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EMEP/EEA air pollutant emission inventory guidebook 2009

Technical guidance to prepare national emission inventories

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LRTAP
Long-range Transboundary Air Pollution

European Environment Agency

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European Environment Agency

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Foreword by the EEA Director and the EMEP Steering Body Chair

It gives us great pleasure to introduce this substantially updated and revised version of the EMEP/EEA air pollutant emission inventory guidebook. The European Environment Agency (EEA) and the Cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (EMEP) of the UNECE Long-range Transboundary Air Pollution Convention have together cooperated in partnership for over 10 years in preparing and publishing earlier versions of the guidebook.

Originally developed under the Corinair initiative, the guidebook today contains the most recognised set of emission estimation methods used in air pollution studies in Europe and the UNECE geographical area. It has evolved over a long period and is now an essential tool allowing compilation of comparable and consistent air pollutant emissions inventory data in Europe.

Access to high quality air pollutant emissions data is a key element in supporting sound policy-making. It helps to better shape and define environmental priorities, improve air quality modelling, assess compliance with national and international targets and assess the effectiveness of policy interventions in terms of protecting human health and the environment.

To a large degree, air pollutants and greenhouse gases are emitted from the same sources. As such, well designed air pollution and climate change mitigation strategies can deliver significant co-benefits in terms of improved air quality and reduced greenhouse gas emissions. Reflecting these close thematic links, the revised guidebook is also now compatible with, and complementary to, the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Finally, we would like to thank all the experts who have contributed to the preparation and review of the updated guidebook over the past years, particularly those from the UNECE/EMEP Task Force on Emission Inventories and Projections (TFEIP) and the European Environment Information and Observation Network (Eionet).

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Executive Director
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Dr Sonja Vidič
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EMEP, Steering Body
UNECE LRTAP Convention

Preface

Dear colleague

It gives us great pleasure to introduce the EMEP/EEA air pollutant emission inventory guidebook. This guidebook is a restructured and updated version of the EMEP/Corinair emission inventory guidebook.

The work on the original guidebook started in 1992 and it has since been developed and updated by the UNECE/EMEP Task Force on Emission Inventories and Projections (TFEIP) under the Convention on Long-range Transboundary Air Pollution (LRTAP Convention). The guidebook is published by the European Environment Agency (EEA).

In 2006 a major restructuring and update of the guidebook was initiated which resulted in the current version being accepted by the EMEP Steering Body in 2009. The major restructuring and update was funded by the European Commission, and was performed by TNO (lead organisation) and AEA Technology in close cooperation with — and additional support from — the TFEIP and the EEA. The guidebook has undergone review by experts from the Task Force, designated emission experts of the Convention, EEA's Environment Information and Observation Network (Eionet) and industry, and comments received during the review have been considered and used to arrive at the current version.

The guidebook is intended as a general reference and, in conjunction with the UNECE Reporting Guidelines, for use by parties reporting emissions to the LRTAP Convention and its protocols, and for use by European Union Member States for reporting under the National Emission Ceilings Directive. In addition the guidebook is the recommended source of methodology information for preparing emission inventories of ozone precursors and of sulphur dioxide following the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories. The guidebook therefore complements the IPCC Guidelines. The guidebook is also frequently used as a reference document by researchers. As such it is the most influential set of emission estimation methods used in air pollution studies in Europe and elsewhere.

Compared to the previous version of the EMEP/Corinair guidebook, the revised guidebook is now structured following the Nomenclature For Reporting (NFR) as defined in the Reporting Guidelines to the LRTAP Convention. The NFR reporting nomenclature is consistent with the one used for reporting under the United Nation Framework Convention on Climate Change (UNFCCC), expanded for particular sources of air pollution. The link to the source nomenclature of the previous guidebook — SNAP97 — is however still included to ensure continuity for emission inventory compilers. In addition, the revised guidebook has been closely harmonised with the IPCC Guidelines by introducing the 'Tiers' approach and by providing decision trees to support the selection of appropriate methodologies. In such ways, the guidebook contributes to the harmonisation of international and EU greenhouse gas and air pollutant emissions reporting. In addition to the restructuring, the guidebook Tier 1 and Tier 2 methods and emission factors have been revised and updated where appropriate.

The guidebook is available in electronic form via the EEA's website: www.eea.europa.eu/emep-eea-guidebook.

We hope that you will continue to find the guidebook a valuable reference document and will make use of it.

Finally, we would like to thank both the TFEIP and the Eionet members for their work in preparing, using and reviewing the material, and all the numerous experts who have provided comments concerning the earlier drafts of this updated guidebook.

Kristin Rypdal, Chris Dore
TFEIP chairs

Aphrodite Mourelatou, Martin Adams
European Environment Agency

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Guidebook introduction

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1 Introduction

The joint EMEP([1])/EEA air pollutant emission inventory guidebook 'Technical guidance to prepare national emission inventories' (hereafter called the guidebook), following the Guidelines for Reporting Emission Data under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution ([2]) and the EU National Emission Ceilings Directive ([3]), provides concise guidance on how to compile an atmospheric emissions inventory. The guidebook has been prepared by the Convention's Task Force on Emission Inventories and Projections (TFEIP), with detailed work by the Task Force's expert panels and the European Environment Agency (EEA) ([4]). The guidebook is published by the EEA and the present edition replaces all earlier versions. The guidebook is compatible with, and complementary to, the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (hereafter called the IPCC Guidelines).

