European Environment Agency

LULUCF NID Transparency Guidance

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1 Introduction

The recent 2025 LULUCF Comprehensive review coordinated by the European Environment Agency (EEA) and Umweltbundesamt (UBA) Vienna have highlighted the opportunity for some improvement in transparency practices among several countries. Analysis of the EMRT observations identified recurring issues such as:

- Lack of transparency surrounding recalculations or outlier
- Lack of transparency regarding sources and/or procedure used to derive parameters.
- Untransparent land representation or approaches.

This guidance gives advice on how to improve transparency in a National Inventory Document (NID) with a focus on LULUCF. It is aimed at improving transparency, shortening the length and making it easier to update and review each year. This guide provides advice on Chapter 6 of the NID on Method, data sources and assumptions for the LULUCF Sector Chapter and methodology-related annexes. There is an additional overview provided for information on Chapter 1. National Circumstances, Institutional Arrangements and Cross-Cutting Information and Chapter 2. Trends in GHG emissions and removals

This guidance follows the requirements for reporting by the UNFCCC as outlined in the modalities, procedures and guidelines for national inventory reports (UNFCCC decision 18/CMA.1[1] Annex II). This guidance also includes advice on the material needed in the NID for the European Union's Governance Regulation (EU 2018/1999)[2].

[1] https://unfccc.int/resource/tet/0/00mpg.pdf

[2] https://eur-lex.europa.eu/eli/reg/2018/1999/oj/eng

2 Why focus on transparency in NIDs

During the 2025 EU LULUCF review of its 29 member countries[3] LULUCF inventories, 446 of the total 702 EMRT (review) observations contained transparency related issues.[4] 171 out of a total of 281 final Review Report (one per country) recommendations also made reference to the need for improved transparency.

The transparency issues raised during the review process represent more than 60% of all observations and recommendations. This results in additional time taken by the review team and the country experts clarifying details, through Q&A, on methods applied, data sources used and assumptions made. There is consequently less time for reviewers to focus on accuracy, consistency, completeness, and comparability of country submissions and additional burden on country compilation teams to respond to Q&A during the review and address recommendations ahead of the next submission.

While the country specific Review Report recommendations cover specific issues related to transparency, these do not cover more general or strategic transparency improvements that could be implemented.

In addition, the review teams find that individual transparency issues addressed by countries as they come up during the review process results in addition of more specific information which contributes to increasing document size and inefficiency in compilation over time. Due to pressures on improving estimates teams rarely have the time to take a more strategic view on transparency of their documents.

Improving transparency in the National Inventory Documents (NIDs) presents opportunities to improve the efficiency for national teams in compiling the documents and for the national teams and review experts with less Q&A during the review. It also improves the overall quality of the NIDs and offer opportunities to enhance compliance with the Enhanced Transparency Framework under the Paris Agreement and EU Governance Regulation.

[3] 27 EU Member states + Iceland and Norway
[4] The full analysis of the transparency issues identified in the 2025 LULUCF Review can be found in Appendix A.

3 How to use this guidance

This guidance is aimed at:

- National focal points responsible for coordinating the preparation and submission of the NID,
- Inventory compilers and sector experts, particularly those working on LULUCF methods and data, and
- QA/QC and country review coordination teams, including those responsible for internal checks and responses to review questions.

This guide provides practical advice on how to present methods, data sources, assumptions, and changes over time in a way that reduces transparency-related review questions and makes NIDs easier to compile, update and review.

This guide draws together insights and good practices from several years of review of National Inventory Documents.

This guide appreciates that most countries have extensive legacy national inventory documents with extremely limited time available to extensively revise them. Therefore, large scale overhaul is rarely an option.

However, there are opportunities to make improvements as new team members join (through their training) as methods get updated (new text is needed) and as the national inventory work fine-tunes its outputs (including the NID) for new national audiences including national and subnational government, research communities and private businesses.

Areas where this guide can be used:

1. **Develop your own team guidance** - Customise and adapt this guide, extract parts and or elaborate as a NID writing guide for your inventory teams. Take what ever works and make it your own. This way new team members can use it as something to help them get into the inventory work and to understand how transparent NIDs can be developed.
2. **Phased update of part or all of your NID** – use this guide to plan updates to all or parts of your NID. You can prioritise certain sectors/chapters and make annual incremental improvements. This can be tied to planned methodological improvements and data updates.
3. **Adopt certain approaches to improve transparency** in certain aspects including presenting tables of data, describing use of input data and assumptions etc. This can be done in combination with responding to EU LULUCF review recommendations or other activities.

However, user it is suggested that the national inventory team has a read through the guide and reflect on suggested approaches and solutions to see if they could be helpful in updating NIDs more efficiently and with greater clarity.

The guidance can be used selectively depending on national circumstances and priorities. **Figure 1** shows an overview of how to navigate the guidance document.

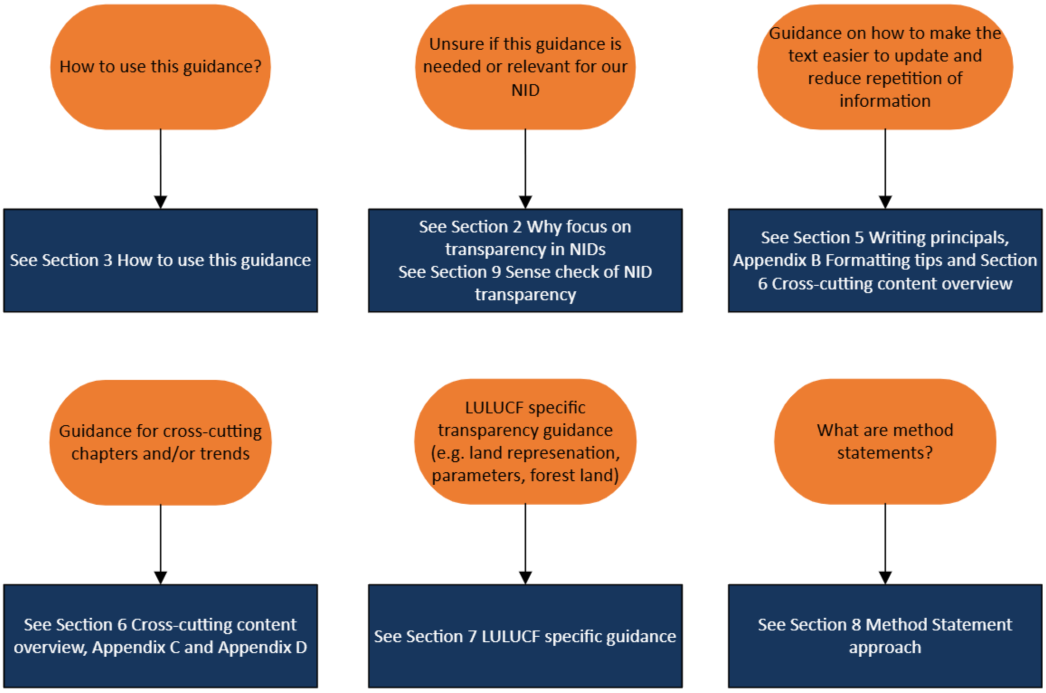

Figure 1 - Overview of how to navigate this guidance document.

4 Scope of the NID

National Inventory Reports (NIRs) consist of a **national inventory document (NID)** and common reporting tables (CRT) to be submitted to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). The NIDs submitted by the Parties to the Secretariat of the UNFCCC can be viewed and downloaded from the repository at: https://unfccc.int/first-biennial-transparency-reports.

Within the European Union, National Inventory Documents (NIDs) also form the basis for the EU-wide greenhouse gas inventory prepared annually by the European Commission (DG CLIMA). Each Member State submits its National Inventory Document (NID) and Common Reporting Tables (CRTs) to the Commission in accordance with Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action[5].

The primary objective of the NID is to accompany the data reported in the CRT and provide clear insights to the relevant trends as well as methods, data sources and assumptions behind the trend estimates. The NID provides the credibility of the estimates and helps ensure that they are reliable enough (or uncertainties understood) for decision making. The NID includes the following elements:

Chapter 1: National circumstances, institutional arrangements and cross-cutting information. This chapter should include relevant information that provides the reader with the context and background necessary to understand the dynamics of how the GHG emissions and removals in the country are compiled including the national circumstances, institutional arrangements and cross-cutting information of the national GHG inventory. The chapter will consist of:

- Background information on GHG inventories and climate change
- A description of national circumstances and institutional arrangements
- A description of methodologies
- Methods and data sources
- A description of key categories
- A description of the QA/QC plan and implementation
- The general uncertainty assessment
- A general assessment of completeness
  Metrics

Chapter 2: Trends in greenhouse gas emissions and removals. This chapter should explain trends and trend features of the national emissions and removals in detail, including trend visualization through tables and figures. This chapter tells the story of the GHG trends as so far as is possible including highlighting uncertainties in the estimates. If methodology or data changes significantly impact on the time series consistency then this needs to be highlighted.

Chapters 3 to 8: Sector method sections. These chapters should provide detailed information on GHG emissions and removals at the sectoral level (Energy, IPPU, Agriculture, LULUCF, Waste and

[5] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, *OJ L 328*, 21.12.2018, pp. 1–77.

Others), especially with regard to details on the methods, data sources and assumptions used to estimate GHGs in the sector, by category. The chapters consist of:

- An overview of the sector (description, GHG trend, and general methodological issues)
- The description and trend in GHGs by each sector category, including methodological issues (choice of activity data, emission factors)
- Uncertainty assessment and time series consistency
- QA/QC
- Recalculations
- And planned improvements.

Chapter 9: Indirect CO2 and N2O emissions. This section is not relevant for LULUCF sector.

Chapter 10: Recalculations and improvements. This chapter should provide information pertaining to the recalculations and improvements made to the inventory. The chapter will consist of an explanation and justification for recalculations; implications for emission and removal levels; implications for emission and removal trends; areas of improvement and capacity-building in response to the review process; and areas of improvement.

NID Annexes providing additional detail on topics such as:

- Key category analysis
- Uncertainty assessments
- A detailed description of the reference approach
- The QA/QC plan
- Any additional information, including methodological descriptions
- Common Reporting Tables (CRT)

5 Writing Principles

Below are important guidance points and general writing principles for technical documents. There is a lot of guidance on effective writing. As an example, the University of Manchester provides detailed guidance on writing technical reports, which can be summarised as follows[6]:

- **Keep it short:** Do not clutter your written material with too much theory or background. Just enough to help the reader understand without so much they get distracted or lose their thread.
- **Keep it simple:** use common words and be specific. Keep sentences short.
- **Cut the waffle:** don't lose your points in background
- **Focus on the action:** use less passive voice,
- **Focus on your reader:** think about your reader's perspective, knowledge and background
- **Get it right:** make sure the facts are right
- **Make it look good:** use bullets, tables with some white space
- **Point the way:** with your headings

Some more general guidance focused on the NID is outlined below:

- **Start by determining your key messages and target audience.** For the NID, the audience is the national and international climate change community. A key target is the UNFCCC annual review expert review teams. These teams will be making sure that the national inventory report clearly describes all methods, data sources and assumptions used in estimating greenhouse gas emissions and removals.
- **Keep sentences and paragraphs short**. Cut out unnecessary words. Split sentences and paragraphs where possible.
- **Use verbs not nouns.** Verb forms are normally shorter and livelier and tend to shorten sentences by removing prepositions (e.g. "We will train (verb) 10 experts." instead of "We will provide training (noun) for 10 experts.").
- **Use active verbs not passive formulations where possible.** This makes the author identify the actor and tends to simplify sentences. To show these last two points, compare the following sentences: 'A recommendation was made by the European Parliament that consideration be given to a simplification of the procedure' 'The European Parliament recommended that Member States consider simplifying the procedure'.
- **Use sub-headings to break up long passages of text.** This allows a reader to scan the structure of a text quickly and understand where detail information is located. It is often also useful for the writer, compelling him or her to clarify what each section of text is supposed to convey.
- **Consider using bulleted lists rather than long paragraphs.** This is much easier for a reader to scan and understand.
- **Minimise the use of acronyms and verbose text.**
- **Document key supporting information** related to the method at the same time as documenting the methods, data sources and assumptions when compiling estimates of

[6] https://staff.cs.manchester.ac.uk/~fumie/internal/TechnicalReportWriting.pdf

emissions and removals. Consider in particular: reasons for changing methods/data sources, issues with time series, specific review and checking of estimates (QA/QC) and information on uncertainties and how data on uncertainties was collected.

- **Include documentation within the calculation files** highlighting QA/QC, uncertainties, data sources and assumptions. This will ensure that the calculations themselves are transparent. This will help with particularly complex methods and models allowing the NID to present a transparent summary of methods data sources and assumptions with any detailed additional documentation provided within or associated with the calculation files.
- As a general rule, **do not repeat information that is presented in the Common Reporting Format (CRF)**. Summaries of data in the CRF can be included in the NID if this improves transparency of methods, data sources or assumptions. It would be best for these summaries to be generated automatically from the CRF databases. This would avoid the risk of errors and time consuming data checks. Speak to the NID administrator about options for using summaries of CRF information in the NID. [Annex I only]
- As a general rule, **do not repeat the same information in different section of the NID.** Simply cross-reference information among sections.
- Try to **draft the text in a format that will not need updating**, referred to as "timeless text". This means, for example, avoiding references to specific times, data for specific years and minimising text that includes numerical information on emissions/removals and percentage changes.
- Include information about **trends in emissions/removals in Chapter 2**. Reference Chapter 2 from the method chapters (3-8) if needed.
- Use the **proposed template for method statements** (see Appendix B of this guide).
- Present **emission factors and parameters in the table in an annex of the NIR**. Include a cross reference to the method sub-sections.
- Run a **readability test** on the NID[7]. This scoring system is not ideal but provides a useful guide for refining text. It is based around a ratio of words per sentence and syllables per word. The shorter the sentences and shorter the words the higher the score. As a highly technical document the national inventory report should aim to achieve a Flesch Reading Ease score of 40 – 50 out of 100 (where 100 is the easiest). Example scores[8]:

> *Time* magazine scores about 52, an average 6th grade student's (a 12-year-old's) written assignment has a readability index of 60–70, and the *Harvard Law Review* has a general readability score in the low 30's.
> P.S. This document struggles to get above 40 because of the required language and dense technical nature of the subject area!

- **Appendix B** provides some formatting tips for the NID.

[7] The following test was available at the time of writing this guidance: https://fleschkincaidcalculator.com/ARI-Calculator

[8] From https://web.archive.org/web/20160712094308/http://www.mang.canterbury.ac.nz/writing_guide/writing/flesch.shtml

6 Cross-cutting content overview

Cross-cutting elements—such as methodological descriptions, QA/QC procedures, uncertainty assessment, time-series consistency discussions—are often repeated in multiple sections of the NID, which can lead to duplication, contradictory explanations, or incomplete documentation. By clearly indicating where each type of cross-cutting information should be placed, the table provides a structured reference that helps authors organise content coherently and avoid overlap between cross-cutting elements and LULUCF chapter.

Table 1: Guidance on suggested location for cross-cutting content in the NID.

Key Elements	NIR Section			
	Chapter 1	Chapters 3-8 (Sectors)	Chapter 10	Annex or other document
Completeness	General assessment of completeness, including information on completeness and description of insignificant categories.	Chapter paragraph highlighting missing sources or statement on completeness for those sectors and categories.	Not required.	Not required.
Method Assumptions & Data Sources	Brief general description of methodologies and data sources used.	Category-specific details of method assumptions, data sources sector specific QA/QC, time series consistency, verification, uncertainties, improvements.	Not required.	Not required.
Key Category (KC) Analysis	Brief description of key categories.	Not required.	Not required.	Annex I – Key categories Description of the approach used for identifying key categories, if different from IPCC Tier 1 approach. Include level

Key Elements	NIR Section			
	Chapter 1	Chapters 3-8 (Sectors)	Chapter 10	Annex or other document
				of disaggregation, and tables 4.2–4.3 of volume 1 of the 2006 IPCC Guidelines for National GHG Inventories, including and excluding LULUCF.
Uncertainties	General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals.	Category-specific method statement text explaining key uncertainties with reference to Annex 2 for numerical information.	Not required.	Annex II – Uncertainty assessment Description of methodology used for identifying uncertainties. Include table 3.3 of the 2006 IPCC Guidelines for National GHG Inventories.
QA/QC	Brief general description of QA/QC plan and implementation.	Category-specific method statement text explaining QA/QC.	Not required.	Annex IV – QA/QC plan Detailed QA/QC plan
Recalculations	Not required.	Category-specific method statement text on the rationale and impact of recalculations. Numerical information in Chapter 10 summary table.	Full detail of explanations and justifications for recalculations. Implications for emissions and removals levels and trends, including time series consistency.	Not required.
Improvement	Not required.	Category-specific method statement text highlighting planned improvements, if applicable. Reference to Chapter 10 for full listing and list of planned improvements.	Areas of improvement in response to the review process.	Not required.

