



# EMEP/EEA air pollutant emission inventory guidebook 2023

Technical guidance to prepare national emission  
inventories

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# Foreword

Dear colleagues,

Welcome to the revised 2023 edition of the *EMEP/EEA air pollutant emission inventory guidebook* – the 'Guidebook'.

As noted in previous Guidebook versions, work on the original *EMEP Corinair Guidebook* started in 1992 and it has since been developed and maintained 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 (<https://www.eea.europa.eu/publications/emep-eea-air-pollutant-emission-2023>) continues to be published by the European Environment Agency (EEA).

The coordination and management of updating the Guidebook has been led by the TFEIP's co-chairs and expert panel leaders, with support from the EEA as part of the EU's contribution to the work of the LRTAP Convention. The majority of efforts have been provided as in-kind contributions from the TFEIP's expert panel leaders (see page 7), and experts based in the United Kingdom, Germany, France, the Netherlands and several other countries. This 2023 version of the Guidebook has undergone review by experts from the Task Force, and industry stakeholders. All comments received during the review have been considered and used in the development of the updated version as far as practicable.

More specifically, updates have been made in the following chapters:

**Energy chapters:**

- 1.A.1 Energy industries
- 1.A.2 Combustion in Manufacturing industries and construction;
- 1.A.3.a Aviation;
- 1.A.3.b.i-iv Road Transport;
- 1.A.3.d Navigation (shipping);
- 1.A.3.e.i Pipeline transport
- 1.A.4 Small combustion (includes a new annex on the reporting of future emissions);
- 1.B.1.a Fugitive emissions from solid fuels: coal mining and handling
- 1.B.1.b Fugitive emissions from solid fuels: solid fuel transformation
- 1.B.2.a.i/b Fugitive emissions: exploration, production and transport
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- 3.D Agricultural soils.

**Waste chapters:**

- 5.A Biological treatment of waste: solid waste disposal on land
- 5.C.1.a Municipal waste incineration
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**A.7 Spatial mapping of emissions.**

Ensuring consistency between the Guidebook's definitions of sectors used to report air pollutant emissions and those used for the reporting of greenhouse gas emission inventories under the United Nation Framework Convention on Climate Change (UNFCCC) remains a priority. Against this background, the Guidebook remains structured according to the latest revised Nomenclature for Reporting (NFR) as defined in the 2014 *Guidelines for reporting emissions and projections data under the Convention on Long-range Transboundary Air Pollution* (ECE/EB.AIR/125).

The Guidebook is intended as a general reference source. In particular, it is used in conjunction with the LRTAP Convention reporting guidelines, and by EU Member States for reporting under the National Emission reduction Commitments Directive. The Guidebook also remains the recommended source of methodology information for preparing emission inventories of indirect greenhouse gases, i.e. ozone precursors and sulphur dioxide, following the *Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories*.

Furthermore, the Guidebook is also frequently used as a reference document by researchers. As such, it remains the most influential set of emission estimation methods used in air pollution studies in Europe and elsewhere.

Finally, we would like to warmly thank the various funding bodies (especially the EU/EEA), the individuals and organisations that undertook the latest updates, and all of the numerous experts from the TFEIP and industry groups who provided comments concerning earlier draft versions.

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# 1 Guidebook introduction

## 1.1 Introduction

The joint *EMEP/EEA air pollutant emission inventory guidebook* <sup>(1)</sup>, the 'Guidebook', supports the 'Guidelines for Reporting Emissions and Projections Data' under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (LRTAP Convention) <sup>(2)</sup>. It provides concise guidance on how to compile an air pollutant emissions inventory. The Guidebook is prepared by the Convention's Task Force on Emission Inventories and Projections (TFEIP), with detailed work facilitated by the Task Force's expert panels and the European Environment Agency (EEA) <sup>(3)</sup>. The Guidebook is published by the EEA and this 2023 edition replaces all earlier versions. This updated version of the Guidebook is compatible with, and complementary to, the 2019 refinement to the 2006 Intergovernmental Panel on Climate Change (IPCC) *Guidelines for National Greenhouse Gas Inventories* <sup>(4)</sup>, (hereafter the 'IPCC Guidelines').