The present version has been substantially updated: it reproduces information from earlier editions only to the extent that this continues to be relevant and introduces a tiered approach to determining emissions. A number of known shortfalls have been addressed and the 'simple methodology' has been upgraded, though in many cases the detailed methodology (now Tier 3) is largely unchanged. The guidebook now provides a more complete coverage of emission sources and emission factors as well as for revised technology descriptions and there is greater methodological consistency throughout. Several general guidance sections have been introduced on the principles of preparing inventories; these are intended to help users identify the areas where improvement would be most beneficial so that limited resources can be focused to best advantage.

In revising the guidebook, emphasis has been given to providing default procedures for all the sources and pollutants that parties to the protocols to the Convention on Long-range Transboundary Air Pollution (the LRTAP Convention — hereafter called the Convention) have the obligation to report. Work has been done to incorporate $PM_{2.5}$ emission factors, the gridding methodology has been updated and sections restructured to avoid double counting emissions from combustion and industrial processes.

The guidebook also follows the example of the IPCC Guidelines in providing decision trees to assist inventory compilers make the most appropriate methodological choice, taking into account data availability and the importance of the source.

The present guidebook is structured according to the Nomenclature for Reporting (NFR), which was first developed in 2001–2002 by the Convention's TFEIP and further improved in 2006–2007 as part of the revision of the Guidelines for Reporting Emission Data under the Convention on Long-range Transboundary Air Pollution (hereafter called the LRTAP Reporting Guidelines). This nomenclature closely resembles the IPCC source nomenclature developed for reporting under the UN Framework

Note 1
Air pollutant inventories and greenhouse gas (GHG) inventories are different in a number of important ways; air pollutant inventories, in particular, need to take into account emission abatement, and more of the emission-related information is derived from facility reporting.

([1]) Cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (EMEP) is a scientific body established under the Convention on Long-range Transboundary Air Pollution.
([2]) ECE/EB.AIR/97, the LRTAP Reporting Guidelines and the associated annexes are available online from the EMEP Centre on Emission Inventories and Projections (CEIP) website http://www.emep-emissions.at/.
([3]) Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (the NEC Directive), OJ L 309, 27.11.2007, p. 22.
([4]) See Section 7 for more information on these bodies.

Climate Change Convention. Cross-referencing to the Selected Nomenclature for reporting of Air Pollutants (SNAP) 97 developed by the EEA's European Topic Centre (ETC/AE) is included.

The structure of the guidebook has been chosen to facilitate internet delivery and to enable more efficient updating gained from new research.

2 Scope

The guidebook has two key functions:

- to provide procedures to enable users to compile emission inventories that meet quality criteria for Transparency, Consistency, Completeness, Comparability and Accuracy (TCCCA criteria);
- to provide estimation methods and emission factors for inventory compilers at various levels of sophistication.

The guidebook may be used for general reference or, in conjunction with the LRTAP Reporting Guidelines, by parties to the Convention to assist them, in meeting their emission reporting obligations under the Convention and its protocols ([5]). It must also be used by the Member States of the European Union to fulfil their emissions reporting requirements under the NEC Directive.

The guidebook may be used to prepare emission inventories of the substances ([6]) which, if emitted into the atmosphere as the result of human and natural activity, are implicated in:

- acidification, eutrophication, and photochemical pollution;
- air quality degradation;
- damage and soiling of buildings and other structures;
- human and ecosystem exposure to hazardous substances.

Inventories prepared according to the guidebook are suitable for:

- providing information to policymakers in UNECE countries and the Member States of the European Union, the EEA, the Convention and its parties, the Convention's implementation committee and the public;
- defining environmental priorities and identifying the activities responsible for the problems;
- setting explicit objectives and constraints;
- assessing the potential environmental impacts and implications of different strategies and plans;
- evaluating the environmental costs and benefits of different policies;
- monitoring the state of the environment to check that targets are being achieved;
- monitoring policy action to ensure that it is having the desired effects;
- ensuring that those responsible for implementing policies make sure that their governments are complying with their obligations. Under the Convention, the national emission inventories allow the Implementation Committee to effectively assess compliance by parties with their emission obligations under the protocols and report on cases of non-compliance to the Executive Body of the Convention.

The guidebook does not provide guidance on the estimation and reporting of emissions of the gases responsible for global warming and climate change included in the IPCC Guidelines. If substances are implicated in both climate change and regional pollution then cross-referencing is provided in the most appropriate specific guidance.

The guidebook does not provide guidance on the estimation and reporting of emissions of gases responsible for stratospheric ozone depletion.

([5]) Parties must submit data annually to the EMEP Centre on Emission inventories and Projections (CEIP (http://www.emep-emissions.at/ceip/)) and inform the UNECE secretariat of the contents of their data submission.
([6]) These substances are listed in the Annex I to the LRTAP Reporting Guidelines.

3 Concepts

Inventory compliers rely on the key concepts outlined below to ensure that inventories are comparable between countries, do not contain double counting or omissions, and that the time series reflect actual changes in emissions.

