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HANDBOOK FOR THE REVIEW OF NATIONAL GREENHOUSE GAS INVENTORIES

Contents

I. Introduction

1. Parties included in Annex I to the United Nations Framework Convention on Climate Change (UNFCCC) (hereinafter referred to as Annex I Parties), are required to submit their greenhouse gas (GHG) emissions inventories annually in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" (hereinafter referred to as the UNFCCC Annex I inventory reporting guidelines). Further, for Parties subject to the Kyoto Protocol (KP), additional supplementary information is reported annually in accordance with decision 3/CMP.11, annex II (Standard electronic format for reporting information on KP units), decision 15/CMP.1 in conjunction with 3/CMP.11 (Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol), decision 16/CMP.1 (Principle and definitions relating to land use, land-use change and forestry activities under the Kyoto Protocol), decision 2/CMP.6 (Forest Management Reference Level (FMRL) under the Kyoto Protocol) decision 19/CMP.1 in conjunction with decisions 3/CMP.11 and 4/CMP.11 (Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol), decision 2/CMP.7, annex (Definitions, modalities, rules and guidelines relating to land use, land-use change and forestry activities under the Kyoto Protocol), decision 2/CMP.8, annex II (Information on land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in annual greenhouse gas inventories) and decision 6/CMP.9 (Guidance for reporting information on land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol).

2. The inventory submissions of Annex I Parties are annually reviewed by expert review teams (ERTs), in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" (hereinafter referred to as the UNFCCC Annex I inventory review guidelines). For Parties subject to the Kyoto Protocol, reviews are also implemented following the Guidelines for review under Article 8 of the Kyoto Protocol (hereinafter referred to as the Article 8 review guidelines). The review under the Article 8 review guidelines encompasses any existing review under the Convention.

3. Review of GHG inventories is a complex process, which requires the use of a large amount of material, including submissions by the Parties, the UNFCCC Annex I inventory reporting guidelines and relevant decisions of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP), the UNFCCC Annex I inventory review guidelines and Article 8 review guidelines, the Intergovernmental Panel on Climate Change (IPCC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), the *2013 IPCC Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol* (hereinafter referred to as the KP Supplement) and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Wetlands Supplement).[1] However, the time available for the review is limited. To facilitate the review process, the UNFCCC secretariat has prepared various review tools and materials, including guidance and calculation tools to review trends and recalculations.

4. The scope of this review handbook is the process of conducting the annual GHG inventory reviews of Annex I Parties. Chapter II provides an overview of the review of GHG inventories and chapter III explains the activities, timing and deliverables during the review

[1] This document also refers to use of the "2006 IPCC Guidelines and its Supplements". This phrase is used to refer to the use of the 2006 Guidelines, in conjunction with, as appropriate, the KP Supplement and the Wetlands Supplement.

process. Chapters IV and V provide an overview of the most important tools and templates, respectively, used in the GHG inventory reviews. Chapter VI provides general guidance applicable to all reviewers and chapter VII includes sector-specific guidance, including guidance for the review of supplementary information under Article 7 of the Kyoto Protocol.

5. The objective of this review handbook is to be a concise, user-friendly tool to help guide review experts, particularly new experts, through the review process (before, during and after the review week). This review handbook is only intended as supporting material for the experts and it does not constitute any mandatory or legally applicable guidance. In a review, members of the ERT must consult the original UNFCCC decisions and the 2006 IPCC Guidelines and its Supplements.

Box 1-1

How to use the review handbook

As elaborated below, the review handbook is one of many tools or materials available to the expert review team (ERT) prior to the review cycle. These tools and materials are in addition to the review-specific material that an ERT should consider prior to the review (e.g. the common reporting format tables, the national inventory reports and the assessment reports for the Parties subject to review). So, where does this review handbook fit in among all the materials?

The review handbook can serve as a refresher on the UNFCCC decisions and guidelines, as well as the greenhouse gas inventory review training programme. Ideally, consideration of the review handbook by the ERT should be encouraged by the secretariat and lead reviewers, starting well in advance of the review weeks, particularly chapter III, so that the expectations, deliverables and the expected time commitments before, during and after the review week are known and accepted by the full ERT.

Approximately four to six weeks prior to the review, as review-specific materials start to be made available, the ERT should consider the specific tools and templates (chapters IV and V) and general and cross-cutting sections (chapter VI) to help prepare for their reviews. As the review progresses, and each ERT member starts focusing on the relevant sector assigned, the ERT may wish to focus on the relevant section of chapter VII to provide guidance on issues to consider and possible checks to carry out.

It is always important to remember that the review handbook, like other tools and materials, cannot replace, but rather supplements official UNFCCC decisions and guidelines

II. Overview of the review of greenhouse gas inventories

A. Objectives of the review

6. According to the UNFCCC Annex I inventory reporting guidelines (decision 24/CP.19, annex I), Annex I Parties are required to report an annual GHG inventory consisting of a national inventory report (NIR) and common reporting format (CRF) tables, from the base year to the latest reporting year (submission year minus 2). The methodologies used by the Parties must be in accordance with the 2006 IPCC Guidelines. Parties to the Kyoto Protocol are also required to report supplementary information under Article 7 of the Protocol, following the reporting guidelines in annex to decision 15/CMP.1 in conjunction with decision 3/CMP.11.

7. These inventory submissions are reviewed annually. The objective of the review under the Convention is to provide, in a facilitative, non-confrontational, open and transparent manner, a thorough, objective and comprehensive technical review of the inventory submissions. The objectiveness and comprehensiveness of the review will ensure that the Conference of the Parties (COP) has accurate, consistent and relevant information in order to review the implementation of the Convention. In the reviews, the ERTs must refrain from making any political judgement.

8. Another important objective of the review is to assist Annex I Parties in improving their inventories, which will facilitate the provision of consistent, transparent, comparable, accurate and complete information by Annex I Parties. The ERT may assist Annex I Parties in improving their inventories through constructive discussions with the Party experts and clear and focused findings and recommendations provided during the review.

9. The objectives of the reviews under the Kyoto Protocol are practically the same as those under the Convention, but also designed to provide relevant information to the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP). In addition to the review of GHG inventory information, the reviews under the Kyoto Protocol cover also the review of supplementary information under Article 7.

10. The review procedures (chapter III), tools (chapter IV), templates (chapter V), training of ERT members and guidance in chapters VI and VII of this handbook all aim at facilitating ERTs in meeting the review objectives.

B. Key roles of actors in the review process

11. The GHG inventory reviews are carried out by ERTs, which consist of two lead reviewers (LRs), at least one generalist and several sector experts. The UNFCCC secretariat invites experts nominated by Parties or by relevant intergovernmental organizations belonging to the UNFCCC roster of experts to participate in specific reviews. When inviting experts to the reviews, the secretariat takes into consideration that the collective skills and competencies of the ERTs cover all sectors under review. The secretariat also considers the balance between experts from Annex I Parties and from Parties not included in Annex I to the Convention (non-Annex I Parties), as well as geographical balance.

12. All the experts participating in the GHG inventory reviews must sign the "Agreement for Expert Review Services" before participating in a review. According to the agreement, each expert shall:

(a) Follow the relevant UNFCCC and IPCC guidance documents in the review;

(b) Perform the review duties in his or her personal capacity and in an objective, neutral and professional manner;

(c) Notify the secretariat of any known potential conflict of interest relating to the review activity in which the expert has been invited to participate;

(d) Work cooperatively with other ERT members;

(e) Not use the information provided by Parties under review and by the secretariat for purposes other than that specific inventory review or disclose any information acquired during the review;

(f) Protect any confidential information provided in the course of the review both during and after the term of service.

13. Training courses are organized by the secretariat to facilitate the knowledge of the ERT members on the UNFCCC Annex I inventory reporting guidelines and 2006 IPCC Guidelines. Training courses also cover the reporting and review under Articles 7 and 8 of the Kyoto Protocol, respectively (national systems, national registries and assigned amounts, application of adjustments, and activities under article 3, paragraphs 3 and 4 of the Kyoto Protocol (KP-LULUCF) as well as the use of the KP Supplement and the Wetlands Supplement). New review experts must pass the general examination as well as an examination for their respective sector before participating in a review (see decision 14/CP.20 (Convention) and decision 5/CMP.11 (Kyoto Protocol).

Box 2-1
Training courses

Following decision 14/CP.20, existing reviewer training courses were updated to reflect the new UNFCCC Annex I inventory reporting guidelines and 2006 IPCC Guidelines. All review experts, including experienced experts and lead reviewers, are encouraged to participate in the online training courses. In addition to the general and sector-specific courses, the training programme includes courses on review of complex models and higher-tier methods and on improving communication and facilitating consensus in expert review teams. For the latest training offerings, please refer to the UNFCCC website.[2]

14. In the review, the ERT is supported by the secretariat. The roles of the key actors in the review process are summarized in table 2-1. More detailed timelines on actions by each actor, along with the particular role each actor plays in ensuring the quality of the final report, are provided in chapter III of this handbook.

Table 2-1
Main actors in the review process

Actor	*Role*
Lead reviewer (LR)	Member of the ERT coordinating the review work. There are two LRs in an ERT, one from an Annex I Party and one from a non-Annex I Party. All LRs are also sector experts or generalists. The LR tasks are to: (a) Ensure that the reviewers have all the necessary information provided by the secretariat prior to the review (b) Monitor the progress of the review (c) Coordinate the submission of queries of the ERT to the Party under review and coordinate the inclusion of the answers in the ARR;

[2] https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/training-of-review-experts/training-programmes-for-the-review-of-information-submitted-by-annex-i-parties.

Overview of the review of greenhouse gas inventories

Actor	*Role*
	(d) Provide technical advice to the members of the ERT, if needed (e) Ensure that the review is performed and the ARR is prepared in accordance with the UNFCCC Annex I inventory review guidelines and the Article 8 review guidelines (f) Ensure that the ERT gives priority to issues raised in previous ARRs
Sector expert	Member of the ERT responsible for the review of a specific sector (energy, IPPU, agriculture, LULUCF or waste) in accordance with the UNFCCC Annex I inventory review guidelines
Generalist	Member of the ERT responsible for the review of inventory cross-cutting elements in accordance with the UNFCCC Annex I inventory review guidelines
Review officer (RO)	The UNFCCC officer supporting the review by the ERT. The RO distributes the relevant material to the ERT, supports LRs in the coordination of the review work, coordinates the communication between the Party and the ERT, provides any requested technical support to the ERT, and supports the ERT in the compilation of the ARR

Abbreviations: ARR = annual review report, ERT = expert review team, IPPU = industrial processes and product use, LRs = lead reviewers, LULUCF = land use, land use change and forestry, QA= quality assurance, QC = quality control, RO = review officer, UNFCCC Annex I inventory review guidelines = Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention.Key guidance documents in the review.

15. The **UNFCCC Annex I inventory reporting guidelines.** During the review process, the ERT must compare the Parties' reporting against the requirements in these guidelines. For further information and additional cross-cutting and sector-specific checks, see chapters VI and VII below.

16. **The 2006 IPCC Guidelines.** In the review, the ERT uses the 2006 IPCC Guidelines and its Supplements to assess whether the methodologies, choice of emission factors (EFs) and other parameters, collection of activity data (AD) and cross-cutting inventory elements (e.g. documentation, quality assurance/quality control (QA/QC), uncertainties) are in accordance with the relevant sections of the 2006 IPCC Guidelines and its Supplements.

17. **The UNFCCC Annex I inventory review guidelines.** In addition to the establishment of the procedures and timelines for the review, they also provide detailed guidance on the review scope (see chapter VI.A).

18. **A review under the Kyoto Protocol** encompasses the review under the Convention (see chapter II.D below). The main additional documents used in KP reviews are:

(a) **Article 7 reporting guidelines**, i.e. Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (annex to decision 15/CMP.1 in conjunction with decision 3/CMP.11);

(b) **Guidelines for national systems** under Article 5, paragraph 1, of the Kyoto Protocol (annex to decision 19/CMP.1, in conjunction with decisions 3/CMP.11 and 4/CMP.11);

(c) **Article 8 review guidelines**, i.e. Guidelines for review under Article 8 of the Kyoto Protocol (annex to decision 22/CMP.1 in conjunction with decision 4/CMP.11);

(d) **Good practice guidance and adjustments** under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with 4/CMP.11);

(e) **CMP decisions concerning land use, land-use change and forestry** (2/CMP.6, 2/CMP.7, 18/CMP.1 in conjunction with 3/CMP.11 and 4/CMP.11, 2/CMP.8 annex II, and 6/CMP.9);

(f) **KP Supplement**, i.e. 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol;

(g) **Wetlands Supplement,** i.e. *2013 Supplement to the 2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories: Wetlands*.

19. **Article 7 reporting guidelines.** During the review process, the ERT must compare the Parties' reporting against the reporting requirements included in these guidelines. This includes reporting of improvements related to areas previously adjusted; reporting on KP-LULUCF; information on KP units[3]; changes in national systems; changes in national registries, and information on minimization of adverse impacts in accordance with Article 3, paragraph 14 (or changes thereof).

20. **Guidelines for national systems.** During the review process, the ERTs will assess whether the Parties' national systems are established and function in accordance with these guidelines. In particular, the ERTs may identify linkages between inventory problems and requirements for general and specific functions of national systems.

21. **Article 8 review guidelines**. The review process under the Kyoto Protocol follows these review guidelines, which establish the review objectives, approach, timing, procedures and scope.

22. **Good practice guidance and adjustments under Article 5, paragraph 2**. In the event that the ERT commences an adjustment procedure, it will follow these guidelines, which define the adjustment procedure, choice of methods and data sources for adjustments, and the approach for ensuring conservativeness of adjusted estimates.

23. **CMP decisions concerning land use, land-use change and forestry**. During the review process, the ERT must compare the Parties' reporting against the reporting and accounting requirements set by those CMP decisions. This includes changes in the national system for the implementation of the natural disturbance provision, for the carbon equivalent forests, for the identification of land under the new activities and for tracking land from the first commitment period through to the second commitment period, where needed, as well as reporting for the harvested wood products (HWP) pool and for the technical corrections of the FMRL.

24. **The Kyoto Protocol Supplement.** In the KP-LULUCF review the ERT uses the KP Supplement in conjunction with the 2006 IPCC Guidelines to assess whether the methodologies, choice of EFs and other parameters, collection of AD and cross-cutting inventory elements (e.g. documentation, QA/QC, time series consistency (including consistency of the FMRL), uncertainties) are in accordance with the relevant guidance.

25. **The Wetlands Supplement.** In the case where the Party has elected the activity wetlands drainage and rewetting (WDR) or it has applied the guidance[4] provided in the

[3] KP units are as follows: emission reduction units, certified emission reductions units, temporary certified emission reduction units, long-term certified emission reduction units, assigned amount units and removal units.

[4] This includes also the use of the emission factors and parameters provided in the Wetlands Supplements in conjunction with methods provided in the 2006 IPCC Guidelines.

Wetlands Supplement, in the KP-LULUCF review the ERT uses the Wetlands Supplement in conjunction with the KP Supplement and the 2006 IPCC Guidelines to assess whether the methodologies, choice of EFs and other parameters, collection of AD and cross-cutting inventory elements (e.g. documentation, QA/QC, time series consistency (including consistency of the FMRL), uncertainties) are in accordance with the relevant guidance.

26. **Other COP decisions and conclusions of the Subsidiary Body for Scientific and Technological Advice** provide additional guidance for the review, in particular, the "Code of practice for the treatment of confidential information in the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention"[5] and the training programme for GHG inventory review experts.[6] Finally, the conclusions from the annual meetings of LRs[7] provide additional guidance for the reviews. Even though not strictly mandatory, following any recommendations from the LR meetings is important to ensure the consistency of reviews across ERTs.

27. A compilation of the key decisions relevant for the KP reviews under the second commitment period (CP2) is available at the UNFCCC website (see box 2-2 below).

Box 2-2
Decisions for reporting and review under CP2

Several of the decisions to be used in the review under the Kyoto Protocol were originally agreed in the first conference of the Parties serving as meeting of the Parties under the Kyoto Protocol, i.e. CMP.1. Such decisions include 15/CMP.1, 20/CMP.1 and 22/CMP.1. In CMP.11, in 2015, several of those decisions were revised or updated to be used in CP2 of the Kyoto Protocol. The revisions to the original decisions are included mainly in decisions 3/CMP.11 and 4/CMP.11. The secretariat has prepared a user-friendly compilation of the decisions for CP2. For example, it includes the updated Article 7 reporting guidelines, i.e. decision 15/CMP.1 in conjunction with 3/CMP.11, and updated Article 8 review guidelines, i.e. decision 22/CMP.1 in conjunction with decisions 3 and 4/CMP.11. The compilation can be accessed at:

http://unfccc.int/files/ghg_data/kp_data_unfccc/compilation_and_accounting_data/application/pdf/compilation_cmp_decisions_for_2nd_commitment_period_v01.06_with_convention_6_july17.pdf.

C. Major differences between reviews under the Convention and the Kyoto Protocol

28. Reviews under the Kyoto Protocol include, in addition to the review of information submitted under the Convention, the review of the supplementary information under Article 7 of the Kyoto Protocol. This includes:

(a) KP-LULUCF (see section VII.H);

(b) National systems and changes thereof (see section VII.B.2);

(c) National registries, changes thereof and information on KP units[8] (see section VII.B.4);

(d) Commitment period reserve (see section VII.B.5);

[5] Decision 12/CP.9, annex II.

[6] Decision 14/CP.20.

[7] Available at: http://unfccc.int/national_reports/annex_i_ghg_inventories/review_process/items/2762.php.

[8] Emission reduction units, certified emission reductions, temporary certified emission reductions, long-term certified emission reductions, assigned amount units and removal units.

(e) Information on minimization of adverse impacts in accordance with article 3, paragraph 14 (see section VII.B.6).

29. Under the Convention, the ERT is tasked with identifying issues. According to paragraph 81 of the UNFCCC Annex I inventory review guidelines, an "issue" is defined as a failure to follow the requirements and definitions in the UNFCCC Annex I inventory reporting guidelines. These same issues are classified as "problems" under the Kyoto Protocol (paragraph 69 of the Article 8 review guidelines). Problems also may be identified with a Party's reporting of supplementary information under Article 7 of the Kyoto Protocol. Issues/problems can be further classified into one of the following categories: transparency, accuracy, consistency, comparability, completeness or adherence to the UNFCCC Annex I inventory reporting guidelines (see section V.D).

30. If a problem identified by the ERT, having an impact on the fulfilment of the commitments by the Party, remains unresolved at the end of the review week, the ERT will list such problems in the 'Saturday paper' (see box 3-2), including guidance on how the Party may resolve the identified problems within the time-frame of six weeks.

31. If the inventory problems remain unresolved after the six-week period, the ERT will commence the adjustments procedure following the 'Good practice guidance and adjustments under Article 5, paragraph 2, of the Kyoto Protocol' (decision 20/CMP.1) as modified by decision 4/CMP.11. The adjustment calculations will be documented in the annual review report (ARR) (see section V.D). The adjustments are to be calculated in close cooperation with the Party. In the event that the Party and the ERT disagree on the adjustment, the issue will be forwarded to the Compliance Committee.

32. If an unresolved problem pertaining to language of a mandatory nature and influencing the fulfilment of commitments remains at the end of the review, including problems related to inventory issues which may not have been subject to adjustment (e.g. problems of the national system), the ERT will raise a question of implementation in the ARR.

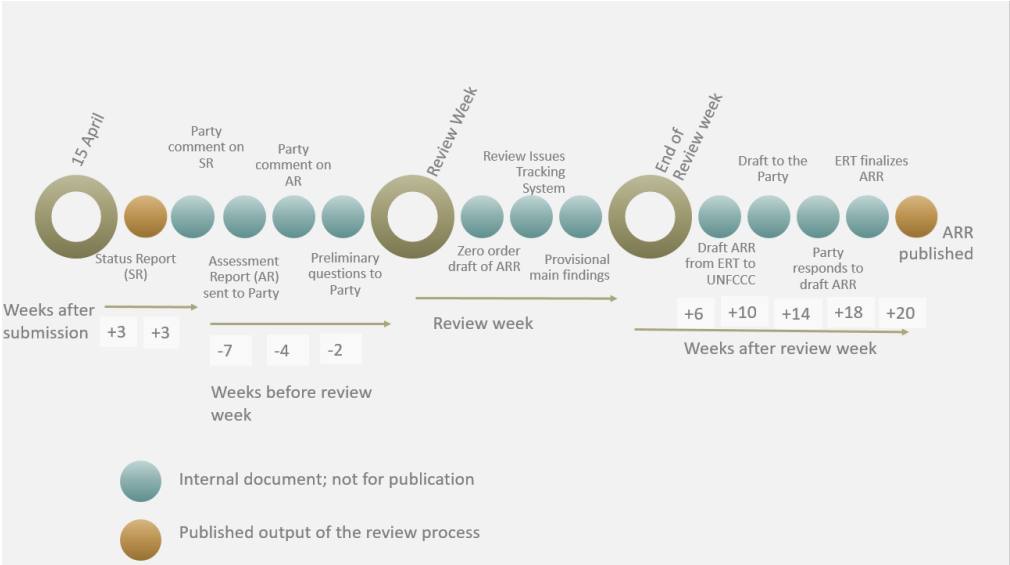
33. All the ARRs from KP reviews, including any questions of implementation or adjustments, if appropriate, will be forwarded to the Compliance Committee. The Compliance Committee may also request technical assistance from the ERT in resolving any remaining problems or disagreement between the Party and the ERT.

III. Activities, timing and deliverables during the review process

A. Overview of review process

34. A summary of the key deadlines and deliverables in the review process is provided in Figure 3-1 below.

Figure 3-1
Overall timing of the review process



35. The annual technical review process comprises two stages:

(a) Initial assessment by the secretariat;

(b) Review of individual annual inventories by the ERT.

36. The initial assessment by the secretariat includes an assessment of the consistency and completeness of the submission and a standardized set of data comparisons mainly based on the CRF data. The results of the initial assessment are a status report and an assessment report, which serve as a starting point for the individual review. The results of the initial assessment, including the comments from the Party concerned, are forwarded to the ERT. The coverage of the initial assessment and guidance for its use by the ERT is explained in the tables in chapter VI.B.

37. The review of the individual annual inventory by the ERT has three phases: preparation prior to the review week, the review week (six working days) and the finalization of the ARR after the review week. The main deliverables of the review are listed in table 3-1. The efficiency of the review process and the consistency of the review are promoted by using a specific template for each of the deliverables. All of the review outputs are stored in a GHG inventory virtual team room (iVTR) (see chapter IV.A). Each of the review phases is explained more thoroughly in chapters III.B–D.

Table 3-1
Main deliverables of the review process and the related templates

Deliverable	*Description*	Template and *chapter reference*
Review Issues Tracking System (RITS)	The RITS was designed as a database repository of the communications that happened between the ERT and the Party during the review, together with the ERT's assessment of the issues discussed. It may highlight discussions that took place during the review, but were determined ultimately not to lead to an issue, and therefore not be reflected in the published ARR. The structure and use of the RITS continues to evolve so you should check with your RO for the latest procedures for using the RITS.	Review issues tracking system, (see section V.A)
Provisional main findings (PMF)	At the end of the review week, the ERT develops a list of PMF, identifying the findings/issues and possible encouragements or recommendations. The Party has an opportunity to provide comments and clarifications on these preliminary findings by the ERT. These findings serve as a basis for the final ARR and may be a useful tool for the Party in its inventory planning process	PMF (see section V.B)
Comment response document	The Party subject to review has four weeks to provide written comments to the draft ARR produced by the ERT. The ERT must consider these comments and provide a written response to the Party indicating if, and if so how, the ERT intends to reflect the comment(s) in the final version of the ARR. In its response, the ERT should include the rationale for its decision	Comment response (see section V.C)
Annual review report (ARR)	The ARR is the main output of the review process, and includes the ERT's assessment of the Party's inventory and provides any recommendations or encouragements for further improvement. The ARR is the only deliverable by the ERT made publicly available through the UNFCCC website	ARR (see section V.D)
Saturday Paper (SP)	If, at the end of the review week, the ERT identifies unresolved potential problems (which may lead to adjustment or question of implementation), it will include those issues in a 'Saturday paper' which is sent to the Party on Saturday of the review week. The Saturday paper also includes guidance to the Party regarding how it can resolve those issues within the time-frame of six weeks	SP template (see section V.E)

Abbreviations: ARR = annual review report, ERT = expert review team, GHG = greenhouse gas, RITS = review issues tracking system, SP = Saturday Paper, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

38. Three operational approaches may be used for the review week: desk reviews (DR), centralized reviews (CR) and in-country reviews (ICRs). In a **DR**, the inventory information of Annex I Parties will be sent to experts, who will conduct the review in their own countries. During a **CR**, the experts will meet in a single location, usually in Bonn, to review the inventory information of Annex I Parties. Owing to easy interaction and availability of support from experienced experts, LRs and the RO, a CR is often the first review in which

new experts participate. During an **ICR**, experts will visit an Annex I Party to review the inventory information of that Party. These review approaches are compared in table 3-2.

39. The differences in the scope of these review approaches are presented in chapter VI.A. In all of the review approaches, the preparation prior to the review (see chapter III.B) and the finalization of the review after the review week (see chapter III.D) are similar. The main differences occur in the composition of the ERT, in communication among the ERT members and between the ERT and the Party during the review week, and in the structure of the ARR template.