7 LULUCF specific guidance

This section outlines LULUCF specific transparency guidance based on key areas for LULUCF NID transparency improvement identified in the 2025 LULUCF Comprehensive Review. Where possible, good practice examples from 2025 NIDs are provided. Note that this guidance is written as an encouragement for increased transparency and does not represent a requirement for reporting.

7.1 Land representation

7.1.1 Land-use definitions across multiple datasets over time

During the comprehensive review, the TERT identified several transparency issues related to the documentation of land-use definitions and the consistency of these definitions across different datasets used for land representation. While countries generally provide definitions for the land-use (LU) categories in the NID, as required by the reporting guidelines, the review found that definitions do not always clearly cover the subcategories within each land-use category (e.g., types of forest or croplands). This can reduce transparency when land-use conversions or activity data are estimated at a more detailed level than the definitions provided in the NID.

In addition, it is noted that different land representation datasets are sometimes used across the time series, particularly for the earlier years of the inventory. For example, historical land-use maps or statistical sources may be used for the initial years, while more recent years rely on improved remote sensing products or national land monitoring systems. While the use of multiple data sources over time is often necessary and appropriate, it is important to ensure that land-use definitions and classification rules remain consistent across datasets.

If the definitions or classification approaches differ between datasets, this may introduce spurious changes in land-use areas that reflect methodological differences rather than real land-use changes, potentially affecting the consistency of the time series. Although the review did not identify widespread evidence of such issues in countries' inventories, the information provided in the NID is sometimes insufficient to clearly demonstrate how consistency between datasets and definitions has been ensured.

To improve transparency, it is encouraged to provide clear definitions not only for the main land-use categories but also for the relevant subcategories used in the land representation system, where applicable. In addition, when multiple datasets are used across the time series, the NID should describe how land-use definitions and classification criteria have been harmonised across these sources, including any procedures used to ensure consistency of land-use categories and to avoid artificial jumps in land-use areas.

6.3.4.6 Change of forest definition in 2005

The forest definition was changed to be in accordance with the FAO definition in 2005 to include crown cover. Until 2005, the forest definition was based on the potential productivity of the land, which had to be greater than or equal to 0.1 m^3 ha^{-1} yr^{-1} to be considered a forest. Since 2005, the crown cover on a 0.1 ha area centered on the plot has to be greater than 10% to be forest land. After harvests, areas may be temporarily unstocked but remain forest in the NFI classification system unless the land use changes later. For young productive forests, the stem number is also considered. All plots meeting the new definition of forest visited for the first time in the NFI period 2005 – 2009 (2005 – 2011 for Finnmark) were backcasted. All plots (not only new plots) meeting the new definition of forest were also considered forests in 1990. Plots with human-induced afforestation were exceptions. Exceptions were also made in productive forests if the plot had been assessed as "non-forest" in a previous cycle and the tree ages clearly allowed determining a year of change from another land-use class to forest.

Figure 2 – Example from the Norway's NID on forest definition change[9]

7.1.2 Level of detail used for activity data and estimations

During the comprehensive review, several transparency findings were raised that related to the level of detail at which the estimations are performed in the GHGI. Activity data reported in the inventory tables are presented in an aggregated form, typically by land-use category and land-use conversion. However, the underlying estimations are usually carried out at a much finer level of detail, such as subcategories, individual plots, spatial polygons, or stratified units defined by climate zones, soil types, or management conditions.

Where the level of estimation differs from the level of reporting, this is not always clearly explained in the NID. As a result, several findings during the review were initially triggered by parameters that vary over time, asymmetric carbon stock changes between similar land-use conversions, or apparent outliers in the time series. In most cases, the issue was clarified during the review when the country explained that the estimations were conducted at a disaggregated spatial level, with specific parameter values assigned to individual plots or spatial units. Under such approaches, the parameters associated with land-use conversions may vary over time depending on the specific areas affected by the conversion.

For example, in some inventories land-use conversions are estimated at the plot or polygon level, with carbon stocks or emission factors assigned to each spatial unit according to its characteristics. Consequently, parameters associated with a given land-use conversion may change from year to year depending on the plots involved in the conversion. Similarly, carbon stock changes associated with conversions from land use A to B may differ from those associated with conversions from B to A because the underlying spatial units involved are different.

To improve transparency, it is encouraged to clearly document the level of detail at which activity data and estimations are performed, including whether calculations are conducted at the level of individual plots, spatial polygons, or aggregated strata, and to describe how this level of estimation relates to the parameters reported in the inventory.

[9] See p. 6-36 of the Norway's 2025 National Inventory Document

7.1.3 Data sources and methods used to construct land-use maps and matrices

During the comprehensive review, the TERT identified several transparency issues related to the documentation of data sources and methods used to construct the land-use (LU) representation and the associated land-use conversion (LUC) matrices. In many inventories, the land representation system relies on multiple datasets and information sources, such as national forest inventories, land-use maps, statistical data, or remote sensing products. These sources are often combined to develop a consistent representation of land-use areas and their changes over time in line with the requirements of the IPCC Guidelines and the EU Governance Regulation (EU) 2018/1999.

In some countries, a single national land-use dataset is available that covers the entire territory and is periodically updated, allowing the same source to be used consistently across the time series. However, in many cases this is not possible, particularly for the earlier years of the inventory, and multiple sources must be combined to reconstruct historical land-use patterns. In such situations, a clear explanation of the datasets used, their hierarchy, and the assumptions and limitations associated with each source is essential to ensure transparency in the development of the land-use representation and the resulting LU and LUC matrices.

While the use of multiple datasets is common and often necessary, the review found that the information describing how these sources are combined across the time series is not always clearly documented in the NID. In particular, there is sometimes limited information on the hierarchy of datasets used, the methodological approach applied to reconcile overlapping or conflicting information, and the procedures used to ensure consistency across sources. In some cases, the description of data sources focuses on the most recent datasets, while the sources used for the earlier years of the time series are not described with the same level of detail.

Where several datasets are combined to construct the LU representation, it is important to clearly explain which sources are used for each period of the time series, how they are prioritised when multiple sources provide information for the same area, and how potential overlaps or inconsistencies between maps are resolved. This includes documenting the assumptions applied when reconciling different datasets and explaining how the resulting land-use matrices are constructed.

The TERT noted several examples of good practice in documenting these approaches. For example, the NID of Austria provides a detailed explanation of how multiple information sources, including the national forest inventory, maps, and statistical datasets, are combined to derive land-use areas (see **Figure 4**). Similarly, the NID of Norway presents a clear hierarchy of data sources used for land representation, illustrated through a flow diagram describing the prioritisation of datasets (see **Figure 5**). Another example is the NID of Iceland, which describes the use of different maps and data sources across the time series, including the role of expert judgement in filling the gaps in the information available (see **Figure 6**).

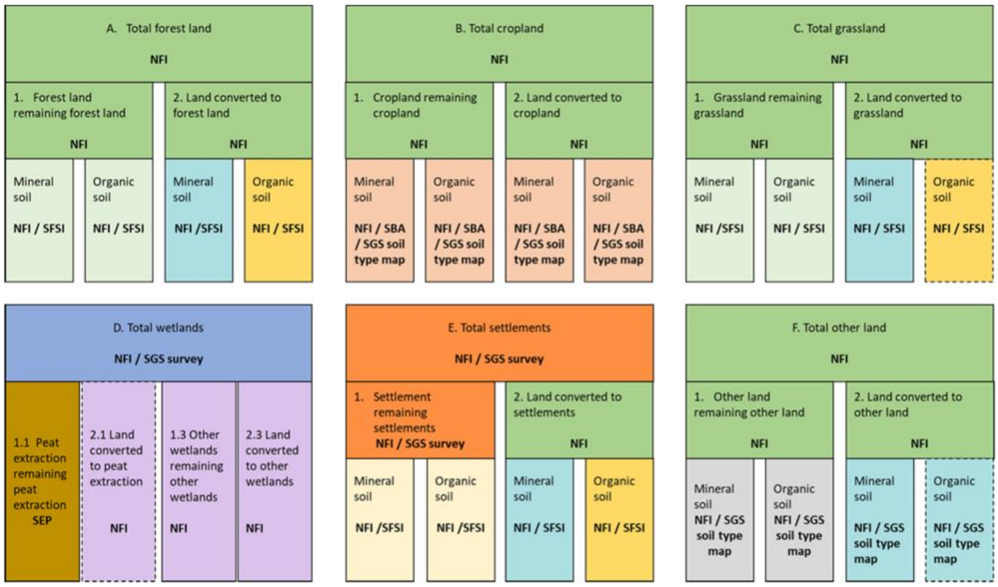

Figure 6.7. The figure shows a summary of sources for area estimation and stratification of areas for calculation of emissions and removals in the LULUCF-sector. Further explanations are provided in Figure 6.8.

Figure 3 – Example from the Swedish NID on sources for area estimation[10]

Figure 31: Austrian system for land representation.

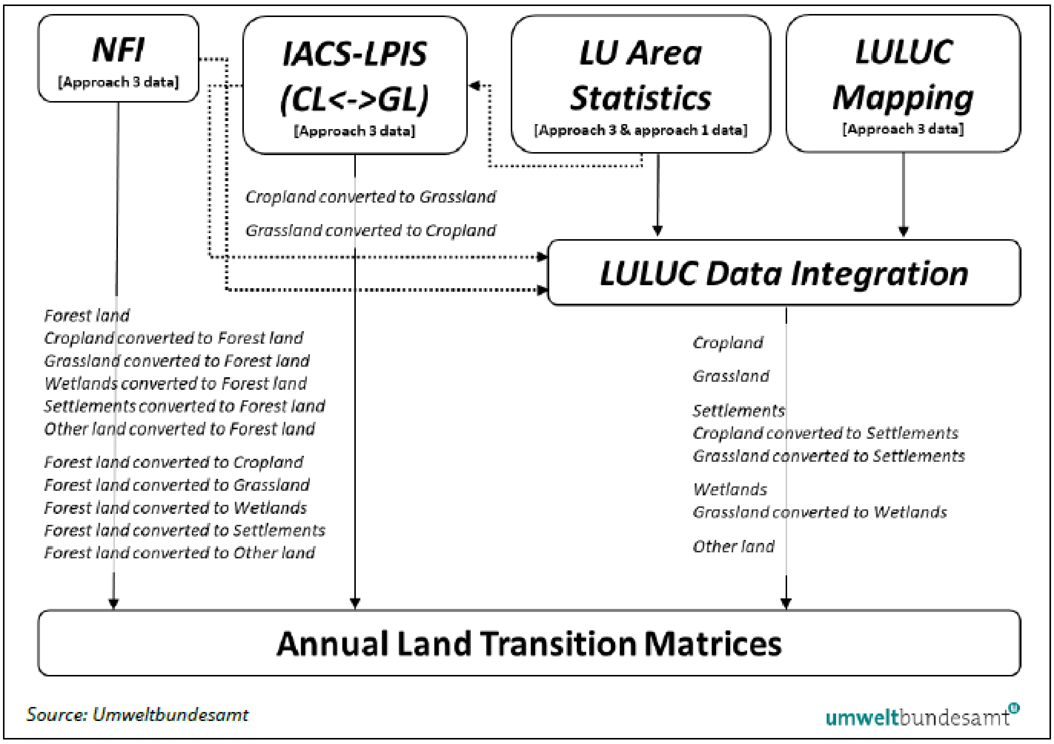

Figure 4 – Example from Austria's 2025 NID on the land representation system[11]

[10] See p 377 of the Sweden's 2025 National Inventory Document
[11] See p.445 of Austria's 2025 National Inventory Document

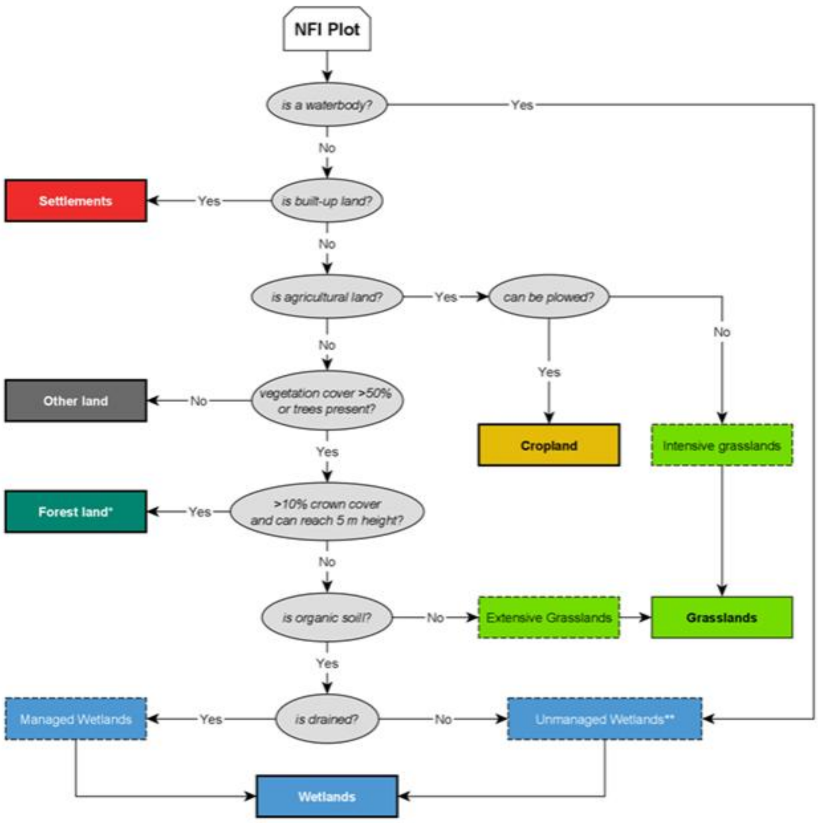

Figure 6.13: Decision tree for land-use classification. An area will remain in a land-use category until it

Figure 5 – Example from Norway's NID on the decision tree for land-use classification[12]

Table 6.31 Methodology and data sources for constructing the time series of Wetlands category.

Land use category		Subcategory	1989	1990	....	2019	....	2023
Wetlands remaining Wetlands	Flooded land remaining Flooded land	Intact Mires converted to reservoirs	Agricultural Research Institute					
		Intact Mires converted to reservoirs >20 years						
		Medium SOC to reservoirs >20 years						
		Low SOC to reservoirs >20 years						
	Other wetlands remaining other wetlands	Lakes and rivers (unmanaged)	The National Power Company of Iceland			Annual IGLUD maps		
		Lakes and rivers converted to reservoirs						
		Intact mires (unmanaged)	Cropland active timeseries and ditches timeseries					
		Intact mires (managed)						
		Rewetted wetland soils >20 years	Recorded areas converted					
		Refilled lakes and ponds >20 years						
Land converted to Wetlands	Grassland to Flooded land	Grassland converted to flooded land (Medium SOC to reservoirs)	Agricultural Research Institute					
	Other land to Flooded land	Other land converted to flooded land (Low SOC to reservoirs)						
	Grassland to Other Wetlands	Rewetted wetland soils	Recorded areas converted					
		Refilled lakes and ponds						
Legend								
Samples or known areas	Maps	Expert judgement	Interpolation	Assumptions				

Figure 6 – Example from Iceland's NID on the data used across the time series[13]

It is encouraged to provide clear and structured documentation of the different datasets used to construct land-use maps and matrices across the time series, including the hierarchy applied when combining sources, the methods used to resolve overlaps or inconsistencies between maps, and any assumptions or expert judgement applied in the process. In addition, the process

[12] See p.6-19 of Norway's 2025 National Inventory Document

[13] See p.274 of Iceland's 2025 National Inventory Document

used to translate spatial land-use map data into LU/LUC matrices should be clearly documented, as the resulting areas constitute the activity data on which LULUCF emission and removal estimates are based.