The present version of the Guidebook has been updated but also reproduces relevant information from earlier editions. More specifically, it presents a number of important improvements and updates, in the following areas:

- stationary combustion sources, industrial processes, and product use guidance have undergone a thorough review. Improvements have been made to the way emission factors are presented. For example, a '<' is now used where emission factors have been derived from measurements that are below the limit of detection and some have been removed because the previous approach to presenting them is considered to be potentially misleading. The intention is to better present the context of the emission factors so that users are better informed about what is, or is not, appropriate use;
- small combustion guidance, a priority emission source for many users, has been improved and refined;
- road transport sources guidance incorporates improved information from real-world emission studies;
- agriculture sources guidance has been updated in-line with the latest scientific evidence base, and some aspects of the methodologies have been redrafted for improved clarity;
- use of pesticides and limestone sources guidance has been updated;
- waste source guidance has been substantially updated in several chapters, and represents the first major update of these chapters in several years.

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<sup>(1)</sup> EMEP is the Cooperative programme for monitoring and evaluation of long-range transmission of air pollutants in Europe – a scientific body established under the Convention on Long-range Transboundary Air Pollution. EMEP is also referred to as the European Monitoring and Evaluation Programme.

<sup>(2)</sup> The LRTAP Convention Reporting Guidelines and the associated annexes are available online from the EMEP Centre on Emission Inventories and Projections (CEIP) website <http://www.ceip.at>.

<sup>(3)</sup> See Section 7 for more information on these bodies.

<sup>(4)</sup> Available at <https://www.ipcc-nggip.iges.or.jp>

The general guidance sections continue to outline the principles of preparing inventories. They are intended to help users identify the areas where improvements would be most beneficial so that limited resources can be focused to best advantage.

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

## Note

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 technologies, and much of the emission-related information from industry is derived from facility reporting.

The present Guidebook is structured according to the Nomenclature for Reporting (NFR), which was first developed in 2001/02 by the Convention's TFEIP, further improved in 2006/07, and revised again in 2013/2014 as part of the revision of the LRTAP Reporting Guidelines. Changes to the NFR structure since 2001 have ensured continuing consistency with the IPCC source nomenclature developed for reporting greenhouse gases under the United Nations Framework Convention on Climate Change (UNFCCC). Cross-referencing to the Selected Nomenclature for reporting of Air Pollutants (SNAP)97, originally developed by the EEA's European Topic Centre on Air Emissions (ETC/AE), now known as the ETC on Air Pollution, Transport, Noise and Industrial Pollution or ETC/ATNI, remains included where relevant.

## 1.2 Scope

The Guidebook has two key functions:

- to provide procedures enabling 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 <sup>(5)</sup>. It must also be used by the EU Member States to fulfil their emissions reporting requirements under the National Emission reduction Commitments (NEC) Directive <sup>(6)</sup>.

<sup>(5)</sup> Parties must annually submit data to the EMEP Centre on Emission inventories and Projections (CEIP (<http://www.ceip.at/ceip>), for the protocols that they have ratified and which have entered into force. They must also inform the UNECE secretariat of the contents of their data submission.

<sup>(6)</sup> Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016, on the reduction of national emissions of certain atmospheric pollutants – amending Directive 2003/35/EC and repealing Directive 2001/81/EC.

The Guidebook is used to prepare emission inventories of substances which, if emitted into the atmosphere as the result of human and natural activity, are implicated in:

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

Inventories prepared according to the Guidebook are suitable for:

- providing information to policymakers in UNECE countries and the EU Member States, the EEA, the Convention and its Parties, the Convention's implementation committee, and the general public;
- defining environmental priorities and identifying the activities responsible for the problems;
- informing the specific policy objectives and constraints;
- assessing potential environmental impacts and the implications of different air pollution 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 comply 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 to report on cases of non-compliance to the Executive Body of the Convention.

