ETC-CME Report 2021/12

# A Guide to Conducting an Emission Inventory Review


Authors:
Justine Raoult (Aether), Lotte Gleeson (Aether), Kirsten May (Aether), Henry Irvine (Aether).

European Environment Agency
European Topic Centre on Climate change mitigation and energy

Cover design: EEA
Cover image © ExplorerBob from Pixabay
Layout: Tom Dauwe (VITO)

**3/3/2022**

**EEA activity "Climate change mitigation and adaptation"**

**Legal notice**
Preparation of this report has been funded by the European Environment Agency as part of a grant with the European Topic Centre on Climate change mitigation (ETC-CM) and expresses the views of the authors. The contents of this publication do not necessarily reflect the position or opinion of the European Commission or other institutions of the European Union. Neither the European Environment Agency nor the European Topic Centre on Climate change mitigation is liable for any consequence stemming from the reuse of the information contained in this publication.

ETC-CM coordinator: Vlaamse Instelling voor Technologisch Onderzoek (VITO)

ETC-CM partners: AETHER Limited, Citepa, CHMI – Czech Hydrometerological Institute, EMISA, Stiftelsen Norsk Institutt fof Luftforskning (NILU), Öko-Institut e.V. Institut für Angewande Ökologie, Öko-Resherche GmbH - Büro für Umweltforschung und -beratung, Rijks Instituut voor Volksgezondheid en Milieu (RIVM), Gauss International Consulting S.L., Transparency for life (T4L), Klarfakt e.U., Exergia S.A., Transport & Mobility Leuven (TML), Umweltbundesamt GmbH (UBA).

**Copyright notice**
© European Topic Centre on Climate change mitigation, 2022
Reproduction is authorized provided the source is acknowledged. [Creative Commons Attribution 4.0 (International)]

More information on the European Union is available on the Internet (http://europa.eu).

European Topic Centre on
Climate change mitigation
https://www.eionet.europa.eu/etcs/etc-cm
etccm@vito.be

# Contents


Contents ..... 1
Acknowledgements ..... 3
Foreword ..... 4
Executive summary ..... 5
1 Introduction ..... 9
1.1 About this guide and its scope ..... 9
1.2 What is an emission inventory review? ..... 10
2 Approach to the review ..... 11
2.1 Review principles ..... 11
2.2 Quality procedures ..... 12
3 Scope of the Review ..... 13
4 Structure of a Review ..... 16
4.1 General Approach to a Review ..... 16
4.2 Review Timeline ..... 18
5 Outcomes of the Review ..... 19
6 Key Review Roles ..... 23
7 Communications and Review Platform ..... 27
7.1 Supporting Remote Working ..... 29
7.2 Review Tools ..... 30
7.3 Training ..... 31
8 Continuous Development ..... 32
9 Abbreviations, units and symbols ..... 33
Annex 1: EU Legislations and UN Decisions considered within this Guide ..... 35
Effort Sharing Decision (ESD) (406/2009/EC) () ..... 35
Monitoring Mechanism Regulation (MMR) (EU) No 525/2013 ..... 35
Effort Sharing Regulation (ESR) (525/2013/EU) () ..... 35
National Emissions reduction Commitments Directive (NECD) (2016/2284/EU) () ..... 36
Forest Reference Level (FRL) (UNFCCC Decision 13/CP.19) () ..... 36
UNFCCC Annex I inventory review (UNFCCC) (UNFCCC Decision 13/CP.20) () ..... 36
Convention on Long-range Transboundary Air Pollution (CLRTAP) (UNECE Decision 2018/1) () ..... 37
Annex 2: Example of Detailed Decision Tree ..... 38
Annex 3: Case Study - The EEA's Emissions Review Tool (EMRT) ..... 39
Development of the Tool ..... 39
Users of the EMRT ..... 39
Annex 4: Visualising Progress – An Example from the ESD Annual Review ..... 44
Annex 5: Case study summary of technical tools used in the ESD annual review ..... 46

Annex 6: Reference Texts for the ESD Review ..... 48
Example 1: Creating a new observation ..... 48
Example 2: Question for Country around a lack of transparency ..... 48
Example 3: Conclusion text as the issue has been clarified and no recommendation is required ..... 48
Annex 7: Corrected Estimate Template Screenshot ..... 49

## Acknowledgements

This report was prepared by the European Environment Agency (EEA) and its European Topic Centre on Climate change Mitigation and Energy (ETC/CME). The ETC/CME is a consortium of European institutes assisting the EEA to support European Union (EU) policy in the field of air pollution and climate change mitigation.

Justine Raoult (ETC/CME) and Melanie Sporer (EEA) ensured the coordination of this report. The authors were: Justine Raoult, Lotte Gleeson, Kirsten May and Henry Irvine (ETC/CME). Chris Dore (Aether), Justin Goodwin (Aether), Izabela Grundova (European Commission), Jürgen Salay (European Commission), Emma Salisbury (Aether), Beatriz Sánchez (Aether), Sabine Schindlbacher (UBA Vienna), Xavier Seront (European Commission) and Courtney Szanto (Aether) reviewed the report and provided invaluable feedback.

Individuals who considerably contributed to the development of the described tools, procedures and principles are, in alphabetical order: Federico Antognazza (EEA), François Dejean (EEA), Chris Dore (Aether), Justin Goodwin (Aether), Bernd Gugele (UBA Vienna), Kirsten May (Aether), Claire Qoul (EEA), Justine Raoult (Aether), Emma Salisbury (Aether), Sabine Schindlbacher (UBA Vienna) and Melanie Sporer (EEA).

## Foreword

Welcome to this 'Guide to Conducting an Emission Inventory Review'.

Since 2012, the European Environment Agency (EEA) has coordinated emission inventory reviews under the EU Effort Sharing Decision No 406/2009/EC (ESD). The ESD is the European Union's (EU's) internal mechanism that defined annual emission reduction targets for the period 2013-2020 for each Member State to contribute to the overall achievement of the EU's 2020 climate target.

The first ESD inventory review was organised in 2012 to determine the annual emission allocations (AEAs) assigned to Member States. Subsequent reviews, starting in 2015, provided the European Commission and Member States with verified greenhouse gas emission data for the assessment of yearly compliance with national ESD targets.

Developing the review process and tools was challenging. The EEA were requested to help the European Commission to develop and implement a review process that would match the high quality of the existing greenhouse gas emission inventory reviews under the United Nations Framework Convention on Climate Change (UNFCCC) but would deliver findings more rapidly - within eight months of the submission of the emission inventory information. This timeline was designed to allow for the annual compliance assessment under the ESD. The Union review was based upon the long-standing experience of the UNFCCC reviews, yet, we had to design an alternative approach to accommodate the ambitious timeline. This was when the idea for a two-step review process was established and elaborated in the Monitoring Mechanism Implementing Regulation shortly thereafter.

The review procedures and the tools evolved over time and continuously improved thanks to the dedication of the Commission's consultants, the colleagues in the European Topic Centre on Climate Change Mitigation and Energy (ETC/CME) supporting the EEA review Secretariat and the valuable feedback from reviewers and Member State experts. In 2017, the online software tool used in the emission inventory review was successfully adapted for the inventory review of air pollutants under the EU's NEC Directive.

Over these 10 years, the EEA review Secretariat and the European Commission's consultants have gained a broad understanding of the principles, good practices and challenges of conducting an emission inventory review. This experience is shared in this Guide. We hope it will contribute to a better understanding of what conducting a quality review may entail and facilitate the design of efficient review procedures. The Guide is aimed at the emission inventory review community - those organising and coordinating reviews, those performing reviews and those subject to reviews.

Finally, we would like to thank the European Commission and their consultants, the lead reviewers, reviewers and Member States experts, who were instrumental in building and shaping the European Union emission inventory reviews.

Melanie Sporer,

EEA review Secretariat

# Executive summary

## Purpose and Approach to a Review

The objective of any emission inventory review is to drive the development and reporting of highly transparent, complete, accurate, consistent and comparable data inventories. The process of a review is to ensure that an independent assessment of an inventory, report and/or data takes place, as well as to ensure consistency historically and across countries subject to a review. Every aspect of a review is therefore geared towards ensuring that such a process can take place in a high quality. The review quality principles steer the nature and emphasis of review activity to engage all key actors, satisfy relevant regulatory requirements, and serves to improve the quality of data submissions from all reviewed countries over time.

In general, a review will have the following review quality principles:

1. **Consistency:** the review should be executed consistently with the relevant legislative mandate, with relevant technical guidelines and across country submissions, within and across review cycles.
2. **Transparency:** the process of the review should be well understood by all stakeholders and clearly documented throughout.
3. **Efficiency:** the review should be well organised and minimise unnecessary burden on the participating countries of the reviews.
4. **Accuracy:** the technical work of the review should be undertaken by experts with substantial experience of material being reviewed such as reported greenhouse gas or air pollution data.
5. **Timeliness:** the review should be carried out in a timely fashion, with clearly defined timelines for all countries involved.

The purpose of this document is to provide guidance on how to set up and subsequently conduct a review. Specifically, this report will focus on reviewing emission and removals inventories and its associated reporting such as historical data, projections and policies and measures. Different reviews can have contrasting aims, outputs, and objectives and therefore will require differing approaches. This document aims to provide a range of different options and approaches for conducting a review, with suggestions for when these may be the most appropriate. Best practice examples are provided in order to illustrate how key review principles have been practically implemented both from reviews conducted by the EEA, and also what can be learnt from other reviews.

## Scope of a Review

It is important to define the scope of a review in order to outline what the priority of the review should be and what the often limited available resources and time should focus on. Largely, the scope of what is being reviewed will be defined by the legal mandate and its corresponding reporting requirements.
The scope of a review, for example in the case of an inventory review, can be defined in numerous ways, including:

- The greenhouse gases or air pollutants covered;
- The years covered by the review;
- The sources and categories considered;
- The thresholds used to categorise findings and prompt certain review actions;
- The consideration of different datasets such as large point sources (LPS) or gridded data;
- Mandatory versus non-mandatory elements;
- Or the format of the review submission.

## Structure of a Review

The general approach to a review will typically follow the structure outlined below:

1. **Initial analysis and checks.** A preliminary scan and check of the submitted data can be carried out by an 'initial checks' team. The primary aim of the initial checks phase is narrow down the focus and scope of the review for the review team, targeting cross-cutting checks in order to allow the review team to focus on more in-depth, specific checks.
2. **Question sent to the country being reviewed such as an EU Member State**. The outcomes of an initial checks phase can then be handed over to a review team, who then decide if issues flagged in the initial check phase requires clarification from the relevant country being reviewed, such as Member States.
3. **Analysis of the Review Countries' Responses.** Once a question has been sent to a designated reviewer in the country subject to review, the country technical expert team will usually discuss internally how to best answer the question. A clear response is then sent back to the review team to clarify the issue.
4. **Closing of simple resolved observations.** If the issue is considered resolved, and the reviewer is satisfied with the response provided by the country subject to review, the observation can simply be closed as it requires no further follow-up.
5. **Promotion of unresolved issues.** If further clarification is required on an issue, it remains unsolved and therefore can be promoted to the next stage of the review.
6. **Additional analysis and follow-up question plus any new questions.** An additional follow-up question can be sent asking for further clarification from the country subject to review.
7. **Further responses from the country subject to review.** The back and forth between review teams will be restricted by the designated review timeframe.
8. **Conclusions and recommendations.** When an observation has been dealt with, an internal conclusion can be drafted on how the issue was dealt with. If it is deemed beneficial to provide a conclusion to the country subject to review, then a more formal recommendation can be sent in order to help them improve their submission. In certain instances, quantitative changes may be applied to manually alter a country's submission.
9. **Review follow-up.** Following the review, feedback from all stakeholders is integral to the continuous development of a review process.

## Outcomes of a Review

The review process has multiple key outcomes aimed at supporting countries to the review in improving the quality, completeness, accuracy and transparency of reported data. The type of outcome will depend on the reporting requirements of the review, and the defined scope of the review. Reviewers are concerned with improving the quality of reported inventories. The following outcomes of a specific issue (also referred to as 'observation' or 'finding') raised are commonly used in reviews:

**Table ES-1 Potential outcomes of an inventory review**

| Outcome | Detail |
|---|---|
| **Closed** | If an observation raised during the review has been internally dealt with, or the country has responded in a way which clarifies the issue, then the observation can simply be closed. The technical review team does not need to provide informal or formal recommendations on how to improve their submission, and the issue will therefore not be followed up in future years. |
| **Encouragement** | In the event an observation is for a non-mandatory year, or below the threshold of significance for the category (mandatory or non-mandatory) and therefore does not warrant a formal recommendation, it can still be useful to provide some information to the country subject to review. Therefore, in some reviews, an encouragement or concluding remark can be communicated to a country. |
| **Recommendation** | A **recommendation** can be provided to a country for each observation relating to a mandatory category, gas or year. A recommendation will typically be sent if the issue is deemed above the threshold of significance for a certain category. The purpose of a recommendation is to provide the country subject to a review with a short, but formal request to implement a certain change to next year's submission, in order to ensure the same issue does not arise the following year. They will be followed up with in future reviews, to make sure the recommendation has been implemented. |
| **Revised Estimate** | A **'revised estimate'** can be provided by a country during the review process, where an emission estimate for a specific source, gas or year is updated following a question raised by the review team. |
| **Technical Correction** | A **'technical correction**' can be provided by the review experts if the numerical estimates are deemed inaccurate, and the country subject to a review has not provided a better estimate ('revised estimate') or a 'revised estimate' has been rejected. In the event of a technical correction, the review team can enforce changes to a country's submitted inventory, as they deem it to be necessary. |
| **Not Fit for Purpose** | In rare circumstances, a submission might simply be categorised as 'not fit for purpose'. There may be various soft penalties in place for these instances, such as failure to come up with a credible inventory for the UNFCCC. The severity of the outcome will depend on the legal framework in which the review sits. |

## Actors of the Review

It is crucial to define the roles within a review, and the structure of the review team can have a significant impact on the efficiency of a review. Each member of a review team must have a clear understanding of their responsibilities and their expected outputs. The key actors typically involved in review processes are:

1. **Review Country.** The country, such as an EU Member State, with their data under review, should be engaged throughout. Countries respond to the review using their own resources.
2. **Organising Body.** There is usually an organisation which oversees the review process and is in charge of ensuring the review mandate is followed. They are the contracting authority.
3. **Review Secretariat.** Helps to oversee the work of the contractors and ensure the quality of deliverables.
4. **Review Project Team.** Most reviews require a high level of administrative support and coordination of practical arrangements, which may be carried out by a review project team led by a **project manager**.
5. **Initial Checks Team.** If a review involves 'initial checks', these are carried out by the initial checks team who then perform preliminary checks on submitted data and hand over findings.
6. **Technical Expert Review Team (TERT).** The 'technical expert review team' (TERT) undertake the core technical assessment of the data under review, following the timelines and

procedures specified in each individual process. The team can include sector experts, lead reviewers and quality controllers.