7.1.4 Land representation approach used to identify land use changes

During the comprehensive review, the TERT identified transparency issues related to the description of the land representation approach used. Under the EU Governance Regulation (Annex V), Member States are required to apply Approach 3 (geographically explicit land-use conversion data). However, the information provided in the NID does not always clearly specify whether the land representation system is fully geographically explicit or whether some elements rely on partially aggregated data, if it is applied consistently across the entire time series and for all land-use categories, or whether limitations in the availability of spatial data required the use of alternative approaches for certain years or datasets. In particular, for the earlier years of the time series, some inventories rely on historical data sources that are not geographically explicit, which may require assumptions or methodological adjustments to reconstruct land-use changes.

It is encouraged to clearly describe the land representation approach used in the inventory, explicitly indicating whether Approach 3 is applied across the entire time series and for all land-use change categories. Where this is not the case, the NID should explain the limitations in the available data, the assumptions applied, and how the transition to geographically explicit data has been handled across the time series, as well as the plans to fulfil the EU Governance Regulation requirements.

7.1.5 Use of pre-1990 data to initialise land-use conversions

During the comprehensive review, the TERT identified transparency issues related to the use of data prior to 1990 to initialise land-use conversion (LUC) areas in the base year of the GHGI. Correctly estimating the areas under land-use conversion in 1990 requires information on land-use changes that occurred during the preceding transition period, which for many carbon pools extends up to 20 years (or even more). Without such information, the inventory may implicitly assume that the area under conversion in 1990 is zero, which does not reflect the actual situation where land-use changes that occurred before 1990 may still be influencing carbon stocks through ongoing biomass growth or soil carbon adjustments.

However, the availability of spatial land-use data before 1990 is limited. In many countries, consistent land-use maps based on satellite imagery are only available from the late 1980s or 1990s onwards, and earlier datasets may rely on historical maps, statistical information, or other indirect sources. As a result, inventories frequently need to combine different datasets and methodological approaches to reconstruct land-use conversions prior to 1990 (see previous finding).

The review found that while many inventories apply procedures to estimate the areas under conversion at the beginning of the time series, the description of these procedures is not always clearly documented in the NID. In particular, information is sometimes lacking on which datasets are used to represent land use prior to 1990, how these datasets are combined with the data used for the GHGI time series, and how areas under conversion are estimated for the base year.

It is encouraged to clearly document how information prior to 1990 is used to initialise land-use conversion areas in the inventory, including the data sources used, the temporal coverage of each dataset, and the methods applied to estimate areas under conversion in 1990. Where direct spatial data are not available for earlier periods, the NID should describe the assumptions and procedures used to reconstruct historical land-use changes, including any interpolation, extrapolation or back-casting methods applied.

7.2 Parameters

7.2.1 Carbon stocks and transition periods used for land-use changes

During the comprehensive review, the TERT identified recurring transparency issues related to the documentation of initial and final carbon stocks used for land-use changes and the transition periods[14] applied to estimate carbon stock changes following land-use change. While most countries apply methodologies consistent with the 2006 IPCC Guidelines, the supporting information describing the parameters used for land-use changes is often incomplete, dispersed across different sections of the NID, or not presented in a way that allows reviewers and readers to clearly understand the assumptions underlying the estimates.

In particular, the review found that information on initial and final carbon stocks for different land uses and carbon pools (e.g. biomass or soil carbon stocks) is frequently embedded within methodological descriptions or referenced indirectly through multiple tables and annexes. Similarly, transition periods used to estimate stock changes following land-use change are not always explicitly reported or clearly linked to the corresponding land-use transitions and carbon pools. As a result, it is often difficult to determine whether the parameters applied are consistent across land-use changes, whether default values from the 2006 IPCC Guidelines or country-specific parameters are used, and how these assumptions affect the resulting emission or removal estimates.

These transparency limitations were particularly relevant in relation to transition periods applied to estimate carbon stock changes following land-use changes. In several cases, countries apply specific transition periods reflecting special national circumstances, which can be appropriate and consistent with the IPCC Guidelines. However, where these transition periods are not clearly documented, justified, or consistently applied across conversions, it becomes difficult to assess their methodological validity and comparability. In the comprehensive review, such cases resulted in a significant number of findings, often requiring clarification from the country regarding the rationale for the chosen transition periods and their application across the time series.

Improving transparency in the documentation of these parameters would significantly facilitate the review process and enhance the clarity and comparability of reported estimates. In particular, there is a need for a clear and aggregated presentation of the key parameters used for land-use changes, including the carbon stocks assumed for each land-use category and the transition periods applied to estimate carbon stock changes following conversion. Presenting this information in a consolidated format would allow reviewers and readers to easily identify

[14] Time needed to move from the original equilibrium level to the one after the LUC.

the assumptions applied across land-use transitions and verify that these are applied consistently throughout the inventory.

One example of good practice identified during the review is the approach used by Spain, which presents the carbon stocks associated and transition periods associated with each land-use changes in a single consolidated table in the NID (see **Figure 7**). By presenting this information in an aggregated format, the approach facilitates the understanding of the methodological framework and allows for straightforward comparison across land-use changes and carbon pools.

Tabla 6.1.5. Periodos de equilibrio y CSC nacionales de los depósitos (cifras en años y t C/ha.año, respectivamente)

Origen \ Destino		FL		CL		GL		WL		SL		OL	
		P	CSC	P	CSC	P	CSC	P	CSC	P	CSC	P	CSC
FL	LB			1	-	1	-	1	-	1	-	1	-
	DW			1	-0,88	1	-0,88	1	-0,88	1	-0,88	1	-0,88
	LT			1	-2,69	1	-2,61	1	-3,02	1	-3,02	1	-3,02
	SOC			20	-1,00	20	-0,13	20	0,58	20	-0,51	20	-2,57
CL	LB	CS				20	-0,09	1	-4,70	1	-4,70	1	-4,70
	DW	20	0,04			NA		NA		NA		NA	
	LT	20	0,13			20	0,004	1	-0,33	1	-0,33	1	-0,33
	SOC	20	1,00			20	0,86	20	1,57	20	-0,31	20	-1,57
GL	LB	CS		1	1,83			1	-2,87	1	-2,87	1	-2,87
	DW	20	0,04	NA				NA		NA		NA	
	LT	20	0,13	1	-0,08			1	-0,41	1	-0,41	1	-0,41
	SOC	20	0,13	20	-0,86			20	0,71	20	-0,49	20	-2,44
WL	LB	CS		1	4,70	1	2,87			NA		NA	
	DW	20	0,04	NA		NA				NA		NA	
	LT	20	0,15	1	0,33	1	0,41			NA		NA	
	SOC	20	-0,58	20	-1,57	20	-0,71			20	-0,63	20	-3,15
SL	LB	CS		1	4,70	1	2,87	NA				NA	
	DW	20	0,04	NA		NA		NA				NA	
	LT	20	0,15	1	0,33	1	0,41	NA				NA	
	SOC	20	0,67	20	-0,33	20	0,54	20	1,25			20	-1,90
OL	LB	CS		1	4,70	1	2,87	NA		NA			
	DW	20	0,04	NA		NA		NA		NA			
	LT	20	0,15	1	0,33	1	0,41	NA		NA			
	SOC	20	2,57	20	1,57	20	2,44	20	3,15	NA			

Figure 7 - Example from Spain's NID on the carbon stocks and transition periods associated with each land-use change[15]

7.2.2 Carbon stock assumptions in opposite land-use changes

During the comprehensive review, the TERT identified several transparency issues related to the symmetry of carbon stock assumptions applied to land-use changes between the same land-use categories, such as conversions from Forest land to Grassland (FL→GL) and from Grassland to Forest land (GL→FL). In principle, conversions between the same land-use categories would be expected to involve similar carbon stocks and parameters, as the biomass or soil carbon lost

[15] See p.457 of Spain's 2025 National Inventory Document

during a conversion in one direction should broadly correspond to the carbon that could be accumulated if the conversion occurred in the opposite direction under comparable conditions.

However, the review found that this symmetry is not always clearly demonstrated in the inventories. In several cases, different carbon stock values or parameters appear to be applied to conversions between the same land-use categories without a clear explanation, making it difficult to determine whether these differences reflect national circumstances or inconsistencies in the application of carbon stock assumptions. This lack of transparency contributed to a number of findings during the review process.

At the same time, the TERT recognizes that asymmetries in land-use changes may legitimately occur due to national circumstances. For example, deforestation may primarily affect plantation forests with relatively high biomass stocks, while afforestation may occur mainly on land where native forest species with different growth characteristics are established (or vice versa). Similarly, conversions may occur predominantly within specific subcategories of land use (e.g. different forest types, management systems, or ecological zones), which can lead to differences in the carbon stocks associated with conversions in each direction. In such cases, differences in carbon stocks between symmetrical land-use changes are justified.

Nevertheless, when these differences occur, it is important that the inventory clearly documents and explains the reasons for the asymmetry. Transparent reporting of the carbon stocks used for each land-use category and conversion pathway, together with a clear explanation of the national circumstances that lead to different stock assumptions, would significantly improve the clarity and credibility of the estimates.

For example, a transparent text for explaining a change in the transition period could be like "*For 4F2 Land converted to other land, mineral SOC stock changes from Forest land conversions are assumed to occur entirely in the year of conversion rather than over the default 20-year transition period. This reflects national circumstances where land-use changes associated with the establishment of military training areas involve intensive soil disturbance that destroys the upper soil layer. This assumption is supported by evidence from NFI plot observations, orthophotographs and in-situ checks indicating that the soil carbon pool is effectively lost within one year*".

In line with the previous transparency recommendation on documenting carbon stocks and transition periods for land-use changes, it is encouraged to review the symmetry of carbon stock assumptions applied to conversions between the same land-use categories and to provide a clear explanation where differences occur. Presenting the relevant carbon stocks and parameters in a consolidated table, together with a brief explanation of the national circumstances that justify any asymmetries, would facilitate the understanding and assessment of these estimates during future reviews.

7.2.3 Carbon stocks at the level of disaggregation used in the inventory

During the comprehensive review, the TERT identified several transparency issues related to the level of disaggregation at which carbon stocks are applied in the estimation of land-use changes. In many inventories, land-use categories are further divided into subcategories with different carbon stock values, such as different crop types within Cropland (e.g. vineyards, orchard trees, and annual crops) or different forest types within Forest Land. When emissions and removals are estimated at this disaggregated level, the associated carbon stocks and parameters should also be clearly documented at the same level of detail.

However, the review found that in some cases the carbon stock values used for these subcategories are not clearly reported, or the values presented correspond to weighted averages across multiple subcategories without clearly indicating how these averages are derived. In other cases, the carbon stock values used for a given conversion pathway appear to change significantly between years because the land use changes occur in different subcategories, but the underlying stock assumptions are not explicitly documented. These situations make it difficult to understand which carbon stocks are applied in specific land-use changes and to assess the consistency of the estimates.

A clear explanation of the level of detail at which land-use changes and associated carbon stocks are estimated is therefore essential. Where inventories distinguish several subcategories within a land-use category and estimate land-use changes at this level (e.g. conversions from vineyards to Forest land or from Grassland to annual Cropland), the carbon stocks applied for each relevant subcategory should be explicitly reported and documented in the NID.

Tabla 6.1.4. Existencias de carbono nacionales de los depósitos (t C/ha)

Categoría	LB	DW	LT	SOC
FL	-(1)	1,07(7)	3,02(7)	51,39(14)
CL	4,7(2)	0(8)	0,33(12)	31,48(14)
GL	2,867(3)	0(9)	0,41(12)	48,73(14)
WL	0(4)	0(10)	0(13)	62,95(14)
SL	0(5)	0(10)	0(13)	80 % uso previo(15)/38(16)
OL	0(6)	0(11)	0(11)	0(17)

Figure 8 - Example from Spain's NID reporting the carbon stocks for different land use categories[16]

In line with the recommendation to provide key parameters in a consolidated table, it is encouraged to present the carbon stock values associated with the different subcategories of land use in a single aggregated table, together with other relevant parameters such as transition periods where these differ across subcategories. For example, biomass transition periods may differ between conversions from Grassland to annual crops and conversions from Grassland to perennial crops such as vineyards. Presenting this information together would facilitate the understanding of the methodological framework and improve the transparency and consistency of the estimates.

7.2.4 Zero values, notation keys and missing estimates

During the comprehensive review, a significant number of findings where zero values, notation keys (e.g., 'NO'), or missing estimates were reported without a clear explanation of the underlying rationale. In many instances, the reported value appears to be zero or not estimated, but the inventory does not clearly explain whether this reflects a methodological assumption, the absence of the activity, the insignificance of the emissions or removals, or limitations in the available data. As a result, reviewers often needed to raise clarification questions to understand the basis for the reported value.

In particular, situations were observed where parameters or emission estimates were reported as zero without providing supporting information on the sources, assumptions, or

[16] See p.426 of Spain's 2025 National Inventory Document

methodological reasoning behind this choice. In other cases, the notation key 'NO' was used, but it was not clear whether the source or sink does not occur in the country, whether it occurs but is not estimated due to lack of data, or whether it was considered zero. These different situations may require different notation keys or explanations according to the reporting guidance, and without sufficient documentation it becomes difficult to interpret the reported values correctly.

To improve transparency, it is important that inventories clearly document the rationale behind the selection or non-selection of parameters and estimates, regardless of whether the outcome is a numerical value, a zero value, or a notation key indicating that the estimate is not reported. This includes explaining the data sources, assumptions, methodological choices, or data limitations that lead to the reported value.

It is encouraged to ensure that the NID provides clear explanations for parameters or estimates reported as zero or with notation keys, including a brief description of the underlying assumptions or data limitations where relevant.

7.3 Biomass stocks

7.3.1 Forest land remaining forest land

A general lack of transparency in the estimation of carbon stocks and carbon stock changes in living biomass appears to be one of the most common transparency issues, as only 5 out of the 29 reviewed NIDs did not receive observations regarding biomass estimates in Forest land remaining Forest land. Reviewers frequently needed to request clarification on how the estimates were derived because the information provided in the NID does not always allow sufficient traceability from input and activity data to the reported results. Ideally, estimates should be reproducible. However, where this is not practical due to the use of large and complex datasets such as NFI data, the NID should at least ensure traceability of the estimates from the underlying activity data and methodological steps to the final reported values.

NIDs can therefore improve transparency by clearly demonstrating the geographical stratification layers considered in biomass estimates, explaining how activity data are acquired, and presenting activity data at the corresponding stratification levels, at least in aggregated form where more detailed data cannot be included in the NID. It is also important to explain how repeated measurements used to construct time series are obtained. This helps ensure transparency and allows reviewers to interpret resulting trends in the estimates, considering the contribution of different data layers together with the corresponding biomass gains and losses. Where the stock-difference method is applied, the NID should demonstrate how successive inventories ensure repeated measurements on same areas with consistent methodology.

To improve transparency, it is encouraged to clearly document the methodological parameters used to translate activity data into biomass estimates across the defined stratification layers. Depending on the chosen method, this may include information on increment (under or over bark), biomass conversion and expansion factors, below-ground to above-ground biomass ratios, basic wood density, carbon fraction of dry matter, and other parameters, assumptions, equations, or models applied in higher-tier methods.

Improved transparency also requires demonstrating the derivation of biomass losses, including wood removals, fuelwood removals, mortality, biomass burning, and other disturbances, where feasible. It is particularly important to show the role of each biomass loss component and how omission or double counting is avoided, including the transfer of carbon from living biomass to the dead organic matter pool. Even when the stock-difference method provides only net changes in living biomass, inventories should still demonstrate how the carbon stock change estimation in dead organic matter derivation and loss estimates by biomass burning and harvesting avoids omissions or double accounting. Therefore, regardless of the method applied, transparency can be improved by presenting the components of biomass carbon stock change for the full time series. A useful way to improve transparency is to present the components of biomass carbon stock change graphically, for example using stacked bar plots showing gross increment, harvest removals, mortality and disturbances in relation to the resulting net carbon stock change. This would improve transparency of biomass gain and loss components and reduce the need for reviewers to raise observations requesting clarification during the review.