Accuracy

Accuracy means that emissions are neither systematically overestimated nor underestimated, as far as can be judged. This implies that parties will endeavour to remove bias from the inventory estimates and minimise uncertainty.

Comparability

Comparability means that the national inventory and projection is reported in such a way that allows it to be compared with other parties. This can be achieved by using accepted methodologies as elaborated in Section IV of the LRTAP Reporting Guidelines, by using the reporting templates and through the use of the harmonised NFR, as specified in the annexes to the LRTAP Reporting Guidelines.

Completeness

Completeness means that estimates are reported for all pollutants, all relevant source categories and all years and for the entire territorial areas of parties covered by the reporting requirements set forth in the provisions of the Convention and its protocols. Where numerical information on emissions under any source category is not provided, the appropriate notation key defined in Annex I of the LRTAP Reporting Guidelines should be used when filling in the reporting template and their absence should be documented.

Consistency

Consistency means that estimates for any different inventory years, gases and source categories are made in such a way that differences in the results between years and source categories reflect real differences in emission estimates. Annual emissions, as far as possible, should be calculated using the same method and data sources for all years, and resultant trends should reflect real fluctuations in emissions and not the changes resulting from methodological differences. Consistency also means that, as far as practicable and appropriate, the same data are reported under different international reporting obligations. For projections, consistency means that a year of the submitted inventory is used as a basis.

Decision trees

Decision trees, for each category, help the inventory compiler navigate through the guidance and select the appropriate tiered methodology for their circumstances based on their assessment of key categories. In general, it is good practice to use higher tier methods for key categories, unless the resource requirements to do so are prohibitive.

Good practice

In order to promote the development of high-quality inventories a collection of methodological principals, actions and procedures have been defined and collectively referred to as good practice. Inventories consistent with good practice are those that contain neither overestimates nor underestimates, so far as can be judged, and in which uncertainties are reduced as far as practicable. (NB The IPCC Guidelines refined the concept of good practice and these are reflected in the guidebook.)

Inventory year and time series

National inventories contain estimates for the calendar year during which the emissions to the atmosphere occur. Where suitable data to follow this principle are missing, emissions may be estimated using data from other years applying appropriate methods such as averaging, interpolation and extrapolation. A sequence of annual inventory estimates (e.g. each year from 1990 to 2000) is called a time series. Given the importance of tracking emissions trends over time, countries should ensure that a time series of estimates is as consistent as possible.

Inventory reporting

Inventory reporting consists of the submission of a set of standard reporting tables for specified substances, for the requisite source, for a given reporting year. The LRTAP Reporting Guidelines provide standardised reporting tables, but the content of the tables and written report may vary according to, for example, a country's obligations as a signatory to individual Convention protocols.

Key category

A key category is a source category of emissions that has a significant influence on a party's total

emissions in terms of the absolute level of emissions, the trend in emissions over a given time period, or the uncertainty in the estimates for that party. The concept of key categories is an important aspect in inventory development in that it helps to identify priorities for resource allocation in data collection and compilation, quality assurance/quality control and reporting.

Pollutants

The guidebook is designed to cover all the substances that parties to the Convention's protocols need to report, plus primary emissions of $PM_{2.5}$, PM_{10}, TSP, heavy metals as defined in the LRTAP Reporting Guidelines, and persistent organic pollutants (POPs) emitted as by-products.

Note 2
Annex I of the LRTAP Reporting Guidelines (ECE/EB.AIR/97) lists all the substances for which there are existing emission reporting obligations. The guidelines and annexes are available online from the CEIP website (www.emep-emissions.at/).

Note 3
The European Community, as with all EU Member States, is a party to the Convention and to most of its protocols.

Sectors, categories, and sources

Pollutant emissions estimates are divided into sectors — groupings of related processes and sources — these are:

- energy
- industrial processes and product use
- agriculture, forestry and other land use
- waste
- other.

Each sector comprises individual categories (e.g. transport) and subcategories (e.g. passenger vehicles). Ultimately countries will construct an inventory from the subcategory (source) level because this is the level at which data tends to be available and total emissions will be calculated by summation. A national total is calculated by the summation of emissions for each pollutant and category as defined in the respective reporting requirements. An exception is for so-called 'memo-items', those sources which following political agreement are not included in included in national totals (which may be used to assess compliance with protocol requirements), but which are reported separately. An example of a memo-item includes the emissions caused by fuel combustion from international shipping.

Tiers

A tier represents a level of methodological complexity. Usually three tiers are provided; Tier 1 is the simple (most basic) method; Tier 2, the intermediate; and Tier 3, the most demanding in terms of complexity and data requirements. Tiers 2 and 3 are sometimes referred to as higher tier methods and are generally considered to be more accurate.

Transparency

Transparency means that parties should provide clear documentation and report at a level of disaggregation that sufficiently allows individuals or groups other than the designated emission expert or the compiler of the inventory or projection to understand how the inventory was compiled and be assured that it meets good practice requirements. The transparency of reporting is fundamental to the effective use, review, and continuous improvement of the inventory and projection.

Note 4
The use of the same methods and data sources throughout, provided there have been no recalculations, should be sufficient to ensure transparency. Parties should document any recalculated estimates. Generally, parties should be able to explain inventory trends for each category, giving particular attention to outliers, trend changes, and extreme trends.