40. An ERT of a CR typically has three to four GHG inventories to review, and there are at least two experts per sector. There are different options for sharing the work among ERT members. For example, if there are four countries and two agriculture experts, both experts could have primary responsibility for the review of two Parties and have a supporting role for the other two. Experts could also decide to divide by category, so in the previous example, one expert might review enteric fermentation and manure management for all four Parties while the other agriculture expert would review the remaining categories. The exact roles and responsibilities of each ERT member should be decided early in the process (usually 2 to 4 weeks before the review week), with explicit agreement among the relevant experts and the LRs. However, it is important to keep in mind that the outcome of the review is the shared responsibility of the entire ERT, and the published ARR will not include information on the division of tasks among the sector experts.

Table 3-2
Characteristics of desk reviews, centralized reviews and in-country reviews

Element	*Desk review*	*Centralized review*	*In-country review*
Typical composition of the ERT[a]	One to two experts per sector; only experienced experts	Two to three experts per sector	One expert per sector, generally experienced
Typical number of Parties reviewed	One to two	Three to four	One
Location	Each expert's home office	Bonn	Party under review
Communication among the ERT during the review week	E-mail, iVTR, phone/videoconferences	In person, through the iVTR	
Communication with the Party during the review week	E-mail/GHG VTR, phone conferences if needed		In person, through e-mail/iVTR
Main deliverables before the review week	(a) Preliminary questions to Party (b) Draft populated RITS (if applicable) (c) Draft ARR		

Activities, timing and deliverables during the review process

Element	*Desk review*	*Centralized review*	*In-country review*
Main deliverables at the end of the review week	(a) Completion of the relevant sector assessment and findings for the ARR and a consolidated zero-order draft of the ARR in the "report preparation" module of the iVTR (b) PMF (c) Saturday paper in KP reviews, if applicable		(a) Completion of the relevant sector assessment and findings for the ARR and a consolidated zero-order draft of the ARR in the "report preparation" module of the iVTR (b) PMF (c) Oral presentation on main findings and recommendations (d) Saturday paper in KP reviews, if applicable
Main deliverables after the review week	(a) Finalized ARR (b) Comment response document addressing the Party's comments on the draft ARR (c) ERT's consideration of the Party's Saturday paper response in KP reviews, if applicable		

Abbreviations: ARR = annual review report, ERT = expert review team, i-VTR = greenhouse gas virtual team room, KP = Kyoto Protocol, PMF= provisional main findings; RITS = review issues tracking system, SP = Saturday Paper.

[a] Depends on the number of Parties reviewed.

41. All the review outputs included in table 3-1 are subject to some form of QA/QC, the nature of the QA/QC undertaken depends on the deliverable (e.g. while the ARR is subject to QA/QC by the RO and the UNFCCC quality officer (QO), the ERT comments on the Party's response to the Saturday Paper may only be considered by the ERT and the RO). Quality of the review is of the utmost importance to ensure that reviews are performed according to the UNFCCC Annex I inventory review guidelines and particularly part III, "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" and the Article 8 review guidelines. A continual focus on QA/QC also contributes to the efficiency and timeliness of the review process: when the outputs (such as questions and draft ARR) are clear and free of errors, the time needed for clarifications throughout the process is significantly reduced. Different actors interact in the review process to ensure the quality of the review (figure 3-2). The role of QC in different phases of the review is illustrated in the QC loops shown in the figures below.

Figure 3-2
Main actors in ensuring quality of the review

42. **LRs:** Ensure that the reviews in which they participate are performed according to the UNFCCC Annex I inventory review guidelines and/or Article 8 review guidelines and are consistent across Annex I Parties. In practice, this can be difficult because the LRs are only directly involved in the review of a limited number of Parties. However, consistency among reviews can be enhanced by engaging in discussions among LRs during the annual meetings, and with the help of the secretariat. LRs should also ensure the quality and objectivity of the thorough and comprehensive technical examinations of the reviews and provide for the continuity, comparability and timeliness of the reviews.[9] The LRs ensure quality, for example by carrying out QC checks of preliminary and follow-up questions and of the draft ARR, in particular, by checking that questions and ARR text are clear, factually correct and contribute to comparability of the reviews.

43. **Parties.** Provide transparent responses to review questions in a timely manner. They respond to the draft ARR, and in doing so, comment on issues related to the accuracy and consistency of the findings.

44. **ERTs.** Are responsible for performing the review in accordance with the procedures and time frames established in the relevant inventory review guidelines to ensure that the COP/CMP have accurate, consistent and relevant information on annual GHG inventories.[10] The ERT members promote quality, for example by ensuring that the questions and ARR text that they produce are clear and factually correct, and by interacting with their co-reviewers in the same sector going through the preliminary and follow-up questions and the draft ARR text.

45. **Secretariat.** Ensures consistent identification and treatment of issues across ERTs by providing technical and administrative support and information to LRs and ERTs, supporting LRs in the QC of preliminary and follow-up questions and providing the QA/QC of the ARR at different phases. The secretariat provides QA/QC through both the RO, as well as a designated QO. The QO is separate from the RO and carries out QA of the draft ARR before it is submitted to the Party. In addition, the draft ARRs are reviewed by professional editors prior to submission to the Party and again are proofread prior to final publication.

9 Paragraph 42 of the UNFCCC Annex I inventory review guidelines.
10 Paragraphs 5(a) and 58(b) of the UNFCCC Annex I inventory review guidelines.

B. Preparation prior to the review week

46. It is essential that LRs and the ERT are ready for the review week. This preparatory phase is probably the most important step in ensuring the success of the review week and the overall review process. Timely preparation for the review allows the ERT to send clarifying questions to the Party before the review week and allows the Party to explore the findings and issues identified and to provide well-elaborated responses, which facilitates further work of the ERT. Good preparation means that the limited time available during the review week can be spent on further interacting with the Party and the sectoral co-reviewer, and on drafting the ARR.

47. The review starts with the distribution of the review package by the UNFCCC secretariat to the ERT through the iVTR (see table 3-3) and, if applicable, with the division of the tasks (e.g. Parties to be reviewed) among ERT members. The review package includes, for each Party under review:

(a) NIRs, CRF tables and other information in the current submission(s) and two earlier submissions;

(b) Status report for the current year;

(c) Review transcript and/or AR for the previous year;

(d) The RITS

(e) ARR template pre-filled with factual information;

(f) ARRs of the two previous years;

(g) Review of the Report to Facilitiate the Calculation of the Assigned Amount (also referred to as the Initial Review Report).

48. The review package includes also background material common to the review of all Parties:

(a) Relevant UNFCCC decisions under the Convention and the Kyoto Protocol;

(b) Relevant IPCC guidance documents, including the 2006 IPCC Guidelines, the KP Supplement and the Wetlands Supplement);

(c) Recommendations from LR meetings;

(d) Review tools with data for all Parties, such as the Locator;

(e) General guidance documents such as this Review Handbook;

(f) LR QC checklist.

49. Before the review week starts, the experts are expected to go through the Party's submission (NIR and CRF tables) and the findings of the initial assessment, including the Party's response, clearly identifying questions to follow up with the Party (see chapter VI on review priorities). The main deliverable of this step is a list of preliminary questions to be sent to the Party, through the iVTR, two weeks before the review begins (see figure 3-3). This list should be as comprehensive as possible, while being clear and precise; providing all actors an insight into the potential issues to be discussed during the review process (please refer to box 3-1 for considerations in drafting questions). The preliminary questions are subject to a QC loop as elaborated in figure 3-3. In addition to the review of the Party's submission and preparation of the questions, the ERT members also start recording review observations, questions and answers in the RITS (if used) and may start drafting sectoral parts of the ARR, as highlighted in table 3-3.

Box 3-1
How to draft questions to the Party

Effective communication between the ERT and the Party is one key to a successful review process. Although the questions and answers sent back and forth between the ERT and the Party are never made public, nor are they considered a formal deliverable of the process, it is important that the ERT makes the necessary effort to ensure the communications are clear and concise.

Before sending a question to the Party, the ERT (through the Lead Reviewers) should consider the following:

(a) Is the question drafted in a clear and concise manner (i.e. free from ambiguity) so that the Party understands the underlying issue? For example, is it clear to the Party to which category, gas and years the question refers? Is it clear where in the NIR/CRF tables the ERT has identified the problem? Is it clear to the Party to which reporting requirement in the relevant guidelines or decisions the question refers? It is not necessary to always specify the reporting requirement; however, it is recommended to do so in case it may not be evident for the Party what the relevant requirement is;

(b) Does the question convey a polite and neutral tone, asking a question and not suggesting or prejudging the ERT's final recommendation?

(c) Have all related answers already provided by the Party been reviewed to ensure that the same question is not asked twice?

(d) Have any follow-up questions been clearly linked to the original question and the Party's subsequent response(s)?

Examples of well-phrased and poorly phrased questions

Poorly phrased		*Well phrased*	
Question	**Why?**	**Question**	**Why?**
The emission factor (EF) for solid fuels used in households is lower than that used by other countries. Please explain why	(a) The ERT is using terminology not used in the UNFCCC Annex I inventory reporting guidelines (b) The gas and year is not specified (c) The ERT is asking the Party to explain why an EF is different from that used by other Parties. In principle, the Party is not required to know that; instead, the ERT should use the identified difference as an indication of a problem	The ERT noted that, for 1990–2014, the CO_2 IEF for solid fuels reported for the category residential – stationary combustion (1.A.4.b.i), 72.2–75.3 t CO_2/TJ, is lower than the values reported by other Parties. Which fuels are reported under solid fuels for the category? Which EFs are used and what are the sources of those EFs? It would also be helpful if you could send the fuel use by fuel type, for example for 2014	(a) Question is specific (gas, category, years) (b) The ERT is asking the Party only to explain issues related to its own submission (c) The ERT is trying to think in advance the rationale for the low EF (fuel mix or sources of EFs) and elaborates the questions on that basis

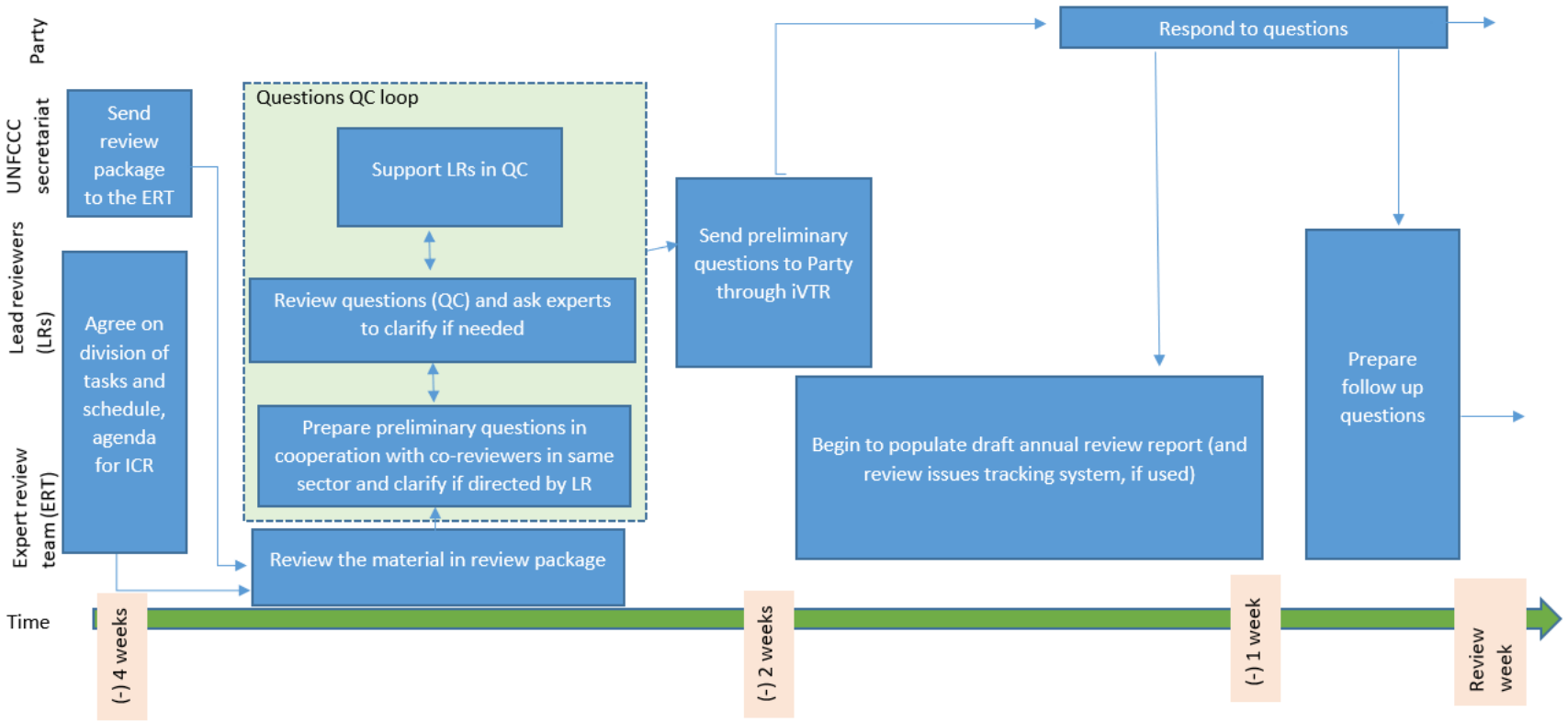
Poorly phrased		*Well phrased*	
Question	**Why?**	**Question**	**Why?**
You have not changed the method for enteric fermentation even though the need to move to tier 2 was discussed during the in-country review two years ago. When will you move to tier 2?	(a) The question is not specific, as the subcategory is not indicated (b) The ERT is not giving the Party a chance to explain (e.g. based on national circumstances) why it has not implemented the recommendation or whether it is addressing the recommendation (c) The ERT is suggesting the final recommendation	The ERT noted that in ARR 2013, paragraph 14, the previous ERT recommended that you implement a tier 2 method for enteric fermentation of cattle. The present ERT noted that tier 1 is still used, and did not identify any indication in the NIR regarding whether you have plans to move to a tier 2 method. Could you elaborate on the current status of addressing the recommendation? Are you planning to move to tier 2 and if so, when? Please elaborate on any possible constraints, such as availability of data, knowledge or resources	(a) The question is specific to the category and references a specific ARR recommendation (b) The ERT is not suggesting the outcome but giving the Party a chance to explain the situation (c) The ERT is trying to anticipate the Party response and potential follow-up questions in order to save time
In the NIR the N_2O EFs for composted waste are presented as kg N_2O/t wet waste. The ERT recommends that these values are converted to g N_2O/kg dm in line with the CRF tables	(a) The question does not specify where in the NIR the problematic value was found (b) There is no question (just a recommendation), so the Party may not understand that the ERT is expecting a response	In NIR table 7.20, N_2O EFs for composting are provided in the unit kg N_2O/t wet waste. Dry-matter fractions are not reported. The disaggregation of waste types is different from that provided in CRF table 5.B, in which the IEF is presented as g N_2O/kg dry matter. The ERT finds there is lack of transparency in NIR table 7.20 on how emissions in CRF table 5.B are derived using country-specific EFs. The ERT would like to receive information on: (1) the applied dry-matter contents for waste fractions included in NIR table 7.20 and (2) which waste fractions in NIR table 7.20 are allocated to each subcategory in CRF table 5.B	(a) The question specifies where in the NIR the problematic value was found (b) The question specifies why the ERT is asking for more information (replication of the calculation) (c) The question asks for additional information that would allow the ERT to replicate the calculation
Poorly phrased		*Well phrased*	
Question	**Why?**	**Question**	**Why?**

Activities, timing and deliverables during the review process

Why is the QA/QC plan not included in the NIR as an annex?	(a) The question has a harsh tone and could sound argumentative to the Party (b) The question suggests that the Party has not met a requirement, but there is no such requirement in the UNFCCC Annex I inventory reporting guidelines (c) The response from the Party may not provide the information the ERT needs for its review	According to the UNFCCC Annex I inventory reporting guidelines Annex I Parties shall report in the NIR on their QA/QC plan and give information on QA/QC procedures already implemented or to be implemented in the future. The ERT did not find this information in the NIR. Do you have a QA/QC plan in place? If so, could you please provide the plan to the ERT or a short summary of it? Which QA/QC procedures were implemented in the current submission? Please provide some evidence on QA/QC activities undertaken (such as checklists)	(a) The question refers to a reporting requirement (b) The question is posed in such a way as to generate a response which will likely allow the ERT to determine whether the Party's QA/QC procedures are in line with the UNFCCC Annex I inventory reporting guidelines

Abbreviations: ARR = annual review report, CRF = common reporting format, EF = emission factor, ERT = expert review team, IEF = implied emission factor, NIR = national inventory report, QA/QC = quality assurance /quality control, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

Figure 3-3
Main preparation steps prior to the review week



Note: Parties are expected to respond to questions before the review week starts. If the Party responds early, the expert review team can work with the responses and start preparation of follow-up questions before the review week starts (dashed lines), following the same quality control loop as in preliminary questions.

Table 3-3
Key actions of the expert review team, lead reviewers and review officer prior to the review week

Task	*Lead reviewers*	*ERT members*	*Review officer*
Division of tasks	Initiate the division of tasks to allow start of the review work. LRs may make a proposal on the distribution of the main responsibilities by Party among members of the ERT, taking into account experience and, if the NIR is submitted in a language other than English, language abilities. For example, if there are three Parties to be reviewed and four energy experts, the LRs may propose that the most experienced expert take the lead for the review of two Parties, whereas the other two experts are primarily responsible for the review of one Party and hold secondary responsibility for two Parties each. In KP reviews, the LRs will suggest also division of tasks related to review of supplementary information under Article 7	Agree with LRs and co-experts in the same sector on the division of tasks	Inform the ERT (through an introductory e-mail) about the Parties to be reviewed, and the composition of the ERT (in particular, the number of experts by sector)

Activities, timing and deliverables during the review process

Task	*Lead reviewers*	*ERT members*	*Review officer*
Schedule	Make and communicate a schedule to the ERT for the work prior to the review week, including: (a) The QC process for preliminary questions, taking into account the time required for sector experts to provide comments on each other's questions, and the time required by the LRs to conduct QC on the questions and ask for clarification from experts, if needed (b) Timing of teleconferences, as needed (c) Deadline for other deliverables, such as the draft ARR (d) For an ICR, support the agreement of an agenda for the review week	Inform the LRs in case of unavailability in specific time periods prior to the review week, and agree on alternative deadlines ensuring that the overall deadlines are not compromised	(a) Inform LRs about the overall schedule prior to the review week and support them in planning (b) In the case of an ICR, support the Party and the ERT in drafting and agreeing to an agenda for the review week
Review package	Encourage the ERT members to start their work as soon as possible. In the event that all materials are not yet available (e.g. assessment report) preliminary work can still be initiated with publicly available information (e.g. the CRF tables and NIR available on the UNFCCC website) and focusing on issues raised in previous review reports	Fully carry out the review following the priorities listed in chapter VI of this handbook. Even though the ERT will go back to the review package materials during, and possibly also after, the review week, it is essential that the review materials be fully reviewed before the review week in order to identify early potential issues. This will allow sufficient time for the clarification of any remaining issues with the Party	(a) Upload the review package to the iVTR approximately four weeks prior to the review week (b) Communicate to the ERT on any delay for individual documents

Activities, timing and deliverables during the review process

Task	*Lead reviewers*	*ERT members*	*Review officer*
Tele-conference/video-conference	Organize teleconference(s) or videoconference(s) by providing an agenda and giving guidance to the ERT on how to prepare for the meeting. In a centralized review, ERTs include approximately 15 experts, and in such a case it may be useful to have two to three meetings. However, it is useful for the LRs and generalist(s) to participate in each meeting. Such meetings can be arranged either before the preliminary questions have been sent to Parties or after. These meetings are a good occasion for the ERT members to get acquainted, ask for clarifications on the process and share any common findings on the submissions of the Parties under review	Prepare for, and participate in, the teleconference or videoconference, sharing information on progress, main findings/issues, etc., as directed by the LRs	Assist the LRs in organizing pre-review week teleconference(s) or videoconference(s). Provide any required technical and substantial support during the meeting in order to contribute to the understanding of the review process and the deliverables
Preliminary questions	(a) Conduct QC of questions. Check that any questions are clear (e.g. clearly specify the category, gas and year and, if referring to the 2006 IPCC Guidelines or its Supplements, the relevant page or equation number), non-confrontational and factually correct. Ask the experts to clarify questions, if needed (b) Approve the questions in the iVTR and send to the RO for approval and submission to the Party (c) If Parties respond before the review week, encourage the ERT to analyse the answers and draft follow-up questions, as necessary, following the QC loop or, if the issue is resolved, draft the findings for the ARR (and the RITS, if used)	(a) Draft questions to the Parties through the iVTR on any observations which need further clarification (see box 3-1 and chapter VI for further guidance). Communicate with co-experts in the same sector and with LRs (QC loop) (b) If Parties respond before the review week, analyse the answers and, as appropriate, fill in the draft ARR text in the report preparation module of the iVTR (and RITS, if used), or draft follow-up questions, following the QC loop	(a) Assist the LRs in the QC of preliminary questions (b) Once questions are approved by LRs in the iVTR, approve the questions in the iVTR for submission to the Party

Activities, timing and deliverables during the review process

Task	*Lead reviewers*	*ERT members*	*Review officer*
RITS **(see chapter V.A)**	Guide the ERT in the use of the RITS, taking into account any guidance from the secretariat	For those ERT members using the RITS: (a) Go through the Party's responses to the assessment report and populate the issues and the Party's responses in the RITS. Mark assessment report observations as resolved, unresolved, or addressing. If unresolved or 'addressing', determine if a follow-up question to the Party is needed (b) Record all other observations, questions to the Party and responses received in the RITS. As the review progresses, continue to classify review observations as resolved, unresolved, or addressing (c) The RITS includes two rows to prepare draft text for the ARR (one entry for describing the finding and a separate entry for inclusion of the recommendation or encouragement). As issues/findings are finalized, if they are to be included in the draft ARR for publication, complete the appropriate row of the RITS	Provide support to the ERT in using the RITS
Draft ARR (see chapter V.D)	Recommend that the ERT start early preparation of the ARR. Provide support to the ERT in drafting of ARR text	Prepare the text of the draft ARR in the report preparation module of the iVTR as work progresses, for example by drafting a paragraph for each observation which does not need further interaction with the Party	Ensure that the review package includes the pre-filled ARR template. Provide support to the ERT in using the template

Abbreviations: ARR = annual review report, CRF = common reporting format, ERT = expert review team, iVTR = greenhouse gas virtual team room, ICR = in- country review, LR = lead reviewer, NIR = national inventory report, QC =- quality control, RITS = review issues tracking system, RO = review officer.

C. Review week

50. The review week is the core of the GHG inventory review: it is during the review week that the ERT clarifies, refines and substantiates its findings, in direct (ICRs) or electronic (CRs and DRs) communication with Party experts. During the review week, the ERT also arrives at a common view on the main issues and findings regarding the inventory of the Party under review.

51. In CRs and DRs, the ERT, including the LRs, continues to work diligently in the first two to three days to identify additional questions, concerns and issues in the implementation, by the Party, of the relevant reporting guidelines. The ERT analyses the responses of the Party to the preliminary questions and drafts any necessary follow-up questions (figure 3-4). During these reviews, the communication with the Party is carried out by using the iVTR, and, if needed, use of email, phone or videoconferences can be arranged. In CRs, discussions among smaller groups are organized when the need arises, for example, between the agriculture and land use, land-use change and forestry (LULUCF) experts or between energy and industrial processes and product use (IPPU) experts.

52. In an **ICR**, a similar sequence occurs, but with the added benefit that the Party and the ERT can be in the same room to discuss issues in greater depth. During an ICR, there are focused discussions between Party experts and the ERT early in the week, drawing from issues raised during the preliminary question phase and brief presentations given by the Party. The ERT also will be asked to lead a presentation on the first day of the review week to highlight its key findings and questions to date. The ERT must be well prepared to lead these focused discussions (i.e. having done a thorough review in the time prior to the review week) (see figure 3-5). Also, during an ICR, bilateral exchange between Party inventory experts and ERT members can be arranged, for example in order to go through detailed calculation files. In addition, during an ICR the ERT is in a position to carry out a thorough review of national inventory arrangements. This is also reflected in the review scope (see chapter VII.B). It is essential to keep in mind that a large majority of time during an ICR is spent in discussions with the Party and in bilateral exchange with Party experts, and that there is only limited time available to review the NIR or CRF tables during the review week. At the end of the week, on Friday, each ERT member gives a presentation on his or her main findings and recommendations arising from the review. The key actions during the review week of the LRs and ERT with support of the ROs are explained in table 3-4.

53. In **all review approaches**, the ERT records observations in the RITS (if used) (see chapter V.A) and drafts the ARR (see chapter V.D), with the aim of finalizing a complete ARR draft by the end of the review week. At the end of the review week the ERT also compiles a list of provisional main findings (chapter V.B), which is sent to the Party.

54. ERTs reviewing a KP Party must also, in all review approaches, consider whether any issues identified could lead to a "potential problem" to be included in a Saturday paper (see box 3-2 and chapter V.E). LRs should ensure that all potential problems including those of transparency are identified well before the end of the review week (and clearly discussed within the ERT. Any transparency issue that could trigger potential problems should be discussed with the Party earlier in the review week. The ERT should always include a potential problem in the "Saturday paper" when it is not able to understand whether the issue leads to an underestimation of emissions or overestimation of removals, because the information provided in the NIR and requested from the Party before and during the review week is not sufficient to assess the possible level of emissions or removals and accuracy of the estimates.

55. The ERT should provide clear guidance to the Party on the expected information that it needs to provide, as soon as possible and before the end of the review week, to enable the final judgment to be made on the identified possible problem with the reported emissions. If

applicable, the ERT starts to draft the Saturday paper on Thursday of the review week. On Saturday of the review week, the ERT discusses and agrees on the content of the Saturday paper, and the RO sends it to the Party.