To improve transparency in biomass estimates, it is encouraged to present sufficient information to allow traceability from activity data to reported carbon stock changes, particularly where higher-tier methods are applied.

Finland provides a good example of transparent documentation of biomass estimation in its NID. Carbon stock changes in living biomass for Forest land remaining Forest land are estimated using a Tier 3 gain–loss approach based on detailed NFI measurements of individual trees on permanent sample plots. Tree-level measurements of diameter, height and other variables are used together with species-specific biomass functions to estimate biomass of different tree compartments (stem, bark, branches, foliage, roots and stumps).

The NID clearly documents the methodological steps used to translate activity data into biomass estimates. Stem volume and biomass increments are first estimated from NFI measurements and then converted to biomass using BCEFs derived directly from NFI data for each stratum. The stratification used in the calculations is described and includes combinations of region (Southern and Northern Finland), soil type (mineral and organic soils), and tree species groups. The documentation also provides appendices with biomass models, BCEF calculations and estimation procedures, allowing reviewers to trace how tree measurements are translated into biomass stocks and stock changes and how the time series is constructed using successive NFIs.

Table 2 App_6c. Biomass conversion and expansion factors applied to convert volume increment to biomass increment based on NFI8 to NFI13 data.

			NFI8		NFI9		NFI10		NFI11		NFI12		NFI13	
			Above-groud	Below-ground	Above-groud	Below-ground	Above-groud	Below-ground	Above-groud	Below-ground	Above-groud	Below-ground	Above-groud	Below-ground
Southern	mineral	Scots pine	0.495	0.112	0.488	0.106	0.477	0.103	0.471	0.099	0.467	0.109	0.458	0.105
Southern	mineral	Norway spruce	0.544	0.148	0.539	0.147	0.532	0.145	0.533	0.148	0.551	0.153	0.531	0.147
Southern	mineral	Broaleaved	0.608	0.21	0.608	0.227	0.597	0.209	0.595	0.202	0.59	0.172	0.592	0.155
Southern	peat	Scots pine	0.516	0.116	0.503	0.11	0.488	0.104	0.482	0.103	0.459	0.111	0.453	0.11
Southern	peat	Norway spruce	0.563	0.152	0.571	0.159	0.572	0.164	0.557	0.154	0.568	0.161	0.551	0.156
Southern	peat	Broaleaved	0.613	0.21	0.607	0.213	0.602	0.214	0.599	0.204	0.591	0.175	0.595	0.163
Northern	mineral	Scots pine	0.538	0.135	0.508	0.122	0.503	0.12	0.496	0.116	0.476	0.128	0.467	0.116
Northern	mineral	Norway spruce	0.656	0.199	0.628	0.184	0.626	0.185	0.615	0.18	0.656	0.245	0.573	0.173
Northern	mineral	Broaleaved	0.718	0.402	0.648	0.281	0.624	0.251	0.648	0.298	0.644	0.189	0.634	0.185
Northern	peat	Scots pine	0.555	0.139	0.526	0.119	0.522	0.117	0.507	0.111	0.471	0.126	0.453	0.116
Northern	peat	Norway spruce	0.627	0.18	0.646	0.189	0.649	0.198	0.629	0.185	0.616	0.203	0.583	0.172
Northern	peat	Broaleaved	0.638	0.213	0.627	0.241	0.601	0.199	0.607	0.205	0.634	0.188	0.624	0.177

Figure 9 - Example from Finland's NID demonstrating biomass estimation components across activity data stratification layers and time series[17]

Finland further demonstrates accuracy by comparing gain–loss estimates with stock-difference estimates derived from successive NFI measurements. The NID also provides estimates of uncertainty associated with the biomass calculations, further supporting the robustness and transparency of the reported results.

Table 6.4-12 Comparison of the results based on the stock-change method and the gain-loss method reported in this submission.

Year	Net emission/removal due to change in tree biomass, Mt CO_2		95 % confidence interval	
	gain-loss method	stock-change method	stock-change method	
2014	-29.5	-10.0	-0.9	-19.0
2015	-23.7	-11.6	-4.4	-18.7
2016	-18.6	-13.6	-7.8	-19.4
2017	-16.5	-13.8	-8.9	-18.7
2018	-7.0	-12.6	-8.2	-17.0
2019	-13.2	-12.1	-7.7	-16.5
2020	-18.9	-12.2	-7.2	-17.1
2021	-8.3	-10.8	-5.1	-16.6
2022	-10.0	-8.7	-1.6	-15.7
2023	-13.4	-6.7	3.2	-16.5

Figure 10 - Example from Finland's NID demonstrating non-woody biomass carbon stock changes, addressing a common lack of transparency in NIDs on the biomass types considered[18]

7.3.2 Data sources in biomass carbon stock change estimates

A recurring transparency issue identified during reviews relates to consistency between different data sources used for land-use representation and biomass stock change components used in biomass carbon stock change estimates. Biomass stock change estimates often combine multiple activity data sources, both spatial and statistical. For example, different datasets may

[17] See p.402 of Finland's 2025 National Inventory Document

[18] See p.343 of Finland's 2025 National Inventory Document

be used to estimate biomass increment, harvest removals, mortality, or standing stock (e.g. NFI measurements, statistical harvest data, remote sensing products, or model-derived indices). However, NIDs do not always clearly explain how these sources are combined, prioritised when contradictory, or how consistency between them is ensured. As a result, it is often unclear whether the combination of these inputs reproduces the observed biomass stock changes in a consistent way. This transparency issue can be addressed by systematically comparing activity data from different sources, explaining the rationale for the selected source, comparing inventory estimates with independent datasets, demonstrating spatial overlap, and explaining any observed differences. Some inventories demonstrate good practice by comparing biomass estimates with independent datasets such as NFI measurements (see **Figure 11**), harvest statistics or alternative estimation approaches (see **Figure 12**) which essentially provides demonstration of used methodology being able to replicate biomass stock changes.

Figure 6.6 Comparison between carbon stock changes, for living biomass pool, by the National GHG Inventory (ISPRA) and estimated data of NFI2005 (II NFI) measurements (modified from Tabacchi *et al.*, 2010)

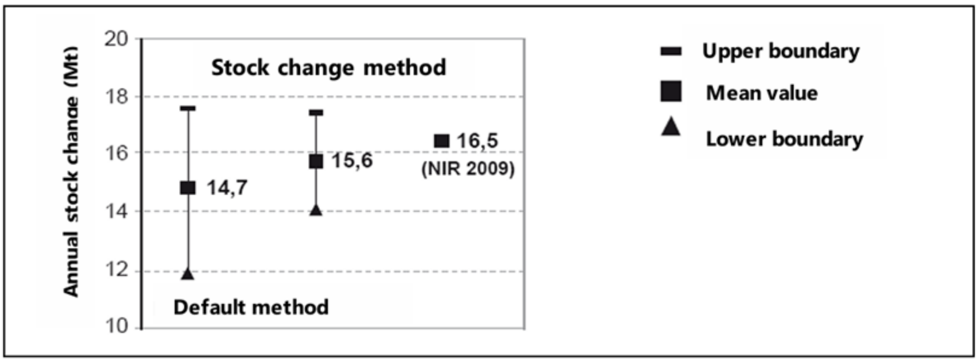

Figure 11 – Example from Italy's NID showing a comparison of modelled biomass changes and NFI measurements[19]

[19] See p.294 of Italy's 2025 National Inventory Document

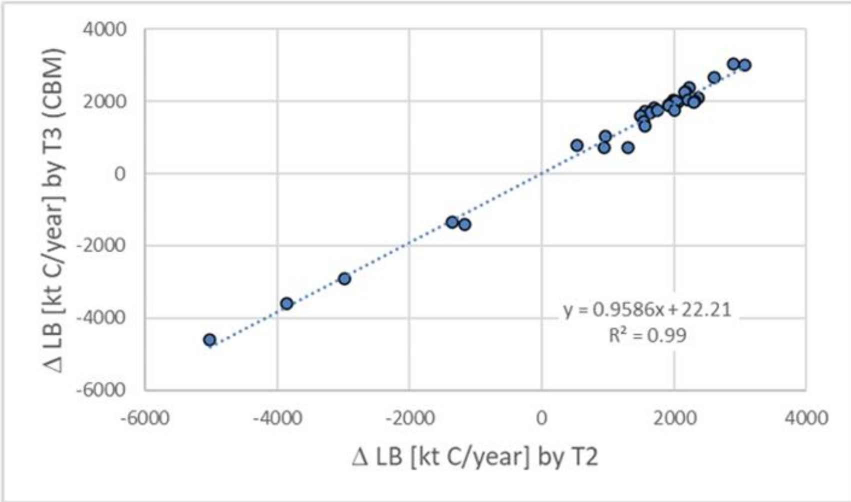

Fig. A3 18 A regression (and its statistics) between the estimates of carbon stock change in living biomass (Δ LB) by the Tier 2 (T2; x axis) approach as used until NIR 2021 and by the Tier 3 approach by CBM (T3; y axis) as implemented since NIR 2022 inventory submission.

Figure 12 - Example from Czechia's NID showing comparisons between Tier-2 and Tier-3 biomass estimation approaches[20]

7.3.3 Carbon stock changes in living biomass due to land-use conversions

Additional biomass related transparency issue concerns how living biomass carbon stock changes are represented during land-use conversions that may involve both woody and non-woody vegetation. In many NIDs, it is not explicitly explained whether the reported living biomass carbon stock changes include woody biomass, non-woody biomass, or both. As conversions between land uses such as forest, cropland, grassland and settlements may involve both vegetation types, the lack of explicit clarification makes it difficult to understand which biomass components are considered in the estimates.

The issue becomes more relevant when the living biomass pool is significant and estimated using higher-tier methods. In such cases inventories may report continuous biomass gains in categories such as grassland, which likely represent woody biomass (e.g. shrubs or scattered trees). However, when such land is later converted to another land use, it often remains unclear whether these woody biomass gains were included in the pre-conversion biomass stock and how they are treated in the conversion estimates, creating a transparency issue in the interpretation of reported carbon stock changes.

Norway is an example providing relatively increased transparency as the NID explains that inventory considers both woody and non-woody vegetation when estimating living biomass carbon stock changes for land converted to forest land. Non-woody biomass (e.g. herbaceous vegetation) is represented using stock change factors provided in the NID, while woody biomass is estimated using the same methodology applied for forest land remaining forest land.

[20] See p.516 of Czechia's 2025 National Inventory Document

Table 6-25: Default non-woody biomass carbon stocks change factors for conversion to forest land.

Conversion	IPCC Climate region	Non-woody biomass gain/losses (tC ha $^{-1}$)	Herbaceous biomass factor (tC (t d.m.)$^{-1}$)	Reference
Grassland to forest land (biomass loss)	Boreal	3.995	0.47	IPCC 2006 Guidelines, Vol. 4, Ch. 6, Table 6.4
	Cool temperate dry	3.055		
	Cool temperate moist	6.392		
Cropland to forest land (biomass loss)	-	4.7		IPCC 2019 Refinement, Vol. 4, Ch. 5, Table 5.9

Figure 13 - Example from Norway's NID demonstrating non-woody biomass carbon stock changes[21]

7.4 Documentation of outliers

Unexplained outliers and counter-intuitive trends can reduce transparency where they are not explained in the NID. Reviewers often identified single-year spikes, abrupt sign changes, unusually high or low implied carbon stock change factors compared to other inventories, counter-intuitive trends, or sudden recalculation effects that were not explained in the NID. For example, observations were raised if similar activity data resulted in very different emissions, gains increased while area decreased, biomass losses increased while harvest decreased, or gains, losses, and net change did not balance as expected. The issue is usually not only the presence of unusual values themselves, but that the NID does not explain what is driving them. Reviewers were therefore unable to determine whether such patterns reflected real events, activity data changes, methodological revisions, model behaviour, parameter choices, interpolation effects, or possible errors. In many cases, such observations were resolved during the review dialogue without resulting in a recommendation, suggesting that improved transparency in the NID can reduce the number of such observations. To improve transparency, it is encouraged to identify and explain major outliers, abrupt changes, or unusual trends in the time series, particularly where these affect key categories or significant pools.

[21] See p.6-79 of [Norway's 2025 National Inventory Document]

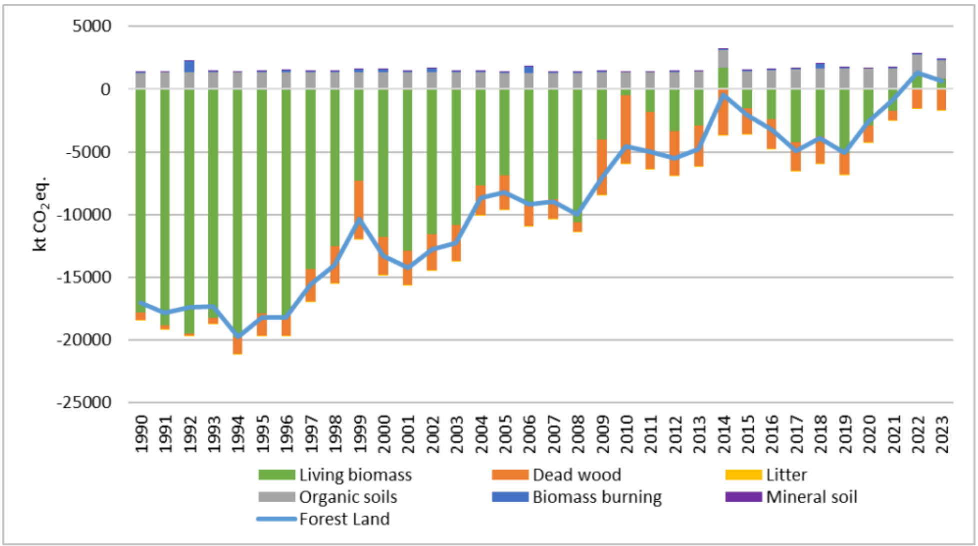

Figure 6.4 Summary of GHG emissions in forest land (kt CO_2 eq.) by source and sink categories

Figure 14 - Example from Latvia's NID demonstrating trends in estimated GHG emissions and CO_2 removals by source and sink categories[22]

In practice, this could be achieved by systematically comparing implied carbon stock change factors reported in the inventory with values reported by inventories of similar regions. Such comparisons and visualisations would help inventory compilers identify counter-intuitive trends and outliers in advance and provide description of the underlying drivers. Presenting estimated trends graphically in the NID is useful, practical and applied by many inventories (see **Figure 14**). However, comparison of implied emission factors should ideally be an automated feature, for example within the ETF platform (https://etf-ghg.unfccc.int/[23]). Until such functionality is available, inventory compilers are encouraged to perform these comparisons themselves, for example by using tools such as Locator (https://rt.unfccc.int/locator) to extract implied emission

[22] See p.354 of Latvia's 2025 National Inventory Document

[23] Note that this link is not publicly accessible and requires a login.

factors from inventories.