## Communications and Review Platform

A key feature of a successful review is effective and transparent communication between the country reviewing (e.g., the TERT) and those being reviewed (e.g., the EU Member States). In order to ensure the key quality principles of a review are upheld, it is beneficial to have an online platform which acts as a focal point for technical reviewers and countries subject to review. A review platform is essential for increasing transparency and efficiency of a review, as everything is held in one place and the review is conducted in a standardised way. Such a platform should have the following features:

1. **Question and Answers.** The platform should allow a question to be sent to the country subject to a review, with added features such as the ability to attach a file.
2. **Access Rights.** The different review roles should have various access rights to the platform, to ensure the necessary privacy which can emerge within a review.
3. **Internal Commenting.** Internal commenting within the review teams which remains private.
4. **Tracking Progress.** The platform should have a way to track the progress of the review, in order to ensure reviewers are actively engaged with the task and the review deadlines will be met.
5. **Flagging Observations.** Flagging and categorising an issue can be beneficial to transparency.
6. **Extraction of Data.** It should be possible to extract the data from the platform in a standardised format, such as an excel download.
7. **Facilitation of Quality Assurance and Quality Control (QAQC).** The four-eyed principle can be enabled through the workflow of the tool.

## Continuous Development

Due to the cyclic nature of some review processes and consistent involvement of key persons, there is the opportunity to build on good practices and carry out continuous developments. There are a number of activities which can take place to capture experiences from reviews, and feed into future review cycles including collecting feedback through questionnaires and surveys; exchange webinars across different reviews; trial reviews for when there are changes in the scope; evolving expectations and objectives set up through various mandates; developing improvement plans etc.

# 1 Introduction

## 1.1 About this guide and its scope

This document provides guidance on how to set up and subsequently conduct a review. Specifically, this guide focusses on reviewing emission and removals inventories of greenhouse gases and air pollutants. It aims at contributing to a better understanding and continuous improvement of review procedures supporting international and European Union (EU) institutions organising and conducting reviews, emission inventory teams in countries who are subject to reviews, as well as emission inventory review experts alike.

The European Environment Agency (EEA) has conducted and supported reviews of various emission data sets since 2012 as part of its tasks in monitoring and verifying the implementation of EU environmental and climate legislation. Through a joint effort, the EEA and consultants commissioned by the European Commission developed a best practice approach of how to conduct an efficient and quality review, using an iterative approach over multiple review cycles.

The review of emissions and removals reported by countries under EU and international legislation is a key verification step and therefore an essential component of the Monitoring, Reporting and Verification (MRV) system. Different reviews can have contrasting aims, outputs, and objectives and therefore will require differing approaches. Taking this into consideration, this guide does not intend to presume there is only one correct way to perform an emission inventory review. Rather, this document should provide a range of different options and approaches for conducting a review, with suggestions for when these may be the most appropriate. Best practice examples will be provided in order to illustrate how key review principles have been practically implemented both from reviews conducted by the EEA, and also what can be learnt from other reviews. This document will further highlight constraints and barriers which may exist within a review, and how these might be overcome.

The reviews related to the following EU legislation and UN decisions (transposed as legislation in the EU) are considered within this guide (see Annex 1 for further detail):

- Effort Sharing Decision (**ESD**) (406/2009/EC) ([1])
- Monitoring Mechanism Regulation **(MMR)** (EU) No 525/2013
- Effort Sharing Regulation (**ESR**) (525/2013/EU) ([2])
- National Emissions reduction Commitments Directive (**NECD**) (2016/2284/EU) ([3])
- Forest Reference Level (**FRL**) (United Nations Framework Convention on Climate Change (UNFCCC) Decision 13/CP.19) ([4])
- UNFCCC Annex I inventory review (**UNFCCC**) (UNFCCC Decision 13/CP.20) ([5])
- Convention on Long-range Transboundary Air Pollution (**CLRTAP**) (UNECE Decision 2018/1) ([6])

([1]) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009D0406&from=EN
([2]) https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018R0842&from=EN
([3]) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L2284&from=EN
([4]) https://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=34
([5]) https://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=3
([6]) https://unece.org/DAM/env/documents/2002/eb/air/EB%20Decisions/Decision_2018_1.pdf

## 1.2 What is an emission inventory review?

This document aims to provide guidance to the reader on the merits of carrying out an emission inventory review, and how to successfully conduct the review process. Following the completion of a 'reporting period', outputs will be produced which may include an emissions inventory and/or a report. To ensure that the outputs of this reporting period are of a high quality, complete, accurate, and transparent, a review process is carried out by an independent team of experts. In turn, this review process helps to build international confidence in the reporting outputs and their validity. This process becomes increasingly important if the reporting output contribute to international targets – for example, the production of emission inventories by a conglomerate of countries may inform international emission reduction targets.

The review process further acts as a monitoring network, aiming to catch compilation and reporting issues as soon as they may arise so that solutions can be implemented efficiently and in a timely manner. Finally, a country can benefit from having their outputs reviewed as it can lead to any potential inaccuracies being corrected, and improvements suggested and implemented.

A number of key activities are required for a flexible, transparent, and efficient review process. Overarching review principles must first be defined for the review to steer the review process at a high level. These principles will then shape the practical elements of the review – for example, a review principle of 'timeliness' will likely lead to review timelines and deadlines being defined. These practical elements are referred to as the review objectives, pertaining to everything from the methodology which must be adhered to, to the specific outputs required from the review. The review objectives, therefore, influence which activities will be carried out as part of the review process. These activities will be carried out by a variety of individuals and organisations, each of which have their own roles to play within the review process. These will include the countries being reviewed, but also the coordination team for the review, those responsible for controlling quality, as well as the technical expert review team. Successful reviews will usually have clearly defined roles with specific responsibilities, and clear lines of communication will be established between individuals and teams involved.

Within the EU emission inventory reviews for example, one review objective was to ensure consistency of the review and equal treatment of all Member States. Thus, in the design of the review procedures, special focus was laid on the four eye principle, review checklists, the exchange among lead reviewers, among review experts reviewing the same sectors for different countries and the exchange between review teams from one year to the other. These practical elements ensure consistency of the review across sectors, across review cycles as well as equal treatment of all EU Member States. This has been key to ensure effective MRV and compliance under EU legislation, and also building trust the review system among the countries subject to it.

# 2 Approach to the review

## 2.1 Review principles

The review objective is to drive the development and reporting of highly transparent, complete, accurate, consistent and comparable emission inventories. The process of a review is to ensure that an independent assessment of an inventory, report and/or data takes place, as well as to ensure continuation historically, but also to ensure comparability between countries. Every aspect of a review is therefore geared towards ensuring that such a process can take place in a high quality. The review quality principles steer the nature and emphasis of review activity to engage all key actors, satisfy relevant regulatory requirements, and serves to improve the quality of data submissions from all reviewed countries over time.

Some reviews, such as the NECD and ESD reviews, are also designed to provide feedback and recommendations to EU Member States that can be implemented to improve the quality of the data submissions over time. In contrast, the FRL and National Air Pollution Control Programmes (NAPCP) reviews are heavily focused on only checking the accuracy of the data provided. The NAPCP review solely checks if reporting is good enough to explain if a country will reach their emission concentration targets. Reviewers reach their conclusion based on whether the transparency and completeness of a country's reporting is sufficient enough to effectively explain how they will reach their concentrations values. As a result, the review quality principles will undoubtedly vary slightly depending on the purpose of the review and its expected outcomes.

In general, a review will have the following review quality principles:

1. **Consistency:** the review should be executed consistently with the relevant legislative mandate, with relevant technical guidelines and across country submissions, within and across review cycles.
2. **Transparency:** the process of the review should be well understood by all stakeholders and clearly documented throughout.
3. **Efficiency:** the review should be well organized and minimize unnecessary burden on the participating countries of the reviews.
4. **Accuracy:** the technical work of the review should be undertaken by experts with substantial experience of material being reviewed such as reported greenhouse gas or air pollution data.
5. **Timeliness:** the review should be carried out in a timely fashion, with clearly defined timelines for all countries involved.

In practical terms, a review's quality principles underlie its ***quality objectives and procedures***, which state the specific ways in which to carry or example, an objective may specify that the review should proceed according to a project timeline and deadlines, or that the review reports are prepared according to a predetermined template.

The '***four-eyes principle***' has become a cornerstone of many reviews, and is a vital contributor to a review's consistency, both between country submissions and across successive review cycles. This principle is also vital for increasing transparency of the review reports and accuracy of the findings. In practice, this means that at least two people must approve an action before it is executed. If correspondence occurs between a country and the review team during a review, this will mean that, for example, experts in the technical expert review team (TERT) cross-check draft questions to countries with at least one other member of the TERT before submission to a country.

## 2.2 Quality procedures

To ensure that the quality objectives are met, appropriate ***quality procedures*** are put in place. This may include:

1. **Training on the support available for technical experts.** Before a review cycle, training of the technical expert review team should occur, covering the review approach, and any tools and templates used. This supports the introduction of new reviewers into the process whilst versing experienced reviewers with changes to the review processes in any given year, ensuring consistency and clarity across the board.
2. **Provision of specific checklists.** In order to ensure different reviewers are reviewing their section of the review to the same standard and quality of another reviewer, it can be beneficial to use checklists. If a reviewer for example is reviewing a specific sector, such as the energy sector in an emission inventory review, sector-specific checklists can be developed as a means of ensuring efficiency and consistency. See section 7.2 for further detail.
3. **Use of a common communications platform.** A key feature of a successful review is effective communication between the country reviewing (e.g., the TERT) and those being reviewed (e.g., the Member States). In order to ensure the key quality principles of a review are upheld, it can be beneficial to have an online platform which acts as a focal point for technical reviewers and the reviewed country. A review platform is essential for increasing transparency and efficiency of a review, as everything is held in one place and the review is conducted in a standardised way. See section 7 for further detail.
4. **Confidentiality procedure.** A confidentiality procedure ensures that confidential data in a country's emission inventory that is requested by a reviewer is transferred from the country to the review team in a secure way. It is important that the review team signs a confidentiality agreement, and the review Secretariat provides a secure transfer of data exclusively to the review team members responsible for the country and sector concerned.
5. **A counterpart system for technical experts.** It can be beneficial to bring in 'counterpart' experts, to help meet the 'four-eyes principle'. These are a group of experts who review the potential questions and observations a technical expert has made before they are sent to the responsible country or review country. Counterparts and further important review actors are discussed in section 6.

# 3 Scope of the Review

It is important to define the scope of a review, outline what the priority of the review should be and what the limited available resources and time should focus on. Largely, the scope of what is being reviewed will be defined by the legal mandate and its corresponding reporting requirements. For example, in the EU's Effort Sharing Decision, the scope of emissions to be reported and monitored is defined in the Decision, whereas the reporting requirements are laid down in separate legislation that regulates the monitoring, reporting and verification of EU climate targets and objectives.

The scope of a review, for example in the case of an emission inventory review, can be defined in numerous ways, including:

- The greenhouse gases or air pollutants covered;
- The years covered by the review;
- The sources and categories considered;
- The thresholds used to categorise findings and prompt certain review actions;
- The consideration of different datasets such as large point sources (LPS) or gridded data;
- Mandatory versus non-mandatory elements; or
- The format of the review submission.

The ESD and NECD reviews have their scopes defined formally through various legislation (see footnotes on page 10), meaning there is less flexibility for the reviewers to define the scope of the review. Table 3-1 illustrates how the scope of the review can differ between reviews, illustrating the importance of a clear scope being defined at the start of the process.

**Table 3-1 Comparison of review scopes for the ESD and NECD review.**

| | Effort Sharing Decision | National Emissions reduction Commitments Directive |
|---|---|---|
| **Gases** | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$ | NOx, NMVOC, $SO_2$, $NH_3$, $PM_{2.5}$, CO, BC, $PM_{10}$, Cd, Hg, Pb, total and individual PAHs, dioxins/furans, PCBs and HCB |
| **Years** | Annual Reviews (e.g., 2019 reviewed in 2021 review)<br>Comprehensive review (e.g., 2012, 2016) | LPS and Gridded data reviewed every four years, with only one year reviewed (e.g., 2019 reviewed in 2021 review)<br>Inventory review takes place annually and focuses on multiple years (e.g., 2005, 2010, 2015-2019 for main pollutants) |
| **Countries** | All EU Member States + those who volunteer in some years (e.g., Iceland and Norway) | All EU Member States |
| **Sources** | All Common Reporting Framework (CRF) sectors excluding Land Use, Land Use Change, and Forestry (LULUCF)<br>No technical changes to domestic and international aviation | All Nomenclature for Reporting (NFR) sectors, with international and domestic aviation, and international navigation also included<br>All Gridded Nomenclature for Reporting (GNFR) categories (A-M) are considered for LPS and gridded |
| **Methodologies** | Methodologies outlined in the 2006 Intergovernmental Panel on Climate Change (IPCC) Reporting Guideline | Methodologies outlined in the 2019 European Monitoring and Evaluation Programme (EMEP) EEA Inventory Guidebook |
| **Thresholds** | Over or underestimate of data which amounts to above 0.05% of national total (excluding LULUCF), or exceeds 500 kt $CO_2$ equivalent, whichever is greater | Over or underestimate of more than 2% of the national total |
| **Other Datasets** | Reported activity data relevant to emissions | Gridded and LPS data every four years<br>Adjustment applications<br>Reported activity data relevant to emissions |
| **Format of Review Submission** | CRF tables<br>National Inventory Report (NIR) | NFR tables<br>Informative Inventory Report (IIR) |

In the case of annual reviews, flexibility in the scope of review processes allows for shifts in the focus and objectives of the review. By altering the scope of the review of submitted data, efficiencies can be achieved through directing resources to the priorities of the given review year. Table 1 illustrates how the scope of an inventory review varies, largely defined by the type of data which is submitted and reporting mandates. Where there is some flexibility, it is important to question what the overall purpose of the review is and change the scope accordingly. For example, there may be a benefit to focusing a review on a given sector and alternating between sectors between reviews. This would allow the review to focus on a specific sector in more detail and addressing systematic issues which might exist in that sector across numerous countries e.g., the difficulty in collecting accurate activity data when calculating air pollutant emissions from domestic combustion or from solvents. In the instance of the NECD, certain pollutants are deemed more important to review in a given year due to certain emission ceilings in EU legislation. This can help to narrow the scope of the review.