Box 3-2
Saturday papers (KP reviews only)

The Saturday paper, formally the list of potential problems and further questions raised by the ERT, is a document in which the ERT lists any potential problems, which are unresolved at the end of the review week. Potential problems are those which may lead to an adjustment (i.e. because emissions in the latest year are underestimated or removals are overestimated) or a question of implementation (because a problem of a mandatory nature still exists and influences the ability of the Party to meet its commitments).

In the Saturday paper, the ERT explains the potential problem(s) and suggests solutions on how the Party may resolve it/them during a six-week period.

The Saturday paper is provided to the Party on the Saturday of the review week. The Party may respond to the Saturday paper within six weeks. In case of a Saturday paper, the deadlines for all deliverables after the review week are extended (see figure 3-1).

Figure 3-4
General review week schedule for centralized and desk reviews

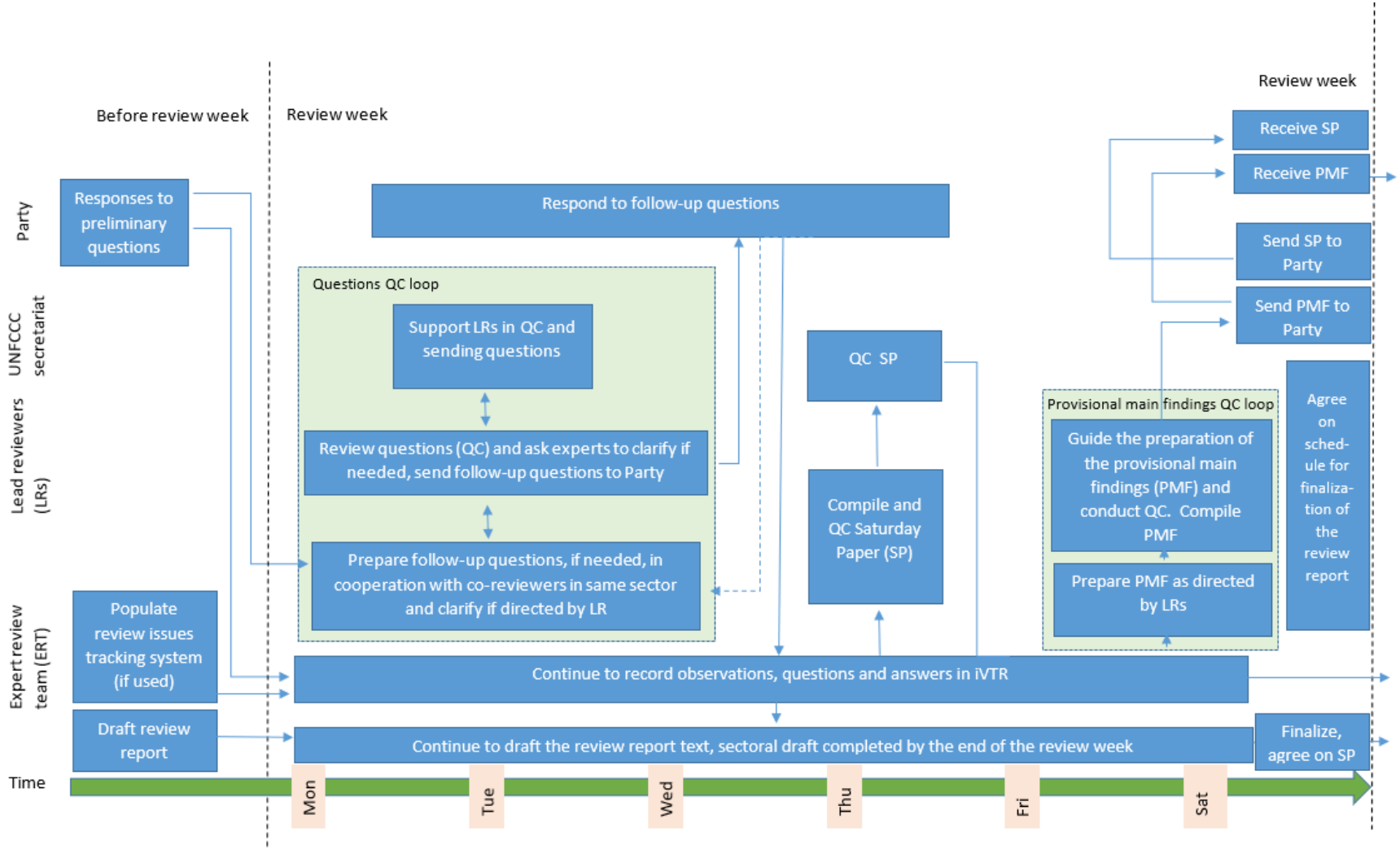
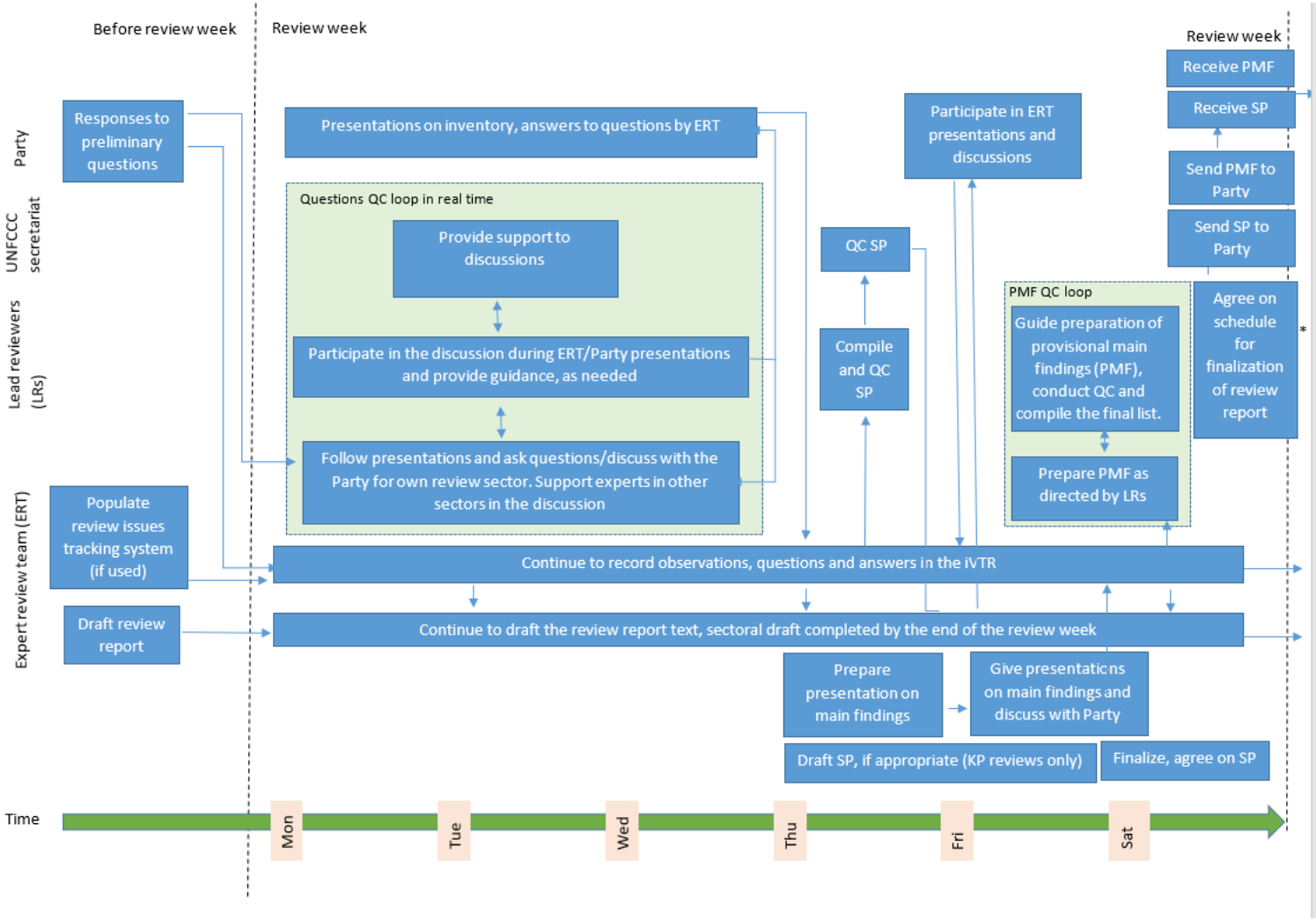


Figure 3-5
General review week schedule for in-country reviews



56. Wrap-up meetings of the ERT are typically organized in all review approaches. The timing of this meeting depends on the preferences of the ERT and, in the case of a desk review, the geographic location of the ERT members. The frequency of these meetings may differ by review format, with daily wrap-up meetings typically held for ICRs and CRs, and less frequent meetings possible for DRs. Depending on the issues under discussion in a DR, the time zones of the experts, and the preferences of the LRs, less frequent wrap up meetings may be held, with email communications used in lieu of teleconference calls. The wrap-ups are chaired by the LRs and are used to monitor review progress, identify any significant or cross-cutting issues, and to discuss and agree on provisional main findings. In KP reviews, discussion on issues that may lead to a Saturday paper, is an important element in wrap-ups. It is important that each ERT member participates in wrap-ups and raises any concerns regarding the timelines of the review, main findings/issues (or potential problems under KP reviews) and any observations that are relevant for the generalist, LR or experts in other sectors. At the end of the review week, LRs may also use the wrap up meeting to discuss what worked well and what did not, including any lessons learned, to help future review activities.

Table 3-4
Key actions of the expert review team, lead reviewers and review officer during the review week

Task	*Lead reviewers*	*ERT members*	*Review officer*
Prepare follow-up questions	(a) Monitor the iVTR for follow up questions from the ERT (b) Conduct QC of the follow-up questions. Ask the experts to clarify, if needed and approve and submit to RO	Draft follow-up questions to the Parties on issues which need further clarification in collaboration with co-reviewers in the same sector. Ensure that the response of the Party to the preliminary question is adequately reflected in any follow-up question	(a) Monitor the iVTR for follow up questions from the ERT (b) Assist the LRs in the QC of follow-up questions and in approving questions for submission to the Party
Review work	Lead and guide the ERT work on substantive findings/issues. Guide and manage the participation of new experts in the review. Facilitate teamwork, for example by identifying and organizing, as appropriate, breakout groups (e.g. between LULUCF and agriculture experts, or between energy and IPPU experts). Facilitate and encourage the early identification and discussion of any potential issues (particularly in KP reviews, those that could lead to a Saturday Paper)	(a) Continue the work started prior to the review week (see chapter VI) by making observations and identifying findings and issues (b) Cooperate with other experts in the same sector and across sectors, as needed. Raise any potential issues for discussion among other experts in the same sector and LRs. Seek advice from the LRs and RO as appropriate (c) To the extent time permits, experts for the same sector should peer review their colleagues' work to help enhance the	Assist the ERT (in particular the LRs) in conducting the review, as needed, explaining procedures and the use of tools, distributing documentation, reviewing draft texts if available, supporting the peer review of reports among sectors experts, providing technical support, and managing any requests to sectoral advisory groups [a]

Activities, timing and deliverables during the review process

Task	*Lead reviewers*	*ERT members*	*Review officer*
		accuracy and consistency of the final ARR	
ERT presentation (ICR only)	Support the ERT in its preparation of the presentation of main findings to the Party. Ensure that presentations are clear. Chair the ERT presentations to the Party	Prepare and deliver the presentation of sectoral findings of the review to the Party on Friday of the review week. Cover the observations, Party responses and potential recommendations. Strive to ensure that all "issues" are included, as well as the most important "findings"	Distribute the presentation template to the ERT and provide guidance, as necessary
Provisional main findings **(see also chapter V.B)**	Make a preliminary QC check of the findings in the ARR. Strive to ensure that the list includes all "issues"	Finalize findings in the sectoral tables of the ARR for inclusion in the PMF, keeping in mind that all "issues" identified should be included	Assist the LRs in the final compilation of the PMF
Saturday paper (KP reviews only) **(see also chapter V.E)**	Keep track of potential problems identified throughout the review week and ensure that the Parties are given an opportunity to clarify the problems through the question and answer procedure. Lead ERT discussions on potential problems. Support ERT members in drafting Saturday Paper and conduct QC. Facilitate the agreement of the ERT on the Saturday paper. Sign the Saturday paper before sending to the Party	Identify any potential problems early in the review week and ask the Party clarifying questions. Communicate the potential problems to the LRs and other ERT members in wrap-ups. Start drafting the Saturday paper midweek with support from LRs and the secretariat	(a) Send an informal notification to the Party on Thursday evening indicating those issues, that if not resolved, may be included in the Saturday Paper (b) Support the ERT and the LRs in discussions of potential problems and in drafting the Saturday paper (c) Ensure that the draft Saturday paper is quality checked by the secretariat (d) Send the Saturday paper to the Party
ARR **(see also chapter V.D)**	Conduct preliminary QC checks of the sectoral ARR findings in the iVTR during the review week	Complete the relevant sector assessment and findings for the ARR in the iVTR by the end of the review week. If time allows, complete the sectoral parts earlier in the review week and provide to LRs/RO for early QC checks	(a) Support the preparation of the ARR by providing guidance on the use of the ARR template and by conducting preliminary QC check of the available findings during the review week (b) Ensure that, at the end of the review week, drafts of all chapters are included in the iVTR

Activities, timing and deliverables during the review process

Task	*Lead reviewers*	*ERT members*	*Review officer*
RITS **(see also chapter V.A)**	(a) Work with the ERT to understand if, and if so, how, each ERT member will use the RITS to track issues identified during the review week (b) Monitor the RITS to track the progress and quality of work during the review week, as applicable	(a) In consultation with the LRs, determine if, and if so, how, each ERT member will use the RITS to track issues identified during the review week (b) Continually maintain and populate the RITS with the latest review findings, as applicable	Conduct preliminary QC checks of the RITS, if applicable and possible, during the review week and alert the LRs/ERT about any key concerns regarding progress or quality. Focus of QC should be on the completeness and accuracy of the ERT language for use in the ARR
Other documentation	Ensure that all documentation produced or used by the ERT, with the exception of data marked confidential by the Party, is in the iVTR, including questions, Party responses and any additional information used during the review		
Schedule and process for ARR completion[b]	Agree to the ARR completion schedule and process with the ERT, including the division of tasks between LRs, and the sequence of actions among the ERT, LRs and RO	Commit to the ARR completion schedule and process by indicating any periods of unavailability and any other concerns	Assist the LRs in the preparation of the ARR completion schedule by providing the framework of deadlines and time needed for QA/QC procedures. Recognize perennially difficult time periods (e.g. the annual meetings of the COP/CMP and holidays) in trying to meet the deadlines set out in the UNFCCC Annex I inventory review guidelines

Abbreviations: ARR = annual review report, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, COP = Conference of the Parties, ERT = expert review team, ICR = in- country review, IPPU = industrial processes and product use, iVTR = greenhouse gas virtual team room, KP = Kyoto Protocol, LR = lead reviewer, LULUCF = land use, land use change and forestry, PMF = provisional main findings, QA = quality assurance, QC =- quality control, RITS = review issues tracking system, RO = review officer, UNFCCC Annex I inventory review guidelines = Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention.

[a] The LRs recommended the establishment of sector-specific advisory groups at their 11th annual meeting. These advisory groups may, upon request, provide technical assistance to ERTs to help in understanding the 2006 IPCC Guidelines and its Supplements.

[b] The preparation of the ARR is a complex task with many actors involved, so the timelines in the original schedule are not always met. Some ERTs have found it helpful to agree on a notification to be sent two to five days before the next version of the ARR is expected to be sent to the ERT. In this manner, the time needed for actual reaction by the experts has been found to be reduced. The RO, in coordination with the LRs, maintains a dashboard that outlines the timing of expected and actual interim milestones.

D. After the review week

57. The main task of the ERT after the review week is to finalize the ARR according to the schedule agreed at the end of the review week. The work after the review week is a follow-up of the deliverables during the review week, as illustrated in figure 3-6.

Activities, timing and deliverables during the review process

58. After the review week, finalization of the ARR is the common responsibility of the ERT members and LRs, with support from the UNFCCC secretariat. In the QA/QC process on the ARR, there are usually at least three rounds of comments on the draft ARR to which the ERT and/or LRs have to respond. These are elaborated on in table 3-5. Due to the tight timelines and the number of actors involved, it is necessary that all actors involved allocate enough time for the timely finalization of the ARR.

59. If the ERT sends the Party a Saturday paper, all the deadlines after the review week are extended. After the Party responds to the Saturday paper, the ERT will give its response, indicating whether it considers the potential problems are resolved.

60. If potential inventory problems remain unresolved, the ERT will commence an adjustment procedure in consultation with the Party, and report the adjustments in the draft ARR (see box 3-3).

61. If potential problems not related to the inventory calculations remain unresolved, the ERT will list a question of implementation in the draft ARR (see box 3-4).

Box 3-3
Adjustments (KP reviews only)

An adjustment referred to in Article 5, paragraph 2, of the Kyoto Protocol, is a correction, calculated by the ERT, to a Party's inventory problem, which remains unresolved at the end of the review. The ERT will commence the adjustments procedure only after the Party has been given an opportunity to correct the problem in its response to the Saturday Paper.

The procedures for calculating adjustments are outlined in the annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11. If an adjustment procedure becomes necessary, the ERT will work with the Party closely to identify readily available data to enable a calculation of the parameter(s) that are in question. The ERT will use these data to calculate a conservative estimate to replace the reported value. Conservativeness means that emissions in a commitment period year are not underestimated or removals overestimated, and that emissions in the base year are not overestimated or removals underestimated.

After the intial review in the beginning of each commitment period, adjustments can be applied only to commitment period year estimates for the energy, IPPU, agriculture and waste sectors. An adjustment may be applied only to data not previously reviewed by the ERT, i.e. to the latest year estimate or to an estimate for an earlier commitment period year that has been recalculated.

For activities under article 3, paragraphs 3 and 4 of the Kyoto Protocol, calculation of adjustments depends on the periodicity of accounting elected by the Party for each activity. If commitment period accounting is elected, adjustments may be calculated only at the end of the commitment period. If annual accounting is elected, adjustments may be applied in each annual review throughout the commitment period.

The LRs clarified during their 14th Meeting[11] that potential problems identified by the ERT that would result in an adjustment less than the thresholds given in paragraph 37(b) of the annex to decision 24/CP.19 (see chapter VI.D) should not be included in the Saturday Paper. This applies to both Annex A sources, as well as KP LULUCF activities.

Figure 3-7 provides information on the general timeline for adjustments and section V.D provides further information on the steps taken in the adjustments process as reflected in the ARR

Box 3-4
Question of Implementation (KP reviews only)

In case a non-inventory related problem included by the ERT in the Saturday Paper remains unresolved at the end of the review (shall requirements in decisions: for example, a problem with implementing the mandatory "shall" functions of the national system), the ERT will list the problem as a 'question of implementation' in its final ARR. A question of implementation will be considered by the Compliance Committee. The Compliance Committee may determine, based on the question of implementation raised by the ERT, that the Party is in non-compliance and suspend its participation in the Kyoto Protocol Mechanisms (emissions trading, joint implementation and clean development mechanism). The Compliance Committee may request technical assistance from the ERT in resolving any remaining problems or disagreement between the Party and the ERT, regarding the question of implementation. While it is important in all reviews that the ERT maintain complete and transparent documentation, it is particularly essential that all communications between the ERT and the Party are clearly documented for cases that go before the Compliance Committee. Further the ERT's rationale for all conclusions should be completely reflected in the ARR

[11] Para. 36(f)(iii) of the Conclusions and Recommendations of the 14th Meeting of LRs. Available online at https://unfccc.int/files/national_reports/annex_i_ghg_inventories/review_process/application/pdf/ghg_lrs_14th-_meeting_conclusions.pdf.

Figure 3-6
Main actions after the review week

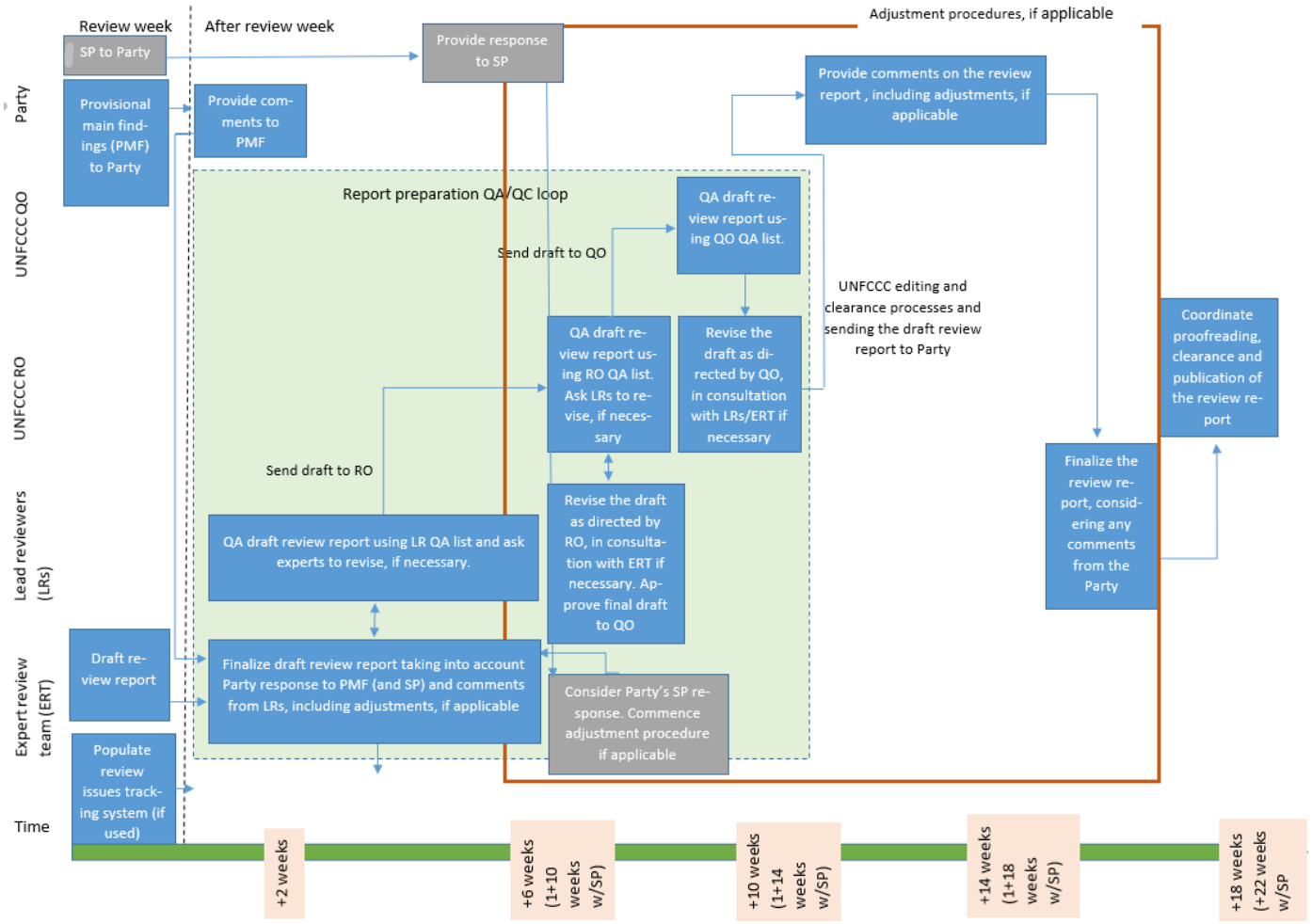


Figure 3-7
Timeline and Procedures for Adjustments

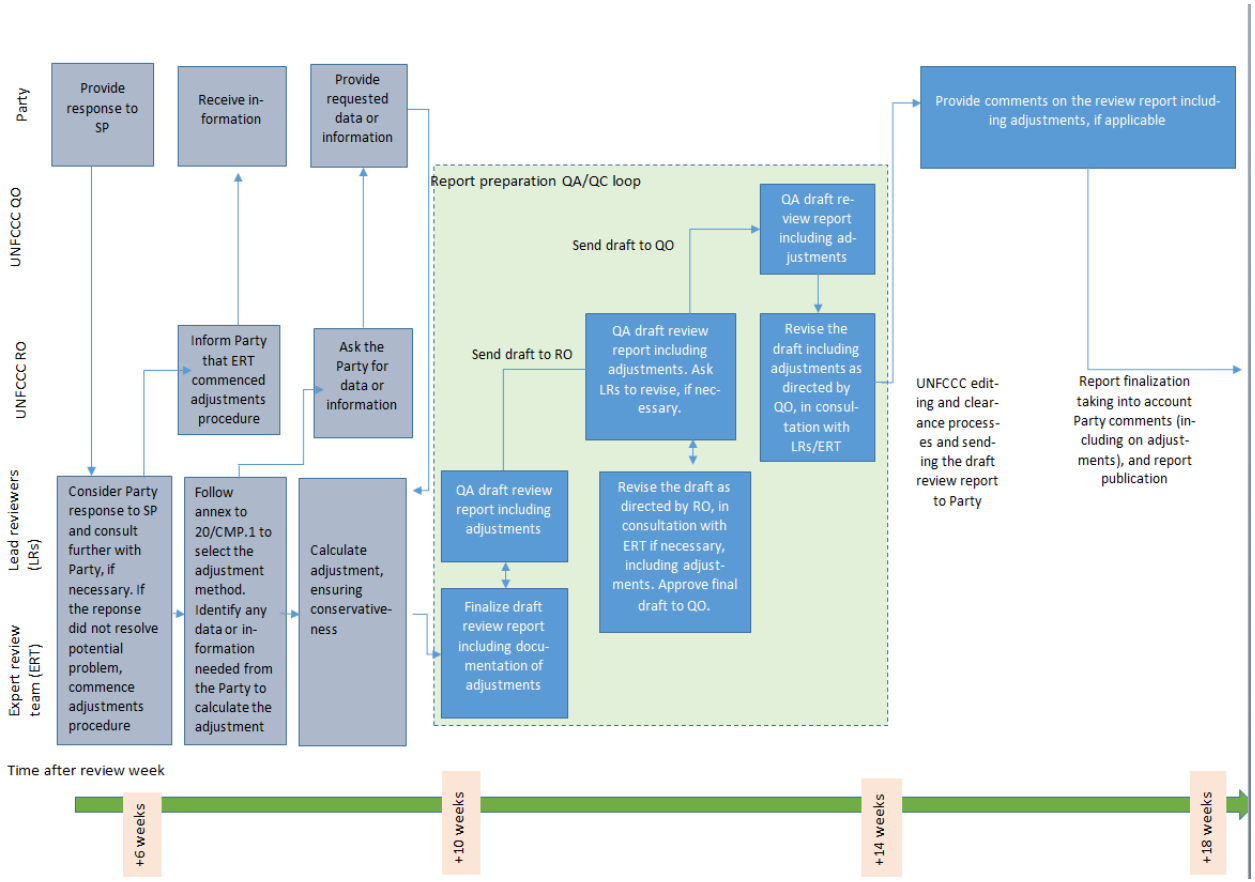


Table 3-5
Key actions of the expert review team, lead reviewers and review officer after the review week