The focus of the Guidebook is always to include the most up-to-date information on current sources of air pollutants. However, there may be occasions when users will only find information applicable to certain emission sources in historical years, in earlier versions of the Guidebook.

Currently, the Guidebook contains very little information on the geographical variation in emission factors. However, there is ambition to increasingly include emission factors that are specific to selected geographical regions of the UN/ECE coverage.

The Guidebook does not provide guidance on the estimation and reporting of emissions of direct gases responsible for global warming and climate change. These are included in the separate 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.

### 1.3 Concepts

Inventory compilers 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 reflects actual changes in emissions.

#### Accuracy

Accuracy means that emission estimates should be accurate in the sense that they are systematically neither over, nor under, true emissions (as far as can be judged) and that uncertainties are reduced as far as practicable. Appropriate methodologies should be used, in accordance with Section V below, to promote accuracy in inventories.

#### Comparability

Comparability means that estimates of emissions reported by Parties in their inventories should be comparable. For that purpose, Parties should use the accepted methodologies, as elaborated in the Reporting Guidelines and the NFR formats, for making estimations and reporting their inventories.

#### Completeness

Completeness means that the annual inventory covers all sources and pollutants, with full geographical coverage, for which methodologies are provided in the latest EMEP/EEA air pollutant emission inventory guidebook, or for which supplementary methodologies have been agreed upon by the Executive Body. Where numerical information on emissions under any source category is not provided, the appropriate notation key defined in the Reporting Guidelines should be used when filling in the reporting template to document its absence.

#### Consistency

Consistency means that an annual inventory should be internally consistent for all reported years, and for all elements across sectors, categories and pollutants. An inventory is consistent if the same methodologies are used for all years of inventory and if consistent data sets are used to estimate emissions. For projections, consistency means using a year of the submitted inventory as a base year.

#### 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.

#### Tiers

A tier represents a level of methodological complexity. Usually three tiers are provided: tier 1 is the simple, basic method, tier 2 is intermediate, and tier 3 is 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.

### Good practice

In order to promote the development of high-quality inventories, a collection of methodological principles, 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. The 2019 refinement to the 2006 IPCC Guidelines updated the concepts 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 and applying appropriate methods such as averaging, interpolation and extrapolation. A sequence of annual inventory estimates, for example, each year from 1990 to 2018, is called a time series. Given the importance of tracking emission 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 means a source category of emissions that has a significant influence on a Party's total emissions, in terms of the absolute level of emissions of a given substance, 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 substances that Parties to the Convention's protocols need to report, plus a number of additional substances for which reporting is voluntary - as defined in the LRTAP Reporting Guidelines.

## Note

The LRTAP Reporting Guidelines list all substances for which there are existing emissions reporting obligations. The guidelines and annexes are available online from the CEIP website (<http://www.ceip.at>).

The European Union, 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, i.e. groupings of related processes and sources.

These sectors include:

- energy
- industrial processes and product use
- agriculture
- waste
- other

Each sector comprises individual source 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'. These are separately reported sources following political agreement, not included in national totals, but sometimes used to assess compliance with protocol requirements. An example of a memo-item includes the emissions caused by fuel combustion from international shipping.

## Transparency

Transparency means that the data sources, assumptions and methodologies used for an inventory should be clearly explained, in order to facilitate the replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of the information. The use of the NFR tables, and the preparation of a structured informative inventory report (IIR), contribute to the transparency of the information and facilitate national and international reviews.

### Note

The use of the same methods and data sources throughout should be sufficient to ensure transparency, provided there have been no recalculations. 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.



## 1.4 How to use the Guidebook

### 1.4.1 Guidebook – not a rule book

The Guidebook aims to provide information that defines best practice in estimating air pollutant emissions, but is not a rule book. There may be occasions where it is appropriate to use alternative methods, approaches and/or input data, if this provides better quality emission estimates.