The ESD and NECD reviews check all EU Member States annually, but there may be some benefits in a review to only focus on some (not all) countries, and instead review countries on a rota basis. This is currently the case for reviews such as the UNFCCC and the CLRTAP. The benefit of reducing the spread of time and resources across a larger number of countries, can in part, result in more in-depth review of a country. Additionally, if a reviewer is only focusing on one or two countries, it allows them to become more familiar with the data they are reviewing and the national circumstances, which can further be beneficial to the overall outcome of the review.

It is therefore extremely important to identify what the initial scope of the review should be, and tailor it according to the data, which is being reviewed, and the main purpose of the review. Decisions have to be made from the outset on who should be reviewed, how often and for what sectors or categories. Reviews which take place annually may respond better to a more cyclical nature (i.e., not all sectors or countries reviewed), as it will ensure that a country is still reviewed regularly.

# 4 Structure of a Review

The structure of a review will largely be driven by the type of data which is being reported. For instance, the structure of the UNFCCC, NECD, ESD and CLRTAP reviews is largely driven by annual reporting of detailed inventory data. The specific focus of the review might differ however, with the NECD and ESD largely focusing on how accurate the reported quantified data is, and whether the review team can trust the numbers and can replicate the estimates. Whereas with the UNFCCC review, the review is more subjective and focuses more on the quality principles and institutional arrangements surrounding the submitted data.
The overall structure of a review therefore will depend on various factors including:

- Time constraints
- Availability of resources and key players
- Availability of data
- Specific demands of the review outputs
- Investment in initial checks
- Investment in tools

## 4.1 General Approach to a Review

The general approach to a review will typically follow the structure outlined below:

1. **Initial analysis and checks.** A preliminary scan and check of the submitted data can be carried out by an 'initial checks' team. The primary aim of the initial checks phase is narrowing down the focus and scope of the review for the review team, targeting cross-cutting checks in order to allow the review team to focus on more in-depth, specific checks. For example, the initial checks team might perform broad checks on time series consistency, or on recalculations between reported inventories. If the reviewed data is reported in a set format, such as NFR or CRF tables, then these initial checks can be automated. The outcomes of the initial checks can then be handed over to review team. In the instance of the ESD, the outcome of the initial checks will determine which countries are subject to a more in-depth review.

2. **Question sent to the country being reviewed**. The outcomes of an initial checks phase can then be handed over to a review team, who then decide if issues flagged in the phase requires clarification from the relevant country being reviewed. In the ESD and NECD review, these initial questions to EU Member States and examination of the results of the initial checks takes place during a first phase of the review. Additionally, reviewers can conduct their own checks on the data submitted and send a question to a designated coordinator from the country subject to review, who is responsible for responding to this question. The purpose of these questions can be linked to specific queries about the data, or broader issues surrounding transparency, for example of a methodology is not clearly explained in the accompanying report.

3. **Analysis of the country responses.** Once a question has been sent to a designed coordinator from the country subject to a review, the country's technical expert team will usually discuss internally how to best answer the question. A clear response is then sent to back to the review team to clarify the issue. A question can be resolved in various ways, including clarifying a methodology which was not clear, to resubmitting updated estimates for a specific gas and/or source. It is down to the reviewer to then analyse the response from the country and make a decision on whether the issue has been resolved.

4. **Closing of simple resolved observations.** If the issue is considered resolved, and the reviewer is satisfied with the response provided by the country subject to a review, the observation can simply be closed as it requires no further follow-up. In instances where the identified issue is linked to transparency issues, such as a lack of a clear methodology, it can be quicker to resolve compared to instances where new estimates need to be calculated.

5. **Promotion of unresolved issues.** If further clarification is required on an issue, it remains unsolved and therefore can be promoted to the next stage of the review. A review might be organized into different phases, for example in the case of the ESD and NECD review, where there is a desk review and a centralised review. In this instance, any issue which has not been dealt with during the desk review (as seen in point 2), can then be promoted to a future stage like the centralised review.

6. **Additional analysis and follow-up question plus any new questions.** An additional follow-up question can be sent asking for further clarification from the country subject to a review. In instances where the issue might be too difficult to solve online, it can be useful to arrange a phone call or in-person meeting. Reviews like the FRL review have benefitted from having both the technical review experts and the country being reviewed in the same room, so that they can ensure all questions are promptly solved in the allotted time.

7. **Further responses from the Country subject to a review.** The back and forth from country subject to a review will be restricted by the designated review timeframe. For example, in the ESD and NECD review, the final questions and responses from the reviewed country are required during the centralised review period.

8. **Conclusions and recommendations.** When an observation has been resolved, an internal conclusion can be drafted on how the issue was dealt with. If it is deemed beneficial to provide a conclusion to the country subject to a review, then a more formal recommendation can be sent in order to help them improve their submission. In certain instances, quantitative changes may be applied to manually alter a country's submission. If it is identified in the review that further capacity building and training is required after the review, then an in-country visit can take place. The possible outcomes of an inventory review are discussed in Section 5.

9. **Review follow-up.** Following the review, feedback from all stakeholders is integral to the continuous development of a review process. This can be collected through various means including a survey, questionnaire or a dedicated feedback session or meeting. It is useful to keep a live log of suggestions for improvements during the review process (for issues that do not require immediate attention). In the review follow-up stage, the project team can review the list of suggested improvements and prioritise what should be implemented.

## 4.2 Review Timeline

Figure 4-1 shows a simplified flow chart of an inventory review, with the main timelines of the EU's ESD annual review. The review preparation process typically takes 2-3 months, and includes activities discussed above, such as training, preparation of tools and guidance documents. The first phase of the review then takes place over 1-2 months, with initial checks being carried out. The outcomes of these initial checks are handed over to the review team, where a 'desk review' takes place over the course of 2 weeks. The desk review is a dedicated timeframe for questions to be sent to the Member States, and their responses to be analysed. After this desk review, a centralised review week will take place about a month later, to consider any resubmissions and send any follow-up questions. Conclusions and recommendations are then finalised following the centralised review week, over 2-3 months, with reports being written and disseminated to the relevant Member States. This is also the time for in-country visits to take place if there is a need for further discussion and capacity building. Finally, review follow-up activities take place for the remainder of the review year. Feedback is gathered from the review actors and improvements are implemented before the following review cycle begins. This figure illustrates the potential timeline of a review which is cyclical and takes place regularly.

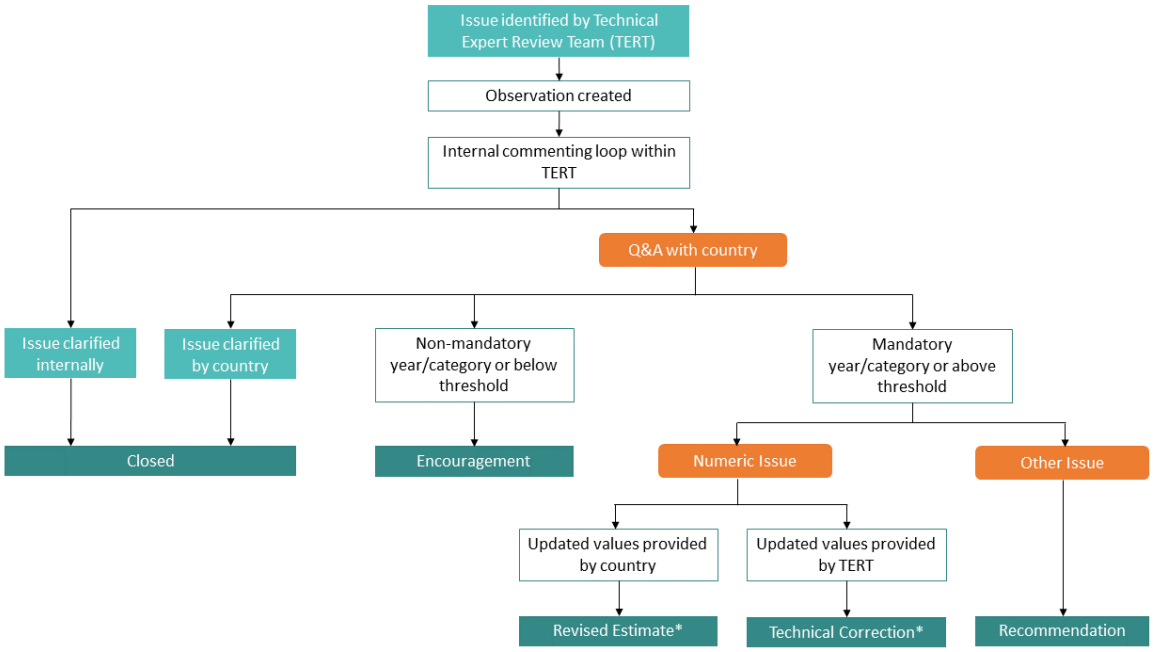
**Figure 4-1 Example review timeline: ESD Review**

# 5 Outcomes of the Review

The review process has multiple key outcomes aimed at supporting countries subject to the review in improving the quality, completeness, accuracy and transparency of reported data. The type of outcome will depend on the reporting requirements of the review, and the defined scope of the review. Reviewers are concerned with improving the quality of reported inventories. For this purpose, a useful tool can be a decision tree in order to determine the appropriate review outcome, as applied by the inventory reviews under the ESD and NECD.

Decision trees are useful tools to define the decision process and ensure all countries to the review are equally reviewed across different review experts. They can be specifically designed for each review process to reflect subtleties in the review of certain datasets and are revised with each iteration of a review. They can be useful to show the workflow, and how various issues should be treated. Figure 5-1 illustrates a simplified decision tree which highlights the general decision process and potential outcomes of a review.

**Figure 5-1 Simplified decision tree illustrating the process and potential outcomes of a review**




Annex 2 shows how a detailed decision tree (taken from the ESD review) can be beneficial during the review once it has been tailored to fit the exact scope of the review in question. It demonstrates how conclusions are reached for varying issues raised with the corresponding conclusion 'status', such as whether the issue is consider resolved, partly resolved or unresolved.

The type of outcome will further depend on the significance of the issue, such as if an estimate issue falls into a mandatory category or year in the case of the NECD or ESD. Table 5-1 outlines the main review outcomes which may arise from an inventory review.

In the event that a review highlights multiple issues in one country, or a significant issue which requires strengthening of institutional arrangements and direct capacity building, an in-country visit might be appropriate following the review.

**Table 5-1 Potential outcomes of an inventory review**

| Outcome | Detail | Relevant Reviews |
|---|---|---|
| **Closed** | If an observation raised during the review has been internally dealt with, or the country has responded in a way which clarifies the issue, then the observation can simply be closed. The technical review team does not need to provide informal or formal recommendations on how to improve their submission, and the issue will therefore not be followed up in future years. It is the primary aim of the review to close as many observations as possible during the review, and this is achieved through consistent communications with the countries. | ESD, NECD |
| **Encouragement** | In the event an observation is for a non-mandatory year, or below the threshold of significance for the category (mandatory or non-mandatory) and therefore does not warrant a formal recommendation, it can still be useful to provide some information to the Country subject to a review. Therefore, in some reviews, an encouragement or concluding remark can be communicated to a country. The purpose of a concluding remark or encourage is to provide sector experts with the opportunity to communicate to countries issues that are not significant enough to be recommendations in the final review report. There is no expectation of follow-up work on these remarks in future reviews. The remarks simply act as an informal means to communicate minor issues to countries that could provide direction on how to improve their inventory submissions. This may also be referred to as a note in other review processes. | ESD, NECD |
| **Recommendation** | A **recommendation** can be provided to a country for each observation relating to a mandatory category, gas or year. A recommendation will typically be sent if the issue is deemed above the threshold of significance for a certain category, see Table 1 for an example of what the threshold might be in a review. Any issue which was not dealt with internally or is above the threshold of significance and was not fully clarified by the reviewed Country, will receive a recommendation. The purpose of a recommendation is to provide the reviewed country with a short, but formal request to implement a certain change to next year's submission, in order to ensure the same issue does not arise the following year. This could be to add further detail to an inventory report to improve transparency. Additionally, a recommendation will further be sent in instances where quantitative changes to the inventory are required (i.e., revised estimate or technical correction). These recommendations are communicated to the reviewed country in a formal review report, which records the formal outcomes of a review. They will be followed up with in future reviews, to make sure the recommendation has been implemented. Recommendations can be adapted to suit the needs and scope of a review. For example, when LPS and gridded data is reviewed under the NECD, in an instance where best practice is not followed or there is a correction of errors required, a '**priority recommendation'** is provided, as it is not possible to calculate a technical correction. | ESD, NECD, UNFCCC, CLRTAP |
| **Revised Estimate** | A **revised estimate** can be provided by a country during the review process, where an emission estimate for a specific source, gas or year is updated following a question raised by the review team. It can be helpful to provide the Country subject to a review with the required template to submit a revised estimate, as is in the instance in the ESD or NECD review where a 'corrected estimate' template is shared'. In general, it is preferred for a country to submit revised emission estimates with the support of the review experts, making sure to fix any potential errors which might have been identified or implement any improved methodologies suggested. | ESD, NECD |

| | Detail | Relevant Reviews |
|---|---|---|
| **Technical Correction** | A **technical correction** can be provided by the review experts if the numerical estimates are deemed inaccurate, and the reviewed country has not provided a better estimate (revised estimate), or a revised estimate has been rejected. In the event of a technical correction, the review team can enforce changes to a country's submitted inventory, as they deem it to be necessary. It is the aim to avoid providing the reviewed country with a technical correction (TC) by communicating with the country during the review process. The potential for a technical correction (PTC) should be flagged as soon as possible in the process, during the initial communication with the Country subject to review. In the event of the NECD, unquantified potential technical corrections (UPTC) exist for instances where it is not possible to calculate a technical correction, but the issue is deemed above the threshold of significance. As the need to correct a Countries estimate is significant, it is important that the 'four-eyes' principle is applied to these cases, and multiple reviewers agree on the relevant cases for technical corrections. | ESD, NECD |
| **Not Fit for Purpose** | In rare circumstances, a submission might simply be categorised as **not fit for purpose**. There may be various soft penalties in place for these instances, such as failure to come up with a credible inventory for the UNFCCC. The severity of the outcome will depend on the legal framework in which the review sits.<br>In some reviews, it might not be appropriate to have recommendations and quantitative changes to reported estimates. If a review is checking compliance for example, the outcome might simply be yes or no, on whether the country has been successful. Similarly, in the case of the FRL review, the first phase was to access whether a complete report had been submitted, which led to a review outcome of yes or no. It is therefore important to consider the scope of the review and what the main purpose of the review is, when defining what outcomes are possible. | ESD, NECD, UNFCCC, CLRTAP, FRL, NAPCP |

# 6 Key Review Roles

The structure of the review team can have a significant impact on the efficiency of a review and therefore ensuring that all members of the review team have a clear understanding as to their responsibilities and their outputs is essential. As well as the review team itself, the review process is intended to be transparent and carried out in close cooperation with the reviewed country representatives e.g., nominated national contact point and experts.