Table 400: Carbon-stock changes in living biomass, in Grassland of various countries (Germany, for 2021 & 2023; other countries, for 2021), in [t C ha^{-1} a^{-1}]

	4.C.1. - Grassland Remaining Grassland	4.C.2 - Land Converted To Grassland	4.C.2.1 - Forest Land Converted To Grassland	4.C.2.2 - Cropland Converted To Grassland	4.C.2.3 - Wetlands Converted To Grassland	4.C.2.4 - Settlements Converted To Grassland	4.C.2.5 - Other Land Converted To Grassland
Belgium	NO	-1.232	-6.888	NO	NO	NO	NO
Denmark	-0.046	-8.092	-0.326	IE	NA	NA	NA
France	0.025	-0.411	-1.651	-0.053	0.056	0.153	NA
UK	-0.001	-0.109	-1.592	-0.072	NO	0.043	NO
Netherlands	0.007	0.044	-3.433	0.158	0.361	0.559	1.004
Austria	NA	-0.886	-2.479	-0.031	NO	NO	NO
Poland	NO	0.192	NO	0.156	1.339	NO,IE	NO
Switzerland	0.049	-0.712	-3.482	-0.102	0.538	0.133	0.503
Czech Republic	NO	0.037	-5.010	0.129	0.846	NO	NO
Germany, 2021	-0.092	-0.026	NO	0.051	-0.571	-0.794	1.742
Germany, 2023	-0.027	0.243	-12.166	0.283	-3.467	-0.232	0.937

Positive: carbon removal by sink; negative: carbon emission by source; Source: (UNFCCC, 2023)

Figure 15 - Example from Germany's NID showing a comparison of implied emission factors[24]

Activity data changes, methodological revisions or error corrections lead to recalculations. These should be clearly presented in the NID to ensure transparency and allow readers to understand what has changed, why the change was necessary, and what impact it has on the estimates. The reason for each recalculation is typically explained in textual form, while information describing the specific changes made—as well as the quantitative impacts on the estimates—can be provided in textual, tabular, or graphical formats. This approach improves clarity, supports time series consistency, and facilitates efficient review.

[24] See p.653 of Germany’s 2025 National Inventory Document

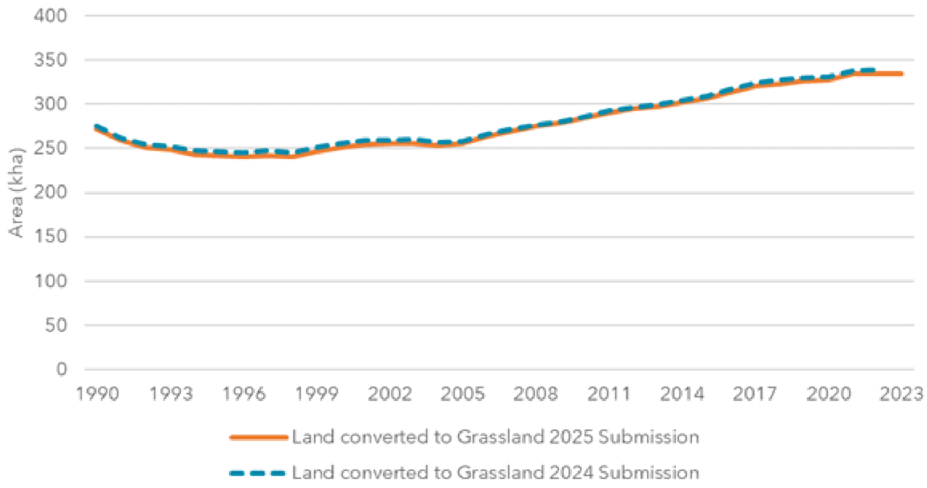

Figure 6.31 Recalculations to the activity data between the current (2025) and previous (2024) submission for Land converted to Grassland

Recalculations to emissions for grassland are mainly driven by changes to the activity data described above. Additionally, new country specific DOC emission factors result in a small decrease in CO_2 and CH_4 emissions from drained organic soils (Table 4(II)).

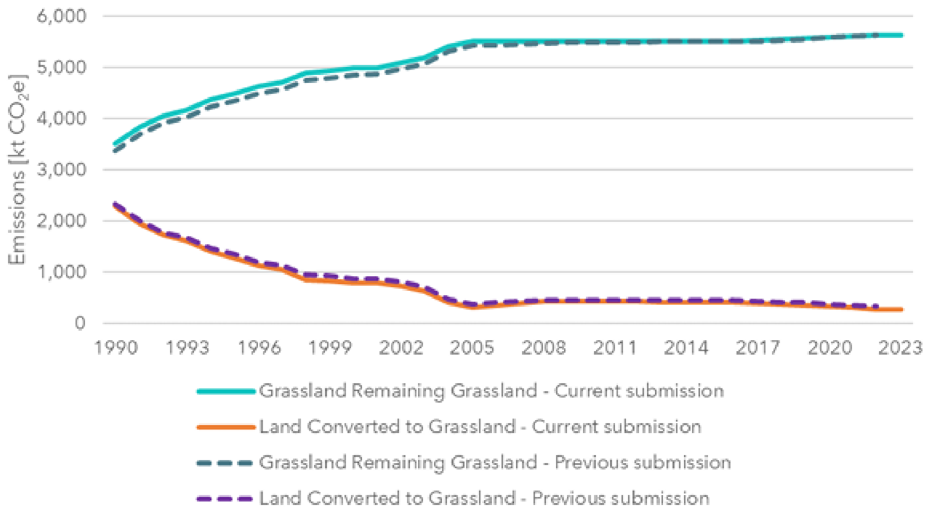

Figure 6.32 Recalculations to the emissions between the current and previous submission for Grassland

Figure 16 - Example from Iceland's NID showing activity data (area) updates and recalculation impact [25]

7.5 Use of models

During the comprehensive review several observations were related to transparency of used models. For SOC pools, the main models referred to were RothC and Yasso15/Yasso20. RothC was used to estimate mineral soil organic carbon stock changes in cropland remaining cropland

[25] See p.266 of Iceland's 2025 National Inventory Document

and grassland remaining grassland. Yasso was used mainly for forest mineral soils, and in some cases also for dead organic matter. For biomass pools, the main models included EFISCEN, the Carbon Budget Model, For-est model, and several country-specific Tier 3 stock-difference or empirical growth models based on repeated inventory data. These were used mainly for living biomass in forest land remaining forest land, but in some cases also for dead wood and litter.

The 2006 IPCC Guidelines (Vol. 4, Ch. 2) describe good practice for Tier 3 model-based estimation systems. Where models are applied, it is encouraged to document several key aspects of model development and implementation to support transparency and traceability. These aspects include, for example: (i) selection or development of a model appropriate for estimating carbon stock changes or non-CO_2 emissions; (ii) calibration and evaluation of the model using measured data; (iii) identification and documentation of required input data (e.g. environmental conditions, activity data, management information); (iv) assessment of uncertainties associated with model structure and inputs; (v) implementation of the model, including preparation of input datasets and simulation procedures; and (vi) evaluation of model results against independent datasets where available. The IPCC Guidelines also emphasise transparent reporting and documentation of the model description, input data sources, calibration and evaluation results, estimated emissions or removals, and interpretation of trends.

Review observations indicate that documentation of several of these elements is often limited or dispersed across the NID. Most commonly, insufficient information is provided on model, parameterisation, calibration procedures, and validation against independent data. In several cases, NIDs refer to published studies or model documentation but do not clearly describe which parameter sets, or input datasets were applied in the inventory implementation. Similarly, the derivation of key model inputs, such as carbon inputs to soils, growth curves, disturbance parameters, or environmental drivers, is often not sufficiently explained. Another recurring issue is limited transparency regarding how model simulations are extrapolated spatially or temporally, for example when results from a limited number of monitoring sites are applied to national areas or extended across the full time series when carbon stock changes are modelled for limited time series period.

Additional issues concern the linkage between model outputs and reported inventory estimates. Transparency can be improved by clearly demonstrating how model results are translated into the carbon stock changes reported in the CRT tables, or how modelled trends relate to observed activity data such as forest age structure, harvest statistics, or management changes.

To improve transparency, it is encouraged to provide clearer documentation of the full modelling workflow. This includes describing the model structure and version used, documenting calibration procedures, parameters, and presenting evidence of model evaluation against calibration and independent datasets where available. NIDs should also describe the sources and preparation of model input data, including activity data, environmental drivers, and explain how these inputs are linked to the stratifications used in the inventory. Transparency would further benefit from documenting how model simulations are aggregated to national estimates and how model outputs correspond to the carbon stock changes reported in the inventory tables. Where models are applied to reconstruct historical time series or extrapolate results beyond measurement periods, the underlying assumptions and methodological steps should be clearly described.

Norway provides a good example of transparent documentation of a Tier 3 model application through its use of the Yasso07 model to estimate carbon stock changes in dead organic matter and carbon in mineral soils in forest land. Model inputs are explicitly linked to NFI data, where biomass inputs to soils are derived from plot-level estimates of biomass, mortality, and harvest residues. The NID explains how these inputs are calculated and how model simulations are performed at plot level and then scaled to national estimates. The documentation also describes model initialization, climate inputs, and the reconstruction of historical inputs for the full inventory time series, together with examples of model evaluation and uncertainty analysis. Norway provides several forms of model evaluation and verification. These include comparison of national estimates with results from other countries and site-level comparison of modelled soil carbon changes with repeated measurements from monitoring sites.

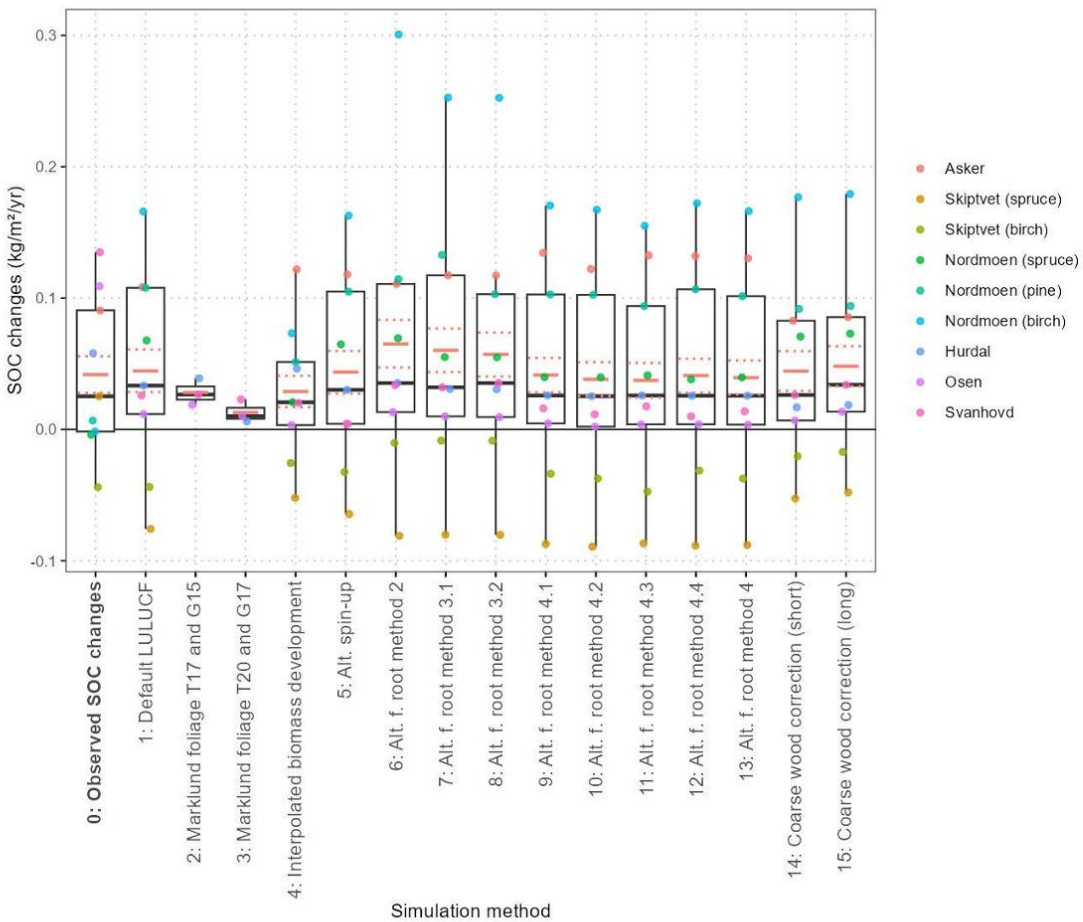

Figure 17 - Example from Norway's NID comparing model results with independent data sources[26]

[26] See p.6-71 of Norway's 2025 National Inventory Document

8 Method Statement approach

Countries may consider developing a method statement template (an example developed by the United Kingdom is reported in Figure 18), adjusted to the information they consider to report, and applying it consistently for each category in the national GHG inventory. Such a template helps ensure that methodological descriptions are structured, transparent, and aligned with reporting needs and national circumstances. The content of the template may be determined by each country; however, consistency across categories should be ensured to make the information comparable. Furthermore, the detail and useability of the method statements should be considered to ensure information is easily accessible in the NID.

A proposed template that includes more information placeholders than those presented in the UK example, is provided in Table 2. Countries may consider and decide which information can be reported to enhance transparency. A short description for each placeholder cell is reported in *italics*.

6.2 CATEGORY 4A – FOREST LAND

6.2.1 Description

Emissions sources	4A Forest Land: carbon stock change 4(I).A Direct and indirect nitrous oxide (N_2O) emissions from nitrogen (N) inputs to managed soils 4(II).A Emissions and removals from drainage and rewetting and other management of organic and mineral soils 4(III).A Direct and indirect nitrous oxide (N_2O) emissions from nitrogen (N) mineralization/immobilization associated with loss/gain of soil organic matter resulting from change of land use or management of mineral soils 4(IV).A Biomass burning
Gases Reported	CO_2, CH_4, N_2O
Methods	T3 for carbon stock changes, T2 for direct CO_2 and CH_4 and N_2O, T1 for other emissions
Emission Factors	Country-specific for T3 methods
Key Categories	4A: Forest land - CO_2 (L1, L2, T1, T2), N_2O (L2)
Key Categories (Qualitative)	None identified
Completeness	N/A
Major improvements since last submission	Improvements to the CARBINE process modelling and minor activity data updates

Figure 18 - Method statement table developed and reported by the United Kingdom[27]

Table 2: A template for NID Method Statements

MS Number + Title
MS number: Unique reference number for the method statement *Title: A short title which uniquely identifies the method statement*

[27] See p.407 of the UK Greenhouse Gas Inventory, 1990 to 2023.

Relevant Categories

List here the relevant IPCC categories, subcategories and sinks/sources that are covered by this method statement.

Relevant Gases

Include here all gases that are covered by this method statement

Relevant carbon pools, activities

List here the relevant carbon pools and activities that are covered by this method statement.

Background

Include here brief background information that helps the reader to understand the scope of the categories and activities. For example, if the method is based on country specific data, include a reference to the table including the country specific data in the sector introduction.

Data sources

Include list of data source references. You can add a short description about how the referenced information is used if needed.

Method approach

Include here text on how the estimates are calculated. Describe the basic calculation, sequence of calculations and how data sources are used. Provide a clear picture of the approach used. Include tables of emission factors or activity data when it is necessary to provide transparency. Activity data that are essential could be included, these will need to be revised annually

***Where methods are simple** the method statement can be very short. It only needs to reference the key data sources and basic calculation and assumptions. For example, Tier 1 and default 2006 IPCC emission factors.*

*Methods should be described in more detail **where methods are complex. This includes where the method has more complexity than 2006 IPCC defaults**, where assumptions are applied, or where there are a number of options to choose from (e.g. in IPCC default EFs).*

For example, Forest Land remaining Forest Land can be estimated using a detailed system based on national forest inventory data combined with growth models, species-specific biomass equations, age-class information, disturbance data, and remote sensing. In such cases, the method description should list all key input data sources used. It should also explain the main principles and assumptions of the approach, such as biomass modelling choices or treatment of harvested wood and dead organic matter. Finally, the description should show if the complex method differs from relevant IPCC default approaches and explain the implications of those differences. More detailed documentation should be kept with the calculations that can be provided to interested parties on request.

*Where **models** are used to make GHG estimates the method description in the NIR should focus on the following:*

- *Fully referencing the model, model version and a link to its user manual (this does not have to be in the public domain but should be available on request),*
- *Description of the main input parameters and sensitivities,*
- *Proof that the model is accurate by presenting any model validation results and highlighting key sensitivities and assumptions.*

It is not necessary to provide the user with all of the detailed information required to recreate the model calculations in the NIR. Therefore, the focus should be on proving the model functions as it should and highlighting the input parameters and key assumptions.

Method Changes

(Yes/No) to indicate whether the method has changed in this latest submission.