Action/task	*Lead reviewers*	*ERT members*	*Review officer*
ERT consideration of Party response to SP (KP reviews only)	Coordinate the ERT's consideration of the Party's response to the Saturday paper	Consider the Party's response to the sectoral issues in the Saturday paper and determine whether the response resolved the potential problems. Share the consideration with the ERT	Distribute the Party's Saturday paper response to the ERT and the ERT's consideration to the Party and support the ERT in technical matters
Adjustments (KP review only)	Coordinate the ERT's adjustments calculations and conduct QC. Ensure that the entire ERT agrees with the adjustments	Calculate adjustments for unresolved inventory problems in consultation with the Party, for example by asking the Party to provide data needed for the adjustment calculation	Provide technical support to the calculation of adjustments and coordinate any communication between the Party and the ERT
Finalization of the draft ARR	Coordinate closely with the ERT to ensure timely finalization of the draft ARR. Conduct a QA check of the draft report based on the LR QA checklist and ask experts to revise, if necessary. Ensure comments from the Party on the PMF are reflected, as appropriate, in the final draft ARR	Complete the draft ARR by incorporating, as appropriate, comments from the Party on the PMF and taking into account any comments from LRs in a timely manner and in accordance with the schedule agreed by the ERT	Coordinate closely with the ERT to ensure the timely finalization of the draft ARR. Be available for any technical or logistical support for the ERT and LRs, as needed
RO QC of the draft report	Coordinate closely with the ERT to ensure the timely revision of the ARR based on comments from the RO	Respond to any comments received from the RO and revise tables of the ARR in a timely manner	Review the draft ARR based on the RO QC checklist, providing comments to the ERT and LRs and supporting LRs in finalizing the revised ARR. Submit the report to the UNFCCC editors (addressing comments as applicable) and for QA

Activities, timing and deliverables during the review process

Action/task	*Lead reviewers*	*ERT members*	*Review officer*
QA/QO review of the draft ARR	Respond to any substantive comments from the QA process; coordinating with the ERT as appropriate. Provide the rationale for any significant comments not accepted	Respond in a timely manner to requests from LRs to clarify or revise the ARR text	Coordinate with the LRs who are addressing the comments from the QA process
Draft ARR sent to Party	Respond to any RO questions prior to the submission of the draft ARR to Party, if required	Respond to any questions from the LR/RO, as needed	(a) Coordinate with the QO for clearance of the draft ARR, consulting LRs if necessary (b) Submit the draft ARR to the Party
Address any comments from Party	Finalize the ARR taking into account comments from the Party and provide justification for any comments not addressed within the agreed schedule	Respond to requests from LRs to revise the ARR text based on comments from the Party and provide justification (in a timely manner) for any comments not addressed in the comment response template	(a) Coordinate the finalization of the ARR, ensuring that Party comments on the draft ARR are distributed to the ERT in the comment response template (b) Send the completed template, with ERT responses, to the Party for review and any final comment
ARR publication			Coordinate the final proofreading and clearance for publication

Abbreviations: ARR = annual review report, ERT = expert review team, KP = Kyoto Protocol, LRs = lead reviewers, PMF = provisional main findings, QA= quality assurance, QC = quality control, QO = quality officer, RO = review officer.

IV. Effective use of the review tools

A. GHG virtual team room (iVTR)

62. The iVTR is a web application that serves as the main documentation hub for the review. It includes all the materials used in the review and is used to store and exchange all review outputs between ERT members and the secretariat.

63. The iVTR includes the following parts:

(a) **Reference library**, including the background materials commonly used by all ERTs such as:

(i) Relevant UNFCCC decisions and guidelines for review under the Convention and the Kyoto Protocol;

(ii) Relevant IPCC guidance documents, including the 2006 IPCC Guidelines, KP Supplement and Wetlands Supplement;

(iii) Recommendations from LRs meetings;

(iv) Review tools (except the Locator);

(b) **ERT workspace, including**

(i) **Inventory submissions** for the Parties under review by an ERT (for the year under review and two previous years);

(ii) **General working space**, in which the ERT can upload documents;

(iii) **Early review materials** for the Parties under review by an ERT, including Status Report for the current year; review transcripts and/or assessment reports for the previous year(if available), ARR template pre-filled with factual information; the review of the report to facilitate the calculation of the assigned amount for the Party, and the two most recently published ARRs;

(c) **Question & Answer** module, which manages, stores and tracks the questions and answers sent between the ERT and the Party. This module provides an interactive interface that allows all ERT members to ask questions to the Party in support of their GHG inventory review tasks. Through the same interface, Parties are able to answer the incoming questions;

(d) **Report preparation** function, which allows the ERT members to simultaneously work with a shared version of the draft ARR;

(e) **The RITS,** which is a database system to create, track and manage review findings. The ERT can add new, edit existing or delete issues they have created. The data can be filtered for each field.

64. It is important that all the ERT members upload all relevant materials used and produced during the review into the iVTR, where they are stored for future reference and future reviews.

65. The iVTR user manual provides more information on the use of the tool and can be found in the Reference Library.

B. Locator

66. The Locator is a database tool that allows the ERT to view the data submitted by Parties in CRF tables without opening individual CRF tables. The ERT may view emissions,

AD and implied emission factors (IEFs) for the selected category and gas. The Locator tool allows the ERT to compare either the entire time series for a single Party or review data reported by the Party as compared with other Parties. The Locator also enables the ERT to track the use of notation keys by the Party.

67. The Locator user manual and survival guide, included in the iVTR Reference Library, provide more information on the use of the tool.

68. In addition to being used offline, the Locator may be found at http://rt.unfccc.int/.

C. Comparison tool

69. The Comparison tool allows the ERT to review the recalculations for all years in the time series without opening individual CRF tables. Recalculations are provided both in absolute and percentage terms and for the entire inventory and for individual categories. The tool also contains a filter to show only those categories that contained recalculations for emissions/removals during the time series greater than ±2 per cent. This filter can help ERTs conducting a DR to prioritize the categories for review, in accordance with paragraph 76(b) of the UNFCCC Annex I inventory review guidelines.

70. The ERT can use the Comparison tool to identify differences between two submissions, including differences in numerical data and changes from notation key to number and vice versa. The Comparison tool can be used both when reviewing the recalculations since the previous year submission, and when reviewing the changes made in any resubmission by the Party in the same year, for example in response to the Saturday paper in KP reviews.

71. The Comparison tool user manual and survival guide, included in the iVTR, provide more information on the use of the tool. The Comparison Tool may be found at http://rt.unfccc.int/.

D. Methods paper

72. The Methods paper, included in the iVTR, provides a list of the categories and gases for which methods and EFs are provided in the 2006 IPCC Guidelines. For example, if a Party reports "NE" ("not estimated") for a category, the ERT may refer to the Methods paper to confirm whether the category in question is mandatory for reporting, and then follow the procedure given in chapter VI.D. In case of doubt regarding the availability of methods and EFs in the 2006 IPCC Guidelines and its Supplements, the ERT should always consult the original 2006 IPCC Guidelines, the KP Supplement and/ or the Wetlands Supplement, including any corrigenda, if appropriate. In addition, the sector-specific advisory groups may, upon request, provide technical assistance to ERTs to help in interpreting questions of completeness related to the 2006 IPCC Guidelines and its Supplements.

V. Effective use of templates

A. Review Issues Tracking System

73. The RITS is one of the modules in the VTR, in addition to the "question & answer" and "report preparation" modules that support the ERT in collecting, organizing and publishing findings related to the current review cycle. The user interface for the RITS continues to be updated and modified periodically, and most recently, has been simplified and better integrated with the question and answer module. All issues included in the RITS from the previous review cycles are viewable by the current ERT, but cannot be edited.

74. The RITS should be used for tracking all findings, including those related to previous recommendations and all new findings by the ERT. The RITS enables a more obvious and direct link between the Q&A interaction with the Party and resulting findings in the ARR. This can be a particularly useful tool for new review experts. Experienced reviewers may prefer to work within and among the question and answer function, the assessment report and the ARR directly.

75. The RITS allow a more detailed recording of the communication with the Party and the findings of the ERT than the ARR. The RITS documents the internal communications between the Party and the ERT members, and is not made public. Unlike the ARR, it may include issues that were discussed with the Party and resolved during the review. It serves as a starting point for the next ERT and thus facilitates the continuity of the review process across subsequent cycles.

76. For each issue, the ERT should add identifying information in the RITS, to categorize the relevant sector, category and GHG for the finding. In addition, the ERT should complete the fields to facilitate transfer to the ARR, including a description of the finding, any response provided by the Party during the review, and the ERT's assessment of the status of all findings. The RITS contains several other fields that should be completed by the ERT to facilitate the completion of the ARR. Table 5-1 shows the input fields.

Table 5-1
Information to be recorded in the RITS

Field in review issues transcript system	*Description*
Title	Descriptive title to be provided by the ERT
Party	The Party name will automatically be populated
Submission Year	The submission year will automatically be populated
Creator	Your name will automatically be populated
Sector	Select the sector from the drop-down list
Category	Select category from the drop-down list
GHG	Select GHG from the drop-down list

Field in review issues transcript system	*Description*
KC Party:	Insert the relevant designation of the Party if it is a key category, considering level, trend or both. This should be based on the Party's assessment in Annex I of the NIR
Issue type	Select the best classification for the issue (transparency, accuracy, consistency, comparability, completeness, or general adherence to the UNFCCC Annex I inventory reporting guidelines, taking into account the definitions in the UNFCCC Annex I inventory reporting guidelines. If the finding is not an issue, indicate this by selecting "not an issue"
SP issue?	Indicate whether or not the issue was included in the Saturday Paper. Note, this field is mandatory so you may select "No" initially, but remember to update it at the end of the review, if necessary.
Subjected to adjustment?	Indicate whether or not an adjustment was applied. Note, this field is mandatory so you may select "No" initially, but remember to update it at the end of the review, if necessary.
Related Q&A	The ERT should select the most relevant question from the dropdown that is leading to the ARR finding
Notes on the Finding	The ERT member may choose to include any informal notes or further information. This field is not mandatory.
Description of the Finding	In the case of those issues from ARR table 5 or table 6 in the previous review report, the ERT should include the full description of the issue from table 5 or 6 (note this should be the entire first paragraph). If the recommendation was from ARR table 3 in the previous review report, the ERT member should go back to the original description of the issue and copy the full description of the issue into the RITS. For new issues, this space should be used by experts to draft paragraph 1 of the finding for the ARR. The paragraph should include the description of the ERT's finding and any communication with the Party, including the Party's response (see table 5-2 for tips on how to write review findings).
Recommendation or Encouragement	For previous recommendations, directly copy the final recommendation from the previous ARR. Do not change the recommendation from the previous ARR. For new findings, include the recommendation or encouragement to be included in the ARR.

Abbreviations: ARR = annual review report, ERT = expert review team, Q&A = question and answer; UNFCCC Annex I inventory review guidelines = Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention.

B. Provisional main findings

77. The PMF is compiled by the ERT and sent to the Party at the end of the review week. The PMF should focus on issues and recommendations, both new issues identified by the ERT, as well as the ERT's assessment of the Party's implementation of previous recommendations. The purpose of this document, as recommended by the LRs at their 10th

annual meeting,[12] is to provide Parties with notice of the issues and recommendations that will likely serve the basis for the recommendations in the ARR. The Party is given two weeks to comment on the list of provisional main findings and the ERT should consider, and as appropriate, incorporate the Party's comments into the draft ARR.

78. The format of the PMF is not outlined in the guidelines; only that it should include "all main issues" and that it should "form the basis for the recommendations in the review report". At their 13th Meeting, the LRs concluded that "[t]he list of provisional main findings should focus on issues and recommendations, including the assessment by the ERT of the progress in addressing recommendations in previous review reports".[13] The secretariat has developed a template which is based on extracting information from ARR tables 3, 5 and, if applicable, 6 to facilitate development of the PMF.

79. Note that all findings and issues included by the ERT in the draft ARR in the report preparation module at the end of the review week will be included in the PMF. The only information that will not be transmitted to the Party at this point in time is the ERT's final conclusion on the status of an issue (e.g. whether it is resolved or not, and whether it will ultimately lead to a recommendation or an encouragement in the draft ARR ultimately sent to the Party). Although the PMF document sent to the Party will include a disclaimer to note that the findings are provisional and subject to change, it is still important that all findings are clearly described in the ARR at the end of the review, to avoid unnecessary confusion and comments from the Party.

C. Comment response document

80. According to paragraph 90(d) of the UNFCCC Annex I inventory review guidelines, the ERT shall produce the final version of the ARR, taking into account the comments of the Annex I Party, within four weeks of receipt of the comments. Parties have preferred ways to provide their comments on the draft ARR. Many include comments directly in the word version of the ARR; others provide a separate document. Upon receipt of the Party's comments, the secretariat will distribute a comment response document to the ERT.

81. In addition to the Party's comment, the comment response document includes template language to be completed by the ERT, which indicates whether the ERT accepts or rejects the Party's comment and why. The ERT will also insert revised ARR language, if applicable, to address the Party's concern. There is no mandated time frame in the decisions by which the ERT must complete this interim deliverable. The LRs generally allow about a week, but the time may be extended depending on the nature and scope of the Party's comments.

82. The main tasks by the LRs and ERT to complete the comment response document are as follows:

(a) Consider carefully all comments provided by the Party;

(b) Provide the ERT's response based on the template language. Possible choices range from "the ERT agreed with the comment" to "the ERT considered the comment but decided that the report already sufficiently addresses the comment" and "the ERT considered, but disagreed with the comment";

(c) Provide a rationale for the response made by the ERT;

12 FCCC/SBSTA/2013/INF.8, paragraph 32.

13 https://unfccc.int/files/national_reports/annex_i_ghg_inventories/review_process/application/pdf/draft_conclusions_lrs_13th_v01_4march2016_incl_location_asr.pdf (paragraph 32(a)).

(d) Indicate what action the ERT will take (e.g. delete the paragraph or modify it to reflect the Party's comment). It is particularly helpful to include a tracked changes version of the relevant paragraph so the Party can easily identify how the ERT intends to address the comment (if at all).

83. The completed comment response document will be sent to the Party for its consideration, along with a revised ARR reflecting the changes. Although the findings contained in the final report are those of the ERT, in accordance with paragraph 66 of the UNFCCC Annex I inventory review guidelines, every effort will be made to reach agreement with the Party on the content of a report prior to its publication. If a disagreement remains, the Party may provide additional information in a separate chapter of the report.

D. Annual review report template

84. The ARR is the most important output by the ERT and the only one which is published on the UNFCCC website. The report contains the final conclusions, encouragements and recommendations of the ERT regarding the Party's adherence to the UNFCCC Annex I inventory reporting guidelines and its commitments under the Convention and, if applicable, under the Kyoto Protocol. The secretariat provides the ERT with a template for the ARR as part of the early review package (see chapter III.B). This template is pre-filled with factual information for each Party under review. Ultimately, the ARR is the collective responsibility of the ERT, so it is critical that each ERT member reviews closely the information contained in the pre-filled template, as well as the final draft of the report prior to submission to the Party, to ensure that each member of the ERT agrees with the contents of the ARR.

85. There are four separate ARR templates:

(a) one for CRs/ICRs for KP Parties;

(b) one for CRs/ICRs for Convention Parties;

(c) one for DRs of KP Parties; and

(d) one for DRs of Convention Parties

86. The ARR template covers the following main topics:

(a) The ERT's general assessment of the Party's inventory submission (ARR table 2);

(b) An assessment of the Party's implementation of recommendations made in the previous review report (ARR table 3), including a separate table highlighting recommendations that have been identified, but not sufficiently addressed or resolved, in at least three successive reviews (ARR table 4);

(c) Any new findings identified by the current ERT and not raised in the previous review report (ARR table 5). For DRs only, ARR table 5 is limited to findings related to categories that have been subject to recalculations that have changed the emission/removal estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent, in accordance with paragraph 76(b) of the Annex I inventory review guidelines;

(d) For DRs only, there is an ARR table 6 devoted to other findings not related to previous recommendations or recalculations. It is not required for the ERT to include findings in ARR table 6 for DRs, given the limited scope of the DR, however, should additional issues be identified, they may be included here;

(e) Adjustments in the KP reviews, if applicable.

87. The ARR template contains instructions at the beginning of the document that will assist the ERT in the completion of the template; these are not repeated in full here. However,

it is important for the ERT to understand the use and inter-relationship of five terms which are key to completing the ARR: issues, problems (in KP reviews only), findings, recommendations and encouragements. Figures 5-1 and 5-2 provide an illustration of the practical relevance of these terms for the ERT in its work.

88. **Issues:** Any ERT findings related to "shall" requirements in the UNFCCC Annex I inventory reporting guidelines or relevant CMP decisions and generally ERT findings related to the definitions of transparency, accuracy, completeness, comparability or consistency (TACCC) are defined as "issues". Note that findings related to transparency, if not related to a specific "shall" requirement in the UNFCCC Annex I inventory reporting guidelines or relevant CMP decisions, are only classified as issues if the information that the ERT is seeking to be included in the NIR is recommended for inclusion in the NIR in the relevant Reporting and Documentation section of the 2006 IPCC Guidelines for that category. Finally, issues may be otherwise identified due to a Party's lack of adherence to the UNFCCC Annex I inventory reporting guidelines. These latter issues are typically related to issues such as inconsistencies between the CRF tables and the NIR, or calculation errors related to the key category or uncertainty analysis.

89. All issues should lead to recommendations by the ERT. Any new issues identified by the ERT during the current review in ARR tables 5 or 6 will be tracked in subsequent ARRs in ARR table 3.

90. **Findings.** Issues are a subset of findings. A finding is any conclusion by the ERT that does not lead to an issue. Findings could be related to reporting elements that are non-mandatory (e.g. tier 2 QC checks) or institutional arrangements, to the extent that these findings do not raise concerns about one of the TACCC definitions. Regarding transparency, findings (as opposed to issues) are appropriate in cases where the ERT is suggesting that information be included in the NIR, but the information suggested for inclusion in the NIR is not specifically recommended in the Reporting and Documentation section of the 2006 IPCC Guidelines or its Supplements for that category.

91. All findings should lead to an encouragement in the ARR.

92. **Problems.** Problems in KP reviews are similar to "issues" under a Convention review and are related to findings on transparency, accuracy, completeness, consistency and comparability. Although "Adherence to the UNFCCC Annex I inventory reporting guidelines" is not specifically included in paragraph 69 of the Article 8 review guidelines as a type of "problem", as the review under the Kyoto Protocol encompasses the review under the Convention, general findings related to adherence to the UNFCCC Annex I inventory reporting guidelines (e.g. related to QA/QC or uncertainty) may also apply to reporting of Kyoto Protocol elements, including KP-LULUCF activities, and therefore would be a problem under the Kyoto Protocol. All issues related to supplementary information under Article 7 of the Kyoto Protocol are also problems. Those problems that remain unresolved at the end of the review week and affect commitments (for example, related to the national system, underestimates in emissions in years of the commitment period) are included in the Saturday Paper.

Figure 5-1
Key terminology used in ARRs

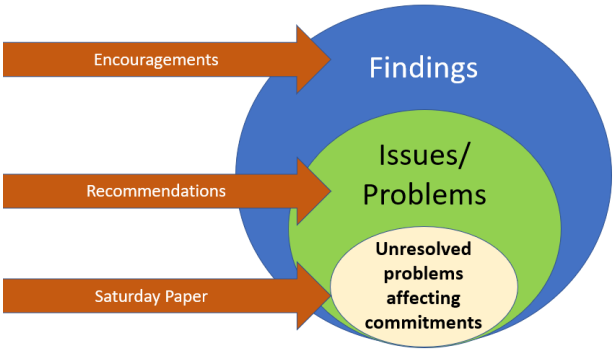
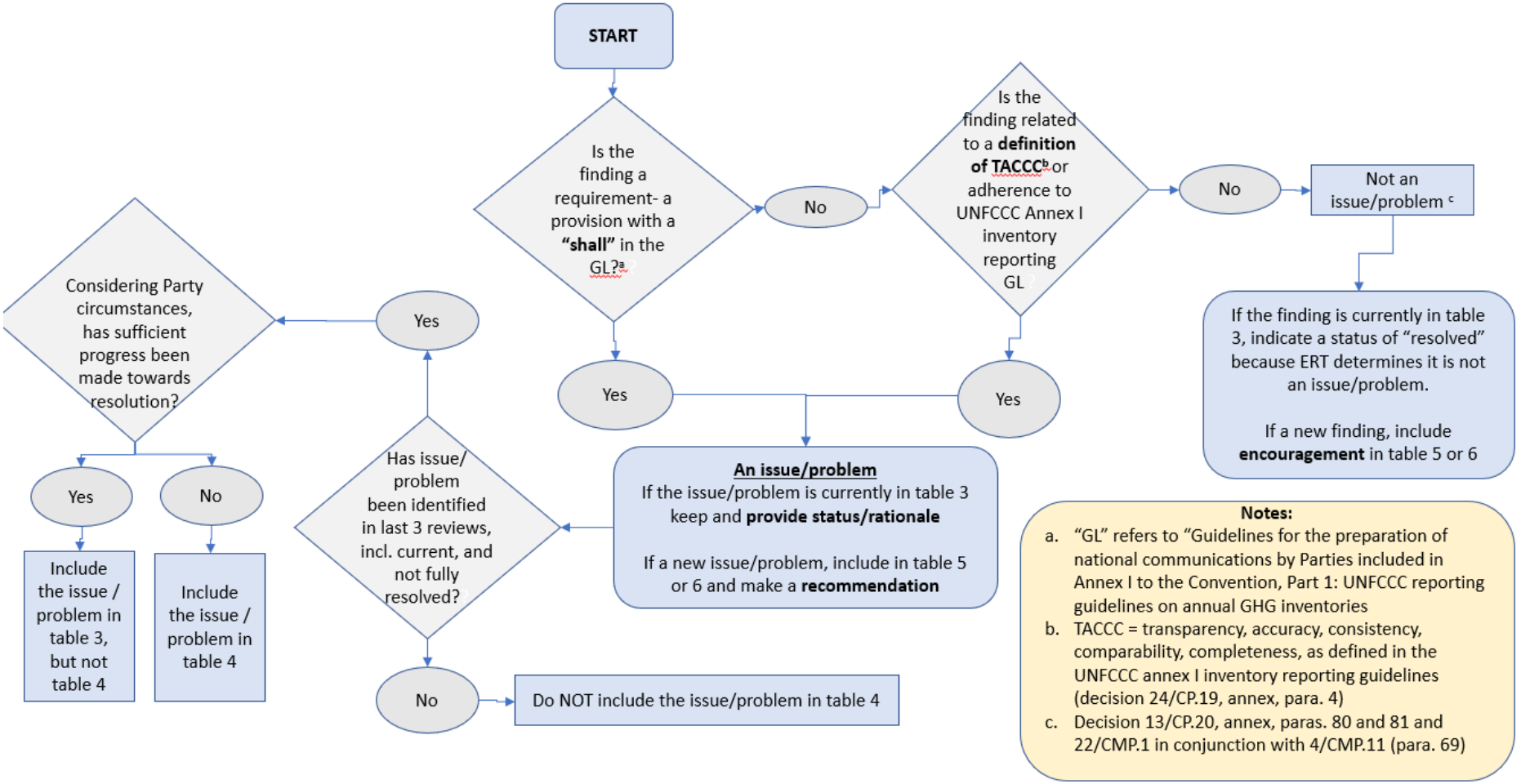


Figure 5-2
Decision tree to determine if a conclusion from the ERT is related to only a finding, or also an issue/problem, and how to reflect in ARR tables 3-6



93. In addition, the importance of drafting clear and concise findings and encouragements/ recommendations cannot be overstated. The ARR is the written record of the key issues that the ERT concludes needs to be resolved by the Party in order for the Party to be fully in compliance with the reporting requirements under the Convention and the Kyoto Protocol. Clarity is necessary to ensure that the Party, future ERTs, the public, and in the case of reviews under the Kyoto Protocol, the Compliance Committee, understand the ERT's assessment of the overall quality of the Party's inventory submission and any outstanding issues requiring resolution.