Depending on the nature of the inventory review, members of the review team may be carrying out their work on a voluntary basis, such as the UNFCCC reviews, whereas other review teams may be composed primarily of contractors, such as the NECD and ESD reviews. The roles included in a review will also be dependent on timings and financial constraints. Nonetheless, it is still important that there are enough roles with clearly defined responsibilities who act independently to one another (also with no conflict of interest with the country they are reviewing), to ensure coordination of the review, that adequate quality checks are performed, and that transparency can be upheld. In addition, allowing individuals involved in the review to have clearly defined roles also encourages efficiency by streamlining the process so that review actors can focus their attention, time, and resources on specific aspects of the review.

The key actors typically involved in review processes are outlined below.

1. **Review Country.** The country, such as a country, with their data under review, should be engaged throughout. Countries respond to the review using their own resources:
    - It is usual that each country appoints one person (with another person on standby) in a coordinating role, who will act as the chief contact point to other review actors for all matters relating to their country. They will be responsible for facilitating communications and providing additional information where necessary.
    - They will also coordinate a group of national experts, who will be responsible for responding to technical questions. The coordinator will pass on communications to the relevant national expert(s) and then compile an appropriate response. It is important that the team's expertise covers all aspects of the scope of the review – for instance, an expert to cover each sector of emissions.
    - Beyond core national teams, other key stakeholders may provide feedback on draft (reporting) outputs.

2. **Organising Body.** There is usually an organisation which oversees the review process and is in charge of ensuring the review mandate is followed. For example, for the ESD and NECD reviews, the European Commission oversees the process and also contracts the technical expert review team. They approve the review timeline and selection of the technical expert review team(s). They take responsibility for the outputs of the review and ensure that findings are published in the public sphere. Where technical corrections arising from the review remain disputed, they will act to reach a decision.

3. **Review Secretariat.** If the main work in the review process is carried out by contractors, it can be useful to have a review secretariat overseeing the work of the contractors. The Secretariat ensures the quality of deliverables (e.g., review reports) and the consistency across years as contractors may change. In the case of the ESD and NECD, the European Environment Agency (EEA) was appointed review secretariat. They are the chief contact point for country coordinators ensuring that a designated coordinator is in place for each country and coordinating communications between national coordinators and technical experts. They also provide technical tools which facilitate communication between the review team and countries. They ensure that the data under review is made readily available to the review team.

The EEA review secretariat has been supported with additional resource through the European Topic Centre.

- **Review Project Team.** Most reviews require a high level of administrative support and coordination of practical arrangements, which may be carried out by a **review project team** led by a **project manager**. This team may also be involved in providing methodological and technical support to the technical expert review team and therefore the team would need to comprise of experts familiar with the data being reviewed and the review process. Example responsibilities may involve:
- Preparing a work plan for review activity (with milestones, tasks and deliverables);
- Compiling and providing all the necessary information for the technical expert review team to undertake the review;
- Ensuring that consistency and adherence to the guidelines is maintained throughout the review process;
- Compiling and editing the final review reports.

4. **Initial Checks Team.** If a review involves initial checks, these are carried out by the **initial checks team** who then perform preliminary checks on submitted data and hand over findings and analysis files to the review team. Sometimes, the initial checks team is made up of junior experts or specific thematic experts depending on the purpose of the review, but the initial checks may also be performed by the review team themselves as in the FRL review. For the NECD review, the initial checks team forms part of the review project team, while for the ESD review, the initial checks are performed by the 'initial checks team' of the European Topic Centre (ETC).

5. **Technical Expert Review Team (TERT).** The **TERT** undertake the core technical assessment of the data under review, following the timelines and procedures specified in each individual process. For any review process, they will also adhere to Quality Assurance and Quality Control (QAQC) guidelines and confidentiality protocols. The size of the team is likely contingent on the scope of the review and the time available to adequately undertake it. In reviews covering multiple sectors of emissions data, the expert team should have appropriate expertise, time, and resources to cover all sectors. Depending on availability and exact structure, it is common for each expert to be assigned to a sector where they hold expertise, to undertake the review for this sector across a number of countries' datasets. However, the structure of the TERT is highly dependent on the review being carried out – for example, the NAPCP reviews by country rather than separating out by sector as the NAPCP covers urban air quality, which cannot be split up strictly by sector. Additionally, it is important to avoid a conflict of interest within the review team, meaning a reviewer should not review their own country.

   While an expert role requires considerable experience, support to experts from more junior staff in their respective organizations is encouraged (where possible). With support from their more experienced counterpart, they can gain controlled exposure to different elements of the review process. Over time, this helps to maintain a strong pool of expertise that can be drawn from.

   To further encourage consistency, accuracy, and transparency, sub-teams of the TERT can also be mobilised to check each other's work through a **counterpart** system. This enables an expert in one sub-team to seek guidance and feedback from a member of another TERT sub-team with similar expertise.

6. **Lead Reviewer.** To enable coordination between the TERT, sometimes a **lead reviewer** is included in the TERT to lead the review activities across a sub-team of experts. The lead reviewer should be independent to encourage transparency and trust in the review process.

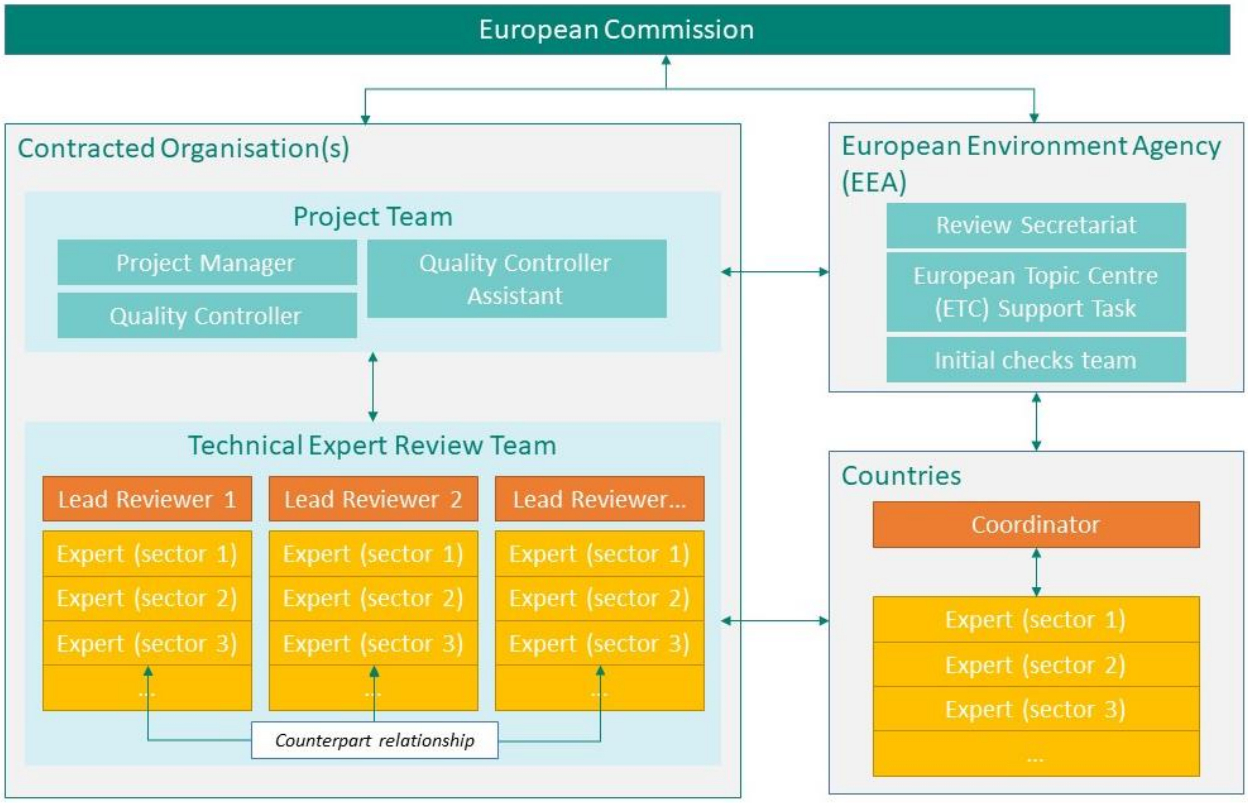
Lead reviewers dedicate their time to guiding and monitoring the progress of the review team, quality checking, and ensuring consistency of questions and review reports across sectors and countries. Before sending review reports and/or feedback to countries, the lead reviewer, usually in collaboration with the quality coordinators and the overseeing body, checks that the outputs are clear and concise.

The number of lead reviewers (and, relatedly, sub-teams), should enable sufficient time and leadership across the TERT, for the adequate completion of the review within the prescribed timelines. If applicable, each sub-team should cover all sectors in scope for the review, for an allocation of countries. As far as the TERT composition and country distribution allow, these sub-teams should ideally be balanced by language skills, experience and gender. A lead reviewer ensures that all technical assessments from their sub-team are objective, consistent with relevant international guidelines (e.g., the IPCC guidelines) and of good quality. The lead reviewers should work together to ensure that guidelines are applied consistently in the review of all countries. In addition, a lead reviewer should: monitor progress of review activity, ensure good communication between sectors and within the TERT, coordinate TERT communication with countries, and ensure that country responses are incorporated into final review outputs. The role of lead reviewer demands substantial technical experience and strong management skills.

7. **Quality Controller.** The review project team may also include someone who takes the leading role in being responsible for ensuring QAQC procedures are in place in the review and are adhered to. This role is referred to as the **Quality Controller** and ensures that the review's QAQC objectives are satisfied, and that accuracy will be upheld. This may involve the provision of guidance, training and/or tools which support these activities.

Figure 6-1 shows the formation of various organisations and roles in reviews managed by the EEA. The purpose of this organogram is to demonstrate how each review role interacts with one another, and the general structure of the review team.

**Figure 6-1 Formation of review roles for the ESD annual review processes**



# 7 Communications and Review Platform

A key feature of a successful review is effective communication between the country reviewing (e.g., the TERT) and those being reviewed (e.g., the EU Member States). In order to ensure the key quality principles of a review (see section 2) are upheld, it can be beneficial to have an online platform which acts as a focal point for technical reviewers and country subject to a review. A review platform is essential for increasing transparency and efficiency of a review, as everything is held in one place and the review is conducted in a standardised way. Such a platform should most likely have the following features:

1. **Question and Answers.** The platform should allow a question to be sent to the country subject to review, with added features such as the ability to attach a file. The question will be recorded within this platform so that there is a transparent record of what has been asked. Equally, the review country should be able to answer the question, creating a unique thread for each specific observation. This back and forth between the technical review team and the Country subject to a review is therefore recorded for future reviews, and clearly lays out how an identified potential issue gets resolved. It is important to note that the scope of the review will largely impact whether question and answer capabilities are required. For example, the NAPCP review had no Question and Answer (Q and A) as the review was carried out solely by the TERT. In most inventory reviews however, Q and A is expected.

2. **Access Rights.** The different review roles should have various access rights to the platform, to ensure the necessary privacy which can emerge within a review. For example, a reviewer should only be able to access and send questions for observations relating to the country or sector they are reviewing. In some cases, it can be beneficial to be able to view other observations in case there is overlap, such as is the case in the energy and industrial processes sectors for example. In these instances, a reviewer should only be able to see these observations, and not to have the ability to make edits. Similarly, the review country coordinator will only have access to the observations sent directly to them. Having these access rights enables the platform to remain tidy, with only the relevant reviewers answering and asking questions where required.

3. **Internal Commenting.** The technical reviewer asking a question might benefit from advice and input from another reviewer, for example to check if a certain revised estimate or methodology is correct. In this instance, it is important to have a means in the review platform, where an internal commenting loop can be created, which allows reviewers and their counterpart to talk with one another, in a way which is recorded. This internal commenting loop is private, and as such should not be visible to the country subject to a review. Similarly, the country can benefit from having this internal commenting loop to bring in their own counterparts to provide input on the answer. If an issue requires further elaboration, it can be wise to have an independent discussion over a web or physical meeting, but then the outcome should be logged within the platform.

4. **Tracking Progress.** The platform should have a way to track the progress of the review, in order to ensure reviewers are actively engaged with the task and the review deadlines will be met. For example, during the centralised review week which takes place for the ESD, there is one designated week where all observations have to be dealt with and closed (or end with a potential technical correction). In this instance, it is essential for the platform to be able to track whose 'desk' an observation might be with (e.g., is a question being drafted by a technical reviewer or is the question already with the review country). It can therefore be helpful to timestamp each time a question and answer is sent. It can further be useful to have a workflow provided for each observation, which provides a quick timeline of the observation and who currently has it. Tracking progress can also be done by visualizing the data in the platform using

a software such as Tableau or PowerBI. The case study presented in Annexes 3 and 4 provide a good example of a visual tracking tool developed from the data stored in the review platform.