4 How to use the guidebook

4.1 Guidebook structure

The guidebook is structured to provide the user with general information on the basic principles of constructing an emissions inventory and the specific

estimation methods and emission factors to compile one.

General guidance is given on:

- key category analysis and methodological choice;
- data collection (including measurement methodologies);
- time series consistency;
- uncertainties;
- inventory management, improvement and quality assurance/quality control (QA/QC);
- spatial emissions inventories;
- projections.

Specific guidance is ordered according to the NFR source categories and is cross-referenced to the SNAP process-based classification. The textual information provides a source description (including a general description about technologies and abatement technologies in use), guidance on methodological choice (including decision trees) and tier-based emission determination methods.

Note 5
Each chapter follows a structure consistent with the IPCC Guidelines supplemented with additional guidance on gridded data.

4.2 Guidebook methodology

It is impractical to measure emissions from all the sources that, together, comprise an emissions inventory. Consequently, the most common estimation approach is to combine information on the extent to which a human activity takes place (called activity data or AD) with coefficients that quantify the emissions or removals per unit activity, called emission factors (EF). The basic equation is therefore:

$$\text{Emissions} = \text{AD} \times \text{EF}$$

In the energy sector, for example, fuel consumption would constitute activity data and mass of sulphur dioxide emitted per unit of fuel consumed would be an emission factor. The basic equation can, in some circumstances, be modified to include other estimation parameters than emission factors, for example, to accommodate the effects of additional, secondary, abatement.

The guidebook describes a tiered methodology for estimating emissions. Simple (Tier 1) methods are given for all the sources and substances which the countries that have ratified Convention protocols need to report. More advanced (Tier 2) methods are given for key categories. Further information is given for advanced (Tier 3) approaches for key categories where suitable methods are available.

- **Tier 1 methods** apply a simple linear relation between activity data and emission factors. The activity data is derived from readily available statistical information (energy statistics, production statistics, traffic counts, population sizes, etc.). The default Tier 1 emission factors are chosen in way that they represent 'typical' or 'averaged' process conditions — they tend to be technology independent.
- **Tier 2 methods** use the same or similar activity data to Tier 1 methods, but apply country-specific emission factors; country-specific emission factors need to be developed, using country-specific information on process conditions, fuel qualities, abatement technologies, etc. In many cases these methods could also be applied at a higher level of detail, where the activity statistics are further split into sub-activities with more or less homogenous process characteristics.
- **Tier 3 methods** go beyond the above; these may include using facility level data and/or sophisticated models. Examples might include the use of PRTR data or data from emission trading schemes for industrial emissions or models like COPERT for road transport emissions.

Wherever possible, an estimate has been made of the uncertainty that can be associated with both the emissions factors and the activity statistics quoted.

5 When to use the guidebook

The guidebook is intended to assist parties to the Convention in meeting their emission reporting obligations under the Convention and its protocols and the Member States of the European Union to

fulfil their emissions reporting requirements under the NEC Directive. In addition the guidebook may be used to report some pollutants of relevance to the UN Framework Climate Change Convention (UNFCCC) and to other international bodies.

5.1 Reporting under the Convention on Long-range Transboundary Air Pollution

Reporting of emission data is required in order to fulfil obligations regarding the general requirements of the Convention and the more specific reporting requirements under the protocols under the Convention. The protocols with reporting requirements are:

(i) the 1985 Helsinki Protocol on the reduction of sulphur emissions or their transboundary fluxes;

(ii) the 1988 Sofia Protocol concerning the control of emissions of nitrogen oxides or their transboundary fluxes;

(iii) the 1991 Geneva Protocol on the control of emissions of volatile organic compounds or their transboundary fluxes;

(iv) the 1994 Oslo Protocol on further reduction of sulphur emissions;

(v) the 1998 Aarhus Protocol on heavy metals;

(vi) the 1998 Aarhus Protocol on persistent organic pollutants;

(vii) the 1999 Gothenburg Protocol to abate acidification, eutrophication and ground-level ozone.

The reporting requirements under these protocols are described in the LRTAP Reporting Guidelines.

Parties to the Convention may use the guidebook both as a reference book on good emission estimation practice and as a checklist to ensure that all relevant activities are considered and their emissions quantified. The guidebook indicates that parties are requested to document in a transparent manner in their inventory report where the guidebook methodology has and has not been used. If another methodology has been used, the parties are requested to provide additional explanatory information.

5.2 Reporting to the European Union

The NEC Directive sets upper limits for each Member State of the European Union for the total emissions in 2010 of the four main substances responsible for acidification, eutrophication and ground-level ozone pollution: sulphur dioxide (SO_2); nitrogen oxides (NO_X); volatile organic compounds (VOCs); and ammonia (NH_3). As the substances concerned are transported in large quantities across national boundaries, individual countries could not, in general, meet the underpinning objectives of the NEC Directive to protect human health and the environment within their territory by national action alone.