94. The approach to drafting review findings differs slightly depending on whether the ERT is assessing the Party's implementation of previous recommendations or whether it is documenting its latest findings from the current review. The primary goal of the ERT when completing ARR table 3 is to provide a short justification for its assessment of the status of implementation by the Party of a previous recommendation. The ERT does not necessarily have to say exactly *how* the issue is resolved, but could provide a short response with the appropriate documentation of where a reader should look in the annual submission to find the Party's action (see figure 5-3). When completing ARR table 5 (and ARR table 6, if applicable), the ERT must clearly describe its findings, including any interactions with the Party during the review and its final recommendation (see figure 5-4).

Figure 5-3

Approach to drafting the ERT's assessment of the Party's implementation of previous recommendations

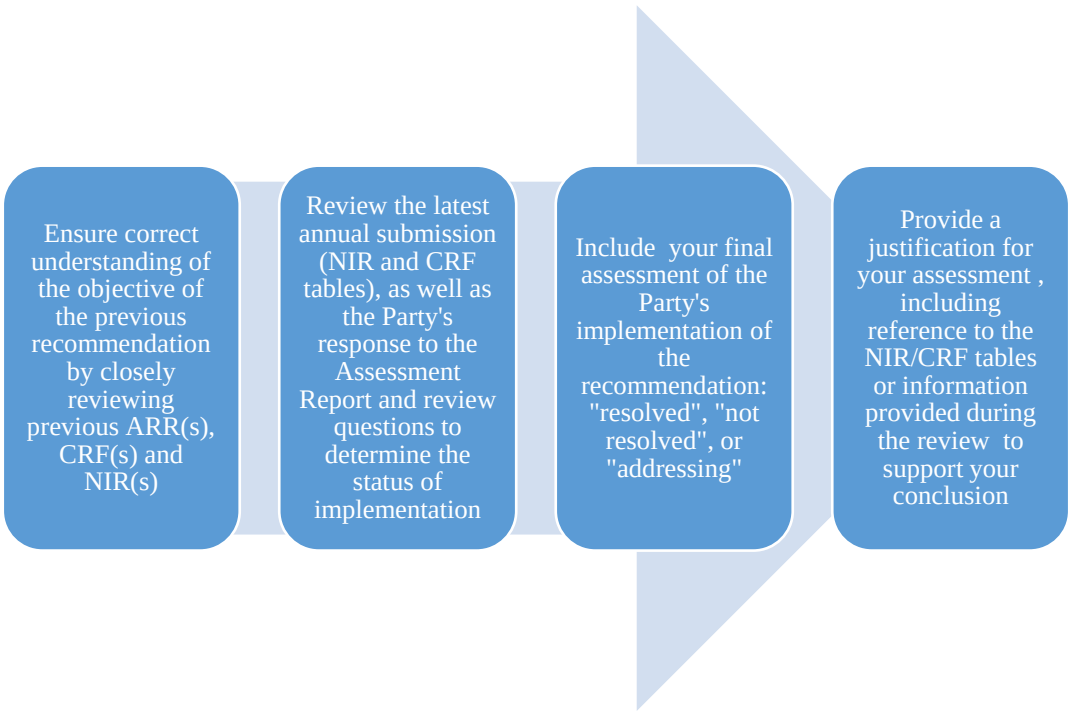
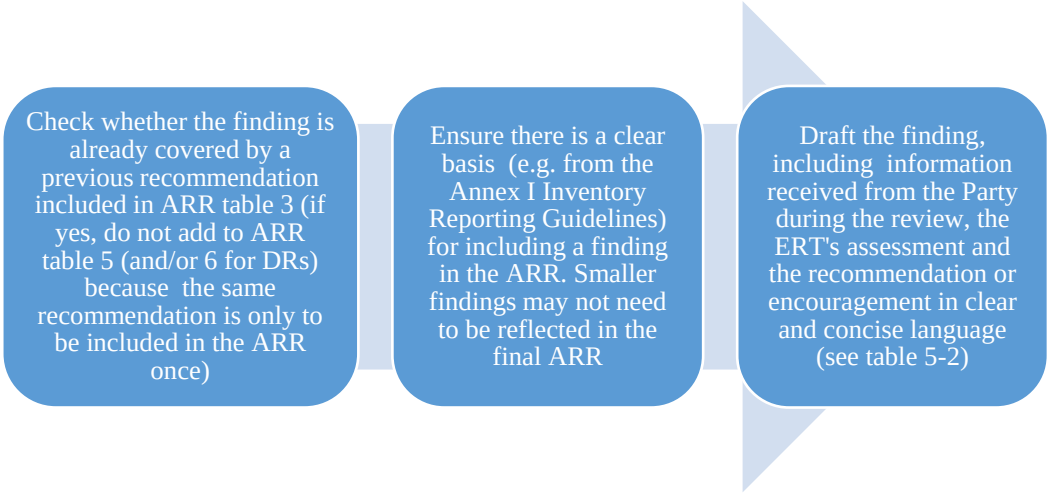


Figure 5-4

Approach to drafting new review findings by the ERT



95. Table 5-2 illustrates the information that is to be provided by the ERT when drafting a new finding in ARR.

Table 5-2
Sample outline of how to draft a new review finding

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem? If yes, classify by type*
	Select category – [Add fuels – Add gas(es)]	Paragraph 1: • Step 1: Explain the ERT's finding with references to the CRF table and/or NIR (page, section, figure or table number). If applicable, include a comparison of the Party's reporting (e.g. EF) with default values in the 2006 IPCC Guidelines; • Step 2: Include the reference to the issue ID# from ARR table 3 if the finding is an elaboration of a broader issue contained in table 3. You do not need to repeat what is in ARR table 3 (and it is important not to duplicate the finding); • Step 3: Summarize any communication with the Party during their review, and the Party's response • Step 4: Indicate why the ERT finds that the Party is not meeting applicable reporting requirements; Paragraph 2 • Included the ERT's recommendation or encouragement in a complete and transparent manner, so that when this single paragraph is included in ARR table 3 in the subsequent review report it clearly conveys the nature of the problem and what it is the ERT expects the Party to do.	Issue type

96. ERT members may face the situation where the description of the previous finding and recommendation are not clearly drafted. This poses a challenge not only for the Party (who may not know how to resolve the issue) but also for subsequent ERTs to determine if the issue has been resolved. When assessing a Party's implementation of a previous recommendation in ARR table 3, ERTs should ensure that they make their assessment based on the original issue without expanding or modifying it. Any additional related issues should be included in ARR table 5 or 6. If the case arises where the ERT cannot assess the previous recommendation because it is vague or too general, and not supported by specific information, in accordance with the conclusions of the 15th Meeting of LRs[14], ERTs should consider closing such a recommendation.

97. Below are possible considerations by the ERT when completing the ARR template. QC checklists are also provided at the end of the ARR template to enable the ERT to make a more systematic review of the draft ARR for accuracy and completeness:

(a) Does the ARR include the most important issues and findings from the ERT member, including those identified in the assessment report, the RITS if used, and as a result of the communications with the Party in the question and answer module of the iVTR? Less significant findings (e.g. editorial issues, problems with the drafting in the NIR) may be included only in the RITS or communicated to the Party through the question and answer module.

(b) Does the ARR retain all the standard language (e.g. introductory paragraphs)? Wherever possible, this standard language should be used. Only in unique circumstances, and in consultation with the LRs, should standard language be altered;

(c) Does table 3 include all recommendations (and only recommendations; not encouragements) from the previous ARR, and does the text indicate if the issue has been resolved or not, and why?

(d) Does table 4 include the ID# and recommendations from table 3 for all issues that have been highlighted for three or more years and designated as "not resolved" or "addressing"? Note, that according to the 13th Meeting of LRs, "ERTs have some discretion as to whether to include a specific issue in Table 4 and should communicate with the Party when assessing whether sufficient progress has been made in the implementation of previous recommendations for the purposes of including the issue in a prominent paragraph." The ERT should discuss with the Party the national circumstances with respect to the recommendation, and based on expert assessment, determine whether the issue should be included in table 4.

(e) Is each issue in tables 3 and 5 (and table 6 for the DR template) clearly classified into one of the following: transparency, accuracy, consistency, completeness, comparability, adherence to the UNFCCC Annex I inventory reporting guidelines or adherence to reporting guidelines under Article 7, paragraph 1 of the Kyoto Protocol?

(f) Do all "issues" lead to a recommendation and all "findings" lead to an encouragement?

(g) Have all the data tables been reviewed to ensure consistency with the Party's latest submission?

(h) Do the cross-references included in table 2 match the issues in tables 3 and 5 (and table 6 for the DR template)?

[14] Para. 33 of the Conclusions and recommendations of the 15th Meeting of LRs. Available online at Conclusions and recommendations of the 15th Meeting of LRs.

98. The ARR template also guides the ERT in its documentation of any adjustments calculated. The adjustment part of the ARR template consists of three tables:

(a) **Background information to support adjustments.** In this table the ERT explains:

(i) The underlying problem and rationale for adjustment;

(ii) Recommendation to the Party to address the underlying problem, as contained in the Saturday paper;

(iii) Assumptions, data and methodology used to calculate the adjustment;

(iv) Description of how the adjustment is conservative.[15]

(b) **Description of the calculation of adjustments for categories included in Annex A to the Kyoto Protocol.** In this table the ERT documents, for each calculated adjustment the:

(i) Party's original value for the parameter which is subject to adjustment;

(ii) Party's emission/removal estimate from the category subject to adjustment;

(iii) input data/parameter used for calculation of the adjustment and its reference;

(iv) value of the parameter subject to adjustment as calculated by the ERT;

(v) conservativeness factor used;

(vi) adjusted conservative estimate for the parameter;

(vii) adjusted conservative estimate for the category;

(viii) Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party;

(ix) Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment;

(x) Difference between original and adjusted total aggregated GHG emissions;

(xi) The ERT's estimate whether the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)

(c) **Description of the calculation of adjustments for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol.** In this table the ERT documents, for each calculated adjustment:

(i) Party's original estimate for the parameter or data subject to adjustment;

(ii) Party's emission/removal estimate from the activity subject to adjustment;

(iii) Input data/parameter used for calculation of adjustment;

(iv) Calculated estimate for the parameter or estimate in question (before applying conservativeness factor);

(v) Conservativeness factor;

(vi) Adjusted conservative estimate for the parameter or estimate in question;

(vii) Adjusted conservative estimate for the activity in question;

[15] Conservativeness means that base year emission are not overestimated (or removals or recovery underestimated) and that commitment period year emissions are not underestimated (or recovery or removals overestimated). Conservativeness is usually achieved by applying a conservativeness factor in Appendix III of Good practice guidance and adjustments under Article 5, paragraph 2, of the Kyoto Protocol.

(viii) Difference between original and adjusted emissions/removals for the activity in question;

(ix) The ERT's estimate whether the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)

E. Saturday Paper template

99. The Saturday Paper template guides the ERT on how to communicate to the Party the potential problems identified in the Party's annual submissions under the Kyoto Protocol, as well as to guide the Party on how to resolve the potential problem(s).

100. The Saturday paper template provides, in the main part, information on the timeline by when the Party must respond to the Saturday paper (six weeks after the end of the review week). The main part also gives general guidance to the Party on what the Saturday paper response should include in the case of revised inventory estimates:

(a) **Relevant background information and a descriptive summary of the revisions made by the Party**. A NIR resubmission is not required to resolve a potential problem;

(b) **A complete official resubmission of the CRF tables** for the entire time-series, reflecting the revised estimates.

101. In the attachment A the ERT includes potential problems which do not need an adjustment. Such potential problems may be related, for example, to problems identified in the national system, the national registry, provision of KP-LULUCF information in accordance with annex II to decision 2/CMP.8, or provision of other supplementary information under Article 7. The attachment has three parts:

(a) Description of the potential problem;

(b) ERT recommendation to resolve the potential problem;

(c) Response/information by the Party (to be filled in by the Party).

102. In the attachment B the ERT describes the potential problems that could lead to an adjustment of Annex A categories. In attachment B the ERT includes a separate table for each potential problem. Each table includes:

(a) Sector, category, sub-category (with code);

(b) Gas;

(c) Indication of whether the potential problem is related to a key category or a non-key category;

(d) Classification of the potential problem (more than one may apply):

(i) Missing estimate (to be used when the Party has not reported a category for which methods are provided in the 2006 IPCC Guidelines or in the Wetlands Supplement when it applies[16] to the Party's reporting);

(ii) Estimate provided but not in line with the 2006 IPCC Guidelines and/or the KP Supplement and/or the Wetlands Supplement, when it applies, (e.g. a wrong calculation was done or the use of specific AD or EF was not justified);

(iii) Estimate provided but lack of transparency (to be used when a value is provided but, due to a lack of transparency, the ERT cannot determine if the estimate was provided in accordance with the 2006 IPCC Guidelines, and/or the KP Supplement and/or the Wetlands Supplement, when it applies);

[16] The Party reports the wetlands drainage and rewetting activity and/or it has applied the Wetlands Supplement guidance to any of its KP-LULUCF activities.

(e) Description of the problem identified. The description should be written clearly specifying the Party's reporting, what the problem is providing a reference to any relevant section(s) of the 2006 IPCC Guidelines and/or the KP Supplement and/or the Wetlands Supplement, when it applies, or the COP/CMP decisions, any communication with the Party during the review and why the ERT considers that the information provided by the Party did not resolve the potential problem. It is particularly important that this is written clearly. In the rare case that an issue is forwarded to the Compliance Committee due to a question of implementation, the Compliance Committee will use this Saturday Paper as one of the inputs for consideration;

(f) Recommendation by the ERT. The recommendation should clearly explain how the Party may compile revised estimates within the time-frame of six weeks. The recommendation should be sufficiently detailed, for example including references to methods or EFs in the 2006 IPCC Guidelines, and/or the KP Supplement and/or the Wetlands Supplement, where applicable. Generally, the ERT should always give the Party the opportunity to justify the Party's current approach to reporting (e.g., by providing additional information to support the use of a country-specific EF) as well as an alternative in the event that the Party cannot provide the requested information (e.g. use the IPCC default tier 1 EF);

(g) Response/information by the Party (to be filled in by the Party when responding to the Saturday paper);

(h) A field for the ERT to indicate whether or not the ERT considers the issue to be "resolved" or "unresolved", and to provide a rationale for its assessment. For an issue to be considered resolved, the Party must have provided a response that is consistent with the recommendation made by the ERT. Table 5-3 shows some possible scenarios for the ERT when assessing whether the issue is resolved.

103. In the attachment C the ERT describes the potential problems that could lead to an adjustment of KP-LULUCF activities. In attachment C the ERT includes a table for each potential problem. The structure of attachment C is similar to that of attachment B. However, in the classification and description of the problem, the ERT will also take into consideration the methods included in the KP Supplement and Wetlands supplement.

104. The Saturday Paper template is signed by the LRs in four copies: one for the Party, one for each Lead Reviewer, and one for the secretariat.

Table 5-3
When is a Saturday Paper considered resolved?

Party response to Saturday Paper	***Is the potential problem resolved? (in all cases, the ERT needs to describe in the response to the Saturday Paper, its rationale)***
The Party submits information which resolves the potential problem	Yes
Party submits revised CRF tables for the full time series and documentation describing the changes fixing the potential problem(s), as recommended. The Party does not submit a revised NIR consistent with the new approach	Yes. There is no need to resubmit the NIR in response to a Saturday Paper. The ERT may include a recommendation for the Party to explain in its NIR the updated method/AD/EF etc.
Party submits revised CRF tables for the full time series but no further documentation is provided to explain the changes made	No. The Party needs to explain the changes made, including reference to methods and data. The ERT should request this documentation from the Party before making its assessment of whether the potential problem(s) is/are resolved
The Party submits revised CRF tables, but following a method	Maybe. The ERT has flexibility to assess whether the alternative approach addresses the matter. The ERT should

Party response to Saturday Paper	***Is the potential problem resolved? (in all cases, the ERT needs to describe in the response to the Saturday Paper, its rationale)***
different to the ERT's recommendation	provide its rationale as to why it believes the potential problem(s) is/are, or is/are not, resolved
The Party submits revised CRF tables satisfactorily responding to the ERT's recommendation for the entire time series, but also changes emissions estimates for categories not included in the Saturday Paper	Not yet. The issue raised in the SP may be resolved, but the Party should not make any other changes to AD/emissions except those required to resolve the potential problems raised in the Saturday Paper. The ERT should discuss the finding with the Party and the Party should submit revised CRF tables to ensure that the resubmission includes changes only in response to the potential problems raised The one exception to this procedure may be the case where the Party and the ERT discuss an issue during the review week for which the Party would like to submit a revised estimate, however it does not do so because it has been informed that it will receive a Saturday Paper. In this case, the Party and the ERT may agree that such a revision may also be included in any revised estimates submitted in response to the Saturday Paper

VI. General approach to the review of two primary elements of the inventory submission: common reporting format tables and the national inventory report

A. Overview of the review of the common reporting format tables and the national inventory report

105. The two primary elements of a Party's inventory submission, the CRF tables and the NIR, are the main focus of the review. The Party also submits Standard Electronic Format (SEF tables), providing information on the KP units in its registry, however, the ERTs review of SEF tables is based on the findings in the Standard Independent Assessment Report (SIAR) (see chapter VII.B.4).

106. The information provided by the Party in the CRF tables includes all estimates of emissions and removals for the entire time series, AD and other related data, including calculated IEFs for all categories. The result of the KCA, automatically calculated by the CRF Reporter software, is also included in the CRF tables. The CRF tables are an integral part of the inventory submission and should be consulted, together with the NIR, throughout the entire process of the individual review.

107. To meet reporting obligations under the Kyoto Protocol, supplementary information is also reported in accordance with decisions 13/CMP.1, 14/CMP.1, 15/CMP.1 and 19/CMP.1 in conjunction with 3/CMP.11 and 4/CMP.11.

108. The appendix of the UNFCCC Annex I inventory reporting guidelines contains an outline and general structure of the NIR. The NIR does not need to strictly follow the outline, but it must include all the elements included in paragraph 50 of the UNFCCC Annex I inventory reporting guidelines.

109. The NIR is the main source of information to describe the institutional arrangements in the country and the procedures undertaken to develop the national GHG inventory, the methodologies used, available AD, EFs and the rationale for these choices. Information on the implementation of an uncertainty analysis and QA/QC procedures and information on any recalculations related to previously submitted data are also included. A separate chapter should be included that identifies changes from previous years regarding methodologies used, sources of information and assumptions, as well as responses to the review process and planned improvements.

110. Parties are allowed to submit their NIR in any of the six official languages of the United Nations (Arabic, Chinese, English, French, Russian and Spanish). Ideally, all ERT members would be fluent in the language of the Party's submission, but practically this is not always the case. However, lack of knowledge of the language of the NIR does not reduce the responsibility of the ERT to fully review the submission. In order to facilitate the review, Parties may provide unofficial translations of their NIRs. The experts can also use automatic translating tools available from the Internet and ask the Party clarifying questions, where needed. In cases where the exact wording of the NIR is of importance, the experts may consult those members of the ERT who are fluent in the language of the submission.

111. In the individual inventory review, the main task of the ERT is to assess whether the Party's submission is in adherence to the UNFCCC Annex I inventory reporting guidelines and, if applicable, the relevant CMP decisions. Particular attention is to be paid to the "shall" requirements and findings that may be considered as "issues" (see figure 5-2), while the ERT should also review whether the Party has implemented the "should" and "may" elements in the UNFCCC Annex I inventory reporting guidelines. The UNFCCC Annex I inventory review guidelines, and as

applicable the Article 8 review guidelines, establish the tasks and priorities of the ERT in its review of the NIR and CRF tables, which are illustrated in figure 6-1 below. In all review approaches (desk, centralized, in-country), focus should be given to the observations which have an impact on the level and/or trend of the GHG emissions or removals. Even in the case of issues related to transparency (i.e. the NIR does not clearly describe how emissions were estimated), the ERT should specifically determine if the lack of transparency in the inventory leads the ERT to question the accuracy of the inventory estimates reported.

112. **Special note: Review of regional economic integration organizations.** The general guidelines and rules above are applicable to all Parties. ERTs responsible for reviewing the annual submission of the European Union (EU) (a regional economic integration organization) face additional complexities. The review of the EU annual submission is unique in that it is the direct sum of emissions and removals from the national inventories compiled by the EU member States as well as Iceland, and because individual member States as well as Iceland are also subject to an individual inventory review. The focus of the EU review should be on ensuring that the EU annual submission accurately reflects the summation of the emissions and removals of its member States as well as Iceland and that information is transparently reported in the EU NIR, particularly for key categories identified at the level of the EU. When drafting the ARR, the ERT should be cognizant that the Party under review is the EU, not an individual member State or Iceland. Recommendations directed at specific member States as well as Iceland are beyond the scope for inclusion in the ARR of the EU.

113. During CRs and ICRs, the ERT, to the extent possible, should make a thorough review of all categories in the inventory. If time does not allow for a thorough review of all categories, priority in CRs and ICRs is given to key categories, categories where recalculations have been carried out, categories for which recommendations were included in the previous ARR and findings in the initial assessment. In its review of non-key categories, the ERT should focus on the most important ones or those which have not been reviewed in recent years. Such categories can be identified based on information in the previous review transcripts or (if available) the RITS, and previous ARRs.

114. As a reviewer in a DR, it is important to remember that the Annex I inventory review guidelines outline a more targeted set of issues to be reviewed in a DR (para. 76 of the annex to decision 13/CP.20). The ERT must conduct a thorough review of: categories for which recalculations exceed the set threshold (see figure 6-1); implementation by the Party of previous review recommendations; and findings in the initial assessment. If time allows, the ERT should carry out other review tasks (those which are carried out in CRs and ICRs), giving priority to key categories. This more focused approach to DRs is reflected in a specific ARR template for DRs (see chapter V.D). In the ARR template for DRs, table 3 focuses on the implementation of previous recommendations, ARR table 5 focuses on issues related to recalculations, while ARR table 6 is available for the ERT to record any additional findings. During a DR, ERTs are not required to complete ARR table 6 and should only include additional findings to the extent time allows.

115. The ERT's tasks in figure 6-1 which are common to all sector experts (and the generalist) are elaborated in chapters VI.B–F together with possible actions by the ERT. The tasks which are under the main responsibility of the generalist are included in chapter VII.B and the sector-specific tasks in chapters VII.C–G. The tables and figures in this handbook, which list ERT actions, are not intended as checklists where the team must complete all the tasks but rather as guidance for the reviewers.

116. A core element of the individual review stage is the clarification of potential issues with the Party. Communication is an essential element of all potential ERT actions that are presented in the tables and figures throughout chapters VI and VII, even if clarification is not explicitly mentioned. Further information on the process

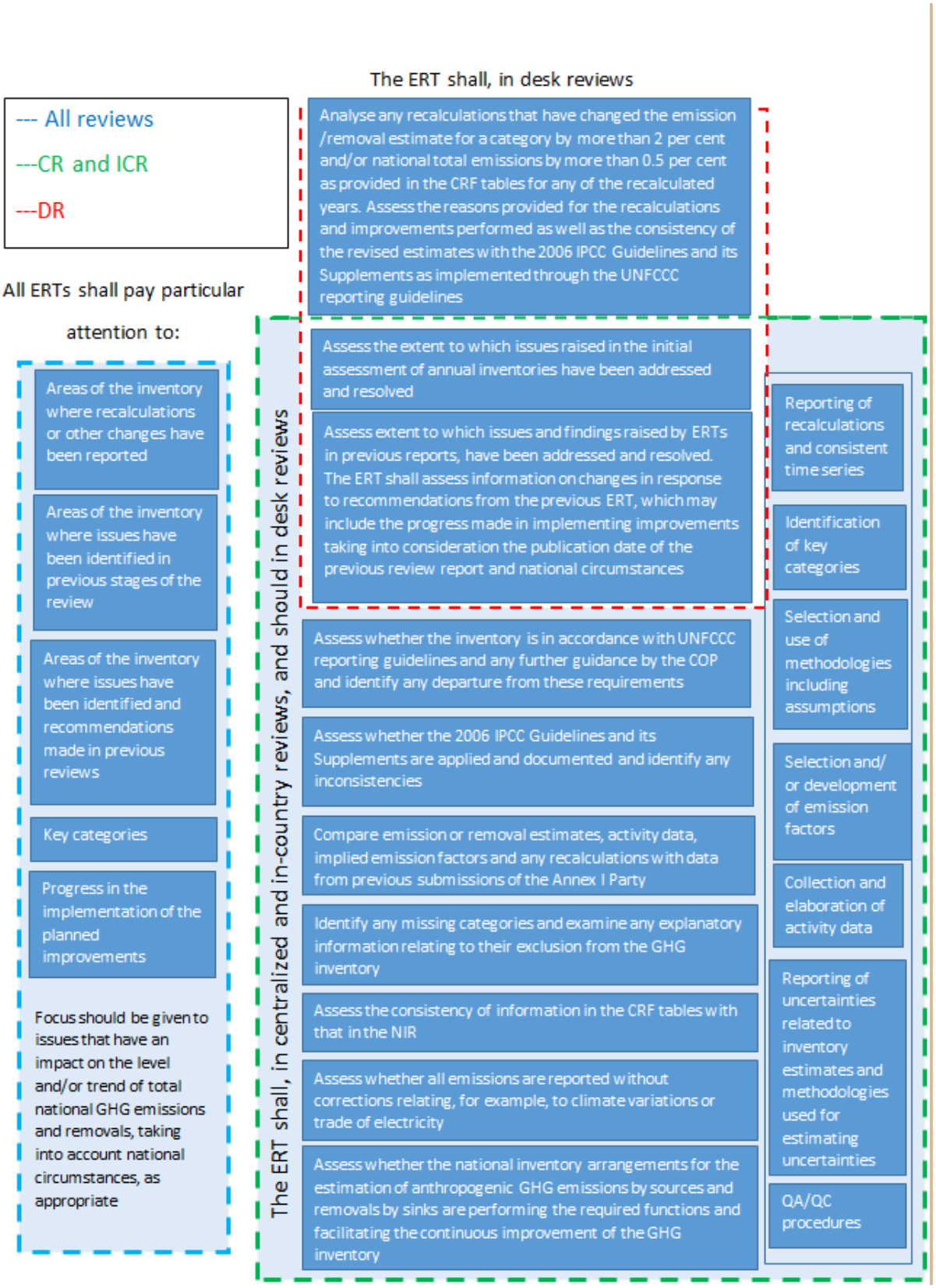
for preparing questions during the review is given in chapter III and guidance for drafting questions is provided in Box 3-1.

