compared with the 2010 reporting round.

32. *Completeness.* The completeness of information on the main pollutants, main heavy metals, and PM emissions is reasonable for the European region, but information provided to EMEP/CEIP covers less than 50 per cent of the extended EMEP area. **EMEP should consider options to further increase awareness in the countries of Eastern Europe, the Caucasus and Central Asia, Turkey and the Balkan countries to improve their reporting of emission data in the near future.**

33. *Gridded data and LPS.* Information reported to EMEP/CEIP on gridded and LPS data is rather limited in spite of the fact that such information is in many cases available at country<sup>17</sup> level. Parties are invited to improve completeness of LPS reporting, as complete and consistent information submitted to CEIP will be critical for the quality of emission distribution in a new gridding system. .

34. CEIP appreciates the effort to submit emission information from new Parties<sup>18</sup> to the Convention (Albania, Azerbaijan, Georgia, Montenegro and Turkey). At the same time, countries such as Kazakhstan and the Asian part of the Russian Federation have not reported emission data to EMEP within the last five years. Increased support to emission experts in the region will assist designated emission experts with reporting of more complex data in the EMEP standard formats.

### B. Stage 3 in-depth review

35. Parties clearly recognize the value of the review process in terms of improving the quality of their national inventories, but difficulties are regularly encountered when EMEP requests complete inventory data and relevant explanatory information. A number of

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<sup>16</sup> The 2012–2013 plan can be revised at the 2011 EMEP Steering Body Bureau meeting if listed Parties do not report required information.

<sup>17</sup> E.g., information on facilities reported by countries under the European Pollutant Release and Transfer Register or the EU Integrated Pollution Prevention and Control (IPPC) and LCP Directives.

<sup>18</sup> It has to be noted that information provided by these countries tends to be incomplete and rather often the format does not correspond to templates provided by EMEP Reporting Guidelines.

Parties could also improve their timeliness in responding to the questions of the review teams.

36. Another key constraint for the stage 3 in-depth review is the limited number of nominations to the roster of review experts.<sup>19</sup> The number of experts increased by 10 as compared with last year, but a pool of 58 experts is still insufficient to maintain a sustainable review process. Each year a portion of these experts cannot accept the invitation due to technical reasons or lack of resources.<sup>20</sup> The number of experts in the roster would have to be increased in order to ensure that the stage 3 in-depth review can be completed annually in full scope. EMEP may wish to consider how best to financially support<sup>21</sup> participation of experts from Eastern Europe, the Caucasus and Central Asia and Balkan countries in the review process.

37. To increase efficiency, consistency and sustainability of the review process, EMEP may wish to consider support of other activities:

- (a) Further development of review tools (e.g., data tools/locator tools/implied emission factors);
- (b) Participation of the Chair of the Task Force on Emission Inventories and Projections in the stage 3 review;
- (c) Further development of the review guidelines and templates;
- (d) Organizing training for review experts (online and/or training workshop); and
- (e) Organizing training and an emissions workshop for the countries in Eastern Europe, the Caucasus and Central Asia, Turkey and Balkan countries.

### **C. Gridding of emissions 2012 onwards**

38. Currently, a paper regarding considerations about changing the EMEP grid (finer resolution and the use of GNFR sectors) is being written and discussed by the EMEP centres. Considering the ongoing discussion and the available resources the implementation of a new “gridding system” will definitely take more than one year. It is therefore extremely important that EMEP soon takes the decision on the new resolution (e.g. 0.2° x 0.2° or 0.1° x 0.1°) and new projections (EMEP grids or geographical coordinates), so the Parties can be informed in due time to prepare national gridded data and CEIP can adopt the system accordingly. EMEP may wish to consider allocating resources to cover this important activity.

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<sup>19</sup> Only 15 Parties (out of 51) nominated experts (altogether 58 experts were nominated). Only 15 experts accepted the invitation for the 2010 review round, therefore it was not possible to frame review teams with eight sectoral experts plus two lead reviewers as planned.

<sup>20</sup> e.g. in 2010, 20 reviewers could not accept the invitation.

<sup>21</sup> In 2010 and 2011, EEA covered travel costs of 4 experts (from Kazakhstan, the Czech Republic, Latvia, Greece) and 2 trainees from Serbia and Macedonia to enable their participation in stage 3 review.