5. **Flagging Observations.** In the platform, it can be useful to add flags to each observation, which allows an observation to be easily categorised. These flags could be a description flag for example, describing what the nature of the issue might be, such as time series inconsistency. Similarly, there can be a flag highlighting what the likely outcome of the review will be for that observation. Is the issue likely to be closed with no recommendation, or should it be flagged with a 'recommendation' flag? These conclusion flags can be very useful at communicating to the country subject to review the current status of an observation. If an observation is flagged as 'potential technical correction' for example, it indicates to the country that it is likely a new estimate is required and that if a satisfactory revised estimate is not provided, the technical review team will have to implement a technical correction. Flags can also be a useful means of filtering down the usually large number of observations, to only deal with certain groups. For example, if the quality controller wanted to carry out checks on all of the revised estimates, they can filter on the 'revised estimate' flag.

6. **Extraction of Data.** It should be possible to extract the data from the platform in a standardised format, such as an excel download. A document output can be used then to generate reports and formal outputs which may be required under the defined review mandate.

7. **Facilitation of Quality Assurance and Quality Control (QAQC).** The four-eyed principle can be enabled through the workflow of the tool. For example, a question should not be sent to the country subject to review without being looked at by another member of the technical review team, like a lead reviewer.

**Box 1 Emission Review Tool (ESD Case Study)**

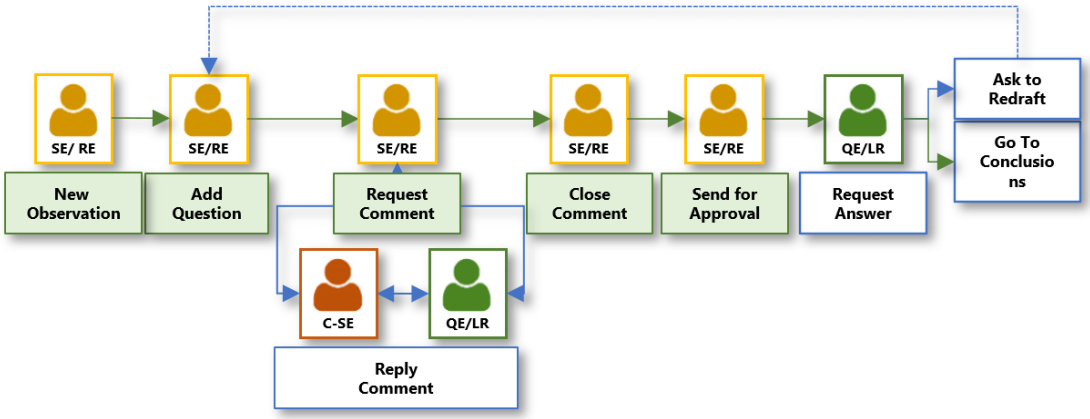
Whilst the review platform can be held on site like Microsoft SharePoint, there is also the option to develop a unique tool if there are the available resources. A bespoke tool can be tailored to meet the needs of a specific review. The EEA has developed an Emissions Review Tool (EMRT) in 2014, which is a web-based tool developed to facilitate the quality checks and reviews of national emission inventories reported by EU Member States, Iceland and Norway, under different EU Legislations. This tool has been used for the ESD review since 2015, and NECD and NAPCP review since 2018 and recently in 2020 it was used for the ESR comprehensive review and a trial LULUCF review.

There are four main users of the tool:

- Review Secretariat (EEA) – who provides administrative support
- EU Inventory Team – who perform the initial checks
- TERT – who carry out the in-depth review and ask questions
- Member State Review Team – who carry out the in-depth review and answer questions

A sector expert is able to raise an 'observation' in the EMRT and ask a question to the country. This question is asked in order to clarify a potential issue which has been identified in the reported emission inventory and/or accompanying report. Lead reviewers, quality controllers, and other sector experts can be called upon within this tool for further consultation before the question is then sent to the Member State. A simple flowchart for the workflow from the side of the TERT is presented in Figure 7-1.

**Figure 7-1. Simple workflow of the EMRT for the ESD review**




**Notes:** For further detail on the EMRT, and screenshots of the user interface, see Annex 3.

## 7.1 Supporting Remote Working

Other communication tools can be used throughout a review to support the communication amongst the TERT. For example, Microsoft Teams has been used as a communication tool during intense periods of the review such as the desk and centralised review. This can be particularly useful if a physical meeting is no

longer possible. Different sectors can have their own channels, and training sessions can take place on this platform, in addition to internal calls amongst counterparts to discuss a potential issue. Outcomes and decisions made through Microsoft Teams can then be recorded in the central review platform such as the Emission Review Tool (EMRT).

Email was only used for more formal communication with country's participating in the review to ensure that technical communication with countries was exclusively documented in the emission review tool. The EEA Secretariat team for example uses email to request for new review Country Coordinator and Expert nominations, request for confidential data, information on potential significant issues according to legislation, organisation of discussions outside the EMRT in webinars or in-country visits if deemed necessary. Draft and final review reports are also formally sent through to the relevant country coordinator over email. Email is also used for ad hoc information and support on process and tool issues.

## 7.2 Review Tools

Specific tools can be developed to help support the technical review team throughout the review, as seen in Annex 5 which provides a summary of technical tools used in the ESD review. General useful tools which can be useful in a review and help to ensure the quality principles of comparability between reviewers, are listed below.

1. **Checklists.** A set of checklists can be designed to assist the review team to organize their time in a concise way, and effectively address all key points during their review. Submissions from countries are likely to be reviewed in parallel, with one reviewer potentially reviewing only a small number of countries. It is therefore beneficial to use checklists, to ensure consistent checks across reviewers. These checklists can include broad checks which target the Transparency, consistency, comparability, completeness and accuracy (TCCCA) principles, in addition to sector specific checks. Additional quality checks can also be provided for the lead reviewers and quality controllers. These checklists can be updated directly on a communication platform such as SharePoint. For example, in the ESD review, unique checklists have been created for the sector experts, lead reviewers and quality controllers. Checks include time series consistency, recalculations, implementation of previous recommendations etc.

2. **Standard Reference Text.** A coordinated approach between reviewers can further be supported by using standardised reference text which experts are encouraged to use in drafting questions and conclusions. This means that similar language is used in communicating with and reporting to each country, ensuring consistency and comparability. The project team can draft various standardised reference texts which capture all different possible outcomes of a review, defined in Table 2. Annex 6 provides example reference text for the ESD review.

3. **Template Documents.** Carefully designed template documents can be used throughout a review, to ensure the relevant data is collected from the relevant actors (e.g., the Member State Expert), and that the data is in the correct format for future processes. The ESD annual review for example, uses a 'corrected estimate' template (see Annex 7), which is a template used by the Member State or technical review team, when they are providing new estimates in their inventory. The template is clearly laid out by year and pollutant, with formulae embedded into the document to calculate the difference between the original and updated estimate. This table is a very useful tool for effectively capturing communications taking place between the review team and the country experts, for improving a specific emission estimate. The corrected estimate files are then fed through an automated process to create new emission estimates for a country, and useful tables in the final review report.

4. **Technical Review Tools.** Several technical tools can be developed and utilised by the technical review team for standardised checks. Checking for time series consistency in the reported data,

and carrying out a key category analysis for example, can be done in specifically developed tools. Annex 5 outlines the technical review tools developed over time for the ESD review.

## 7.3 Training

It is important to provide training to the technical expert review team, regardless of experience, to ensure they know how to use all available technical tools. It is suggested that training should be given when materials and procedures for the review have been finalised, approximately two weeks prior to the beginning of the first round of the review (e.g., the desk review). This means that information will be fresh in the minds of the TERT when the desk review begins. Experience suggests that remote delivery of training, facilitated through interaction tools, is sufficient for the training.

# 8 Continuous Development

Due to the cyclic nature of review processes and consistent involvement of key persons, there is the opportunity to build on good practices and carry out continuous developments. There are a number of activities which can take place to capture experiences from reviews, and feed into future review cycles.

1. **Collecting Feedback.** It is important to collect feedback from both the technical review team and the country subject to the review's technical team. This feedback can focus on various aspects including the success of the focal review platform (e.g., EMRT) and any potential improvements which could be made; the structure of the review process; any cross-cutting or reoccurring issues that kept emerging etc. One method used by the EEA to collect feedback is a detailed questionnaire, tailored to a specific review team. The questionnaire includes multiple choice responses and open-ended questions and aims to capture what went well in the review, and what could be improved. Such a questionnaire should be shared soon after the end of the review cycle.

2. **Exchange Webinars**. It can be beneficial to run exchange webinars where lessons are shared, an activity which takes place during the UNFCCC review as well as in ESD reviews. These exchange webinars are helpful as they allow review teams to compare and share their experiences with one another and learn from each other.

3. **Evolving Expectations and Objectives.** A review will have to further develop in order to capture any changes in the defined scope and objectives of the review. For example, as new pollutants are introduced into a review (as defined under the NECD), the review has to react to this and further develop. Updates are required on the EMRT for example, and further tools such as the progress tracking tool. Similarly, when the NECD had to review gridded and LPS data for the first time, new 'review outcomes' had to be considered as a 'technical correction' did not seem appropriate, leading to the introduction of an 'unquantified technical correction'.

4. **Trial Reviews.** If the scope of a review is to change significantly, it can be beneficial to host trial reviews which effectively acts as a 'practice' review, and the technical review team and country being reviewed can both learn from the experience and develop the review through feedback and lessons learnt. For example, the European Commission and the EEA organised a trial review for greenhouse gas emission and removals in the LULUCF sector in 2021. This opportunity allowed the technical review team and the project team to ensure the review was well tailored to its desired objectives. Feedback was collected throughout the process from the various stakeholders involved, which will feed into future EU reviews of the LULUCF sector.

5. **Improvement Plan.** Improvement plans should be developed throughout the process, logging feedback received throughout the review and through feedback questionnaires and/or exchange webinars. It is then a useful exercise to go through the improvement plan before the next review cycle begins, and prioritise which improvements to implement, based on available resources and what is deemed most useful to the process.

Continuous development of the review process is essential and can be driven through learning from different reviews and identifying what successes could be applied.

## List of abbreviations

| | |
|---|---|
| AD | Activity Data |
| CEIP | Centre on Emission Inventories and Projections |
| CLRTAP | Convention on Long-Range Transboundary Air Pollution |
| COP | Conference of the Parties |
| CRF | Common Reporting Format |
| EC | European Commission |
| EEA | European Environment Agency |
| EF | Emission Factor |
| EMEP | European Monitoring and Evaluation Programme |
| EMRT | Emissions Review Tool |
| ESD | Effort Sharing Decision |
| ESR | Effort Sharing Regulation |
| ETC | European Topic Centre |
| ETC/CME | The European Topic Centre on Climate change mitigation and energy |
| EU | European Union |
| FRL | Forest Reference Level |
| GHG | Greenhouse Gas |
| GNFR | Gridded Nomenclature for Reporting |
| IIR | Informative Inventory Report |
| IPCC | Intergovernmental Panel on Climate Change |
| LPS | Large Point Sources |
| LULUCF | Land-Use, Land-Use Change and Forestry |
| MMR | Monitoring Mechanism Regulation |
| MRV | Monitoring, Reporting, Verification |
| MS | Member State |
| NAPCP | National Air Pollution Control Programmes |
| NECD | National Emissions reduction Commitments Directive |
| NFR | Nomenclature for Reporting |
| NIR | National Inventory Report |
| PSI | Potential Significant Issue |
| PTC | Potential Technical Correction |
| Q and A | Question and Answer |
| QAQC | Quality Assurance and Quality Control |
| RE | Revised Estimate |
| TC | Technical Correction |
| TCCCA | Transparency, consistency, comparability, completeness and accuracy |
| TERT | Technical Expert Review Team |

| | |
|---|---|
| UNECE | United Nations Economic Commission for Europe |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UPTC | Unquantified Potential Technical Correction |

## Annex 1: EU Legislations and UN Decisions considered within this Guide

The reviews related to the following EU legislation and UN decisions (transposed as legislation in the EU) are considered within this guide:

### Effort Sharing Decision (ESD) (406/2009/EC) ([7])

The Effort Sharing Decision forms part of the EU's climate and energy policy framework for 2020. It sets national emission targets for 2020, expressed as percentage changes from 2005 levels. It also lays down how the annual emission allocations (AEAs) in tonnes for each year from 2013 to 2020 are to be calculated and defines flexibilities.

The national targets are based on Member States' relative wealth, measured by gross domestic product (GDP) per capita. Less wealthy countries have less ambitious targets because their relatively higher economic growth is likely to be a stronger emission driver and they have relatively lower investment capacities. The national emission targets for 2020 range from a 20% reduction by 2020 (from 2005 levels) for the richest Member States to a 20% increase for the least wealthy one, Bulgaria. Croatia, which joined the EU on 1st July 2013, is allowed to increase emissions by 11% ([8]).

### Monitoring Mechanism Regulation (MMR) (EU) No 525/2013

The European Union EU Monitoring Mechanism regulation (MMR) is a mechanism for monitoring and reporting greenhouse gas emissions and other information relevant to climate change. It allows the EU to report to the UNFCCC as a single entity, following reporting requirements set out by the UNFCCC. Member States must report draft greenhouse gas emission and removal estimates to the European Commission by the 15th January each year, with final estimates submitted on the 15th March. The EU estimates are then compiled for submission to the UNFCCC by the 15th April. Under the MMR, Member States further report data on projections and policies and measures every two years. The MMR covers the seven greenhouse gases ($CO_2$, $N_2O$, $CH_4$, HFCs, PFCs, $SF_6$ and $NF_3$) plus four indirect greenhouse gases (NOx, CO, NMVOC and $SO_2$) ([9]).

The MMR allows the European Commission and individual Member States to effectively measure, analyse and manage information on the progress and future action of climate change which in turns informs policy decisions.

### Effort Sharing Regulation (ESR) (525/2013/EU) ([10])

The Regulation on binding annual emission reductions by Member States from 2021 to 2030 (Effort Sharing Regulation) adopted in 2018 is part of the Energy Union strategy and the EU's implementation of the Paris Agreement. EU Member States have binding annual greenhouse gas emission targets for 2021-2030 for those sectors of the economy that fall outside the scope of the EU Emissions Trading System (EU ETS). These sectors, including transport, buildings, agriculture, non-ETS industry and waste, account for almost 60% of total domestic EU emissions. It sets national emission reduction targets for 2030 for all Member States, ranging from 0% to -40% from 2005 levels ([8]). They specified that sectors of the economy not covered by the EU ETS must reduce emissions by 30% by 2030 compared to 2005 as their contribution to the overall target.