### 1.4.2 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.

**Part A.** 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.

**Part B.** Sectoral 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.

### 1.4.3 Guidebook methodology principles

It is impractical to measure emissions from all the sources that, together, constitute 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 or EF). The basic equation is therefore:

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

In the energy sector, for example, fuel consumption would be activity data and the 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 estimation parameters other than emission factors to, for example, accommodate the effects of additional secondary abatement.

The Guidebook describes a tiered methodology for estimating emissions. Simple (tier 1) methods are given for all sources and substances that countries which 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** assume a simple linear relation between activity data and emission factors. The activity data is derived from readily available statistical information, e.g. energy statistics, production statistics, traffic counts, population sizes, etc. The default tier 1 emission factors are chosen to 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 which 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 homogeneous process characteristics.
- **Tier 3 methods** go beyond those of tiers 1 and 2, and may include using facility-level data and/or sophisticated models. Examples might include the use of pollutant release and the transfer of register data, data from emission trading schemes for industrial emissions, or models such as COPERT for road transport emissions.

Methodology descriptions are accompanied by tables of emission factors that include relevant pollutants. However, there can be emissions which are particularly small or insignificant compared to other sources. It is often challenging to accurately represent these very small emissions with any certainty, and make a distinction between no emission, an emission that is so small that it is not quantified, and small emissions that can be reliably estimated.

In general, the emission factor tables identify a pollutant as not occurring:

- **Not applicable EF:** Pollutants that are included under this heading in emission factor tables are considered to be emissions that do not occur at all – not even in trace quantities.
- **Not estimated EF:** Pollutants may be included in the emission factor tables as 'not estimated', but it does not mean that there is a requirement for the pollutant emissions to be reported as 'not estimated' from this source in the inventory. Nationally specific data though, may provide sufficient information to allow an emission estimate to be made.

This means that there is insufficient information to provide a reliable emission factor in the Guidebook. Wherever possible, an estimate has been made of the uncertainty that can be associated with both the emissions factors and the activity statistics quoted.

## 1.5 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 to assist EU Member States to fulfil their emissions reporting requirements under the NEC Directive. In addition, the Guidebook may be used to estimate emissions of selected indirect greenhouse gases of relevance to the UNFCCC and to other international bodies.

### 1.5.1 Reporting under the Convention on Long-range Transboundary Air Pollution

Reporting of emission data is required to fulfil obligations regarding the general requirements of the Convention and the more specific reporting requirements for the protocols under the Convention.

Protocols with reporting requirements are:

- 1985 Helsinki Protocol on the reduction of sulphur emissions or their transboundary fluxes
- 1988 Sofia Protocol concerning the control of emissions of nitrogen oxides or their transboundary fluxes
- 1991 Geneva Protocol on the control of emissions of volatile organic compounds or their transboundary fluxes
- 1994 Oslo Protocol on further reduction of sulphur emissions
- 1998 Aarhus Protocol on heavy metals and its 2012 amended version
- 1998 Aarhus Protocol on persistent organic pollutants and its 2009 amended version
- 1999 Gothenburg Protocol to abate acidification, eutrophication and ground-level ozone and its 2012 amended version

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 on the justification for the choice of methodology and whether it is considered an improvement on the methodology available in the Guidebook.

### 1.5.2 Reporting under the European Union's National Emission reduction Commitments Directive

The 2016 revised version of the NEC Directive sets 2020 and 2030 emission reduction commitments for the five main air pollutants responsible for acidification, eutrophication, particulate matter formation, ground-level ozone pollution, i.e. sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), fine particulate matter (PM<sub>2.5</sub>), non-methane volatile organic compounds (NMVOCs), and ammonia (NH<sub>3</sub>).

The NEC Directive specifies that countries prepare and annually update national emission totals for SO<sub>2</sub>, NO<sub>x</sub>, NMVOCs, PM<sub>2.5</sub>, NH<sub>3</sub> and other pollutants for which the European Union is obliged, or requested, to report to the LRTAP Convention, including emission projections, gridded data and large point source (LPS) data.