Assumptions & observations

List the assumptions made in the calculations that have an impact on the estimates. This could include assumptions about changes to emission factors and activity data or other relevant parameters. Explain how these assumptions have been made, for example, expert judgement or based on evidence (which should be referenced).

Recalculation

(Yes/No) statement on whether recalculations have been done for the current submission.

Recalculation justification & summary of change

Qualitative exploration of the calculations and summary of changes (text only). Describe the recalculations and their impacts. Include justification of why they were undertaken and how they have improved the quality of the GHG inventory.

Improvements

Include text on improvements undertaken in the last inventory cycle and list any agreed planned improvements there.

QA/QC processes

Include here short text on the sector specific QA/QC applied for this method. Include a description of QA/QC for the sector/category and ensure that this represents the comprehensive QA/QC that is undertaken. Also include reference to where QA/QC elements proposed by 2006 IPCC guidelines are undertaken (see sector specific QA/QC sections e.g. 4.4.3 of Forest land chapter and other similar sub-chapters of 2006 IPCC).

Time series consistency issues

State here how the time series is ensured. Where there is some discontinuity to the input data and work is needed to ensure time series consistency, highlight these efforts here.

Uncertainties

Describe the key uncertainties that arise for this method. Include text on how the uncertainty information has been derived or collected (measurement error, expert judgement, statistics etc). Only include text describing the main areas of uncertainty. Explain why uncertainties are particularly high or low and for which gases/fuels etc.

Verification

Describe any verification exercises undertaken for the categories calculated using this method. Include text on how the verification was performed and a summary of the results. Explain why this verification gives confidence to the emission estimates.

9 Sense check of NID transparency

Here, we propose an exercise to assess overall transparency of the LULUCF information in the NID. If answers to the following questions can be easily found in the NID, this suggests that the NID is relatively transparent. Note that these questions are not exhaustive but are an example of the type of information that a reviewer may be looking for in an NID.

Before NID submission, this set of questions can support the QA[28] of the LULUCF information, by following these steps:

1. Draft NID is provided by the QA expert.
2. QA expert responds to each question of the sense check, annotating the answer:
    a. answer with a reference (section, page in NID),
    b. not clear,
    c. information not found.

   QA expert is encouraged to also provide general feedback on transparency.

   Note that if any questions are not relevant to the country’s circumstances, this should be also clearly explained in the NID.

   This step can have different length depending on the familiarity of the QA responsible with the sector. It is recommended to first read the LULUCF chapter[29] of the NID to understand the structure and main characteristics, rather than directly trying to look for the specific response to the question. As a rule, it should take no more than 3 hours (an average of 6 minutes per question) in addition to the time needed for an initial scan through the LULUCF chapter.

3. QA results shared with inventory compilator, who reviews the responses to the questions are correct.

[28] Quality Assurance (QA) is a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process. (2006 IPCC Guidelines, vol. 1 chapter 6).

[29] If information is included in Cross-cutting sections of the NID, these should be cross-reference in the LULUCF chapter.

4. QA results discussed for transparency improvement: decide priority, implementation period (current reporting cycle, next reporting cycle, …) and responsible for the implementation.

These steps should be documented.

Land use identification

1. What is the update frequency of the land use data (annual, 3 year cycle, 5 year cycle)?
2. What definition is applied to classify land as “managed” versus “unmanaged”?
3. What spatial resolution is used for land-use identification?
4. What is the uncertainty of the areas of FL remaining FL in the last year of the time series?
5. What rule is used to assign a single land-use category to mixed or mosaic land parcels (e.g., majority rule, dominant cover)?

Forest Land (FL)

6. What dataset is used to estimate above-ground and below-ground biomass carbon stock in Forest Land remaining Forest Land (FL-FL) in 2021?
7. What method (Tier 1/2/3) is used to estimate soil organic carbon changes in drained organic forest soils in 2019?
8. What is the reported reason for any significant increase in SOC emissions/removals from biomass burning in Forest Land in year X?

Cropland (CL)

9. What approach (Tier 1/2/3) is used for mineral soil carbon stock change in CL-CL in 2021, and what equilibrium period is assumed?
10. What carbon pool (e.g., soil organic carbon) shows the largest contribution to total CO_2 emissions from Cropland remaining Cropland (CL-CL) in year X?
11. What justification is provided for excluding dead-wood carbon pool estimates in Cropland converted to Forest Land (CL-FL)?

Grassland (GL)

12. What method is applied to estimate N_2O emissions from drainage of organic soils in Grassland converted to Cropland (GL-CL) in 2021?
13. What is the main driver identified for changes in soil carbon stocks in Grassland remaining Grassland (GL-GL) between 2020 and 2022?
14. How are Cropland fallow lands differentiated from Grasslands?

Wetlands (WL)

15. What source of activity data is used to quantify peat extraction area under Wetlands remaining Wetlands (WL-WL) for 2020?
16. What emission factor is used for CH_4 emissions from rewetted wetlands in 2021?
17. What justification is provided for applying a Tier 1 approach to CO_2 emissions from drained peatlands in Wetlands converted to Settlements (WL-SL) in 2022?

Settlements (SL)

18. What assumptions are made regarding living biomass and SOC wood pools in Forest land converted to Settlements (FL-SL) in 2019?

Harvested Wood Products (HWP)

19. What method is used to estimate CO_2 removals in the HWP category for sawnwood produced domestically in 2021?

Biomass burning 4(IV)

20. What dataset is used to quantify the mass of biomass burned due to wildfires in FL-FL in 2020 (e.g., satellite burned-area product, national fire statistics)?
21. What uncertainty (±%) is reported for CH_4 emissions from forest wildfires in 2021, and what method is used to derive it (e.g., error propagation, Monte Carlo)?

Direct & indirect N_2O from N inputs to managed soils (Cropland, Grassland, Settlements) 4(I)

22. What assumption is used for N inputs to managed soils in SL-SL for 2020 (e.g., landscaping fertilizer)?

Emissions and removals from drainage, rewetting & other management of soils (organic & mineral) 4(II)

23. What area (ha) of drained organic forest soils is reported for 2021, and what dataset (e.g., national peatland map, forest inventory) supports it?
24. What year did rewetting begin to be reported for WL-WL, and what method (Tier 1/2) and CH_4 emission factor are used for rewetted peatlands in 2021?

Direct & indirect N_2O from N mineralization/immobilization due to SOC loss/gain 4(III)

25. What share of mineralized N is assumed to volatilize or leach (parameters used) for CL-CL in 2021, and are FracGASF and FracLEACH applied to this source?

Cross-cutting: Recalculations, QA/QC, Time Series

26. What recalculation was performed for soil organic carbon in Cropland in the 1990–2020 time series, and what specific new dataset triggered this recalculation?
27. What institutional body is responsible for QA/QC of activity data for Forest Land?
28. What documented reason is provided for any break in the time series of land-use change data between year X and year Y?
29. What institutions are identified as primary data providers for (a) fertilizer inputs, (b) drained/rewetted areas, and (c) burned area?
30. Where are archived files for the burned biomass calculations in 2021 stored?

Glossary

Acronym	Definition
AFOLU	Agriculture, Forestry and Other Land Use
BCEF	Biomass Conversion and Expansion Factor
BTR	Biennial Transparency Report
CL	Cropland
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CRT	Common Reporting Tables
EF	Emission Factor
EFISCEN	European Forest Information Scenario Model
EEA	European Environment Agency
EMRT	EEA Emission Review Tool
ETF	Enhanced Transparency Framework
FL	Forest Land
FracGASF	Fraction of synthetic fertiliser N that volatilises as NH3 and NOx
FracLEACH	Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff
GHGI	Greenhouse Gas Inventory
GHG	Greenhouse Gas
GL	Grassland
HWP	Harvested Wood Products
IACS	Integrated Administration and Control System
IE	Included Elsewhere
IPCC	Intergovernmental Panel on Climate Change
KC	Key Category

KCA	Key Category Analysis
LB	Living Biomass
LPIS	Land Parcel Identification System
LU	Land Use
LUC	Land-Use Conversion
LULUCF	Land Use, Land-Use Change and Forestry
MPGs	Modalities, Procedures and Guidelines
MS	Member State
NA	Not Applicable
NE	Not Estimated
NFI	National Forest Inventory
NID	National Inventory Document
NIR	National Inventory Report
QA/QC	Quality Assurance / Quality Control
RothC	RothC is a model for the turnover of organic carbon in non-waterlogged topsoil that allows for the effects of soil type, temperature, soil moisture and plant cover on the turnover process.
SOC	Soil Organic Carbon
TERT	Technical Expert Review Team
Tier 1/2/3	IPCC methodological complexity levels
UNFCCC	United Nations Framework Convention on Climate Change
WL	Wetlands
Yasso	Soil carbon model (Yasso07 / Yasso15 / Yasso20 variants)

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Appendix A: Analysis of transparency issues in the 2025 LULUCF review

During the 2025 EU LULUCF review its 29 member countries[30] LULUCF inventories, 446 of the total 702 EMRT observations contained transparency related issues. 171 out of a total of 281 final Review Report (one per country) recommendations also made reference to the need for improved transparency.

The transparency issues in in the EMRT observations can be grouped under transparency issues relating to assumptions, data or methods. During the 2025 LULUCF review, 82 issues were related to assumptions, 264 issues were related to data, and 203 issues were related to methods (note that one issue can be flagged as related to some or all groups: assumptions, data and methods). Transparency issues included lack of transparency surrounding assumptions, inconsistencies in reporting, lack of recalculation transparency, unexplained outliers, lack of transparency of sources, and unexplained approaches. A more detailed summary of the top 10 transparency issues in the assumptions, data and method groups can be found in **Figure 19**.

[30] 27 EU Member states + Iceland and Norway

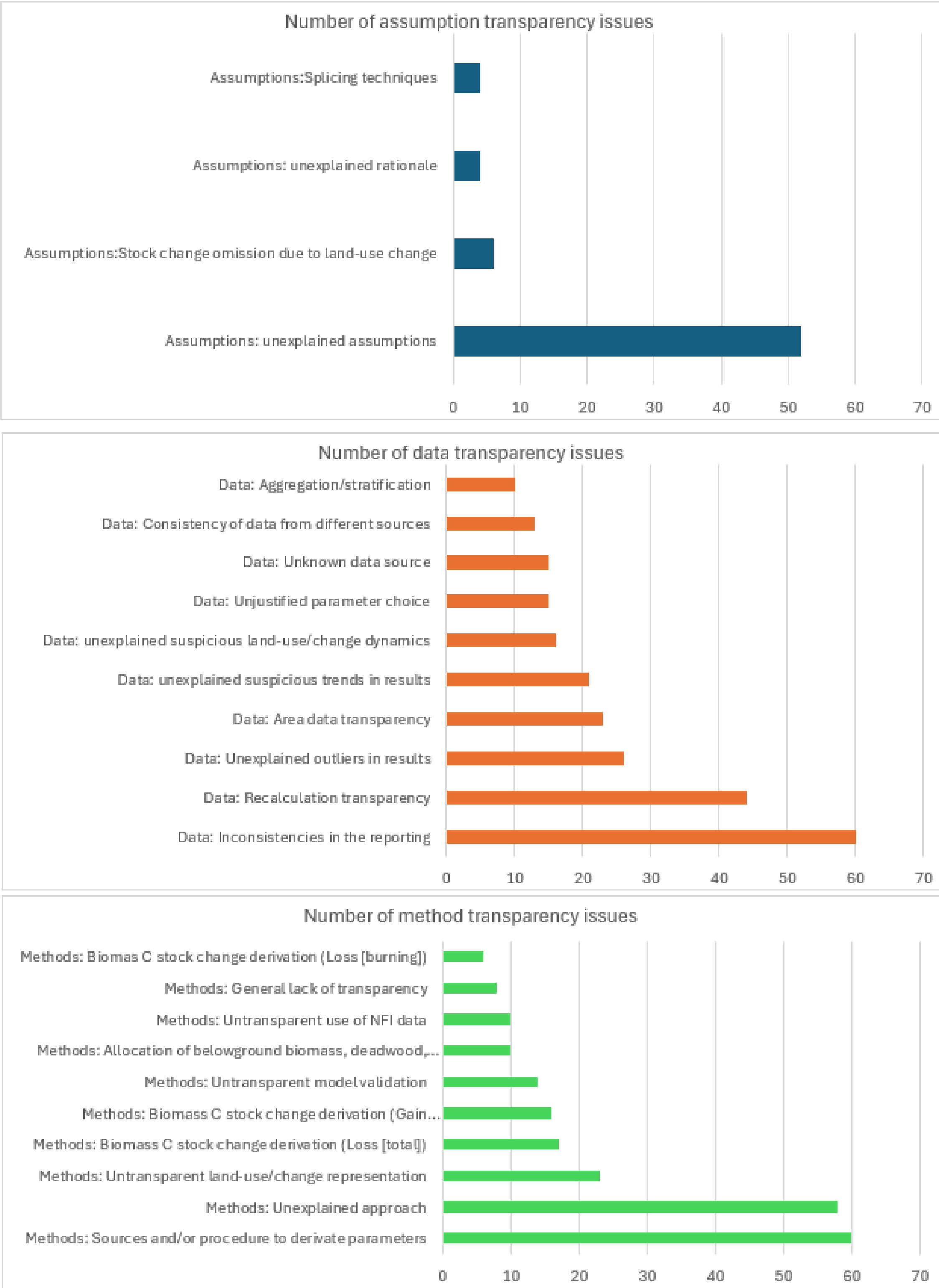

Figure 19 - The top 10 transparency issues identified for assumptions, data and methods in the 2025 LULUCF review. Note that one issue can be flagged as related to some or all groups: assumptions, data and methods

9.1.1 Method transparency issues

Observations frequently flagged with the transparency issue **"Methods: unexplained approach"** were often also associated with other transparency flags, showing that these observations frequently covered a combination of issues across different carbon pools, methodological steps, activity data, and in some cases also land-use representation. Often this flag was used together with data-related transparency flags concerning unexplained result outliers or suspicious trends.

- Most commonly, this flag related to the estimation of carbon stock changes in living biomass, where the methodological description was too vague for reviewers to understand how biomass carbon stocks and stock changes were derived. In many related cases, the information provided in the NID was insufficient to ensure traceability from input data to reported results, or the data sources used were not clearly documented. For example, reviewers were unable to trace the source of growing stock or increment data, or to understand how biomass carbon stocks were derived due to insufficient information on BEFs, BCEFs, root-to-shoot ratios, wood density values, their sources, or the rationale for related assumptions. Similar issues arose regarding below-ground biomass, where it was unclear whether and how it was included. Under gain–loss approaches, reviewers also had difficulty understanding how reported losses accounted for harvesting, natural mortality, and biomass burning, and therefore whether omissions or double counting had been avoided. Further related issues concerned the consistency of estimates where different activity data sources were used for area and biomass data, and how higher-granularity raw data were translated into the aggregated values applied in the inventory estimates. Land-use change-related issues involved insufficient documentation of initial biomass carbon stocks and unclear treatment of woody and non-woody biomass on lands undergoing conversion. In several cases, it was not clear if or how biomass losses from the previous land use were estimated, and whether both above- and below-ground biomass components were included. Reviewers also noted difficulties in assessing whether biomass gains assigned to land-use conversion categories were consistent with the carbon stock change estimates reported for the corresponding "remaining land" categories.
- In cases related to dead organic matter pools (deadwood and litter), reviewers were unable to replicate the calculations or trace how the reported values were derived from the parameters and input data provided. Although carbon stock changes were reported in the CRT tables, the NID did not clearly describe the methodology used to derive these estimates. A recurring issue was insufficient explanation of assumptions applied to deadwood and litter pools, particularly for land converted to forest land. The lack of transparency did not allow reviewers to understand the reasons for unexplained outliers or suspicious trends in implied carbon stock change factors.
- Mineral soil–related observations concerned incomplete methodological descriptions, insufficient information on stock change factors, and limited transparency regarding the activity data used to represent management practices and land-use transitions. In several cases, the NID did not provide justification for the use of default methodologies, including assumptions of carbon stock equilibrium. The information provided was insufficient to allow reviewers to replicate the estimates and making it difficult to interpret trends in the time series, including sudden changes in implied carbon stock change factors.
- For land-use related issues, the NID did not clearly describe how land-use areas or management subcategories were defined, tracked, or linked to the calculations of carbon stock changes and emissions. Reviewers noted that underlying activity data,

such as areas of specific cropland management systems, perennial cropland types, and woody versus non-woody grassland, were not explicitly reported or were insufficiently disaggregated. In some cases, reviewers could not confirm how organic soils are assessed, whether the approach leads to underreporting, or whether temporal changes are considered. These issues made it difficult to trace how changes in management practices were represented in the estimates and how these activity data translated into reported emissions or removals. Similarly, when different activity data sources or classifications were used (e.g. national statistics, NFI data, or land cover datasets), the linkage between these sources and the reported estimates was often not fully explained.