With regard to establishing and reporting emission inventory data, the NEC Directive specifies that countries shall prepare and annually update national emission totals for the pollutants SO_2, NO_X, VOCs, and NH_3, and emission projections for 2010. Member States shall, by 31 December each year, report to the Commission and European Environment Agency their national emission inventories and emission projection for 2010; final emissions data should be submitted for the previous year but one and provisional emissions for the previous year. Data reported by Member States under the NEC Directive is compiled and made available through the website of the EEA's Data Service (http://dataservice.eea.europa.eu/).

To help ensure harmonised and consistent emission information is reported, the NEC Directive requires all Member States to establish emission inventories using the methodologies agreed under the LRTAP Convention and to use the guidebook in preparing these inventories and projections.

5.3 Other reporting

The guidebook may facilitate reporting under a number of other international agreements.

5.3.1 Reporting under the UNFCCC

All parties to the UNFCCC and the Kyoto Protocol shall 'develop, periodically update, publish and make available to the Conference of the Parties … … national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties'. Consequently, parties are required to annually report emissions and sink

(and any recalculations that have occurred) of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) using the IPCC Guidelines for National Greenhouse Gas Inventories for estimating national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases.

Parties should also provide information on emissions of carbon monoxide (CO), nitrogen oxides (NO_X) and non-methane volatile organic compounds (NMVOCs) and are encouraged to provide information of emissions of sulphur oxides (SO_2).

The IPCC Guidelines contain links to information on methods, used under other agreements and conventions, for the estimation of emissions of tropospheric precursors which may be used to supplement the reporting of emissions and removal of greenhouse gases for which methods are provided here. Volume 1, Sections 7.1 and 7.2, for example, refers inventory developers to the EMEP/Corinair guidebook (now the EMEP/EEA Air Pollution Emission Inventory guidebook) for the purpose of estimating emissions of sulphur dioxide (SO_2); carbon monoxide (CO); nitrogen oxides (NO_X); ammonia (NH_3) and non-methane volatile organic compounds (NMVOCs).

5.3.2 Reporting to the EU monitoring mechanism

Within the European Community, the European Community Greenhouse Gas Monitoring Mechanism ([7]) is used to monitor all anthropogenic greenhouse gas emissions not controlled by the Montreal Protocol. It is also used to transpose related requirements under the Kyoto Protocol into EU legislation and to evaluate progress towards meeting greenhouse gas reduction commitments.

The Decision provides for the harmonisation and reporting of emission projections at Member State and Community level. Article 3(1)(b) requires Member States to determine and report '… data on their emissions of carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen oxides (NO_X) and volatile organic compounds (VOC)'. Since no further guidance is given on how to do so, by extension, the guidebook may be used.

5.3.3 Multimedia inventories

The guidebook may be of value to countries preparing source-oriented inventories that cover emissions made to various media including releases to air, water and soil and/or waste releases and transfers. Such multimedia inventories are commonly referred to as Pollutant Release and Transfer Registers (PRTRs). Internationally, the Kiev Protocol (to the UNECE Aarhus Convention) on pollutant release and transfer registers establishes PRTR requirements for parties. The Organisation for Economic Cooperation and Development (OECD), in close cooperation with the United Nations Institute for Training and Research (UNITAR) and United Nations Environment Programme (UNEP) Chemicals, has also, for a number of years, run a PRTR programme providing guidance to countries interested in establishing a PRTR. Within the European Union, two such initiatives covering multimedia releases are the European Pollutant Emissions Register (EPER) and the European Pollutant Release and Transfer Register (E-PRTR).

UNECE Aarhus Convention: Kiev Protocol on pollutant release and transfer registers

The Kiev Protocol has the objective 'to enhance public access to information through the establishment of coherent, nationwide pollutant release and transfer registers (PRTRs)'. Although the protocol does not directly regulate pollution from emitting sources, it does ensure that there is public access to information concerning the amount of pollution released from such sources. Having such information publicly available is expected to exert a significant downward pressure on levels of pollution.

Under the protocol, PRTRs developed by parties should be based on a reporting scheme that is mandatory, annual and covers multimedia releases (air, water, land) as well as transfers of waste and wastewater. PRTRs should:

- be publicly accessible and searchable through the Internet;
- cover releases and transfers of at least 86 substances covered by the protocol;
- cover releases and transfers from certain types of major point source (e.g. thermal power stations, mining and metallurgical industries, chemical plants, waste and wastewater treatment plants, paper and timber industries);
- accommodate available data on releases from diffuse sources (e.g. transport and agriculture);

([7]) Decision 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol, OJ L 33, 4.2.2006, p. 1.

- allow for public participation in its development and modification.

Following the adoption of the protocol, a working group on PRTRs was established to prepare for the entry into force of the protocol. The working group has the mandate of assisting parties to the Aarhus Convention prepare for the protocol's implementation, by the preparation of guidance documents, sharing information and experiences, etc. Documents related to the tasks being undertaken by the working group are available from the website (www.unece.org/env/pp/prtr.wg.htm).

OECD/PRTR

For a number of years, the OECD has supported countries who are considering establishing a national pollutant release and transfer register (PRTR). The Guidance manual for governments, published in 1996 (OCDE/GD(96)32), was developed through a series of workshops which addressed the key factors countries should consider when developing a PRTR: why should a country establish a PRTR; what are the goals/objectives of the system and which chemical substances should be reported; how should the data be disseminated; how should a PRTR system be implemented.