Each year, EU Member States must report the required information to the Commission and the EEA. Data reported by EU Member States under the NEC Directive are compiled and made available through the website of the EEA's Data Service ([https://www.eea.europa.eu/ds\\_resolveuid/DAT-20-en](https://www.eea.europa.eu/ds_resolveuid/DAT-20-en)).

To ensure harmonised and consistent emission information reporting, the NEC Directive requires all EU 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.

### 1.5.3 Other reporting

The Guidebook also facilitates reporting under a number of other international agreements, as described in the following sections.

#### Reporting under the United Nations Framework Convention on Climate Change

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, sinks and any recalculations that have occurred, of several greenhouse gases, including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and various fluorinated chemicals. Parties should also provide information on emissions of carbon monoxide (CO), NO<sub>x</sub> and NMVOCs and are encouraged to provide information on emissions of sulphur oxides (SO<sub>x</sub>/SO<sub>2</sub>).

The 2006 IPCC Guidelines contain links to information on methods used under other agreements and conventions, for the estimation of emissions of tropospheric precursors that 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 (this Guidebook), for the purpose of estimating emissions of SO<sub>2</sub>, CO, NO<sub>x</sub>, NH<sub>3</sub> and NMVOCs.

#### 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 the United Nations Environment Programme (UNEP) Chemicals, has run a PRTR programme for a number of years, providing guidance to countries interested in establishing a PRTR. Within the European Union, the European Pollutant Release and Transfer Register (E-PRTR) is the main PRTR instrument for which annual reporting from EU Member States is required.

#### 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 for reducing levels of pollution.

Under the protocol, PRTRs should be based on a reporting scheme that is mandatory, annual, covers multimedia releases (air, water, land) and transfers of waste and waste water. 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 waste water treatment plants, paper and timber industries;
- accommodate available data on releases from diffuse sources, e.g. transport and agriculture;
- allow 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 to 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 (<https://www.unece.org/env/pp/prtr.html>).

### **The Organisation for Economic Co-operation and Development's Pollutant Release and Transfer Register**

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

Based on the recommendation of a workshop held in Canberra, Australia, on release estimation techniques (RETs), a task force on PRTRs was established in 2000. Its main tasks were 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-Organization programme for the sound Management of Chemicals (IOMC) PRTR coordination group and is now called the Task Force on PRTRs. Useful products include a resource centre and a PRTR portal (<https://prtr.unece.org>) providing links with international and national PRTR activities and information sources. Information is also provided on quality control methods, the methodology for estimating emissions from

small and medium-sized enterprises, emissions from product use, and links between emissions and statistical data, e.g. national product or number of inhabitants.

### The European Pollutant Release and Transfer Register

E-PRTR is the European Union's pollutant release and transfer register (<https://prtr.eea.europa.eu>). The EPRTR, based on Regulation (EC) No 166/2006 <sup>(7)</sup>, succeeded the European Pollutant Emission Register (EPER) and implements the obligations of the UNECE PRTR Protocol, with a wider and more comprehensive scope. E-PRTR goes beyond the requirements of the protocol by covering more pollutants with often stricter release thresholds. It covers more than 91 substances released to air and water from industrial installations in 65 different sectors of activity. It includes transfers of waste and wastewater from industrial facilities to other locations, and data on emissions caused by accidents on-site.

The first reporting year under the E-PRTR was 2007: the data was reported by the EU Member States in June 2009 and was made available to the public by the European Commission and the EEA later that year. Since that year, data has been annually updated.

To assist countries in preparing for the implementation of the E-PRTR, the Commission, in cooperation with the EU Member States and other stakeholders, has published a guidance document for implementation of the E-PRTR (<https://prtr.eea.europa.eu/#/downloadguidance>).

## 1.6 Guidebook management

Maintaining the technical content of the Guidebook is the responsibility of the TFEIP <sup>(8)</sup>. It is published by the EEA.