9.1.2 Data transparency issues

Observations related to activity (area) data most often concerned insufficient transparency regarding the sources, representativeness, and consistency of land-use area data used in the inventory. In several cases, the NID did not clearly describe the origin or methodological basis of spatial datasets, nor how these datasets were combined or updated for inventory purposes. In some cases, inconsistencies between activity data used in the inventory and results from other national datasets mentioned in the NID were not explained. Reviewers also noted cases where activity data were not sufficiently disaggregated (e.g. by cropland subcategories or vegetation types), making it difficult to assess how area data were linked to emission factors or biomass estimates.

A recurring issue concerned unexplained recalculations. Changes in estimates between submissions were not sufficiently documented in the NID, making it difficult for reviewers to understand the reasons for the recalculations or their impact on the time series. Such observations typically did not lead to recommendations, thus indicate that improved documentation of recalculations could reduce the number of transparency-related observations in future reviews.

9.1.3 Assumption transparency issues

Observations related to assumptions most often concerned insufficient justification for assumptions that had a potentially meaningful influence on the estimates. These included assumptions on no carbon stock change, the use of fixed average or half-stock values for perennial crops or land conversions involving forest lands, constant biomass gain or loss rates, symmetry of gains and losses between paired land-use conversions, uniform emission factors across different subcategories, assumed transition periods, and assumptions that certain land-use changes, management changes, or carbon pools were insignificant or did not occur. In such cases, the NID did not provide the justification to support the assumptions, or did not explain why specific default values or values form inventories of other countries were considered appropriate for national conditions. Similar concerns arose where assumptions effectively replaced missing activity data or methodological detail, for example by assuming no management change, no biomass loss, no SOC change, or immediate or linear stock development. In such cases, limited transparency on assumptions made it difficult for reviewers to assess whether the estimates could be related to under- or over-estimates.

9.1.4 Model transparency issues

Variety of assumption, data and methodology issues were related to the use of models and most often concerned insufficient transparency regarding model configuration, input data, calibration, and validation, lack of demonstration of improved accuracy compared to lower-tier methods. In several cases, the NID did not clearly describe how models were parameterised, how input data were derived, or how these inputs were applied over the time series. Reviewers requested clarification on how model outputs were verified against independent data sources, and whether calibration or validation procedures had been applied. In some cases, it was unclear how transitions between different methodological approaches were implemented, or how assumptions such as constant inputs affected the results. These issues limited the ability of reviewers to assess whether model results were consistent with observed data and whether unexplained trends, outliers, or large recalculations in reported estimates could be attributed to model assumptions, input data, or methodological choices.

Appendix B: Formatting tips

Ensuring a consistent format across NIDs is important for the readability of the document and the efficiency of the review process. The following table showcases a series of tips organised by category, each accompanied by a guiding example:

Table 3: NID formatting tips summary

Item	Guidance	Example
	Document structure and navigation	
Section numbering	Use a numbered, three-level hierarchy	*6.4.2 Soil Organic Carbon*
Headings	Keep it short, descriptive, consistent	*6.3 Activity Data for Grassland*
Table naming	Use “Table X.Y – Title”	*Table 6.12 – Emission Factors for SOC (t C/ha)*
Figure naming	Use “Figure X.Y – Title”	*Figure 6.4 – LULUCF Removals 1989–2024 (kt CO_2 eq.)*
	Tables and figures	
Table captions	Include data source, years, units	*Source: LPIS/IACS (APIA), 2024; Units: kha*
Figure captions	Include units, data source, years	*Axis: Area (kha); Source: CLC+ 2023*

Table placement	Place after first reference in text	Table appears immediately after "Table 6.12 shows…"
Long tables	Move to annexes	*Annex 6A – Land-Use Change Matrix*
	Formatting of technical content	
Equation formatting	Number and label equations	*Equation 6.1 – Carbon Stock Change (CSD)*
Variable tables	Provide table of variables after equation	Table listing (C_{t1}), (C_{t2}), units, definitions
Units	Use consistent units	*kha, t C/ha, kt CO_2 eq., %*
Units in headers	Include units in column headers	*Area (kha)*
Terminology	Use consistent terms across the document	Always "Living Biomass (LB)"
Glossary	Include glossary of national terms	*Pd = Forests; Ag = Arable land*
	Visual clarity	
Highlight boxes	Use for assumptions	Box: *Assumption: All grasslands are managed*
Deviations from IPCC	Highlight deviations	Box: *National SOC factors used for CL→FL*
Transition periods	Highlight transition periods	Box: *20-year transition applied to SOC*
Colour coding	Use consistent colours for LU categories	FL = dark green; CL = yellow; GL = light green
	Cross-referencing	
Cross-references (tables)	Use cross-references nested in a sentence.	"See Table 6.12 for SOC factors."
Cross-references (sections)	Use cross-references nested in a sentence.	"Method described in Section 6.4.1."
Cross-references (equations)	Use cross-references nested in a sentence.	"Calculated using Equation 6.1."
Citation style	Use a consistent citation format	*IPCC 2006, Vol. 4, Ch. 2*
	Writing style	
Tone	Use a neutral, technical tone	"Romania applies the Gain–Loss method for LB in FL."
Sentence structure	Use short, direct sentences	"AD were obtained from LPIS/IACS for 2008–2024."
Avoid vague language	Replace vague phrases with specifics wherever possible	Replace "some data were used" with "LPIS/IACS data were used."
	Accessibility and Layout	
Fonts	Use consistent fonts	Body: 11 pt Calibri; Headings: 14–16 pt bold

Spacing	Use consistent spacing	1.15 line spacing; 6 pt before/after paragraphs
Margins	Use standard margins	2.5 cm
Grayscale readability	Ensure figures are readable in grayscale	Distinct patterns or line styles used
Acronyms	Define acronyms at first use	*LPIS (Land Parcel Identification System)*
Cross reference	Add hyperlinks for internal references	*e.g.* Why focus on transparency in NIDs
Data sources	Cite all data sources clearly	*Source: NFI 2012, 2017*
Annex content	Move long or technical content to annexes (e.g. Land-use change matrices, detailed AD tables, EF tables, recalculation logs, QA/QC logs, maps and geospatial metadata)	*Annex 6B – Emission Factors and Parameters*
Annex structure	Number and reference annexes	*Annex 6B – Emission Factors and Parameters*
	Metadata and version control	
Metadata	Include version, date, institution	*Version 1.2 – Updated Feb 2026 – NEPA/MEWF*
Version control	Include document history	*Revision log table included*

Appendix C: National Circumstances, Institutional Arrangements and Cross-Cutting Information

This appendix highlights key information to provide in Chapter 1 of the NID document on National Circumstances, Institutional Arrangements, and Cross-Cutting Information. Example text is shown in *italics*.

Chapter 1. NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS AND CROSS-CUTTING INFORMATION

1.1 Background information on GHG inventories and climate change

Climate change

Summary of key features:

- Climate = long-term average weather and its variability.
- Humans have influenced climate since industrialisation through greenhouse gas emissions.
- UNFCCC (1992) launched global climate action but without binding emission limits.
- Kyoto Protocol (1997) set binding targets for industrialized countries (first and second commitment periods).
- Paris Agreement (2015) created a global post-2020 framework with temperature goals (well below 2°C, aiming for 1.5°C).
- All countries now submit Nationally Determined Contributions (NDCs) for emission reductions
- A paragraph about EU
- A paragraph about the MS, link to BTR where more information on climate change can be found.

National greenhouse gas inventories

The national greenhouse gas (GHG) inventory is the cornerstone of the country's reporting obligations under the United Nations Framework Convention on Climate Change (UNFCCC). Its preparation follows the requirements established in key UNFCCC decisions, including Decision 17/CP.8 on national communications, and the Enhanced Transparency Framework (ETF) under the Paris Agreement, particularly Decision 18/CMA.1. These decisions define the scope, methodological standards, and reporting formats that Parties must apply to ensure transparency, consistency, comparability, completeness, and accuracy.

The inventory is compiled using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, complemented where relevant by the 2019 Refinement and the 2013 Wetlands Supplement. Estimates cover all major sectors defined by the IPCC:

- *Energy*
- *Industrial Processes and Product Use (IPPU)*
- *Agriculture*

- *Forestry and Other Land Use (AFOLU)*
- *Waste*

The inventory includes all gases required under the Paris Agreement: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3. National activity data, country-specific emission factors (where available), and internationally recognized models are used to generate estimates. The application of uncertainty analysis, key category assessment, and QA/QC procedures follows IPCC good practice guidance.

- **A tailored paragraph on country submissions:**

The country has been submitting national GHG inventories since its first national communication, progressively improving methodological rigor, data completeness, and institutional coordination. Early inventories relied heavily on default emission factors and limited sectoral data, while more recent submissions incorporate enhanced national statistics, updated land-use information, and improved sector-specific models. The transition to the Enhanced Transparency Framework has further strengthened the institutional arrangements, documentation systems, and quality management processes.

- **A tailored paragraph on the GHGI system:**

A formalized institutional system coordinates the preparation of the inventory. XXX oversees methodological decisions, data collection, and compilation. Sectoral ministries, statistical offices, research institutions, and other data providers contribute activity data, technical expertise, and sector-specific validation. The system includes defined roles and responsibilities, data-sharing protocols, and timelines aligned with the UNFCCC reporting cycle. Regular capacity-building activities support continuous improvement.

- **A section on GHGI objectives:**

The national GHG inventory responds to multiple, complementary objectives:

International obligations: To fulfil reporting requirements under the UNFCCC and the Paris Agreement, demonstrating progress toward global efforts to limit temperature rise to 1.5°C and ensuring compliance with the Enhanced Transparency Framework.

Domestic policy support: To provide robust, science-based information for national climate strategies, mitigation planning, and sectoral policy development. The inventory informs the design, monitoring, and evaluation of mitigation actions and long-term low-emission development strategies.

Subnational and sectoral needs: To support voluntary or mandatory GHG programmes at regional or local levels, enabling consistent accounting frameworks for municipalities, industries, and other stakeholders.

Analytical and planning functions: To supply inputs for emissions projections, scenario modelling, and assessments of mitigation potential across sectors.

- **A section on GHGI system benefits:**

A robust national inventory delivers multiple benefits:

Strengthens evidence-based climate policymaking.

Enhances credibility in international reporting and cooperation.

Supports access to climate finance by demonstrating transparency and accountability.

Improves national data systems and inter-institutional coordination.

Enables consistent tracking of emission trends and mitigation outcomes over time.

- **Table with basic information on each objective by stakeholder, the sectors or categories involved in the objective, expected outputs by objective, the date of delivery, format of the report, reference to legal acts, etc. It may change significantly depending on the national circumstances**

Table 4: National GHG inventory objectives

Objective	*Gases, sectors and categories*	*Time series span*	*Reporting frequency*	*Reporting format*
Annual time series update of GHG trends	*GHGs* *SLCPs*	*1990 – submission year - 2*	*Annual*	*CRT and NID*
Annual time series update of Air Pollutant trends	*CLRTAP pollutants*	*1990 – submission year - 2*	*Annual*	*NFR and NIR*
NDC and mitigation tracking indicators				
Subnational GHG estimates for local governments				

1.2 Description of national circumstances and institutional arrangements

1.2.1 National entity or national focal point

- Describe the national entity or national focal point with overall responsibility for the national GHG inventory.
- Include the reference the legal arrangement supporting the national entity.

1.2.2 Inventory preparation process

Institutional arrangements:

- Provide a diagram of institutional arrangements and a process flow diagram showing data flows, QA/QC loops, and decision points.
- Describe the roles and responsibilities of each organization involved
- Document the legal basis for data collection and coordination.
- Describe continuity measures (manuals, training, procedures) to avoid dependence on individuals.
- Describe the changes to institutional arrangements, if any, compared with the previous update
- Provide a table of institutions, mandates, and update frequencies.

For example, the Germany NID provides a full institutional diagram showing ministries, statistical offices, research institutes, and QA/QC contractors (see Figure 20).

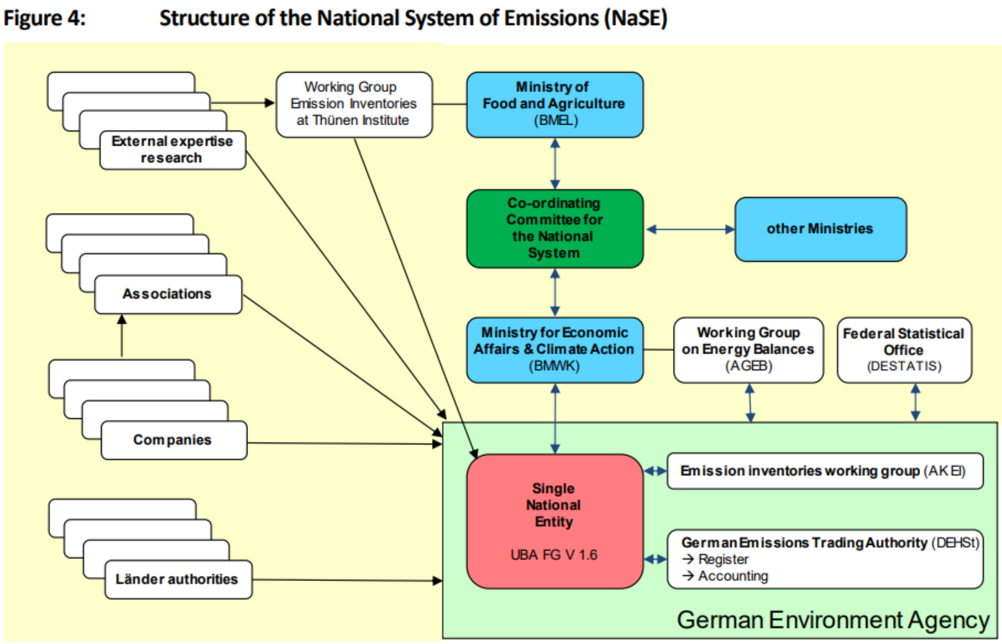

Figure 20 - Figure from the German 2025 NID showing national institutional arrangements[31]

Another example is the Netherland NID that provides a clear matrix of responsibilities across ministries, agencies, and contractors (see Figure 21).

[31] See p.51 of German's 2025 National Inventory Document

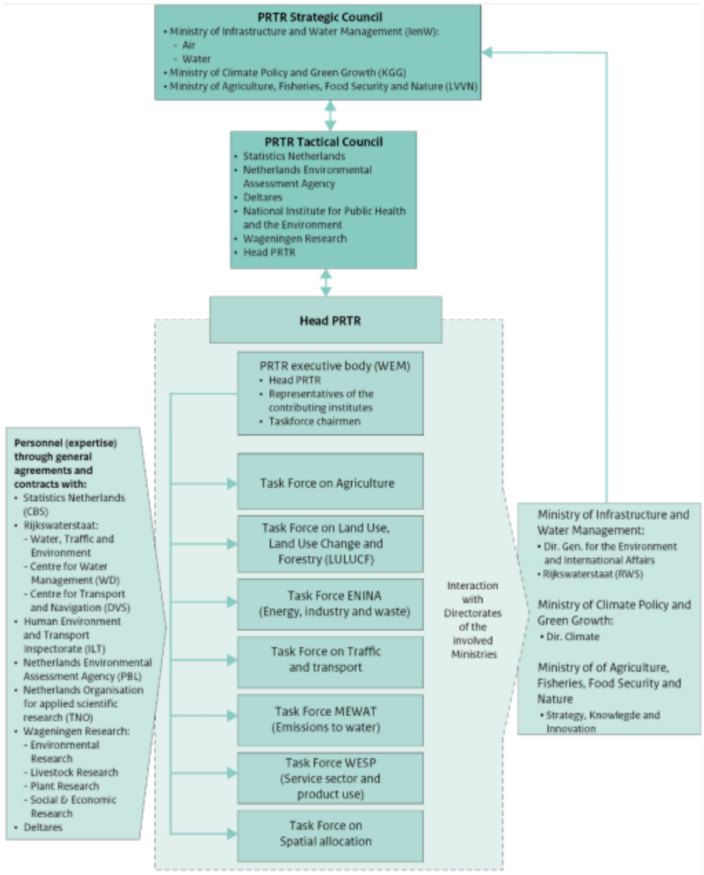

Figure 1.1 Organisational arrangements for the Dutch PRTR project

Figure 21 - Figure from the Dutch 2025 NID showing organisational arrangements and responsibilities[32]

Inventory cycle:

Describe in detail of how the inventory submitted in this report was prepared and managed, information management tools used, specific responsibilities at each stage of the process, expert judgment processes, and main gaps and barriers identified during the process and how they were overcome.