([7]) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009D0406&from=EN
([8]) https://ec.europa.eu/clima/eu-action/effort-sharing-member-states-emission-targets_en
([9]) https://naei.beis.gov.uk/about/why-we-estimate?view=mmr
([10]) https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018R0842&from=EN

## National Emissions reduction Commitments Directive (NECD) (2016/2284/EU) ([11])

The National Emissions reduction Commitments (NEC) Directive entered into force on the 31st December 2016, setting new 2020 and 2030 emission reduction commitments for five main air pollutants. The directive transposes the reduction commitments for 2020 agreed by the EU and its Member States under the 2012 revised Gothenburg Protocol under the Convention on Long-range Transboundary Air Pollution (LRTAP Convention). The more ambitious reduction commitments agreed for 2030 are designed to reduce the health impacts of air pollution by half compared with 2005.

Further, the Directive requires that the Member States draw up National Air Pollution Control Programmes that should contribute to the successful implementation of air quality plans established under the EU's Air Quality Directive.

The five main air pollutants reported are NOx, NMVOCs, $SO_2$, $NH_3$and PM2.5. Additionally, carbon monoxide (CO), PM2.5, PM10, and if available, black carbon (BC) and total suspended particulate matter (TSP) are reported. Furthermore, heavy metals such as lead (Pb) and mercury (Hg) are reported, alongside persistent organic pollutants (POPs) such as dioxins and furans ([12]). In previous years, gridded and large point sources data has been submitted in order to aid the European Commission to perform checks on the submitted data.

## Forest Reference Level (FRL) (UNFCCC Decision 13/CP.19) ([13])

In the LULUCF Regulation (EU 2018/841), the EU include an EU climate target of reducing greenhouse gas emissions by 40% in 2030, relative to 1990. A number of specific accounting rules need to be taken into account when calculating the LULUCF contribution towards a target, due to the difficulty in identifying the impact activities, natural processes and age legacy effects. In the case of forests, the accounting used is based on the 'Forest Reference Level' (FRL). The FRL looks at the net emissions of a country from managed forest land and harvested wood products (HWP), against what the future actual net emissions will be compared to. Each Member State aims to quantify what their mitigation impact will be, and if the reported net emissions are lower than the FRL, then they will receive credits. The European Commission adopted the FRL for each EU Member State in 2020, for the period 2021 and 2025. It is projected the forest sink for the EU 27 + UK will be about 337 million tons $CO_2$eq per year (Vizzarri et al, 2021) ([14]).

## UNFCCC Annex I inventory review (UNFCCC) (UNFCCC Decision 13/CP.20) ([15])

Annual review of individual inventories of each Annex I Party became mandatory in 2003 (decision 19/CP.8). The UNFCCC Annex I inventory review guidelines, revised in 2014 ( decision 13/CP.20) , ensure that the Conference Of the Parties (COP) is provided with an objective, consistent, transparent, thorough and comprehensive technical assessment of the quantitative and qualitative inventory information submitted annually by Annex I Parties. Annual review ensures that adequate consideration is given to recalculations and emission trends over time. The review of greenhouse gas (GHG) inventories comprises two stages. Each stage complements the previous one. Review reports are prepared and published on the secretariat web site.

- Initial assessment by the secretariat: a standardized set of data comparisons mainly based on the common reporting format (CRF) data, aiming to examine that each Annex I Party has submitted a consistent, complete and timely annual inventory in the correct format, including the national inventory report (NIR) and the CRF tables, and to identify issues for further

([11]) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L2284&from=EN
([12]) https://www.eea.europa.eu/themes/air/air-pollution-sources-1/national-emission-ceilings
([13]) https://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=34
([14]) Vizzarri, M., Pilli, R., Korosuo, A. *et al.* Setting the forest reference levels in the European Union: overview and challenges. *Carbon Balance Manage* **16,** 23 (2021). https://doi.org/10.1186/s13021-021-00185-4
([15]) https://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=3

consideration during the review of individual inventories. Status reports for each Party are published at this stage while assessment reports are available to Parties and expert review teams (ERTs);

- Review of individual annual inventories by ERTs: ERTs examine the data, methodologies and procedures used in preparing the national inventory. ERTs are required to pay particular attention to key categories, areas of the inventory where issues have been identified and recommendations made in previous reviews, or stages of the review, progress in the implementation of the planned improvements, or where recalculations or other changes have been reported by the Annex I Party. This is the most detailed review stage. Individual review reports are published for each Party ([16]).

Three operational approaches may be used during the second stage of the technical review, namely desk reviews, centralized reviews or in-country reviews.

### Convention on Long-range Transboundary Air Pollution (CLRTAP) (UNECE Decision 2018/1) ([17])

To improve air quality, UNECE member States have been working successfully to reduce air pollution in the region through the Convention on Long-range Transboundary Air Pollution. Eight protocols identify specific measures to be taken by Parties to cut their emissions. The Convention provides access to emission, measurement and modelling data and information on the effects of air pollution on ecosystems, health, crops and materials. The technical review process takes place over three phases, performed sequentially. At each stage, national experts will have the opportunity to clarify issues or provide additional information related to their inventory.

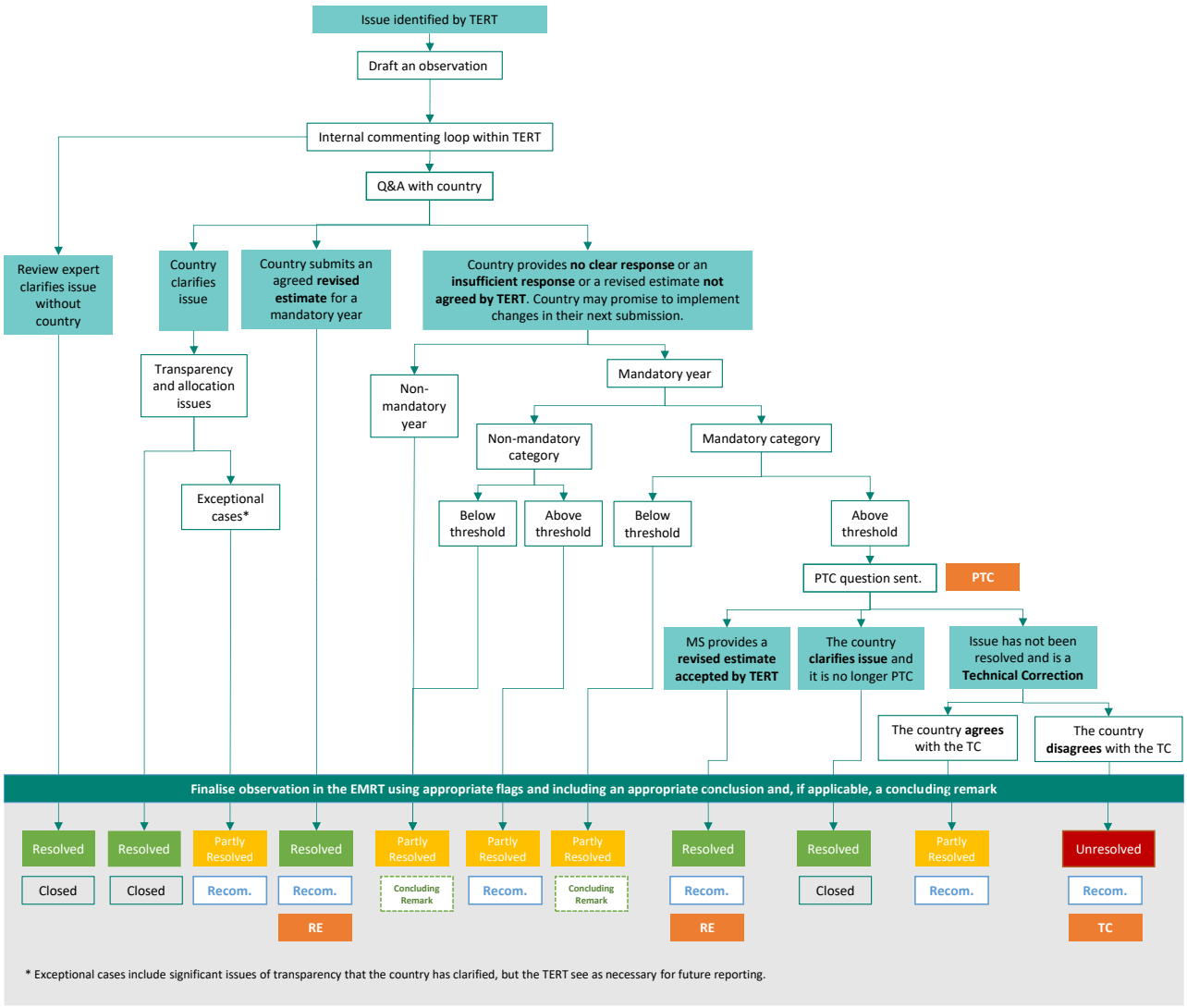
Parties to the Convention submit air pollution emission data annually to the European Monitoring Evaluation Programme (EMEP) Centre on Emission Inventories and Projections (CEIP). Submissions consist of both quantitative and qualitative information. Quantitative data should be reported using the EMEP reporting templates and in line with the Convention's Emissions and Projections Reporting Guidelines (ECE/EB.AIR/125). Qualitative data, including methodologies used in calculating emissions, should be included in informative inventory reports (IIR) in line with the Reporting Guidelines.
The three stages of the annual review are:

- Stage 1: An initial check of the submission for timeliness and completeness;
- Stage 2: An extended review of the submission with respect to consistency and comparability of data;
- Stage 3: In-depth reviews of selected national inventories as specified in the annual work plan agreed by the Executive Body; these may be annual centralized reviews or ad hoc reviews. These reviews assess consistency of the submission with the Reporting Guidelines

([16]) https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/review-process
([17]) https://unece.org/DAM/env/documents/2002/eb/air/EB%20Decisions/Decision_2018_1.pdf

# Annex 2: Example of Detailed Decision Tree

## Figure A2-1 Decision tree for ESD review processes



# Annex 3: Case Study - The EEA's Emissions Review Tool (EMRT)

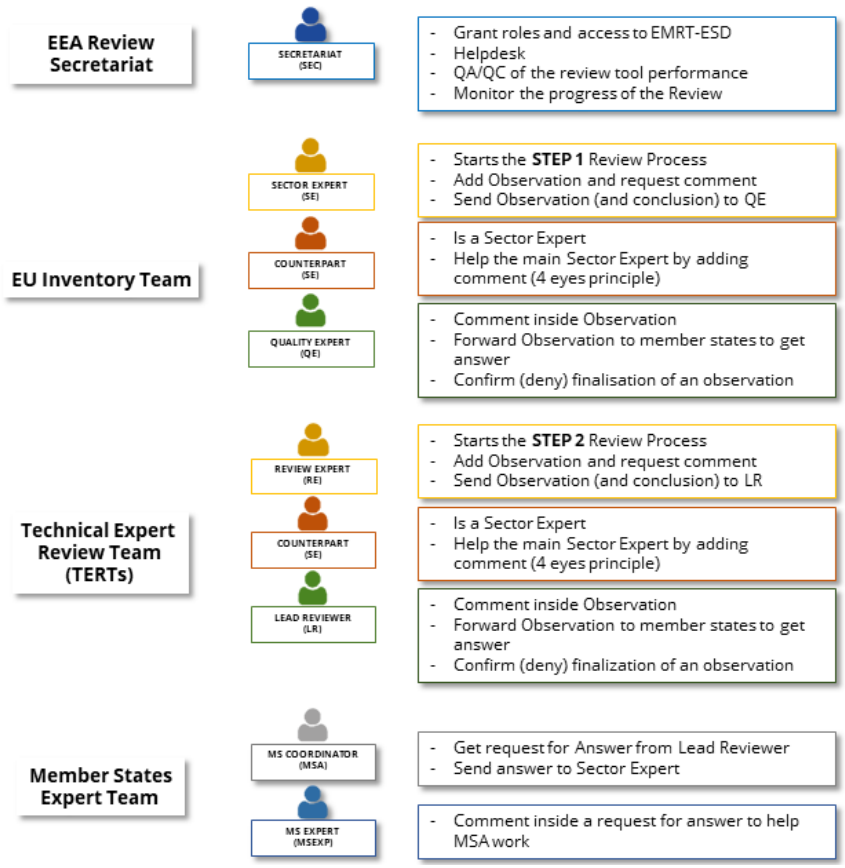
## Development of the Tool

The Emissions Review Tool (EMRT) is a web-based tool developed and hosted by the EEA which facilitates quality checks and reviews of national emission inventories reported by EU Member States, Iceland, and Norway under different EU legislation. The EMRT was first developed in 2014 under a service contract managed by the European Commission's Directorate General for Climate Action in order to streamline the procedure of recording review findings and communicating questions to countries and replies back to the review team. From 2015 onwards the tool is used in the annual review process under the Effort Sharing Decision (ESD) and the 'initial QAQC checks' under the EU greenhouse gas (GHG) inventory compilation (EU QAQC programme). Since 2018, the EMRT was further developed to be used for the annual review of air pollutants under the National Emission Ceilings Directive (NECD) and the National Air Pollution Control Programme (NAPCP). In 2020, the tool was used to facilitate the comprehensive review under the Effort Sharing Regulation (ESR).

## Users of the EMRT

The tool is used by most of the key actors identified in section of this guide and can be categorised into four different user groups: the Review Secretariat, EU Inventory Team, Technical Expert Review Team (TERT) and the Member State Expert Team. The EEA Review Secretariat and the Member State Review Team users participate in both steps of the review, whereas the EU Inventory Team participate in the first step of initial checks, and the TERT perform the second step of detailed checks. The roles of each user are presented below in Figure A3-1. All those using the tool receive training from the EEA secretariat at the beginning of a review cycle.