117. Based on the review carried out by the ERT following the tasks in figure 6-1, the ERT will then identify any areas where the Party is not adhering to requirements and other fundamental reporting elements in the UNFCCC Annex I inventory reporting guidelines or relevant CMP decisions, and provide recommendations to the Party for improving its inventory. The ERT may also encourage the Party to make improvements in other non-essential elements of its inventory planning, preparation and management process. Further guidance on documenting the review observations in the RITS and on preparing recommendations and encouragements for the Party are included in chapter V.

General approach to the review of two primary elements of inventory submission: common reporting format tables and the national inventory report

Figure 6-1

Areas to which the expert review teams shall pay particular attention in the reviews, and tasks in centralized, in-country and desk reviews



B. Follow-up of initial assessment

118. As explained in chapter III, the first stage of a review of an Annex I Party's GHG inventory is the initial assessment by the secretariat. The initial assessment's outputs, the status report and the assessment report, are starting points for the individual inventory review carried out by the ERT.

119. Tables 6-1 and 6-2 outline how the ERT can use these reports generated by the secretariat to begin its phase of the review process, the individual inventory review. Table 6-1 outlines possible ERT follow-up to the status report and table 6-2 outlines how the ERT may use the assessment report.

120. The status report provides a high-level introduction to the inventory submission by the Party, identifying possible gaps for further consideration by the ERT during the individual review. Table 6-1 identifies how each ERT member may use this report and areas that may lead to questions for further clarification from the Party.

Table 6-1
Using the status report as a tool in the individual inventory review

Expert review team member	*Tasks when reviewing the status report*
All experts	**Review part I (provision of information for the latest report year).** If any box is blank, it means that the relevant information (e.g. CRF table, totals, the reference approach) may not have been reported by the Party, or in the case of notation keys, used, in the latest submission. Any gaps should lead to a question by the relevant ERT member for the Party to explain the gap **Review part II (provision of CRF tables for years reported).** This table provides high-level information regarding whether the relevant table was provided and complete. Comments may indicate that the table was reported using notation keys. Each ERT member should review the relevant tables for their assigned sector, and try to understand the reason for any non-reported tables, or, in the event that notation keys are used, whether the notation keys are appropriate. Any unexplained gaps, or comments, should lead to a question by the relevant ERT member **Review part III (information related to recalculations).** If recalculations are indicated, the ERT member should review CRF table 8 and the NIR to understand the recalculation(s) for specific categories, and if the recalculation changed the emission/removal estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent, the ERT member should assess the reasons provided by the Party for the recalculations as well as the consistency of the revised estimates with the UNFCCC Annex I inventory reporting guidelines
Generalist	In addition to the checks for all ERT members, the generalist should check the following: (a) Does the date of receipt of the NIR and CRF tables, and if appropriate the SEF tables, match the date of submission pre-filled in the ARR template? (b) Is the base year reported by the Party in accordance with the UNFCCC Annex I inventory reporting guidelines?

General approach to the review of two primary elements of inventory submission: common reporting format tables and the national inventory report

Expert review team member	*Tasks when reviewing the status report*
	(c) Are there any common issues identified across sectors (e.g. tables missing, extensive use of notation keys) that may require follow-up questions? (d) Are there gaps and/or comments on the summary tables, CRF tables 6, 7, 8, 9 and 10? (e) What is the impact of the overall recalculations for the base year and latest year? (f) Were any questions on the key category analysis presented in the NIR and/or CRF table 7? (g) In KP reviews, does the status report indicate that the Party has failed to include an estimate for a category (as defined in chapter 4 of volume 1 of the 2006 IPCC Guidelines) that individually accounted for 7 per cent or more of the Party's aggregate emissions?
Energy expert	In addition to the checks for all ERT members, the energy expert should review whether energy estimates are reported using both the reference approach and the sectoral approach, and whether differences of more than 2 per cent are explained
IPPU expert	In addition to the checks for all ERT members, the IPPU expert should focus on any gaps related to the reporting of HFCs and PFCs disaggregated by species
Agriculture expert	Carry out the checks noted for all ERT members
LULUCF expert	Carry out the checks noted for all ERT members In KP reviews, does the status report identify gaps in the provision of supplementary information in accordance with decisions 2/CMP.7, 2/CMP.8 and 6/CMP.9 (see part IV of the status report)?
Waste expert	Carry out the checks noted for all ERT members

Abbreviations: ARR = annual review report, CRF = common reporting format, ERT = expert review team, IPPU = industrial processes and product use, LULUCF = land use, land use change and forestry, NIR = national inventory report, SEF = standard electronic format, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

121. The assessment report is based on comparisons of CRF data undertaken by the secretariat using internal statistical tools and considering year-to-year changes in the Party's time series for a particular category and gas; and comparison of IEFs and other parameters across Annex I Parties and with default values or ranges included in the 2006 IPCC Guidelines and its Supplements. In such an analysis, an identified outlier may, but does not necessarily, indicate a problem in the Party's submission. The assessment report also lists the recommendations contained in the previous ARR. Before the individual review stage begins, the ERT receives the Party's response to each of the observations in the assessment report, as well as any response by the Party regarding its implementation of the recommendations in the previous ARR.

122. The observations in the assessment report can serve as a solid foundation for each ERT member to begin to identify possible issues for further clarification during the review. Table 6-2 illustrates how each ERT member may use the observations in

the assessment report to identify areas that may lead to questions for further clarification from the Party.

Table 6-2
Using the assessment report as a tool in the individual inventory review

Expert review team member	*Tasks when reviewing the assessment report*
All experts	(a) Analyse each observation and the response from the Party and review the following: (i) Are additional follow-up questions needed to fully understand the situation in the Party? If so, ask the question through the iVTR (ii) Has the Party appropriately responded to the observation and is it either resolved or not an issue? Remember that the resolution of some issues may require an official submission of revised CRF tables. Similarly, while the Party may clarify some questions related to transparency, if the provided information should have been provided in the NIR in accordance with the 2006 IPCC Guidelines and its Supplements the issue can only be officially resolved through the submission of a new NIR, which may not take place until the following year; (iii) If the situation has not been resolved, or the Party is addressing it, determine whether the observation is an issue (see figure 5-2) (iv) If an issue is identified, this issue should be added to the RITS (if used) and the ARR and classified as one of transparency, accuracy, consistency, completeness, comparability, adherence to the UNFCCC Annex I inventory reporting guidelines, or adherence to reporting guidelines under Article 7, paragraph 1 of the Kyoto Protocol (v) In reaching a conclusion, is the assessment based on the actual values and approaches used in the preparation of the inventory (i.e. the emission factors and other relevant parameters) – not the implied emission factors? (b) When reviewing the Party's implementation of previous recommendations, the status of which should be indicated by the Party in the RITS and the ARR, each ERT member should ask questions similar to those above regarding the status of the implementation of those recommendations (see also figure 6-2). The ERT's final assessment on the status of these recommendations must be documented in ARR table 3 (c) When comparing data reported in the CRF tables with internationally reported data (e.g. to the International Energy Agency or the Food and Agriculture Organization of the United Nations (FAO)) it is important to remember that the ERT can include a recommendation in the Party's ARR only if the ERT is able to provide the data used in comparisons to the Party (i.e. data that are not freely available and cannot be made available to the Party should not be used)

Expert review team member	*Tasks when reviewing the assessment report*
	(d) For inconsistencies identified, clarify (through a question to the Party) whether the inconsistency is due to an error in the NIR or CRF table(s). Errors in CRF tables are given more prominence during the review because they are related to the review's primary focus on issues that have an impact on the level and/or trend of GHG emissions
Generalist	In addition to the checks above, the generalist should consider whether a large number of inconsistencies between and/or within the NIR and CRF tables across inventory sectors may indicate a problem in the QA/QC processes of the Party

Abbreviations: ARR = annual review report, CRF = common reporting format, ERT = expert review team, NIR = national inventory report, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

C. Implementation of previous review recommendations

123. One of the core tasks of the ERT when conducting an individual inventory review is to consider whether the Party has implemented the previous review recommendations. It is a "shall"[17] requirement in the UNFCCC Annex I inventory reporting guidelines for the Party to include in its NIR information on changes in response to the review process.

124. The ERT's task is to assess information on changes made in response to the recommendations made by the previous ERT, which may include the progress made in implementing improvements taking into consideration the publication date of the previous ARR and national circumstances. Unless the status of addressing a recommendation is very clear from the NIR and/or CRF tables, or is clarified by the Party in its response to the assessment report, the ERT should ask the Party a clarifying question. In particular, the ERT should not conclude, without consulting the Party, that there is no progress in addressing a recommendation made in a previous review. Based on the Party's response, the ERT's task is to classify the recommendations made in the previous review as "resolved" (the Party fully implemented the recommendation), "not resolved" (the Party did not implement the recommendation and has not taken any action to address it), or "addressing" (the Party has made sufficient progress in resolving the recommendation) in the ARR and also to provide a rationale for its assessment. Assessing the implementation of recommendations made in previous review reports has become an even more important task of the ERT in the latest UNFCCC Annex I inventory review guidelines because of the requirement to include a prominent paragraph in the review report noting all issues that have been identified in three successive reviews and not addressed.

[17] Paragraph 50(i) of the UNFCCC Annex I inventory reporting guidelines.

Box 6-1

Issues identified in three successive reviews and not addressed by the Party

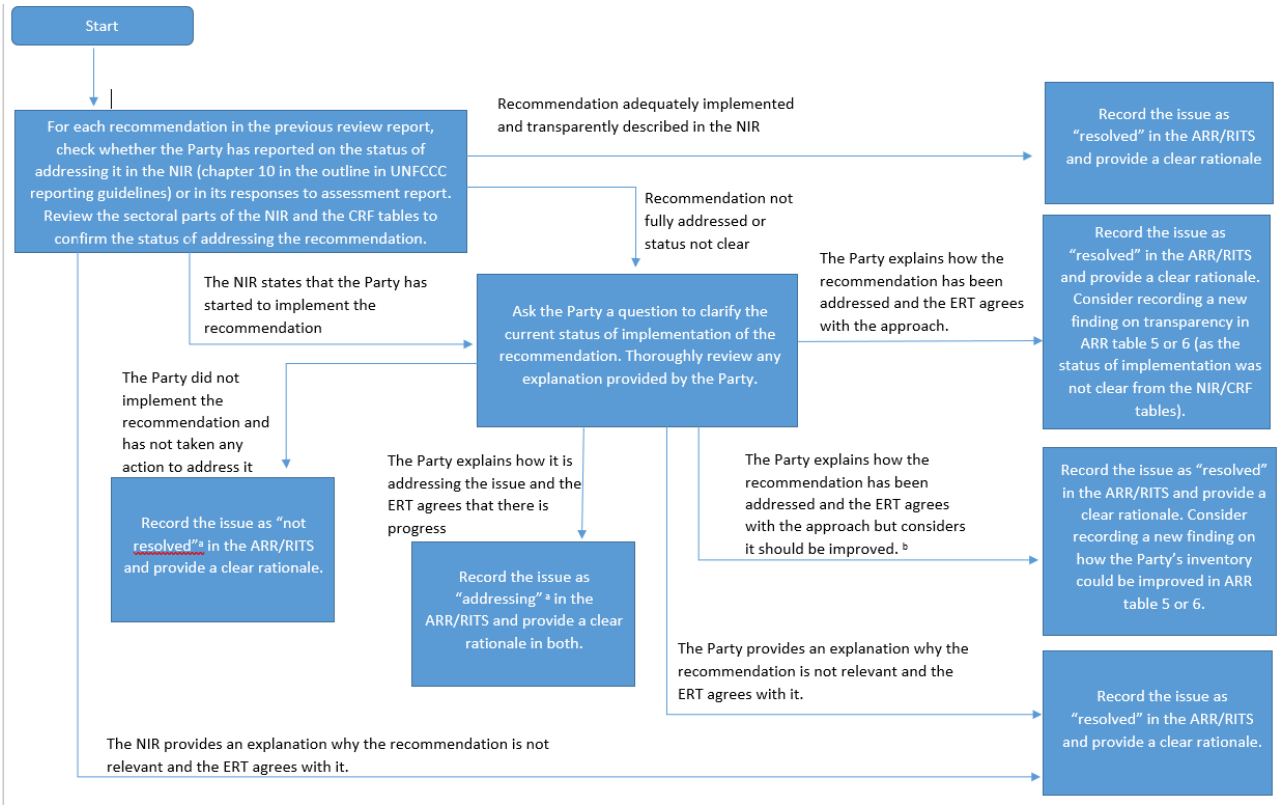
The UNFCCC Annex I inventory review guidelines (paragraph 83) introduced a concept of successive review recommendations not addressed by the Party.

The ERT will identify issues, in particular those relating to accuracy and completeness for key categories as described in paragraph 73 above, missing categories as described in paragraph 75(d) above, or potential key categories as identified by the ERT and that could not be clarified with the Party during the review week. In the case where, after such an issue has been identified in three successive reviews, in accordance with paragraphs 75(f) and 76(a) above, and has not been addressed by the Party, the ERT will include a prominent paragraph in the review report noting the issue, the number of successive reviews in which the Party has been notified of the issue, and that the Party has not addressed the issue.

Guidance for the consideration of whether a recommendation is addressed or resolved by the Party is given in figure 6-2, and guidance for the recording of such cases in the ARR is addressed in chapter V.D

125. To support the ERT's task in tracking how many sequentially preceding ARRs have raised the issue, as part of the review package, the secretariat will provide to the ERT the pre-filled ARR template, which includes, in table 3, all the recommendations from the previous ARR and a preliminary indication about the number of sequentially preceding ARRs which have included the issue. It is the ERT's task to review the pre-filled information for accuracy and completeness. Figure 6-2 includes possible actions by the ERT to assess the extent to which issues raised by ERTs in previous ARRs have been resolved. (Further guidance on how to reflect these cases in an ARR is provided in chapter V.D.)

Figure 6-2
Possible approach by the expert review team to consider whether the Party has addressed a recommendation made in the previous annual review report



[a] For previous review recommendations that have the status "not resolved" or "addressing", consider national circumstances, and, if appropriate, include in ARR table 4 also the number of sequentially preceding ARRs and (the review years) that have included the issue.

[b] For example, if the Party updates the EF as recommended by a ERT, but does not adequately describe what was done in the NIR and that was not explicitly requested by the previous ERT, the issue in the previous ARR is resolved, but the ERT may decide that there is a new transparency issue.

D. Completeness, use of notation keys and confidential information

126. As part of its task to review whether the Party's submission is in adherence with the UNFCCC Annex I inventory reporting guidelines, one of the core tasks of the ERT is to review the use of notation keys by the Party. It is important to remember that the use of notation keys is completely acceptable and consistent with the UNFCCC Annex I inventory reporting guidelines and experience suggests that every Party uses notation keys in one or more CRF tables; it is the ERT's job to make sure the notation keys have been used correctly. Possible actions by the ERT to support this task are included in table 6-3 and figure 6-3 illustrates the proper use of notation keys by the Party, depending on data availability.

127. The Annex I inventory reporting guidelines allow a Party to exclude from reporting emissions/removals from categories that are considered insignificant, even though they occur in the country and methods are available in the 2006 IPCC Guidelines or its Supplements (see box 6-2). However, the level of significance has to be properly documented in the NIR and the CRF tables (e.g. in CRF table 9) in accordance with paragraph 37(b) of the Annex I inventory reporting guidelines. In order to be below the level of significance, emissions/removals for the unique category/gas combination must be below 0.05 per cent of the national total GHG emissions, excluding LULUCF, and not exceed 500 kt CO_2 eq. In addition, the total national aggregate of estimated emissions for all gases and categories considered insignificant must remain below 0.1 per cent of the national total GHG emissions, excluding LULUCF. Figure 6-4 provides a decision tree to be used when the Party reports emissions/removals from a category using the notation key "NE" (not estimated). If a Party does not properly justify a category as insignificant in its submission, the ERT should consider this as a possible issue of completeness for inclusion in the Saturday Paper.

128. The significance threshold as contained in paragraph 37(b) of the Annex I inventory reporting guidelines is also applied to determine whether a potential problem identified by an ERT should be included in a Saturday Paper. At their 14th Meeting, the LRs clarified that a potential problems identified by the ERT that would result in an adjustment less than the thresholds given in paragraph 37(b) of the annex to decision 24/CP.19 should not be included in the Saturday Paper (paragraph 36(f)(ii)).

129. In practical terms, when considering whether to include a potential problem in the Saturday Paper, the ERT should assess two questions (1) is it possible for the ERT, during the review week, to estimate the change resulting from an adjustment for a category (if "no" the potential problem is automatically included in the Saturday Paper) and 2) if the change resulting from an adjustment can be calculated, would the adjustment for a particular category/gas combination, including the conservativeness factor, be greater than 500 kt CO_2 eq or 0.05% of emissions, whichever is lower? If "yes" the potential problem is to be included in the Saturday Paper. Any assessment by the ERT to these questions during the review week should be "evidence-based" and where evidence lacks, a potential problem should be included in the Saturday Paper (see figure 6-5).

Table 6-3
Possible actions by the expert review team to review the use of notation keys by the Party

Review element	*Possible action by the ERT*
Reporting on completeness in the NIR	* Has the Party reported, in the NIR, an assessment of completeness, including information and explanations in relation to categories that are reported as "NE" (not estimated) or "IE" (included elsewhere), and information related to the geographical scope?
Use of notation keys – general	Are notation keys used to fill in all blanks in the CRF tables? Are notation keys used where data were previously reported? If yes, is an explanation provided in the NIR? Have any notation keys changed from the previous submission? If yes, was the change properly documented in the NIR?
Use of notation key "NA"	Is the notation key "NA" (not applicable) used for activities under a given category that occur within the Party but do not result in emissions or removals of a specific gas? Where "NA" is reported and the 2006 IPCC Guidelines and its Supplements provide a method and an EF for the particular category–gas combination, carefully review the justification provided by the Party for using "NA" and consider whether a question should be asked to the Party as to why "NE" was not reported Note that when for a specific carbon pool an IPCC default method is applied that assumes no net C stock changes occur, the correct notation key to be used is "NA" with the explanation provided in the information box that the "NE" indicates a Tier 1 estimate
Use of notation key "C"	Is use of the notation key "C" (confidential) justified (i.e. is its use required to protect confidential business or military information)? Has the Party provided the basis for protecting such information, including any domestic law? Is the ERT confident that the emissions or removals reported as "C" are included in sectoral (or, if necessary, national) totals? For further information on the process for reviewing confidential data, see paragraph 130 below
Use of notation key "IE"	Are emissions that are reported as "IE" actually included elsewhere? Such an assessment may require coordination among ERT members in different sectors. Does CRF table 9 document where these emissions are reported? Often Parties use the notation key "IE" because of the way national statistics are collected, and this results in the inability to allocate emissions according to the 2006 IPCC Guidelines and its Supplements. If this is the case, the ERT should consider whether a recommendation to report emissions consistent with the allocation in the 2006 IPCC Guidelines and its Supplements is appropriate
Use of notation key "NO"	Where the notation key "NO" (not occurring) is used, has the Party provided justification that the category or process does not occur within the country? In some cases, it may be difficult for the Party to justify that a category or process is not occurring. The ERT should pay attention to use of the notation key "NO" if it has a good reason to assume

Review element	*Possible action by the ERT*
	that the activity is occurring in the Party, for example, if the emission is related to use or production of a product which generally occurs in Annex I Parties or the ERT is aware of other references indicating that the process occurs/product is produced in the country
Use of notation key "NE"	Is an explanation provided in CRF table 9 for the use of "NE"? Is "NE" reported for a category for which a method is provided in the 2006 IPCC Guidelines, or if applicable, the Wetlands Supplement? If the Party claims that the category is "insignificant", is the Party's determination of "insignificant" consistent with the requirements in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines (see figure 6-4)? If, in KP-LULUCF reporting, the Party claims that the C pool is not a source, is the Party reporting information in the NIR that demonstrates that the C pool is not a net source of GHG emissions?

*Mandatory element.

Abbreviations: C = confidential, CRF = common reporting format, IE = included elsewhere, IPCC = Intergovernmental Panel on Climate Change, NA = not applicable, NE = not estimated, NIR = national inventory report, Wetlands Supplement = 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

130. According to the UNFCCC Annex I inventory reporting guidelines, Parties may indicate that specific data or information are confidential. Where a Party reports information as confidential, the ERTs should assess whether the Party transparently describes in the CRF tables and the NIR where these emissions are reported, and may encourage the Party to provide in the NIR the specific basis for protecting the confidentiality of such information, including any domestic law. Parties should be encouraged to provide, on a confidential basis in response to a request made by the ERT, the confidential data or information on relative indicators or indices or other well-defined alternative means to consider the emission estimates reported by Parties based on the confidential information. As an ERT member, it is important that you maintain the confidentiality of any information provided, in accordance with the "Code of practice on the treatment of confidential information in the technical review of GHG inventories from Parties included in Annex I to the Convention"[18] and the UNFCCC procedures to implement the code of practice.[19] The RO will further guide and assist the ERT members in dealing with confidential data. Confidential data will be provided only to the expert(s) who review the specific sector instead of the entire ERT, and will not be uploaded to the GHG VTR. The ERT must also take confidentiality into account when documenting its findings in the RITS and in drafting the ARR, by not including the confidential data or information there. In line with the agreement to provide expert review services (see chapter II.B), the expert is obligated to maintain the information confidential after the review process.

Box 6-2
Threshold of significance

The UNFCCC Annex I inventory reporting guidelines (paragraph 37(b)) introduced the concept of an "insignificant category". Following the guidance in paragraph 37(b), the

18 https://unfccc.int/sites/default/files/ext_cp0306a1.pdf.
19 https://unfccc.int/sites/default/files/impl_proc.pdf.