Describe the processes for the official consideration and approval of the inventory by the relevant parties, especially high-level authorities.

Table 5: Example summary of the key milestones for the finalisation of a NIR

Description of Key Activity	*Start date*	*End date*
Review of improvement plan including possible edits to the NID		
Agree improvements including those for the NID		
Implement improvements to methods and NID		

[32] See p.14 of The Netherlands 2025 National Inventory Document

QA/QC of estimates		
Compile estimates and document methods in NID		
UNFCCC review of previous submission		
Finalisation of data and methods		
Drafting of NID chapters		
Official country review of estimates		
UNFCCC recommendations including recommendations for NID		
Submission to Commission		
Review by Commission		
Feedback to Review by Commission with possible revisions to NID		
UNFCCC Submission of CRT and NID		

1.2.3 Archiving of information

- Description of the archiving of all information for the reported time series, including all disaggregated emission factors and activity data, all documentation about generating and aggregating data, particularly quality assurance/quality control (QA/QC), review results and planned inventory improvements]
- Describe the archiving system, retention periods, and version control procedures.
- Describe the traceability chain: raw data → processing → calculation → CRF.
- Describe the datasets and data flows, including a description of the archive of datasets (documentation and archive system) for the time series being reported and the agreements with data providers (whether mandatory or voluntary)

1.3 General description of methodologies and data sources

- Explain in general the scope and range of methods applied in your estimates across all sectors. This can reference in general methodologies (e.g. 2006 IPCC Guidelines, 2013 Supplement for Wetlands, 2019 Refinement, or any subsequent version of the guidelines approved by the CMA) and in general where higher tiers are not used for key categories and or where more complex models and methods are used. Reference should be made to the detailed method statements or methodology chapters. **Provide general rational** for the application of methods where they do not follow guiding principals (e.g. 2006 IPCC or later, Tier 1 for key categories) with reference to more details.
- Describe in general your important **data sources including census, survey, national statistics, other reporting and research** with enough detail that another analyst could find them. Provide clear references to national statistics, surveys, key models.
- If expert judgement is applied for some key assumptions, highlight this including who provided it, on what basis, and how it was applied and how uncertainties are reflected.

- Description of the tool and technologies used when estimating GHGs (spreadsheets, IPCC software, other software, etc.). Detailed information on methods and data sources can be included in the sector or category sections]

Table 6: Example summary table for data used

Dataset	Sector/Category	Data source	Update frequency	Principal collection mechanism

1.4 Key categories

This section includes an overview of the key category analysis.

- Include details of the key category analysis applied and reference the detailed annexes. Description should use consistent language to that presented in IPCC 2006 or later. Indicate the method used to conduct the quantitative key category analysis (for example, Approach 1 or Approach 2) for the starting year and the latest reporting year, including and excluding the LULUCF categories. (summary table)
- Clearly explain the results of the key category analysis. (summary table and short explanation of key categories). Provide a narrative explanation of why categories are key.
- List the criteria by which each category was identified as key (for example, level, trend, or qualitative), (summary table). The rationale for selecting key categories must be explicit.
- Indicate how the key category analysis provides inputs for the improvement plan.
- Provide reasons for the qualitative assessment of key categories.
- Include the full KCA in an annex

For example, the Switzerland NID provides a summary of the key category analysis (see **Figure 22**)

Table 1-6 Summary of Switzerland key category analysis, including LULUCF categories and indirect CO_2 emissions. L: Level assessment (2023); T: Trend assessment (1990–2023); 1: KCA approach 1; 2: KCA approach 2. SF_6 and NF_3 are not emitted from any key category. Results of the level assessment for the base year are not reported in this table.

SUMMARIES TO IDENTIFY KEY CATEGORIES							
A	B	C & D					
Code	IPCC category	CO2	CH4	N2O	HFCs	PFCs	Ind. CO2 (NMVOC)
1.A.1	Energy industries; Gaseous fuels	L1, T1			NA	NA	NA
1.A.1	Energy industries; Liquid fuels	L1, T1			NA	NA	NA
1.A.1	Energy industries; Other fossil fuels	L1, L2, T1, T2	NA		NA	NA	NA
1.A.2	Manufacturing industries and construction; Gaseous fuels	L1, L2, T1			NA	NA	NA
1.A.2	Manufacturing industries and construction; Liquid fuels	L1, T1			NA	NA	NA
1.A.2	Manufacturing industries and construction; Solid fuels	L1, T1			NA	NA	NA
1.A.2	Manufacturing industries and construction; Other fossil fuels	L1, T1			NA	NA	NA
1.A.3.a	Domestic aviation; Kerosene fossil	T1			NA	NA	NA
1.A.3.b	Road transportation; Diesel oil	L1, L2, T1		T1	NA	NA	NA
1.A.3.b	Road transportation; Gasoline	L1, T1	T1	T1	NA	NA	NA
1.A.4.a	Commercial/institutional; Gaseous fuels	L1, T1			NA	NA	NA
1.A.4.a	Commercial/institutional; Liquid fuels	L1, T1			NA	NA	NA
1.A.4.b	Residential; Gaseous fuels	L1, L2, T1, T2			NA	NA	NA
1.A.4.b	Residential; Liquid fuels	L1, T1			NA	NA	NA
1.A.4.c	Agriculture/forestry/fishing; Liquid fuels	L1, T1			NA	NA	NA
1.A.5	Other; Liquid fuels	L1			NA	NA	NA
2.A.1	Cement production	L1, L2, T1	NA	NA	NA	NA	NA
2.B.10	Other			T1, T2	NA	NA	NA
2.C.3	Aluminium production	T1	NA	NA	NA	T1	NA
2.D	Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	T1
2.F.1	Refrigeration and air-conditioning	NA	NA	NA	L1, L2, T1, T2		NA
2.F.2	Foam blowing agents	NA	NA	NA	L2, T2	NA	NA
3.A	Enteric fermentation	NA	L1, L2, T1, T2	NA	NA	NA	NA
3.B.1-4	Manure management	NA	L1, L2	L2	NA	NA	NA
3.B.5	Indirect N2O emissions	NA	NA	L1, L2	NA	NA	NA
3.D.1	Direct N2O emissions from managed soils	NA	NA	L1, L2	NA	NA	NA
3.D.2	Indirect N2O Emissions from managed soils	NA	NA	L1, L2, T1, T2	NA	NA	NA
4.A.1	Forest land remaining forest land	L1, L2, T1, T2	NA	NA	NA	NA	NA
4.A.2	Land converted to forest land	L1, L2, T1	NA	NA	NA	NA	NA
4.B.1	Cropland remaining cropland	L1, L2	NA	NA	NA	NA	NA
4.C.1	Grassland remaining grassland	L1, L2, T1, T2	NA	NA	NA	NA	NA
4.C.2	Land converted to grassland	L1, L2, T1	NA	NA	NA	NA	NA
4.D.1	Wetlands remaining wetlands	L2	NA	NA	NA	NA	NA
4.E.2	Land converted to settlements	L1, L2	NA	NA	NA	NA	NA
4.G	Harvested wood products	T1, T2	NA	NA	NA	NA	NA
5.A	Solid waste disposal		L1, L2, T1, T2	NA	NA	NA	NA
5.C	Incineration and open burning of waste			L2	NA	NA	
5.D	Wastewater treatment and discharge	NA	L1, L2, T1, T2	L1, L2, T1, T2	NA	NA	NA
Total number of key categories		26	5	9	2	1	1

Figure 22 - Figure from the Switzerland 2025 NID showing an overview of the key category analysis.[33]

1.5 General description of QA/QC plan and implementation

- Include a theoretical description of what is understood by quality assurance and quality control (QA/QC) and QA/QC plan pursuant to the 2006 IPCC Guidelines
- Include a detailed description of the following components:
- inventory QA/QC plan prepared and implemented;
  - b) agency responsible for implementing QA/QC;
  - c) general inventory QC procedures implemented pursuant to the QA/QC plan;
  - d) specific QC procedures for key categories and for those individual categories in which significant methodological changes or data revisions have occurred;
  - e) implemented QA procedures, such as basic expert reviews of inventories (peer review);

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[33] See p.28 of Switzerland's 2025 National Inventory Document

  - f) log of implemented QA/QC activities with reference to associated documentation and findings;
  - g) inventory improvement plan containing potential, planned and implemented improvements; and
  - h) how confidential information was treated (for example, to protect the confidentiality of business and military information, data cannot be fully disaggregated)
- Make explicit which checks are Tier 1 (routine) and which are Tier 2 (in-depth, independent, or external).
  - Describe Tier 1 QA/QC (routine checks)
  - Describe Tier 2 QA/QC (independent reviews, expert checks)
  - Explain verification (comparison with atmospheric measurements, models, EU ETS data)
- Documented evidence: Mention where QA/QC logs, checklists, and review comments are archived and how they can be traced.
- Use of review reports: State how UNFCCC and EU review recommendations are tracked and addressed (e.g. a table of recommendations and responses).
- Follow-up on findings: For each major QA/QC or review finding, indicate whether it led to a recalculation, method change, or planned improvement.
- The tables and other detailed information may be included in Annex IV]

Table 7: Example QA/QC activities table structure

Inventory cycle stage	*Activity*	*Quality objective*	*QA or QC*	*Responsible*

1.6 Uncertainty assessment

- As deemed appropriate by the country, include a theoretical description of what is understood by uncertainty pursuant to the *2006 IPCC Guidelines*[34]
- Present uncertainties for activity data, emission factors, and total emissions
- Present uncertainties by sector and key category
- Include the quantitative estimate AND
- Include qualitative discussion
- Explain assumptions and expert judgement
- Include a description of the general uncertainty assessment result at the country and sector level

[34] For more information, see Chapter 3, Volume 1, *2006 IPCC Guidelines*.

- Indicate how the general uncertainty assessment provides inputs for the improvement plan

Table 8: Example of a summary of uncertainties table structure (full Uncertainty table to be included in an Annex)

Category	*Gas*	*EF uncertainty*	*AD uncertainty*	*Combined uncertainty*	*Contribution to Variance by Category in Year t*	*Uncertainty introduced into the trend in total national emissions*

Time series consistency

- Describe how time series are harmonized *for the combination of different datasets or methods across the time series)
- Explain how structural breaks are handled
- Describe splicing techniques used
- Describe back-casting of data and emissions factors

1.7 General assessment of completeness

1.7.1 Information on completeness

- Include information on sources and sinks (categories, pools and gases) not estimated (NE) in the inventory but for which estimation methods are included in the IPCC guidelines also explain the reason for such exclusion.
- Include information on sources and sinks identified as included elsewhere (‘IE’).
- Include information on the geographical coverage of the inventory and identify if any territory was excluded from the inventory and the reason for such exclusion.
- Include how assessment of completeness may identify priorities for inventory improvement and capacity-building needs

Table 9: Example summary table for sources and sinks that are not estimated (‘NE’)

GHG	*Sector*	*GHG source and sink categories* *(CRT code)*	*Explanation or comment*

Table 10: Summary table for sources and sinks that are included elsewhere ('IE')

GHG	GHG source and sink categories	Allocation as per 2006 IPCC Guidelines	Allocation used by the country	Explanation or comment

1.7.2. Description of insignificant categories and Total aggregate emissions considered insignificant

- Include a detailed list of categories considered insignificant and their specific contribution.
- Include a description, using a table, of the total national aggregate for categories considered insignificant
- Include any conclusion or relevant aspect that the country may want to highlight

Treatment of confidential data

- Explain how confidentiality is protected
- Describe aggregation methods
- Provide justification for any withheld data
- Ensure transparency is preserved through proxy data or aggregated reporting.

Use of Models and Assumptions

To ensure transparency in the use of models it is *good practice* to document the following items (references should be made to existing model documentation and publications wherever possible):

- Basis and type of model (statistical, deterministic, process-based, empirical, etc.);
- Reasons for selecting the particular model;
- If an existing model is being used and adapted: Area of application of original model and adaptation of the model (description of why and how the model was adapted for conditions outside the originally intended domain of application);
- Main equations/processes;
- Material assumptions (important assumptions made in developing and applying the model);
- Domain of application (description of the range of conditions for which the model has been developed to apply). Model outputs should match the definitions and requirements of the IPCC Guidelines. ;
- How the model parameters were estimated;
- Description of key inputs and outputs;
- Details of calibration and evaluation with calibration data and independent data (showing intermediate outputs at an adequately disaggregated level);

- Description of the approach taken to the uncertainty analysis and to the sensitivity analysis, and the results of these analyses;
- QA/QC procedures adopted;
- Findings of QA by experts not involved in the model development;
- Interpretation of model results;
- Comparison of model results with lower tier approaches; It is not necessary to do this every year, but in establishing a model as part of a national inventory system, the impact of the model results compared with the lower tier approach should be considered. For example, a model may be able to better describe annual temporal changes and so better describe larger year-to-year variability: this would be averaged out in lower tiers.
- References to peer-reviewed literature (where details of the research on the model can be found).

Recalculations and improvements

- Provide a structured recalculation table with reasons and impacts.
- Quantify impacts on national totals. This could include a table of recalculations with: Category/Reason/Method change/Data change/Impact on time series

Improvements

- Provide a multi-year improvement plan with timelines and responsibilities.
- Link improvements to KCA and uncertainty.

Appendix D: Trends

Chapter 2. Trends in GHG emissions and removals

Most countries have made good progress in reporting aggregated emissions and removals under Chapter 2 of the NID. Therefore, this information may serve as a refinement or consolidation of elements that were previously missing or not fully addressed.

Chapter 2 demonstrates the overall direction of emission trends and the key changes over time. It should be clear, visually presented, and fully consistent with the Common Reporting Tables (CRT). The points below outline several suggestions to improve the transparency of Chapter 2.

- Start with a clear overview of total GHG trends: According to the MPGs[35] requirements, countries must report aggregated emissions and removals over the entire time series. This section should include:
  - The overall trend for the entire time series (usually from 1990 to the latest reporting year).
  - The total absolute and percentage change relative to the base year. However, avoid text that includes year specific values. Instead, refer to graphs and summary tables for specific values.
  - Support the descriptive information with graphs and summary tables.
- Present trends by main IPCC sectors:
  - Include a brief description of trends in each sector and highlight most significant categories influencing the overall trend. Include more general statements on key trends and importance of sectors/categories. Make use of key summary tables to present numerical information.
  - Highlight notable fluctuations, structural changes, or the effects of PaM implementation (e.g., energy system transformation, industrial restructuring, land-use changes). Focus the text on the real-world reasons for a trend and avoid speculating.
- Highlight the contribution of individual gases: the MPGs require reporting of CO_2, CH_4, N_2O, and F-gases separately and in total CO_2 equivalent.
  - Include trends by individual gases and reasons for changes in specific gases (e.g., reduction of CH_4 from waste, increase of SF_6 in the energy sector).

The description of aggregated trends and the numerical values reported should be consistent with the information reported in Chapters 3-9.

[35] Para 47 of the MPGs