**Figure A3-1 Users of the EMRT for the ESD review**



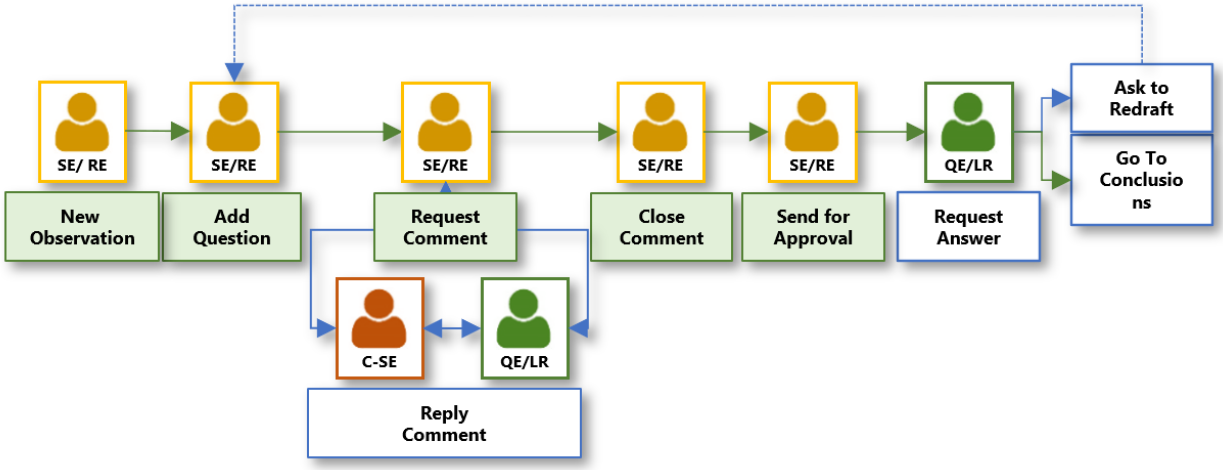

## Workflow in the tool

The tool is specifically used during an inventory review to facilitate quality checks and reviews on national emission inventories in a structured and transparent way, guaranteeing an equal treatment of all Member States. Inside the EMRT, there are three main workflows which could occur during the review process:

- Preparation of a question from the review team to the Member State;
- Preparation of an answer from the Member State to the review team;
- The finalization of an observation.

A sector expert is able to raise an 'observation' in the EMRT and ask a question to the country. This question is asked in order to clarify a potential issue which has been identified in the reported emission inventory and/or accompanying report. Lead reviewers, quality controllers, and other sector experts can be called upon within this tool for further consultation before the question is then sent to the Member State. A simple flowchart for this workflow is presented in Figure A3-2.

**Figure A3-2 Simple workflow in the EMRT**

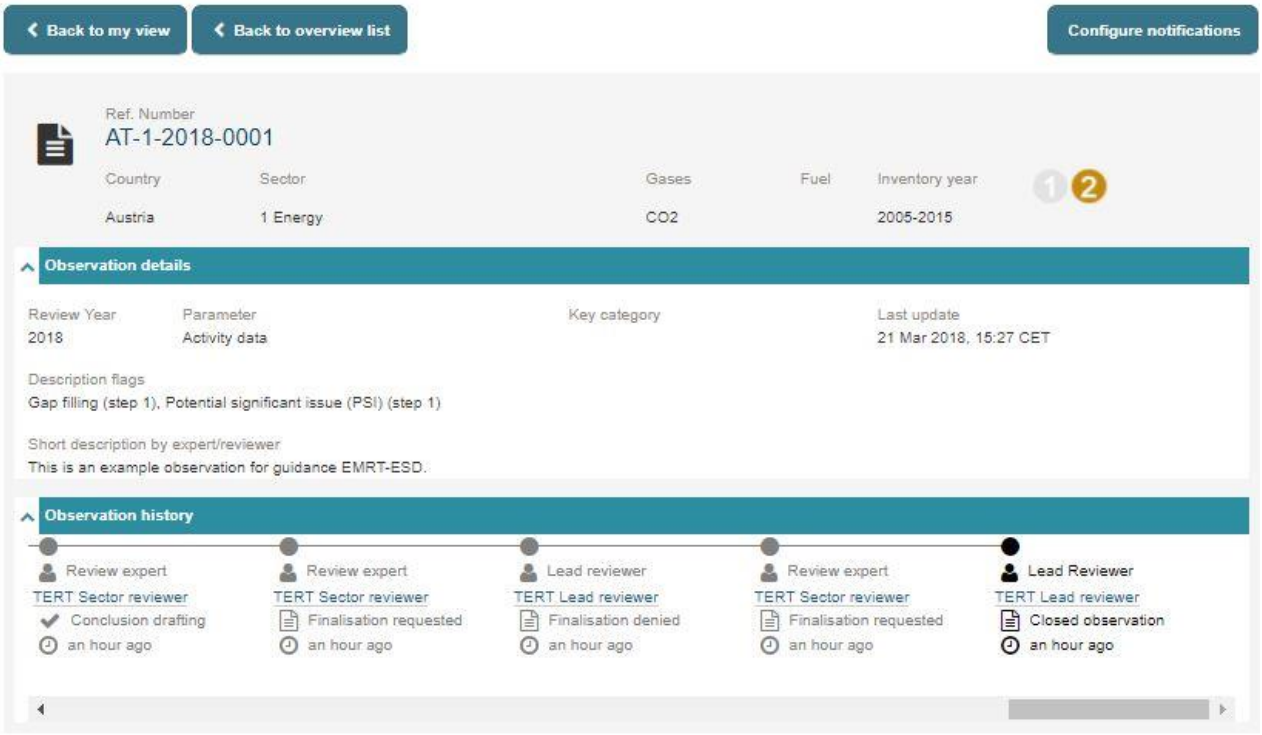



The country then has the opportunity to provide further transparency on the issues raised and respond to the technical reviewer. Internal commenting loops can be opened between members of the review team, such as sector experts, which is not visible to the Member State; only the final submitted question will be sent to it. Equally, a Member State review team can open an internal commenting loop before an answer is sent back to the review team. This process goes back and forth between the technical review team and the countries, until the issue is resolved. Where an issue is not resolved in time before the review is finalised, an issue will be marked as an 'unresolved technical correction'. All communications between the technical review team and Member States initially go through the lead reviewers, in order to ensure high quality standards are met. Files can be attached and sent to various actors if appropriate within the tool.

The finalization of an observation can take the form of an updated emission estimate provided either by the Member State (a revised estimate), or the technical review team (a technical correction). The resolution can also simply be a recommendation for future submission years such as including more transparent methodologies in a country's corresponding report. If a question or issue raised is dealt with during the review and requires no further action, the observation can be closed directly within the tool. Observations which end with a recommendation, technical correction or revised estimate are included in the final review report, extracted directly from the EMRT.

The tool keeps a record of all communications and files shared by the various review actors, which can then be referred to in future years. By clicking on an individual observation, a timeline of the observation's history can be found, which effectively presents how the observation has moved through various stages in the workflow. Specific details of the observation are also presented, such as the relevant country, sector, gases, fuel, inventory year and review step relevant to the selected observation (see Figure A3-3).

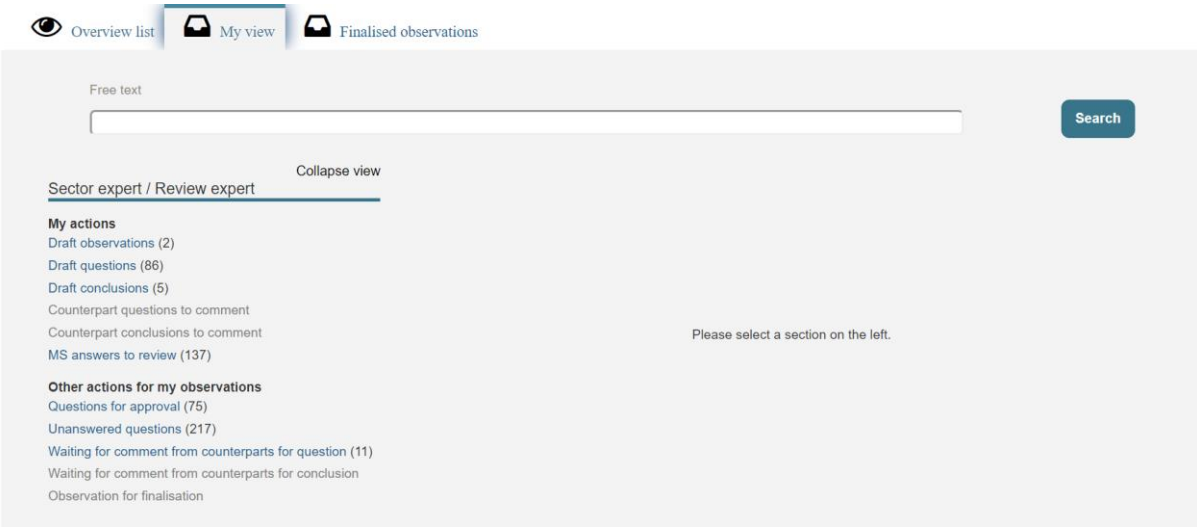
**Figure A3-3 Screenshot of observation uploaded in the EMRT**




## User Interface

Not all content held within the EMRT is visible to all users, in order to maintain some privacy between actors. For example, when an internal commenting loop is opened between the technical review team, or the Member State participants, only the finalised question or answer is visible to the corresponding team. Questions and answers can additionally be 'drafted' and 'redrafted', meaning they will only be visible to the relevant team involved before being finalised. The final recommendation or conclusion is not visible to the Member State within the tool, as it is published within the review report. Once a user logs into their account, they will have their observations and actions neatly summarized in their 'My View' (as seen in Figure A3-4) This feature in the tool is a useful way for highlighting what actions the user has to deal with and is important for tracking how much remaining work they have to do. The example below shows the 'My View' for a Sector Expert. The My View changes according to the user type, with each reviewer role having a different list of actions.

**Figure A3-4 My View in the EMRT**



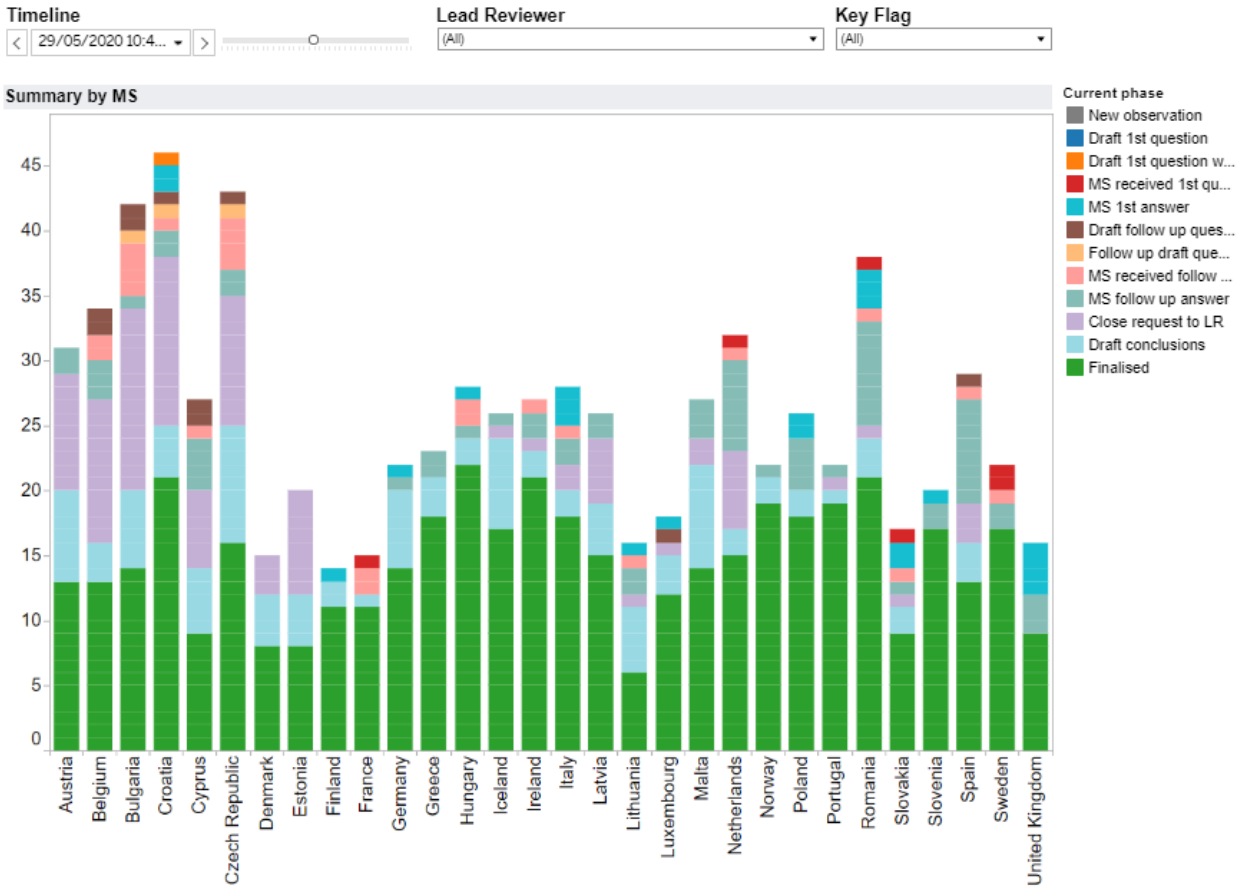

## Continual Improvements

The EMRT is a tool which is consistently undergoing improvements and transformation, as it seeks to improve its user friendliness and adapt to changing legislation. Throughout the review, country experts and the technical review team can provide the EEA secretariat with improvement ideas. These improvement plans are then considered and implemented at the end of every review cycle. The EEA has a dedicated IT team which maintains the tool and is available during review-intensive periods to resolve issues. User testing is then carried out by the secretariat team before the start of the next review cycle, in order to ensure all improvements have been successfully implemented and the tool is running smoothly.