Parties are allowed to report "NE" (not estimated) for a category given that it meets the threshold of insignificance and that it has not been reported in previous submissions (see figure 6-4)

Note: The insignificance criteria apply to a given category for the whole time series (category–gas combination). Therefore, if a Party reports "NE" (not estimated) only for some years of the time series, even if it demonstrates that estimates for those years fall below the significance threshold, the ERT should identify this as an issue of completeness for the years identified and affecting the time-series consistency, and recommend that the Party report emission estimates for that category for all years of the time series

Figure 6-3
Correct use of notation keys

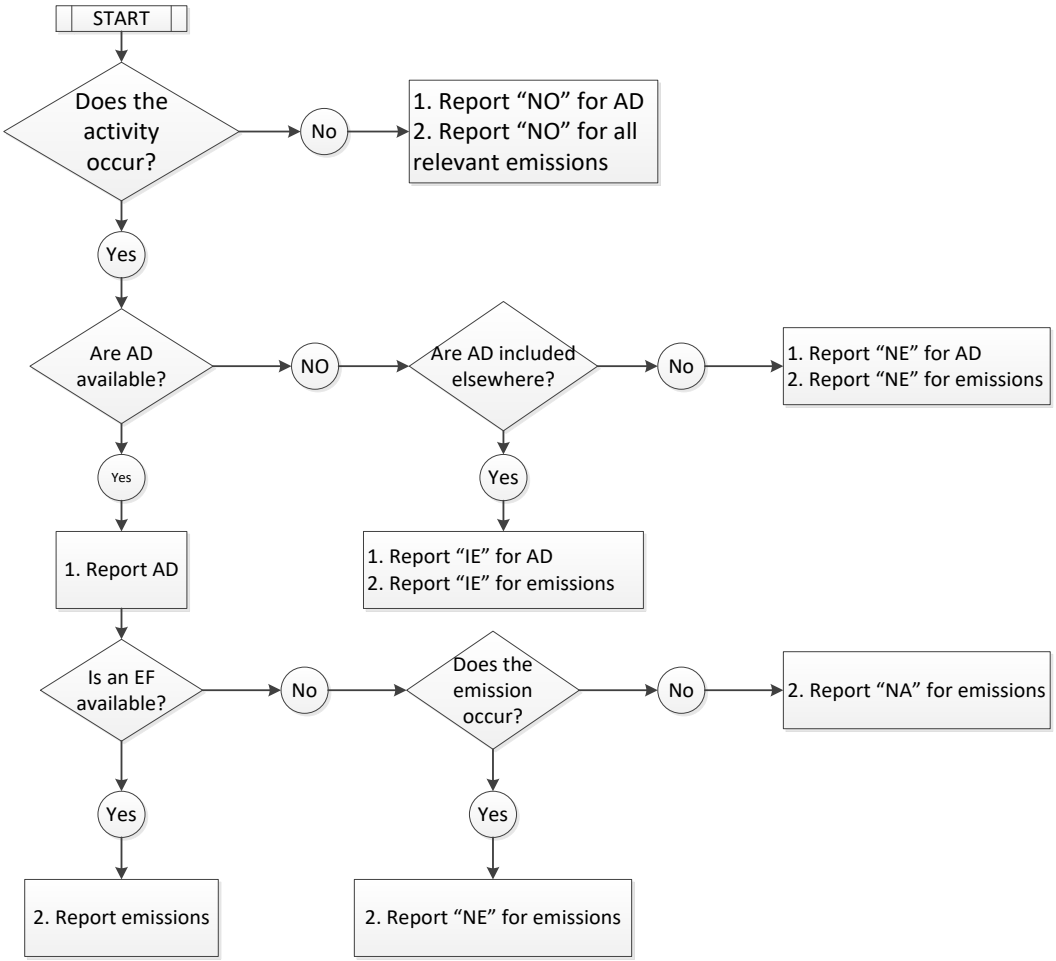
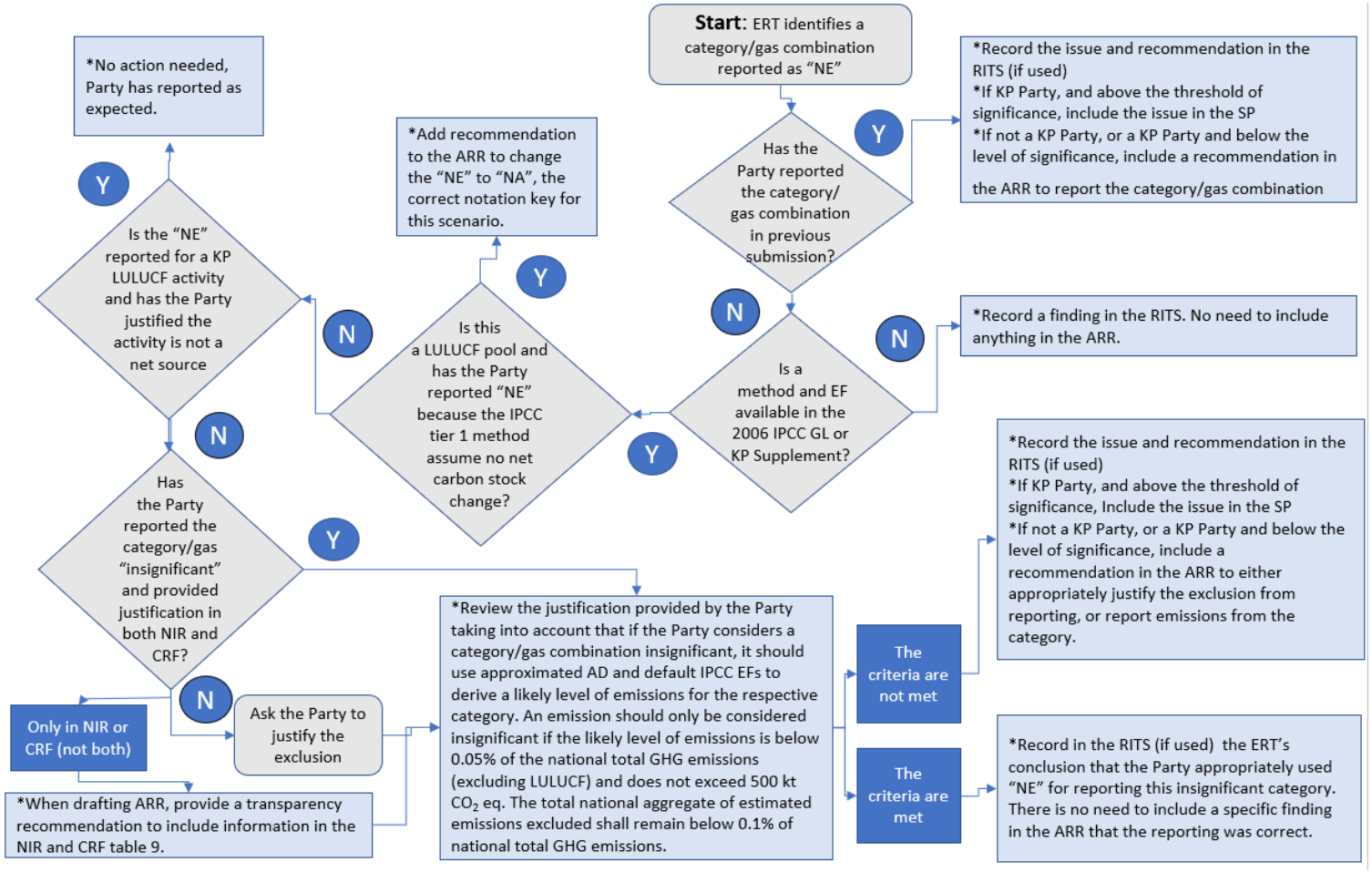


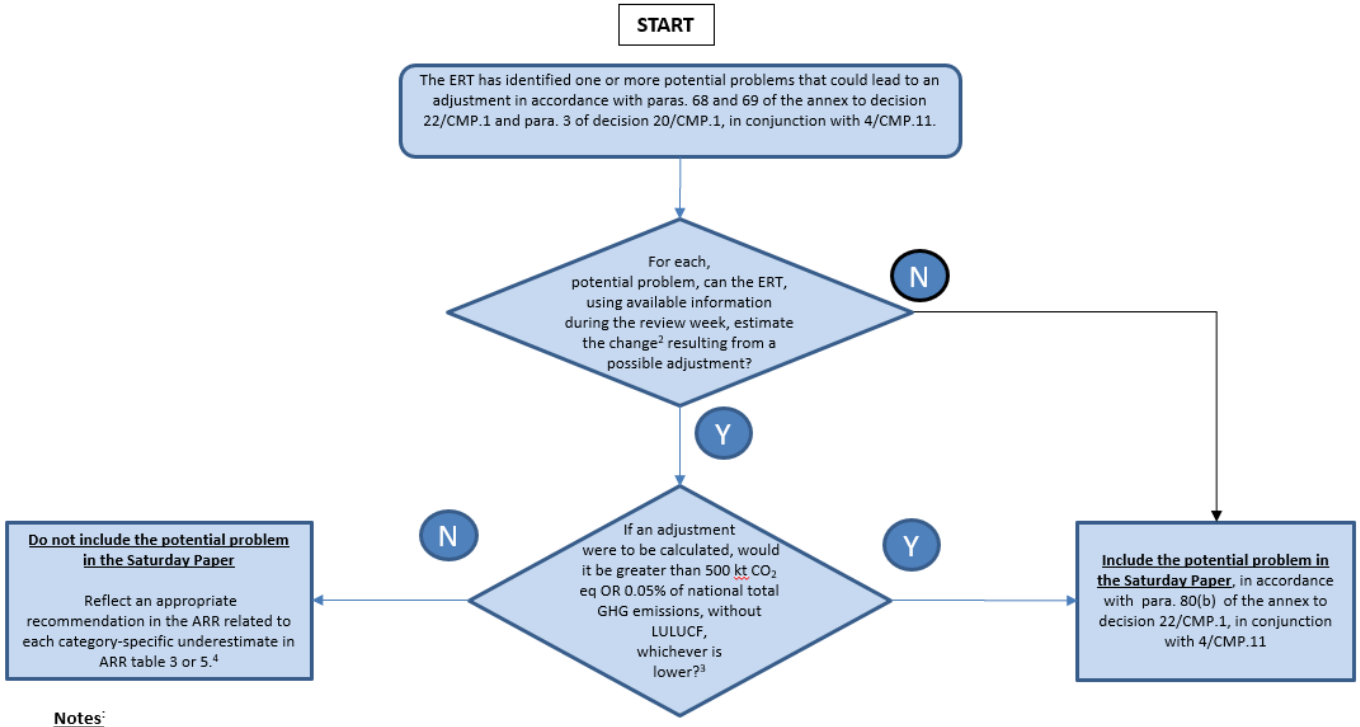
Figure 6-4
Decision tree for expert review team actions in the case of a category–gas combination reported as "NE" (not estimated)



Abbreviations: ARR = annual review report, CRF = common reporting format, EF – emission factor, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, KP LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use land use change and forestry, NE = not estimated, NIR = national inventory report, RITS = review issues tracking system.

Figure 6-5

Interpretation of para. 80(b) of decision 22/CMP.1 in conjunction with 4/CMP.11 for inclusion of issues in a Saturday Paper[1]



Notes:

[1.] For the case of the KP-LULUCF, the issuance of a SP needs to take into consideration the accounting period chosen by the Party

[2.] The "change resulting from a possible adjustment" means the value equal to the difference between the estimate of the adjusted value (including the conservativeness factor) and the original value (in the case where the Party has not reported emissions/removals for the category/gas combination, the original value equals zero) . At this stage the ERT does not have the actual data from the Party, and therefore this is a first order approximation for the purposes of implementing para. 80(b) (the ERT "assumes that the change resulting from the adjustment …") and determining whether to include the issue in the SP.

[3.] The threshold of 0.1% contained in paragraph 37(b) of the annex to decision 24/CP.19 has been considered but is not operationalized in this decision tree.

[4.] The most common recommendation would be one of accuracy or completeness, which lead to the underestimate in emissions/overestimate in removals. However, problems related to time series consistency (e.g. a different method was used in the latest year) and/or transparency (e.g. the ERT cannot be certain if an underestimate exists) may also be appropriate.

E. Methods, assumptions, emission factors and activity data

131. The choice of methods, selection of assumptions, development and selection of EFs and collection and selection of AD are the main drivers of inventory quality. The ERT task is to ensure that the selection of these data are carried out by the Party in accordance with the 2006 IPCC Guidelines and its Supplements and in line with the requirements in the UNFCCC Annex I inventory reporting guidelines. Table 6-4 provides possible ERT actions for review of these elements.

Table 6-4
Possible actions by the expert review team to assess, for each category whether the 2006 IPCC Guidelines and its Supplements are applied and sufficiently documented, in relation to the methods, assumptions, emission factors and activity data

Review element	*Possible action by the ERT*
Choice of method	(a) The 2006 IPCC Guidelines and its Supplements often include several alternative methods (tiers) for each category. In general, a higher -tier method will yield a more accurate estimate of the emissions from a category, and is therefore to be preferred. The appropriate choice of tier for the particular category in question will depend upon the overall national circumstances and availability of data (see the 2006 IPCC Guidelines, volume 1, figure 4.1), and on the decision tree specific to the category. Typically, the 2006 IPCC Guidelines and its Supplements include different methodological approaches for key categories and non-key categories, including the concept of a significant subcategory for determining whether each subcategory of a key category should be considered as key. In its review of choice of method for each category, the ERT may consider the following: (i) *Does the NIR include information on the IPCC tier used? (ii) *For key categories, does the NIR include an explanation if the recommended methods from the appropriate decision tree in the 2006 IPCC Guidelines and its Supplements are not used? (iii) If a recommended method is not used owing to lack of data or resources, has the Party adequately explained the national circumstances in the NIR? Does the Party have plans to improve the situation? (iv) If a recommended method is not used, has the Party justified its choice of an alternative method? (v) Is the method more accurate for the Party (e.g. is uncertainty smaller with the country-specific method than with a lower-tier method)? (vi) Is the Party's reporting on choice of method transparent?
Use of a method	(a) *Has the Party applied the method correctly? (b) *Does the NIR include a description of any national methodology used, as well as information on anticipated future improvements?

General approach to the review of two primary elements of inventory submission: common reporting format tables and the national inventory report

Review element	*Possible action by the ERT*
	(c) *Is any country-specific method in line with the 2006 IPCC Guidelines and its Supplements? (d) *Does the NIR include descriptions, references and sources of information for the specific methodologies, including higher-tier methods and models, as well as the rationale for their selection? (e) *For tier 3 methods and/or use of models, does the NIR include verification information consistent with the 2006 IPCC Guidelines and its Supplements?[a] (f) *For tier 3 methods, does the NIR include additional information for improving transparency, such as information described in box 6-5 below?[a] (g) *Are the descriptions of the methods complete and transparent?
Selection of assumptions	(a) *Does the NIR include descriptions, references and sources of information for assumptions as well as the rationale for their selection? (b) *Is selection and documentation of assumptions in line with the general guidance in the 2006 IPCC Guidelines and its Supplements and with the reporting and documentation guidance for the specific category?
Development and selection of EFs	(a) *Does the NIR include descriptions, references and sources of information for EFs as well as the rationale for their selection? (b) Is development or selection of EFs and their documentation in line with the general guidance in the 2006 IPCC Guidelines and its Supplements and with the guidance for the specific category? (c) Are country-specific EFs periodically reviewed and updated to ensure accuracy if underlying conditions change?
Collection and selection of AD	(a) *Does the NIR include descriptions, references and sources of information for AD as well as the rationale for their selection? (b) *Are the AD complete (i.e. includes the entire activity in the Party, such as all industrial plants or all landfills)? (c) Are the collection and selection of AD and the related documentation in line with the general guidance in the 2006 IPCC Guidelines and its Supplements and with the reporting and documentation guidance for the specific category?

*Mandatory element.

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, NIR = national inventory report, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[a] For more guidance regarding review of tier 3 methods, see the text in this chapter paras. 132-136.

Box 6-3

Treatment of the 2019 Refinement to the 2006 IPCC Guidelines in the Review Process

Although the 2019 Refinement has not yet been adopted for use under the Convention, it can be used by Parties under determined circumstances. The ERT should pay attention to the possible treatment of the 2019 Refinement in the review process, as below:

It can be used by Parties under the following conditions:

- For new categories or subcategories that are not covered by the 2006 IPCC Guidelines, the ERT should recognize in the annual review report (ARR) the estimates for such new categories, when such estimates enhance the completeness of the GHG inventory;

- For categories and subcategories covered by the 2006 IPCC Guidelines, the ERT should review whether (1) the methodologies, emission factors (EFs) and/or assumptions taken from the 2019 Refinement or a country-specific approach based on or consistent with the 2019 Refinement are well documented, (2) the Party demonstrated that they better represent the national circumstances and justified their use in its NIR, and (3) emission and removal estimates are accurate and time-series consistency has been maintained in accordance with the 2006 IPCC Guidelines;

- If a Party uses new emission allocation rules following the 2019 Refinement or a country-specific approach based on or consistent with the 2019 Refinement, the ERT should recommend that the Party revise such allocations in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories;

- The ERT should also check that emissions and removals have not been double counted or omitted, and, if double counting or an omission is identified, raise an issue in the ARR accordingly.

Box 6-4

Use of a method from previous IPCC methodological guidance

Considering that the 2006 IPCC Guidelines provide solid methodological basis for performing emission estimates, if Parties use methods, EFs or parameters from the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* or the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the ERT should review whether such methods, EFs or parameters are well documented, the Party demonstrated that they better represent the national circumstances and justified their use in its NIR, as well as review whether emission and removal estimates are accurate and time-series consistency has been maintained in accordance with the 2006 IPCC Guidelines;

Tier 3 methods and/or use of models

132. Tier 3 methods include models, plant/technology-specific knowledge and measurement systems tailored to address national circumstances. Review of tier 3 methods is often challenging because of their complexity and the limited time available for the review, particularly during centralized and desk reviews. Care must be taken to avoid spending too much time and effort when reviewing tier 3 methods, as this may hamper the review of other estimates. In-depth review of models should be prioritized during ICRs as it offers an ideal opportunity for the ERT to sit down with the Party and more thoroughly review the data and assumptions used in the application of tier 3 methods.

133. The first task of a reviewer in the review of estimates prepared using tier 3 methods is to check whether the transparency of the description of the tier 3 method fulfils the requirement in table 6-4 and if not, the reviewer should request the Party

to provide complete information on models and tier 3 methods before the review week starts. It will allow enough time for the ERT to make a full review of completeness, consistency, comparability and accuracy of the estimates. It is not responsibility of the ERT to judge on the application by a Party of a model or tier 3 method, including country-specific approaches, but the ERT should review whether input and output data and parameters of the model or tier 3 method have been reported transparently and accurately and are consistent across the time series. In its review, the ERT may find that the IPCC report *Use of Models and Facility-level Data in Greenhouse Gas Inventories*[20] is a useful background document. In particular, the checklist in Annex 1 of that report may be of use in a review of the transparency of reporting on tier 3 methods, even though it does not constitute any formal requirement for the Parties.

Box 6-5

The review of models can be deemed to have been transparently and well documented in the NIR when the information provided covers:

(i) Reasons for selecting the particular model;

(ii) If an existing model is being used and adapted: area of application of the original model and how it has been adapted (description of why and how the model was adapted for conditions outside the originally intended domain of application);

(iii) Main equations/processes;

(iv) Material assumptions (important assumptions made in developing and applying the model);

(v) Domain of application of the model (description of the range of conditions for which the model has been developed to apply);

(vi) How the model parameters were estimated;

(vii) Description of key inputs and outputs;

(viii) Details of calibration and evaluation using calibration data and independent data;

(ix) Description of the approach undertaken for the uncertainty analysis and for the sensitivity analysis, and the results of these analyses;

(x) Quality assurance (QA) and quality control (QC) procedures applied and findings from these procedures;

(xi) Comparison of the results from models, tier 3 methods or country-specific approaches with the results from lower-tier or default approaches; (see figure 6-6);

(xii) References to peer-reviewed literature (where details of research on the model can be found).

134. For the review of completeness, consistency, comparability and accuracy to the estimate generated using the tier 3 method, the ERT should use the approaches in table 6-4 and figure 6-6.

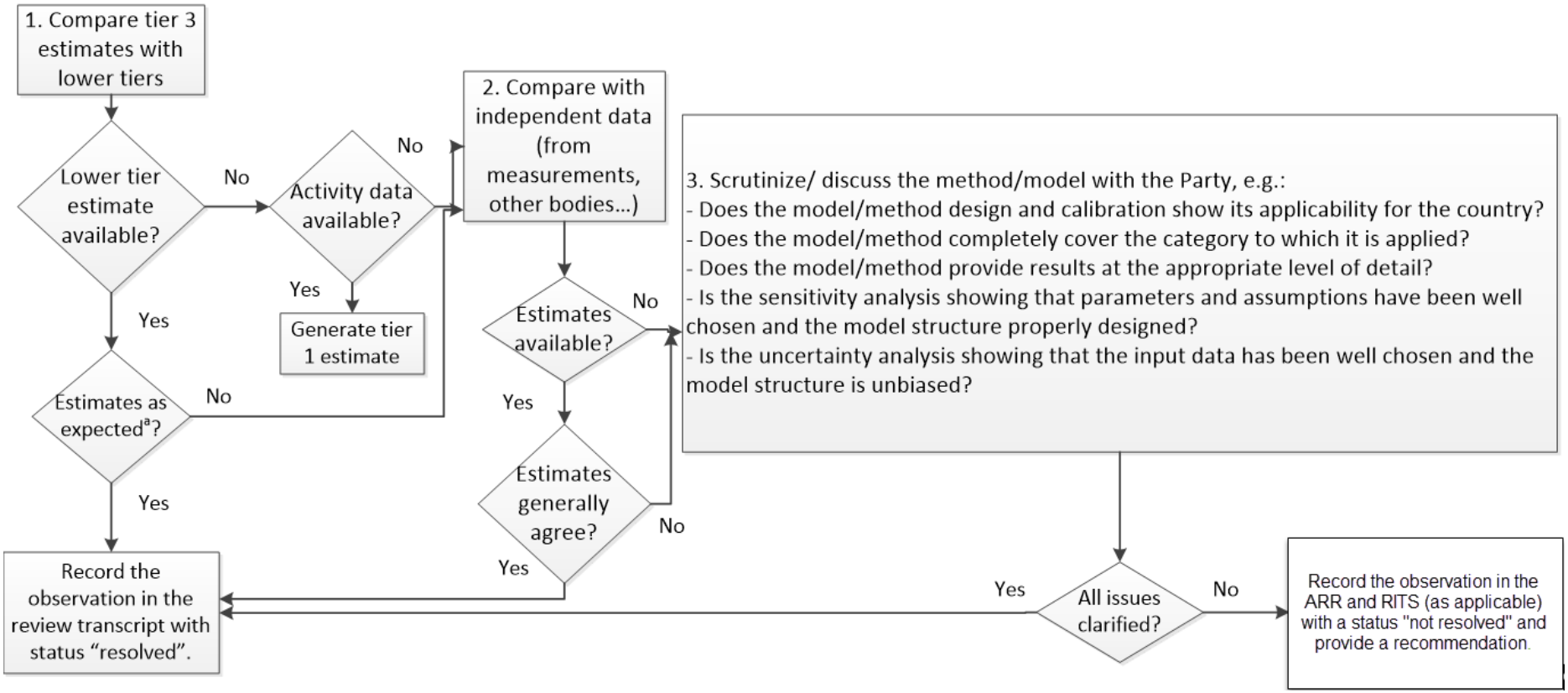
135. During DRs and CRs a review of the accuracy of tier 3 methods is particularly challenging and may require a lot of time from the reviewer. A reviewer in a CR or DR, should prioritize reviewing whether the models and tier 3 methods, including country-specific approaches, have been transparently and well documented in the national inventory report (NIR). In particular, a reviewer should review the package of materials provided by the secretariat, as well as the ARR for the most recent ICR of the Party's inventory to see if the tier 3 method was recently subject to an in-depth review. The information available may help guide the current review, or even indicate

[20] Available at: http://www.ipcc-nggip.iges.or.jp/meeting/pdfiles/1008_Model_and_Facility_Level_Data_Report.pdf.

that the tier 3 method does not need to be evaluated again during the current review. The reviewer should indicate in the review report whether the models and tier 3 methods were already reviewed during a previous in-country review. If further review is deemed necessary, a possible approach is to assess the accuracy of the tier 3 method by comparing it with the results of the tier 1 (or tier 2) method which are, or can be, made available. The application of tier 3 methods will generally be aiming at increasing the accuracy of the inventory, leading to a lower uncertainty of the estimates for a specific category or group of categories where the method is applied, when compared with a tier 1 estimate. At the same time, as both tier 1 and tier 3 methods are expected to be unbiased, the tier 3 estimate could be expected to fall within the uncertainty range of the tier 1 estimate.

136. Figure 6-6 suggests two possible tests to compare the results of a tier 3 estimate with a tier 1 estimate: (1) to check whether the results of the tier 3 method fall within the uncertainty range of tier 1 and (2) to check whether the uncertainty of the estimate generated by the tier 3 method is lower than the uncertainty of an estimate generated by the tier 1 method. If the results from the tier 3 method fall outside of the expected ranges, this does not necessarily mean that the method should not be used, so the reviewer should carefully assess any results and discuss them with the Party. It is possible that the tier 3 method results in a higher uncertainty estimate, but is actually a less uncertain estimate of the actual emissions or removals from the category, for example if the tier 3 method makes explicit sources of uncertainty that the Tier 1 method had previously not identified.

Figure 6-6
Possible expert review team actions in its review of accuracy of a tier 3 method



[a] "as expected" means that: (i): the tier 3 estimate is within the uncertainty range of the lower tiers; (ii) the uncertainty of the tier 3 is lower compared to lower tiers.

F. Cross-cutting elements by category

137. There are several common elements to be assessed across sectors when reviewing the quality of the Party's submission. These cross-cutting elements include uncertainty analysis, QA/QC, time-series consistency, recalculations and progress in implementing planned improvements. The overall review of cross-cutting elements of an inventory is the task of the ERT's generalist (chapter VII). However, the members of the ERT in each sector also review cross-cutting elements in their sectors, and cooperate with the generalist to obtain an overall understanding of the reporting of cross-cutting elements in the Party's inventory. Table 6-5 outlines possible actions that the ERT can consider to review the cross-cutting inventory elements.

138. Annex I Parties should aim at continuous improvement of their inventories. Inventory improvements are implemented through recalculations and they should be carried out only to improve accuracy or completeness. Maintaining a consistent time series is of utmost importance to ensure that the reported trends of GHG emissions and removals are not affected by changes in methodologies or data sources. Potential ERT actions in relation to continuous improvement and time-series consistency are also included in table 6-5.