Based on the recommendation of a workshop held in Canberra, Australia, on Release Estimation Techniques (RETs), a task force on pollutant release and transfer registers was established in 2000, which is part of the OECD's Environment, Health and Safety programme. Its main tasks being to continue to improve RETs and make them widely available, to facilitate the sharing and comparing of PRTR data between countries, to advance and improve the use of PRTR data and to identify, analyse and develop tools and provide guidance to promote PRTR establishment. In 2005 the task force was merged with the Inter-Organisation programme for the sound Management of Chemicals (IOMC) PRTR coordination group and is now called the PRTR coordination task force. Useful products so far are a resource centre created by Environment Canada and a PRTR portal (www.PRTR.net) providing links with international and national PRTR activities and information sources. Information is also provided on quality control methods, methodology for estimating emissions from small and medium-sized enterprises, emissions from product use, and links between emissions and statistical data like national product or number of inhabitants.

The European Pollutant Release and Transfer Register (E-PRTR)

E-PRTR is the European Community's European pollutant release and transfer register. The E-PRTR, based on Regulation (EC) No 166/2006 ([8]), succeeds the European Pollutant Emission Register (EPER) and fully implements the obligations of the UNECE PRTR Protocol. The E-PRTR has a wider and more comprehensive scope than its predecessor EPER; it goes beyond the requirements of the protocol, covering more pollutants with stricter thresholds. It covers more than 91 substances released to air and water from industrial installations in 65 different sectors of activity; it will also include transfers of waste and wastewater from industrial facilities to other locations as well as data on emissions caused by accidents on-site. One important further difference is that data on releases from diffuse sources (such as road traffic, agriculture, domestic heating, shipping, etc.) is included.

The first reporting year under the E-PRTR is 2007; this data was reported by the Member States in June 2009 and made available to the public by the European Commission and EEA later that year.

To assist countries in preparing for the implementation of the E-PRTR the Commission, in cooperation with the Member States and other stakeholders, has published a guidance document for implementation of the E-PRTR in a number of languages (http://eper.ec.europa.eu/eper/gaps.asp).

6 Guidebook management

Maintaining the guidebook is the responsibility of the TFEIP ([9]). It is published by the EEA.

6.1 Mandate of the sectoral expert panels of the TFEIP

The expert panels are ad hoc groups established by the TFEIP. There are currently three sectoral expert panels:

- Combustion and industry;
- Transport;
- Agriculture and nature.

([8]) Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European pollutant release and transfer register, OJ L 33, 4.2.2006, p. 1.
([9]) The task force has assigned the detailed work to its expert panels which report their results to the task force.

In addition, there is one expert panel dealing with cross-cutting issues; the expert panel on projections.

TFEIP has defined the role of the sectoral panels as:

- to collect and review available information on activities, emission factors and inventory methodology (emission estimates, emission factors, activity statistics, etc.) within the sector;
- to consider the significance of each source in terms of its contribution to emissions, the need to subdivide or merge source categories and to identify where new sources categories need to be added;
- to update the guidebook to reflect developments within the sector (e.g. appearance of new technologies);
- to update the methodologies within the guidebook when new knowledge concerning the processes driving emissions becomes available;
- to update emission factors within the guidebook in the light of new emission measurements;
- to gather feedback and answer queries concerning the guidebook from inventory compilers or from the Expert Panel on Review;
- to identify the need for further research or study to improve the methodology;
- to encourage the exchange of information between experts.

Maintenance of the technical content of the guidebook is the responsibility of the TFEIP expert panels.

Note 6
Queries or offers of contributions to the technical work of the expert panels may be made by contacting the relevant expert panel leader. Names and contact details for the respective expert panel leaders are provided through the expert panel link on the website of the TFEIP (http://tfeip-secretariat.org).

7 Additional information

7.1 Historical context

7.1.1 Overview

The Convention on Long-range Transboundary Air Pollution was adopted in 1979. The convention, negotiated under the auspices of UNECE, was the first international environment agreement to address the threat of air pollution to human health and the environment. The Cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (EMEP) is responsible for providing the parties to the Convention with information on the deposition and concentration of air pollutants, as well as on the quantity and significance of the long-range transmission of air pollutants and fluxes across boundaries. In providing this information EMEP is supported by various task forces; the Task Force on Emission Inventories and Projections (TFEIP), established by the Executive Body to the Convention, as the Task Force on Emissions, in 1991, is a technical forum for the exchange of information and the harmonisation of emission inventories — including emissions factors, methodologies and guidelines.

The European Council of Ministers established the Corine (Co-oRdination d'Information Environnementale) work programme in 1985. Subsequently, the European Environment Agency task force created Corinair, an inventory of emissions of air pollutants in Europe, the Agency's European Topic Centre on Air and Climate Change later took over the coordination of this work.

TFEIP is today responsible for the technical content and EEA for hosting the EMEP EEA guidebook. The guidebook now contains the most influential set of emission estimation methods used in air pollution studies in Europe and the UNECE geographical area. It has evolved over a long period and has become an essential tool for compiling air emissions inventories to be reported under the LRTAP Convention protocols and the NEC Directive.