## Annex 4: Visualising Progress – An Example from the ESD Annual Review

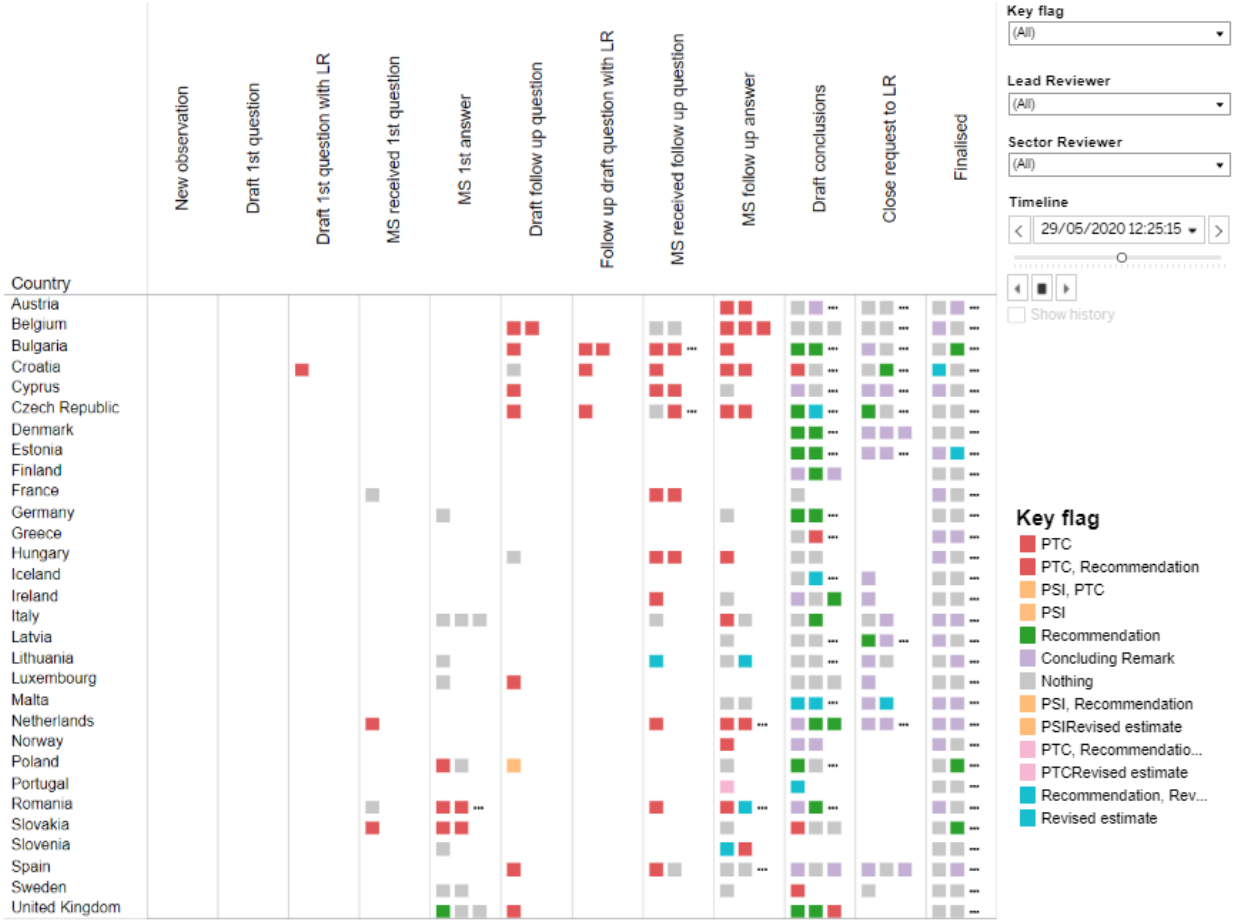
A very useful means of tracking progress of a review is to visualise it by seeing where observations are in the EMRT and what is still left to do. During a review, creating a tracking tool which is continuously updated using data pulled directly from the EMRT is extremely useful. It is used as a quality control tool to ensure observations are working steadily through the workflow, and nothing is forgotten. The tracking tool is particularly helpful during review-intensive period such as the centralised review week. The tool can be used during wrap up meetings to summarise how progress is going, either by Member State or sector expert. In the example below, each observation is colour coded according to a specific phase in the workflow. Several filters are added so that users can filter by their name or specific phases, in addition to a timeline. Figure A4-1 shows a summary chart organized by Member States, and a similar one can be made organized by sector expert.

**Figure A4-1 Data visualisation tracking tool used throughout review - bar charts**




Another useful means of tracking data is by presenting it according to Figure A4-2. This figure allows individual observations to move from left to right as they progress through the workflow. Observations are colour coded by key flags, further aiding in quality control. This is a very good means of tracking certain observations which may be progressing too slowly, if they are stuck in a certain early phase. Similar to Figure A4-1, this chart can be categorized by country, or sector expert. Certain filters allow for specific reviewers to consider only observations relevant to them.

**Figure A4-2 Data visualisation tracking tool used throughout review - review phases**



## Annex 5: Case study summary of technical tools used in the ESD annual review

| Short description of check/tool/material | Location/folder on SharePoint | Relevant sectors | Description/guidance for Sector Experts and Lead Reviewers |
|---|---|---|---|
| **GHG emissions** | **(1) EEA locator tool** | All sectors | Includes emissions, implied emission factors and activity data for your reference |
| **Check major changes in methodological descriptions in the NIR** | **(2) Recalculations**<br>Annex VIII under Article 16 MMR | All sectors | Check in the NIR if the methodological changes are made in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; check if the recalculated estimates could be over- or underestimates.<br>Focus on 2017 and consider threshold of significance -->'potential technical correction' |
| **Check recalculations compared to previous year submission** | **(2) Recalculations**<br>Recalculations checking tool<br>Annex III under Article 8 MMR | All sectors | Check if recalculations are made in accordance with 2006 IPCC guidelines; check if the recalculated estimates could be over- or underestimates. This was already checked to a certain extent by step 1 team and related findings may be included in EMRT.<br>Focus on recalculations that may have an impact on 2017 and consider threshold of significance -->'potential technical correction' |
| **Check recalculations compared to previous submission of the same year (e.g., 15 March 2017 versus 15 January 2017)** | **(2) Recalculations**<br>Recalculations checking tool | All sectors | Check if recalculations are made in accordance with 2006 IPCC guidelines; check if the recalculated estimates could be over- or underestimates.<br>Focus on recalculations that may have an impact on 2017 and consider threshold of significance -->'potential technical correction' |
| **Check correct use of notation keys related to completeness** | **(3) Completeness checking tool** | All sectors | If countries argue that the emissions in this category have not been estimated because they are insignificant check:<br>(1) Has the countries reported these emissions in previous inventories? If the countries reported emissions for this category in previous inventories it should also include an emission estimate in the current inventory.<br>(2) Has the countries provided the likely level of emissions as required under the UNFCCC reporting guidelines? If not, ask the countries to provide the likely level of emissions. If yes, is the likely level of emissions reported by countries plausible and do you agree that the emissions in this category are insignificant?<br>(3) Are activity data (AD) and emission factors (EFs) available for the category? If AD (either national or international) and EF (either country-specific or default) are available, then the countries should include an emission estimate in the current inventory. |
| **Check time series of emissions** | **(4) Outlier tools**<br>Outlier tools EMISSIONS | All sectors | Check time series consistency of emissions for potential over- and underestimates.<br>Focus on 2017 and consider threshold of significance -->'potential technical correction' |
| **Check time series of emissions** | **(5) Previous year values checking tool** | All sectors | Check if previous year values have been used in the time series of emissions and evaluate if this could be a potential over- and underestimate.<br>Focus on 2017 and consider threshold of significance -->'potential technical correction' |
| **Check time series of implied emission factors** | **(4) Outlier tools**<br>Outlier tools IEFs | All sectors | Check time series consistency of IEFs /AD for potential over- and underestimates.<br>Focus on 2017 and consider threshold of significance -->'potential technical correction' |

| Short description of check/tool/material | Location/folder on SharePoint | Relevant sectors | Description/guidance for Sector Experts and Lead Reviewers |
|---|---|---|---|
| **Compare implied emission factors across countries** | **(4) Outlier tools**<br>Outlier tools IEFs | All sectors | Compare IEFs across countries and assess if there are potential over- and underestimations of emissions<br>Compare countries IEFs with (range of) default EF from 2006 IPCC GL<br>Focus on 2017 and consider threshold of significance -->'potential technical correction' |
| **Check of consistency of EU ETS data with the CRF** | **(6) EU ETS checking tool**<br>Annex V under Article 10 MMR | Energy, IPPU | Check consistency of EU ETS data with the CRF and assess if there are any over- or underestimates.<br>Focus on 2017 and consider threshold of significance -->'potential technical correction' |
| **Compare the results of Eurostat's reference and sectoral approach with the countries' reference and sectoral approach** | **(7) Comparison tool Eurostat CRF** | Energy | Check consistency of EU ETS data with the CRF and assess if there are any over- or underestimates.<br>Focus on 2017 and consider threshold of significance -->'potential technical correction' |

# Annex 6: Reference Texts for the ESD Review

## Example 1: Creating a new observation

For [**category A**], [**fuel B, if relevant**], and [**gases a, b, c**] for year[s] [**x, y, z**] we noted that [**in CRF table x, cell x**] [**in the NIR, page x**] [**explain what the observation is**].

## Example 2: Question for Country around a lack of transparency

The TERT notes with reference to [**clearly reference the CRF tables and NIR pages/tables and category/fuel/gas/year**] that there is a lack of transparency regarding [**explain what the problem is**]. The TERT is unable to determine whether there is an under or overestimate that may be above the threshold of significance. Please provide further clarification of [**add what needs clarifying**] by providing [**add what information is needed**].

## Example 3: Conclusion text as the issue has been clarified and no recommendation is required

The TERT

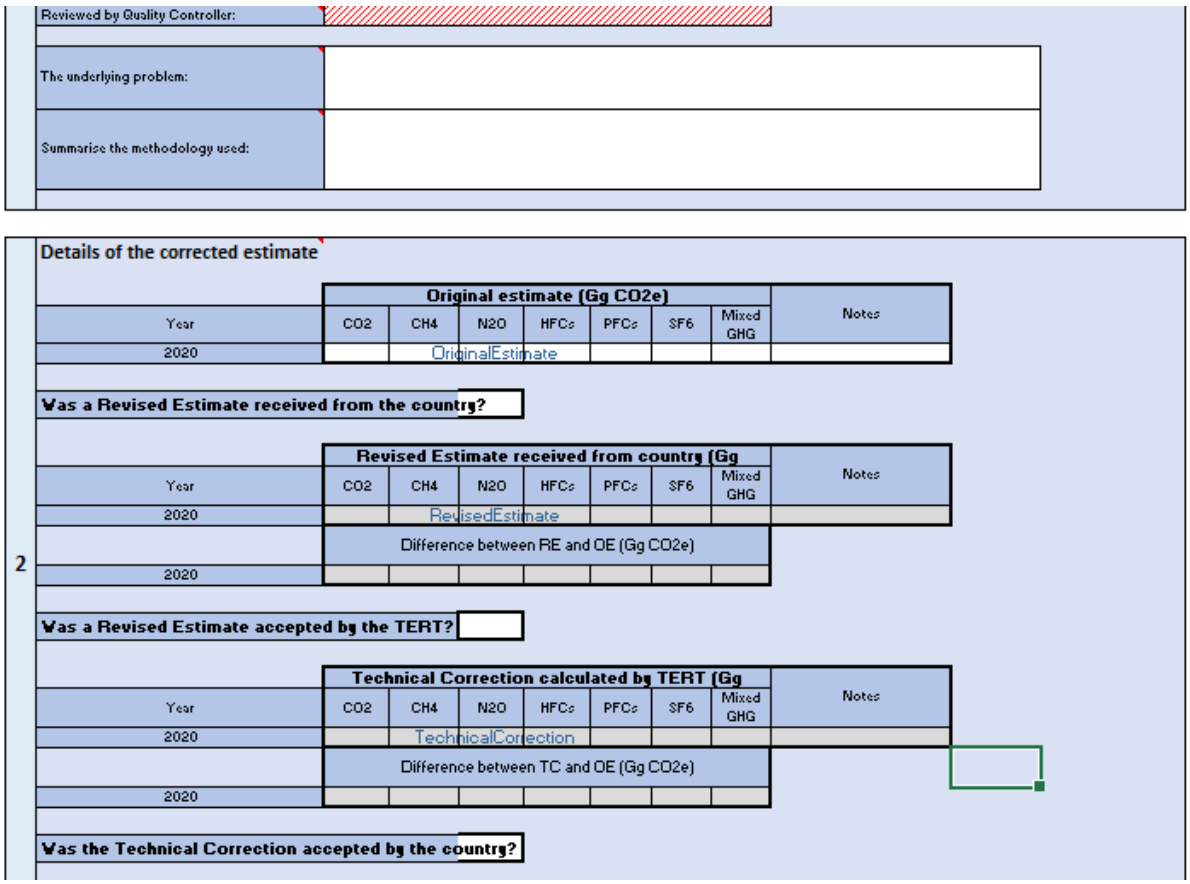
- clarified the issue [**internally/with the country**] and concluded that [**brief explanation of conclusion reached and why the issue is resolved**].
- noted that [**brief explanation of issue**]. The TERT noted that the issue is below the threshold of significance.

As such, a recommendation does not need to be added to the review report.

## Annex 7: Corrected Estimate Template Screenshot

The screenshot below is of the Corrected Estimate Template developed and used during the ESD review, in order to standardise the way in which a country can submit a revised estimate, and the TERT can calculate a technical correction. The tool has formulas to determine whether a revised estimate or technical correction is above a certain threshold e.g., percentage of the national total.

**Figure A7-1 Corrected Estimate Template for the ESD**



Reviewed by Quality Controller:

| | |
|---|---|
| The underlying problem: | |
| Summarise the methodology used: | |

Details of the corrected estimate

| Year | Original estimate (Gg CO2e) CO2 | CH4 | N2O | HFCs | PFCs | SF6 | Mixed GHG | Notes |
|---|---|---|---|---|---|---|---|---|
| 2020 | | OriginalEstimate | | | | | | |

Was a Revised Estimate received from the country?

| Year | Revised Estimate received from country (Gg CO2e) CO2 | CH4 | N2O | HFCs | PFCs | SF6 | Mixed GHG | Notes |
|---|---|---|---|---|---|---|---|---|
| 2020 | | RevisedEstimate | | | | | | |
| | Difference between RE and OE (Gg CO2e) | | | | | | | |
| 2020 | | | | | | | | |

Was a Revised Estimate accepted by the TERT?

| Year | Technical Correction calculated by TERT (Gg CO2e) CO2 | CH4 | N2O | HFCs | PFCs | SF6 | Mixed GHG | Notes |
|---|---|---|---|---|---|---|---|---|
| 2020 | | TechnicalCorrection | | | | | | |
| | Difference between TC and OE (Gg CO2e) | | | | | | | |
| 2020 | | | | | | | | |

Was the Technical Correction accepted by the country?

European Topic Centre on
Climate change mitigation
https://www.eionet.europa.eu/etcs/etc-cm
etccm@vito.be

The European Topic Centre on Climate change mitigation (ETC-CM) is a consortium of European institutes under contract of the European Environment Agency.

European Environment Agency
European Topic Centre
Climate change mitigation