### 1.6.1 Mandate of the expert panels of the Task Force on Emission Inventories and Projections

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

1. Combustion and industry
2. Transport
3. Agriculture and nature
4. Waste
5. Projections (cross-cutting)

<sup>(7)</sup> 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.

<sup>(8)</sup> The task force has assigned the detailed work to its expert panels which report their results to the task force.

## 6. User engagement (including emission mapping)

The TFEIP's expert panels have the following tasks:

- collecting and reviewing available information on activities, emission factors and inventory methodology, e.g. emission estimates, emission factors, activity statistics, etc.;
- considering the significance of each source in terms of its contribution to emissions and identifying where new source categories are needed;
- updating the Guidebook to reflect developments within the sector, e.g. the appearance of new technologies;
- updating methodologies within the Guidebook when new knowledge concerning the processes driving emissions becomes available;
- updating emission factors within the Guidebook in light of new emission measurements;
- gathering feedback and answering queries concerning the Guidebook from inventory compilers or from the Expert Panel on Review;
- identifying the need for further research or study to improve the methodology and to encourage the exchange of information between experts.

## 1.7 Additional information

### 1.7.1 Overview

The LRTAP Convention 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, and on the quantity and significance of long-range transmission of air pollutants and fluxes across boundaries. In providing this information, EMEP is supported by various task forces, for example the 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 Coordination d'Information Environnementale work programme (CORINE) in 1985. Subsequently, the EEA task force created CORINAIR, an inventory of emissions of air pollutants in Europe. The European Topic Centre on Air Emissions (ETC/AE), now the European Topic Centre on Air Pollution, Transport, Noise and Industrial Pollution, later took over the coordination of this work.

The TFEIP is currently responsible for the technical content of the EMEP/EEA Guidebook and the EEA is responsible for hosting it. 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.

### 1.7.2 CORINAIR and the EEA Task Force

Council Decision 85/338/EEC <sup>(9)</sup> 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 Community'. The work programme was given the name CORINE (as explained previously), and included a project called CORINAIR to gather and organise information on emissions into the air relevant to acid deposition. 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, namely SO<sub>2</sub>, NO<sub>x</sub> and VOCs, and recognised eight main source sectors: combustion (including power plants but excluding other industry), oil refineries, industrial combustion, processes, solvent evaporation, road transport, nature, and miscellaneous.

The project also developed:

- 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;
- computer software packages for data input and the calculation of sectoral, regional and national emission estimates.

The CORINAIR 1985 inventory was developed in collaboration with the 12 Member States, Eurostat, OECD and the LRTAP Convention/EMEP. The inventory was completed in 1990 and the results (Eurostat, 1991; CEC, 1995), published and distributed in tabular and map forms. It was agreed in 1991 to produce an update to CORINAIR 1985. This update, CORINAIR 1990, was performed in cooperation with both EMEP and IPCC-OECD to assist in the preparation of inventories required under the LRTAP Convention and the UNFCCC, respectively.

The CORINAIR90 system was made available to the:

- 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;
- former five European Free Trade Association (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 (now Czechia), Hungary, Poland, Romania, Slovakia and Slovenia;
- Russia.

<sup>(9)</sup> 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.



This collaboration:

- produced further 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<sub>2</sub>, NO<sub>x</sub>, NMVOC, NH<sub>3</sub>, CO, CH<sub>4</sub>, N<sub>2</sub>O and CO<sub>2</sub>);
- extended the number of sources to be considered as point sources (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):

1. Public power, cogeneration and district heating plants
2. Commercial, institutional and residential combustion plants
3. Industrial combustion
4. Production processes
5. Extraction and distribution of fossil fuels
6. Solvent use
7. Road transport
8. Other mobile sources and machinery
9. Waste treatment and disposal
10. Agriculture
11. Nature

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

The sources provided as point sources were:

- power plants with thermal input capacity  $\geq 300$  MW;
- refineries;
- sulphuric acid plants;

- nitric acid plants;
- integrated iron/steel with production capacity > 3 Mt/year;
- paper pulp plants with production capacity > 100 kt/year;
- large vehicle paint plants with production capacity > 100,000 vehicles/year;
- airports with > 100 000 landing and take-off (LTO) cycles/year;
- other plants emitting  $\geq 1\,000$  t/year  $\text{SO}_2$ ,  $\text{NO}_x$  or VOC or  $\geq 300,000$  t/year  $\text{CO}_2$ .