7.1.2 Corinair and the EEA task force

Council Decision 85/338/EEC ([10]) established a work programme concerning an 'experimental project for gathering, coordinating and ensuring the consistency of information on the state of the environment and natural resources in the

([10]) Council Decision 85/338/EEC of 27 June 1985 on the adoption of the Commission work programme concerning an experimental project for gathering, coordinating and ensuring the consistency of information on the state of the environment and natural resources in the Community, OJ L 176, 6.7.1985, p. 14.

Community'. The work programme was given the name CORINE — CO-oRdination d'INformation Environnementale — and included a project to gather and organise information on emissions into the air relevant to acid deposition — Corinair. This project started in 1986 with the objective of compiling a coordinated inventory of atmospheric emissions from the 12 Member States of the Community in 1985 (Corinair 1985).

The Corinair 1985 inventory covered three substances — SO_2, NO_X, and VOCs — and recognised eight main source sectors: combustion (including power plant but excluding other industry), oil refineries, industrial combustion, processes, solvent evaporation, road transportation, nature, and miscellaneous.

The project also developed:

- a source sector nomenclature — Nomenclature for Air Pollution Socioeconomic Activity (NAPSEA) and Selected Nomenclature for Air Pollution (SNAP) — for emission source sectors, sub-sectors and activities;
- a default emission factor handbook;
- a computer software package for data input and the calculation of sectoral, regional and national emission estimates.

The Corinair 1985 inventory was developed in collaboration with the countries, Eurostat, OECD and LRTAP/EMEP. The inventory was completed in 1990 and the results published (Eurostat, 1991; CEC, 1995) and distributed in tabular and map forms. It was agreed in 1991 to produce an update to Corinair 1985 (Corinair 1990). This update was performed in cooperation with both EMEP and IPCC-OECD to assist in the preparation of inventories required under the LRTAP Convention and the UN Framework Climate Change Convention (UNFCCC) respectively.

The Corinair 1990 system was made available to the:

- then 12 Member States of the European Community in 1990: Belgium, Denmark, Germany, Greece, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom;
- then five EFTA countries: Austria, Finland, Norway, Sweden and Switzerland;
- three Baltic States: Estonia, Latvia and Lithuania;
- central and eastern European countries: Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia;
- Russia.

This collaboration:

- produced a more developed nomenclature (source sector split) — SNAP90 — involving over 260 activities grouped into a three level hierarchy of sub-sectors and 11 main sectors;
- extended the list of substances to be covered to eight (SO_2, NO_X, NMVOC, NH_3, CO, CH_4, N_2O and CO_2);
- extended the number of sources to be considered as point sources (there were over 1 400 large point sources in the Corinair 1985 inventory);
- recognised that an emission inventory needs to be complete, consistent and transparent;
- extended the availability of the Corinair system to 30 countries;
- increased awareness of Corinair and the need to produce an inventory within a reasonable timescale to serve the requirements of the user community (policymakers, researchers, etc.).

The Corinair 1990 inventory recognised 11 main source sectors (as agreed with EMEP, see below):

- public power, cogeneration and district heating plants;
- commercial, institutional and residential combustion plants;
- industrial combustion;
- production processes;
- extraction and distribution of fossil fuels;
- solvent use;
- road transport;
- other mobile sources and machinery;
- waste treatment and disposal;
- agriculture;
- nature.

Data were provided on large point sources on an individual basis and on other, smaller or more diffuse sources, on an area basis (usually by administrative boundary at the county, department level (NUTS level 3)). The sources provided as point sources were:

- power plants with thermal input capacity ≥ 300 MW;
- refineries;
- sulphuric acid plants;
- nitric acid plants;
- integrated iron/steel with production capacity > 3 Mt/yr;
- paper pulp plants with production capacity > 100 kt/yr;
- large vehicle paint plants with production capacity > 100 000 vehicles/yr;
- airports with > 100 000 landing and take-off (LTO) cycles/yr;
- other plants emitting ≥ 1 000 t/yr SO_2, NO_X or VOC or ≥ 300 000 t/yr CO_2.

The goal of Corinair 1990 was to provide a complete, consistent and transparent air pollutant emission inventory for Europe in 1990 within a reasonable timescale to enable widespread use of the inventory for policy, research and other purposes. Data from Corinair 1990 was finalised and published by the EEA (see under Section 5) in 1996 and 1997.

Corinair 1990 was followed by Corinair 1994, an expanded European air emission inventory for 1994 prepared by the EEA and its then European Topic Centre on Air Emissions (ETC/AE). In 1995 the ETC/AE developed the Corinair 1994 methodology and software, which were made available to the 18 EEA member countries and other interested countries (e.g. Malta, Switzerland) in January 1996 and to 13 central and eastern European countries in June 1996. Based on the submitted emission estimates from the countries, a final report describing the assessment was published by EEA in 1997.

The Corinair Technical Unit, followed by the European Topic Centre on Air Emissions (ETC/AE), worked closely with the IPCC, OECD and International Energy Agency (IEA) to ensure compatibility between the joint EMEP/Corinair Atmospheric Emission Inventory guidebook and reporting formats and the IPCC Guidelines and reporting formats. This was achieved by means of the preparation by ETC/AE of the revised SNAP97, distributed in 1998 and fully in line with the 1996 revised IPCC Guidelines.