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 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 ETC/AE. In 1995, the ETC/AE developed the CORINAIR94 methodology and software, which were made available to the 18 EEA member countries and other interested countries, e.g. Malta and 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 ETC/AE, worked closely with the IPCC, the OECD and the 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 the ETC/AE preparing the revised SNAP97, distributed in 1998 and fully in-line with the 1996 revised IPCC Guidelines.

### 1.7.3 EMEP and the Task Force on Emission Inventories and Projections

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 estimating and reporting emission data for  $\text{SO}_x$ ,  $\text{NO}_x$ , NMVOCs,  $\text{CH}_4$ ,  $\text{NH}_3$  and CO under the Convention. The 1991 workshop recommended the following:

- 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.
- 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.

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 then European Community (including the EEA). In 1995, the Executive Body agreed that the TFEI should be merged with the Task Force on Emission Projections to form the TFEIP.

Between 2004 and 2008, the TFEIP was led by Norway and its activities were supported by the other Parties to the Convention including the European Community, through the European Commission and the EEA. In September 2008, following the approval of the EMEP Steering Body, the United Kingdom again resumed lead country responsibilities for the TFEIP. Since its establishment, the task force has been co-chaired by the European Union (EEA).

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.

Therefore, the objectives of the TFEIP are 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;
- cooperate with other international organisations working on emission inventories with the aim of harmonising methodologies and reporting requirements, and avoiding duplication of work.

The TFEIP meets these objectives through an annual meeting (usually sponsored by a host country), by guiding the annual emissions review process and by developing the Guidebook – for which panels of experts were established (see Section 1.6).

#### 1.7.4 The European Environment Agency

The EEA is an agency of the European Union. Its task is to provide sound, independent information on the environment. The EEA aims to support sustainable development by helping to achieve significant and measurable improvement in Europe's environment, through the provision of timely, targeted, relevant and reliable information to policymakers and the public. Its multiannual strategy and annual work plans are publicly available through its website ([www.eea.europa.eu](http://www.eea.europa.eu)).

The regulation establishing the EEA was adopted by the European Union in 1990. It came into force in late 1993 immediately after the decision was taken to locate the EEA to Copenhagen. Operations started in October 1993, and work started in earnest in 1994.

The EEA's mandate is to:

- help the European Union and member countries make informed decisions about improving the environment, integrating environmental considerations into economic policies and moving towards sustainability;
- coordinate Eionet.

The main stakeholders of the EEA are the EU institutions, including the European Commission, the European Parliament and the Council.

The business community, academia, non-governmental organisations and other parts of civil society are also important users of the Agency's information.

The geographical scope of the Agency's work is not confined to the EU Member States. Membership is open to other countries that share the concerns of the European Union and the objectives of the Agency.

The Agency currently has 32 member countries:

- 27 EU Member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, and Sweden;
- Iceland, Liechtenstein, Norway, Switzerland and Turkey.

The EEA also cooperates closely with the six countries of the Western Balkans: Albania, Bosnia and Herzegovina, Kosovo <sup>(10)</sup>, Montenegro, North Macedonia and Serbia.

The EEA works closely with Eionet. Eionet is a partnership network of the EEA and its member and participating countries. It consists of the EEA, eight European Topic Centres, a network of around 1500 experts from over 400 national environment agencies, and other bodies dealing with environmental information.

## 1.8 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](http://www.tfeip-secretariat.org)) for contact details of the current co-chairs.

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<sup>(10)</sup> Under United Nations Security Council Resolution 1244/99.

## European Environment Agency

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