7.1.3 EMEP and the Task Force on Emission Inventories and Projections (TFEIP)

The Cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (EMEP) (funded in part through the 1984 EMEP Protocol to the LRTAP Convention) arranged a series of workshops on emission inventory techniques to develop guidance for estimation and reporting of emission data for SO_X, NO_X, NMVOCs, CH_4, NH_3 and CO under the Convention. The 1991 workshop recommended that:

- a task force on emission inventories should be established by the Executive Body of the Convention to review present emission inventories and reporting procedures for the purpose of further improvement and harmonisation; and
- the EMEP Steering Body should approve the guidance proposed by the workshop for estimating and reporting to the Executive Body of the Convention. The guidance included a recommendation that emission data should be reported as totals and at least for the 11 major source categories agreed with the Corinair project and other experts for the Corinair 1990 inventory (see above).

The Task Force on Emission Inventories (TFEI) was established in December 1991 by agreement of the Executive Body to the LRTAP Convention. The task force reported to the EMEP Steering Body and was led by the United Kingdom with support from Germany and the European Community (including the EEA). In 1995, the Executive Body agreed that TFEI should be merged with the Task Force on Emission Projections to form the Task Force on Emissions Inventories and Projections (TFEIP).

Between 2004 and 2008, TFEIP was led by Norway and its activities supported by the other parties to the Convention including the European Community, through the European Commission and the European Environment Agency (EEA). In September 2008, following the approval of the EMEP Steering Body, the United Kingdom again resumed the lead-country responsibilities for TFEIP (http://tfeip-secretariat.org).

The TFEIP provides a technical forum and expert network to harmonise emission factors, establish methodologies for the evaluation of emission data and projections and identify problems related to emission reporting.

The objectives of the TFEIP are therefore to:

- provide a technical forum to discuss, exchange information and harmonise emission inventories including emission factors, methodologies and guidelines;
- conduct in-depth evaluation of emission factors and methodologies in current operation; and
- cooperate with other international organisations working on emission inventories with the aim of harmonising methodologies and reporting requirements, and avoiding duplication of work.

TFEIP meets these objectives through its one or two annual meetings (usually sponsored by a host country), by guiding the annual emissions review process and developing the guidebook. For its detailed work it has established a number of expert panels.

7.2 The European Environment Agency

The European Environment Agency is an independent agency of the European Union and assists the Commission, as appropriate, with monitoring activities, especially in the scope of the Community inventory system, and in the analysis by the Commission of progress towards the fulfilment of commitments under international agreements. The inventory data reported annually by both the member countries and the European Community is available through the Data service of the EEA (http://dataservice.eea.europa.eu/).

The European Environment Agency (www.eea.europa.eu/) was established by Regulation (EC) No 1210/90 ([11]) (updated in 1999 by Regulation (EC) No 933/1999 ([12]) and commenced operation in Copenhagen on 30 October 1993.

The overall objective of the Agency as specified in the regulation is 'to provide the European Community and the member countries with objective, reliable and comparable information at European level enabling them to take the requisite measures to protect the environment, to assess the results of such measures and to ensure that the public is properly informed about the state of the environment'.

The geographical scope of the Agency's work is not confined to the Member States of the EU; membership is open to other countries that share the concerns of the EU and the objectives of the Agency. The Agency currently has 32 member countries:

- 27 European Union Member States — Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden and the United Kingdom;
- EU candidate country Turkey;
- Iceland, Liechtenstein, Norway and Switzerland (European Free Trade Area countries).

EEA also cooperates with the countries of the Western Balkans: Albania, Bosnia and Herzegovina, Croatia, Kosovo, Montenegro, Serbia and the Former Yugoslav Republic of Macedonia.

The strategy and annual work plans of the EEA are made available to the public. The current 2009–2013 strategy of the Agency is aligned with the sixth environment action programme and describes the Agency's objectives across four major thematic areas: tackling climate change, tackling biodiversity loss/understanding spatial change, protecting human health and quality of life (including a priority on air quality issues), use and management of natural resources and waste. Important products of the EEA include its regular 'State of the environment' reports published every five years.

The EEA works closely with the European Environment Information and Observation Network (Eionet). Eionet is a network of the EEA and its member and participating countries. It consists of the EEA itself, five European

([11]) Council Regulation (EEC) No 1210/90 of 7 May 1990 on the establishment of the European Environment Agency and the European environment information and observation network, OJ L 120, 11.5.1990, p. 1.
([12]) Council Regulation (EC) No 933/1999 of 29 April 1999, OJ L 117, 5.5.199, p. 1.

topic centres (ETCs) and a network of around 900 experts from 37 countries in over 300 national environment agencies and other bodies dealing with environmental information. Through Eionet, the EEA coordinates the delivery of timely, nationally validated, high-quality environmental data from individual countries (including a variety of official air emissions and air quality data). This forms the basis of the integrated environmental assessments that are disseminated and made accessible through the EEA website.

8 Point of enquiry

Enquiries concerning this chapter should be directed to the co-chairs of the Task Force on Emission Inventories and Projections. Please refer to the TFEIP website (www.tfeip-secretariat.org/) for contact details of the current co-chairs.

European Environment Agency

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