Box 6-6
Recalculation explanations

The common reporting format (CRF) tables in the UNFCCC Annex I inventory reporting guidelines no longer include the CRF table with an explanation of recalculations (CRF table 8(b) in earlier CRF tables). The requirements for reporting on recalculations in the national inventory report are provided in paragraphs 43–45 and 50 in the UNFCCC Annex I inventory reporting guidelines

Table 6-5
Possible actions by the expert review team to assess, for each category, whether the 2006 IPCC Guidelines and its Supplements are applied and sufficiently documented in relation to cross-cutting inventory elements

Review element	*Possible action by the ERT*
Estimating and reporting category-specific uncertainties	(a) *Are uncertainties estimated for the category? (b) *Is the information on the uncertainty assessment per category sufficiently transparent (e.g. methods, underlying assumptions, data sources and documentation of expert judgements)? (c) Is the estimation of uncertainties in line with the 2006 IPCC Guidelines (general guidance on uncertainties in volume 1, and sector-specific guidance in the relevant sectoral volumes)?
QA/QC procedures	(a) *Does the Party apply general QC procedures for each category, in line with its QA/QC plan? (b) Does the Party apply category-specific QA/QC procedures for the category in line with the 2006 IPCC Guidelines and its Supplements? (c) If the NIR contains a number of errors across different categories, consider (in cooperation with the ERT's generalist) whether this may be an indication of lack of sufficient QA/QC procedures or whether the national inventory arrangements/national system are not sufficiently carrying out their functions. This issue should be discussed with the Party to gain an understanding of whether these, or other reasons, have resulted in the errors

General approach to the review of two primary elements of inventory submission: common reporting format tables and the national inventory report

Review element	*Possible action by the ERT*
Consistency of time series	(a) Is the same method and AD source used for the entire time series? If not, is consistency of the time series ensured in line with the 2006 IPCC Guidelines, volume 1, chapter 5? (b) Are the parameters and EF consistent over the time series? If they are not, are the changes in these factors supported by changes in national circumstances (e.g. technological development)? (c) Is the data set prepared on a calendar year basis and consistently across time? According to the 2006 IPCC Guidelines, use of calendar year data is good practice whenever the data are available. However, if calendar year data are unavailable, then other types of annual year data (e.g. non-calendar fiscal year data, April–March) can be used for certain categories provided that they are used consistently over the time series and the collection period for the data is documented
Recalculations	It is the ERT's task to review all recalculations carried out by the Party using CRF table 8 (using the Comparison tool) and the NIR to identify them. Remember that in the case of a DR, recalculations that have changed the emission/removal estimate for a category by more than 2 per cent and/or national total emissions by more than 0.5 per cent are a primary focus of the review. The ERT can consider the following: (a) *Does the NIR include sufficient information as to why a recalculation has been conducted (e.g. error correction, statistical reason or reallocation of categories, changes in methodologies, sources of information and assumptions)? (b) *Have the recalculations been sufficiently justified by improvement of accuracy or completeness? Are these justifications transparently reported in the NIR? If the recalculation has been carried out in response to the review process, is this indicated in the NIR? (c) *Have the recalculations been reported for the base year and all subsequent years of the time series up to the latest year for which the recalculations are made? (d) *Does the NIR include a discussion on the impact of the recalculations on the trend in emissions at the category, sector and national total level? (e) *Does the NIR include information on the procedures used for performing the recalculations, changes in the calculation methods, EFs and AD used? (f) *Does the NIR include information on the inclusion of categories not previously covered?
Progress of implementation of the planned improvements	Track the progress of the Party regarding planned inventory improvements and ask clarifying questions if necessary. If the Party has a number of planned improvements with limited or no progress in recent years, consider, in collaboration with the ERT's generalist, whether this may be related to problems with the Party's national inventory arrangements (e.g. lack of sophisticated prioritization of inventory improvements or lack of sufficient capacity for the performance of the functions)

*Mandatory element.

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, NIR = national inventory report, QA/QC =- quality assurance/quality control, RO = review officer, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

VII. Sector-specific guidance

A. Introduction to the sectoral parts

139. This chapter provides specific guidance to assist in the review of the estimation of emissions and removals, by sector, during the individual review of national GHG inventories. The overall aim is to help review experts in performing their tasks, avoid duplication of efforts, and promote consistency in the different types of reviews (desk reviews, centralized reviews and ICRs).

140. The guidance presented in this document is independent of which review approach is taken (i.e. DRs, CRs or ICRs).

141. The possible ERT actions presented in the tables in this chapter are not intended as a checklist whereby the team must complete all the tasks but rather as guidance for the reviewers. The tables highlight sector-specific areas that the ERT may wish to consider, for example regarding consistency of inter-linked estimates across sectors and categories. The review tasks relevant for checking cross-cutting issues like uncertainty and QA/QC are provided in table 6-5 and ERT actions related to review of methods, EFs, AD and parameters, which are common for all sectors, are provided in table 6-4. Each of the tables, and to a large extent the tasks, in this chapter may be used independently.

B. Generalists

1. Introduction

142. The role of the generalist is to review cross-cutting inventory elements and information on national inventory arrangements. The tasks of the generalist overlap with the tasks of all sector experts and LRs, and often one of the LRs is also a generalist. The generalist can support the work of sector experts through identification of potential issues in all sectors during the review. It is important for the generalist to make sure that there is no duplication in the questions sent to the Party by the generalist and sector experts.

143. It is essential for the generalist to keep an overall view on the Party's submission in order to identify any issues which occur in multiple sectors and may thus indicate a wider problem in the inventory. Wrap-up meetings generally occur daily during the review week (less frequently for DRs), and this may be a good opportunity to identify and discuss such possible issues. At the end of the review week, the generalist should, together with LRs, seek for consensus among ERT members on the general assessment of the Party's inventory, which will be documented in the ARR.

144. Key changes related to the tasks of the generalist in the UNFCCC Annex I inventory reporting guidelines are presented in the box below.

Box 7-1
Major changes for the generalist owing to the use of the UNFCCC Annex I inventory reporting guidelines and decision 3/CMP.11

(a) **The *2006 IPCC Guidelines for National Greenhouse Gas Inventories*** replaces the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. With the exception of a new chapter on "Data collection", the 2006 IPCC Guidelines do not introduce major

changes/approaches for reporting elements related to the generalist, but the reviewer should consult volume 1 of the 2006 IPCC Guidelines for a full description of the approaches

(b) **More detailed reporting and guidelines for national inventory arrangements,** including inventory planning, inventory preparation and inventory management. Decision 3/CMP.11 did not lead to any substantive changes to the reporting of elements on national systems under the Kyoto Protocol

(c) **Expanded definition for "NE" (not estimated)** to allow for the use of the notation key for categories which the Party determines to be "insignificant". This may impact the generalist's overall assessment of completeness

(d) **Need to ensure proper reporting of indirect carbon dioxide (CO_2) and nitrous oxide (N_2O) emissions;** Parties may elect to report indirect CO_2 emissions, but if they do, totals should be presented with and without indirect CO_2 emissions. In all cases, national totals are to be reported without indirect N_2O emissions for sectors other than agriculture and land use, land-use change and forestry

2. Specific tasks for review of national inventory arrangements and national systems

145. National inventory arrangements include all institutional, legal and procedural arrangements made within an Annex I Party for its inventory compilation, reporting and archiving.

146. National inventory arrangements are largely the same as national systems under the Kyoto Protocol with the primary difference being that specific elements are a "should" under the Convention but a "shall" requirement under Kyoto Protocol. Under the Kyoto Protocol, an in-depth review of the national system is carried out during the review of the report to facilitate calculation of the assigned amount (initial review).[21] Since then, the mandatory reporting in the NIR is focused on changes in the national system. However, national systems under the Kyoto Protocol can be expected to be the same as national inventory arrangements under the Convention. This means that in practice it is likely that the annual reporting of the KP Parties covers the national systems, in addition to changes thereof. Furthermore, even though there is no requirement for annual reporting on national systems, the review of the functioning of the national system (i.e. whether the Party's national system performs its general and specific functions in accordance with decision 19/CMP.1 in conjunction with decision 3/CMP.11) is part of each annual review.

147. An in-depth review of national inventory arrangements and/or functioning of the national system is carried out during an ICR. The review of national inventory arrangements and functioning of the national systems may[22] be conducted, as appropriate, through interviews with personnel involved in inventory planning, preparation and management, and through examination of relevant records and documentation, including use of the inventory CRF and preparation of the NIR.

148. During an ICR, the ERT (coordinated by the generalist) will consider the 'paper trail' of the inventory from the collection of data to the reported emission estimates and will

[21] For the Parties which had a quantatitative emission reduction or limitation commitment in CP1, the initial review was carried out before the first commitment period started. For those Parties which did not have a commitment in CP1, but have a commitment in CP2, the initial reviews including review of the national system was carried out in conjunction with each Party's submission of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol.

[22] Under KP, this approach for the review is a 'shall'.

examine procedures and institutional arrangements for inventory development and management, including QA and QC, record-keeping and documentation procedures. Table 7-1 includes possible actions by a generalist in the review of national inventory arrangements or functioning of the national system during an ICR. Many of these actions, in particular those related to inventory preparation, are not separate actions as such, but can be assessed by the generalist by reviewing the ERT's findings during the review.

149. The review of the national inventory arrangements and changes in national systems during CRs focuses on the reporting in the NIR. In addition, during a CR following an ICR that examined national inventory arrangements or national systems in detail, the ERT will identify any changes that may have occurred in the procedures and institutional arrangements, based on the information provided in the NIR and further information from the Party provided to the ERT. The ERT should focus on whether, given any changes in the national inventory arrangements or national systems, the arrangements continue to be effective and reliable for estimating GHG emissions. The ERT's assessment on national inventory arrangements and national systems will be recorded in the ARR.

150. In DRs, national inventory arrangements need not be considered in detail; however, if an issue has been raised in the previous ARR, the generalist will want to determine by reviewing the NIR, and by asking the Party a question if necessary, whether the issue has been resolved. If resolution of the issue cannot be sufficiently assessed during a desk review, the reviewer should make an appropriate note in the ARR.

Table 7-1
Possible actions by the generalist in the assessment of national inventory arrangements and functioning of national systems for in-country reviews

Check	*Action by the generalist*
Review of National Inventory Arrangements and Functioning of National Systems	
General	(a) *Has the Party provided information on national inventory arrangements, including a description of inventory preparation?
	(b) *Have there been any changes to the national inventory arrangements/national system?
	(c) Are the institutional, procedural and legal arrangements (including potential changes discussed by the Party during an in-country review) effective and reliable for estimating GHG emissions?
In the implementation of its national inventory arrangements	(a) Has the Party established and maintained the institutional, legal and procedural arrangements necessary to perform the inventory planning, preparation and management functions, between the government agencies and other entities involved in the inventory planning, preparation and management? (b) Has the Party ensured sufficient capacity for the timely performance of the functions defined in the relevant guidelines, including: (i) Data collection for estimating anthropogenic GHG emissions and removals (ii) Arrangements for the technical competence of the staff involved in inventory development? (c) Has the Party designated a single national entity with overall responsibility for the national inventory? (d) Has the Party prepared national annual GHG inventories in a timely manner? (e) Has the Party provided the information necessary to meet the reporting requirements defined in the guidelines and in relevant decisions of the COP/CMP?

Check	*Action by the generalist*
In the implementation of inventory planning functions of national inventory arrangements	(a) Has the Party defined and allocated specific responsibilities in the inventory development process, including those relating to: (i) Choice of methods (ii) Data collection, particularly AD and EFs from statistical services and other entities (iii) Processing and archiving (iv) QA/QC? (b) Does the definition of specific responsibilities specify the roles of, and the cooperation between, government agencies and other entities involved in the preparation of the inventory, as well as the institutional, legal and procedural arrangements made to prepare the inventory? (c) Has the Party elaborated an inventory QA/QC plan? (d) Has the Party established processes for: (i) Official consideration and approval of the inventory, including any recalculations, prior to its submission (ii) Responding to any issues raised in the inventory review process? (e) Has the Party considered ways to improve the quality of AD, EFs, methods and other relevant technical elements of the inventory? (f) Has information obtained from the implementation of the QA/QC programme, the inventory review process and other verification activities been considered in the development and/or revision of the QA/QC plan and the quality objectives?
In the implementation of inventory preparation functions of national inventory arrangements	(a) Has the Party prepared estimates in accordance with the requirements defined in the UNFCCC Annex I inventory reporting guidelines? (b) Has the Party collected sufficient AD, process information and EFs as are necessary to support the methods selected for estimating anthropogenic GHG emissions by sources and removals by sinks? (c) Has the Party quantified uncertainty for each category and for the inventory as a whole? (d) Are recalculations prepared in accordance with the UNFCCC Annex I inventory reporting guidelines? (e) Has the Party compiled the NIR and the CRF tables in accordance with the UNFCCC Annex I inventory reporting guidelines? (f) Has the Party implemented general inventory QC procedures in accordance with its QA/QC plan, following the 2006 IPCC Guidelines and its Supplements? (g) Has the Party applied category-specific QC procedures for key categories and for those individual categories in which significant methodological and/or data revisions have occurred, in accordance with the 2006 IPCC Guidelines? (h) Has the Party provided a basic review (QA) of the inventory by personnel that have not been involved in the inventory development process, preferably an independent third party, before the submission of the inventory, in accordance with its QA/QC plan? (i) Has the Party provided a more extensive review (QA) of the inventory for key categories, as well as for categories where significant changes to methods or data have been made, in accordance with the 2006 IPCC Guidelines and its Supplements?

Check	*Action by the generalist*
	(j) On the basis of the QA reviews described above, and periodic internal evaluations of the inventory preparation process, has the Party re-evaluated the inventory planning process, in order to meet the established quality objectives included in the QA/QC plan?
In its implementation of inventory management functions of national inventory arrangements, has the Party	(a) Archived all relevant inventory information for the reported time series, including: (i) All disaggregated EFs and AD (ii) Documentation on how EFs and AD have been generated and aggregated for the preparation of the inventory (iii) Internal documentation on QA/QC procedures, external and internal reviews (iv) Documentation on annual key categories and key category identification (v) Planned inventory improvements? (b) Has the Party provided the ERT with access to all archived information used by the Party to prepare the inventory through the single national entity? (c) Has the Party responded in a timely manner, to requests for clarifying inventory information resulting from the different stages of the process of review of the inventory information and information on the national inventory arrangements?
General	(a) Are the national inventory arrangements facilitating the continuous improvement of the GHG inventory?
General	(b) Do findings of the ERT made during the review indicate problems in national inventory arrangements?

*Mandatory element.

Abbreviations: AD = activity data, COP = Conference of the Parties to the United Nations Framework Convention on Climate Change, CRF = common reporting format, EF = emission factor, ERT = expert review team, GHG = greenhouse gas, NIR = national inventory report, QA/QC = quality assurance/ quality control, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

151. Under the KP review, the Parties have to report, as part of their annual submissions, about changes in national systems since the previous submission. The ERT may also identify a change in a Party's national system which was not reported by the Party. Table 7-2 also includes the mandatory elements for reporting on national systems in the initial report. The ERT can use this list to identify any changes in the Party's national systems.

152. Whenever the ERT identifies a change in the Party's national system, the ERT must examine whether the change affected the performance of the national system's general and specific functions.

153. Based on any findings during the individual inventory review and on findings relating to reported changes in national systems considered by the ERT to be potentially significant in relation to an identified problem in the Party's inventory, the ERT may request, in the ARR, an exceptional ICR to review the relevant components of the national system.

Table 7-2
Possible actions by the generalist in the review of changes in the national systems

Check	*Action by the ERT, task*
Inventory planning	Has the Party reported in the NIR, or has the ERT identified a change in the following areas: (a) Designation of single national entity, including contact information (b) Definition/allocation of specific responsibilities for inventory development process (c) Establishment of process for approving the inventory (d) Elaboration of the QA/QC plan (e) Consideration of ways to improve inventory quality Was the reporting of the change complete and transparent? Does the change have an impact (positive or negative) on the performance of the national system's inventory planning functions?
Inventory preparation	Has the Party reported in the NIR, or has the ERT identified a change in the following areas: (a) Identification of key categories (b) Preparation of estimates in line with the 2006 IPCC Guidelines and its Supplements (c) Selection of sufficient AD and collection of EFs to support methods selected (d) Conducting quantitative uncertainty analysis (e) Preparation of recalculations in accordance with the 2006 IPCC Guidelines and its Supplements (f) Compilation of the inventory in accordance with Article 7, paragraph 1 of the Kyoto Protocol (g) Implementation of general QC (approach 1) procedures (h) Implementation of category-specific QC procedures for key categories (i) Provision of a basic review, preferably by an independent third party (j) Implementation of a more extensive review for key categories (k) Re-evaluation of the inventory preparation process to meet quality objectives Was the reporting of the change complete and transparent? Does the change have an impact (positive or negative) on the performance of the national system's inventory preparation functions?
Inventory management	Has the Party reported in the NIR, or has the ERT identified a change in the following areas: (a) Archiving of inventory information, including emission factors, activity data, documentation, QA/QC procedures, external/internal reviews, key category documentation and planned inventory improvements (b) Providing the ERT with access to archived information (c) Responding to requests for clarifying inventory information during the review process (d) The collection and gathering of archived information in a single location? Was the reporting of the change complete and transparent? Does the change have an impact (positive or negative) on the performance of the national system's inventory preparation functions?

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, NIR = national inventory report, QA/QC = quality assurance/ quality control.

3. Specific tasks for review of cross-cutting elements of the inventory

154. As explained in chapter VI, the review by the generalist starts by noting any problems identified in the status report. If anything is unclear, the generalist must ask questions to the Party in order to fully understand the reasons for problems indicated in the status report,

coordinating with sector experts, where relevant. The next step is to go through any observations and Party responses raised in the general chapter of the assessment report, including how previous recommendations have been addressed, and classifying all observations as resolved, not resolved, or addressing in the ARR (see chapter V.D). The generalist must clarify with the Party any issues believed to be not resolved through the question and answer procedure, and only after the Party has had a chance to respond should any issue be classified as "addressing" or "not resolved" in the RITS.

155. The next step by the generalist is to identify any potential new issues by assessing whether, in the Party's submission, all "shall" requirements in the relevant guidelines are met. Table 7-3 includes possible actions by a generalist in this regard, and also other actions that the generalist may wish to carry out in the review of cross-cutting inventory elements. Many tasks include coordination with sector experts (see chapters VI.D–F).

Table 7-3
Possible actions by the generalist in the review of inventory cross-cutting elements

Cross-cutting element	*Action by the generalist to assess whether "shall" requirements are met*	*Other possible actions by the generalist*
Key categories (see also box 7.2)	Has the Party implemented an approach 1 KCA, with and without LULUCF, for the base year and latest year, and presented the results in the NIR (approach 1 must be done, even if approach 2 is done)?	(a) Has the Party used tables 4.2 and 4.3 of the 2006 IPCC Guidelines to report the KCA in the NIR? (b) If the Party reports a national KCA in addition to the KCA provided in CRF table 7, is the aggregation in accordance with the 2006 IPCC Guidelines and its Supplements? (c) Are there significant differences between the Party's national KCA reported in the NIR and the KCA in CRF table 7? If so, can the differences be explained by different aggregation levels or a different approach (if approach 2 or a hybrid approach is used in the national KCA)? (d) Has the Party used qualitative criteria in its KCA in accordance with the 2006 IPCC Guidelines? (e) Are results of the KCA used to prioritize inventory improvements?
Uncertainties	Has the Party implemented at least an approach 1 uncertainty analysis for all categories, for the base year, the latest year and the trend, and presented results in the NIR? (Approach 2 may be done instead of approach 1 or in addition to it.)	(a) Has the Party used the 2006 IPCC Guidelines, volume 1, table 3.3, for reporting on the uncertainty analysis? (b) Has the Party indicated, in the above-mentioned table, categories which are identified as key? (c) Are any expert judgements used in the uncertainty analysis documented and archived?
	Have the methods in the 2006 IPCC Guidelines for the uncertainty analysis been	(a) Is the uncertainty analysis technically correct in accordance with the 2006 IPCC Guidelines?

Cross-cutting element	*Action by the generalist to assess whether "shall" requirements are met*	*Other possible actions by the generalist*
	applied and the methods and assumptions been reported in the NIR?	(b) Coordinate with sector experts to identify any problems with the methods and data sources used, in relation to the 2006 IPCC Guidelines (c) Does the uncertainty analysis cover all categories? This can be checked by comparing total emissions and removals in an uncertainty reporting table with the national totals reported in CRF table Summary 2 (d) Are results of the uncertainty analysis used to prioritize inventory improvements?
	Coordinate with sector experts to check whether uncertainty of data has been discussed in sectoral parts	
QA/QC and verification	(a) Has the Party developed a QA/QC plan and reported on it in its NIR? (b) Are the QA/QC procedures in line with the 2006 IPCC Guidelines and its Supplements?	(a) Has the Party performed QA activities, e.g. basic expert peer review of the inventory? (b) Are QA activities implemented in accordance with the 2006 IPCC Guidelines, in particular is QA carried out by personnel not involved in inventory preparation? (c) How are the findings of QA/QC procedures taken into account in the inventory compilation cycle (in particular, does the timing of QC activities take into consideration the time needed to implement any changes in the inventory)? (d) How is the QA/QC plan linked to planned improvements, including those arising from review recommendations, results of uncertainty analysis and KCA, and periodic assessment for the need for recalculations (new AD or EFs available, possibility to move to higher tier, etc.)?
	Has the Party implemented at least approach 1 QC checks and reported on checks implemented in the NIR?	(a) In an ICR: check evidence of the implementation of QA/QC procedures (e.g. checklists, reports of peer review) and interview the inventory compiler to understand how QA/QC is performed and whether improvements are needed (b) Coordinate with sector experts to assess whether inventory findings, such as recurring inconsistencies between the NIR and CRF tables, indicate a problem in the QA/QC process (c) Are the checks performed in accordance with the QA/QC plan?

Cross-cutting element	*Action by the generalist to assess whether "shall" requirements are met*	*Other possible actions by the generalist*
	Coordinate with all sector experts: for any use of tier 3 methods or models, has the Party provided verification information consistent with the 2006 IPCC Guidelines?	
Completeness	Coordinate with all sector experts to assess whether the Party provides a rationale in both the CRF tables and the NIR where "NE" is reported	
	Is the total of emissions determined to be insignificant and reported as "NE", below 0.1% of national emissions excluding LULUCF but including indirect CO_2 if reported by the Party?	
	Coordinate with all sector experts: do all categories reported in previous submissions continue to be reported?	
	If the Party chooses to report indirect CO_2 emissions, are national totals presented with and without indirect CO_2?	
Recalculations	Coordinate with all sector experts: Have recalculations been reported in the NIR, with explanatory information and justifications?	Does the NIR explain the impact of the recalculations on the trend at the category, sector and national level?
	Have recalculations been carried out with a view to improve accuracy and/or completeness?	(a) Do recalculations result in a consistent time series? (b) If a Party has used two different methods in the time series, is it able to justify why use of two methods is preferable to applying one of the splicing techniques from the 2006 IPCC Guidelines?
Corrections	Has the inventory been reported without corrections relating to, for example, climate variations or trade patterns of electricity?	
Implementation of previous recommendations	Has the Party provided information on changes in response to the review process regarding sectoral (coordinate with sector experts) and cross-cutting elements?	Assess, taking into account the publication date of the previous ARR and national circumstances, whether the Party has demonstrated sufficient progress in implementing improvements in its submission. If the Party did not provide in the NIR information on changes in response to the review process or the progress made under the relevant sectors, the ERT should recommend that the Party include such information in the NIR

Cross-cutting element	*Action by the generalist to assess whether "shall" requirements are met*	*Other possible actions by the generalist*
Response from the Party during the review		Coordinate with sector experts to assess whether the Party has provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the COP
Overview of all inventory findings		Coordinate with the entire ERT to assess, on the basis of all the findings of the review, whether the ERT recommends that the next review be conducted as an ICR?[b]

Abbreviations: ARR = annual review report, COP = Conference of the Parties to the United Nations Framework Convention on Climate Change, CRF = common reporting format, ERT = expert review team, ICR = in- country review, KCA = key category analysis, LULUCF = land use, land use change and forestry, NE = not estimated, NIR = national inventory report, QA/QC =- quality assurance/quality control, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[a] Paragraph reference for the shall requirements.

[b] If the ERT recommends an exceptional ICR, the annex to the ARR must contain a list of questions and issues to be considered during the ICR.

Box 7-2
Assessment of the reporting of key category analysis

If a Party does not report in the NIR how it performed the key category analysis for the base year and the latest reported inventory year, using approach 1 from the 2006 IPCC Guidelines, level and trend assessment, and including and excluding land use, land-use change and forestry, when it used a different level of disaggregation of categories than that recommended in the 2006 IPCC Guidelines, the ERT should recommend that the Party report this information in the NIR.

If a Party to the Kyoto Protocol does not include in the NIR information on the identified KP-LULUCF key categories and describe how each category was identified as key in accordance with the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*, the ERT should recommend that the Party include this information in the NIR

Box 7-3
Indirect CO_2 emissions

When indirect CO_2 emissions are reported by a Party, the ERT should assess the accuracy, consistency, comparability and transparency of the indirect CO_2 emission estimates. When an issue has been identified with the reported estimates in relation to these principles, the ERT should encourage the Party, as necessary, to improve the accuracy, consistency, comparability and transparency of the estimates and the relevant background information provided. The ERT may cross-check NMVOC estimates originating the indirect CO_2 emission estimates against those reported in the air pollutant inventories submitted under the Convention on Long-range Transboundary Air Pollution (CLRTAP), and it should ask the Party for the reasons for any discrepancies and, where relevant, encourage the Party to correct the estimates. In the cases when a Party decided to report indirect CO_2 emissions, the ERT should check that the Party has reported the national totals with and without indirect CO_2, and encourage the Party to continue reporting such emissions in subsequent GHG annual inventory submissions and ensure that no double counting occurs

4. Tasks for review of the registry and Kyoto Protocol units in KP reviews

156. A thorough review of a Party's national registry is carried out as part of the Party's initial review. In the annual review, the ERT will check whether there are any problems in the Party's registry, Kyoto Protocol units or accounting of assigned amount. In this task, the ERT will largely rely on the Standard Independent Assessment Report (SIAR) (see box 7-4). Table 7-4 outlines possible actions by the ERT in its annual review of the registry.

Box 7-4
Standard Independent Assessment Report

The Standard Independent Assessment Report (SIAR) is the main source of information for the ERT in its review of national registries, information on Kyoto Protocol units and accounting of assigned amounts. The SIAR is provided to the ERT by the secretariat and it provides information to the ERT about the assessment of:

(a) The completeness and accuracy of the information reported by the Party in its annual report related to holdings and transactions of Kyoto Protocol units and the national registry
(b) The conformity of transactions of Kyoto Protocol units with accounting rules
(c) The continuing adherence of the registry with the technical standards for data exchange between registry systems, and the operational performance of the registry
(d) The accessibility of publicly available information, including information on registry accounts, projects under Articles 6 and 12 of the Kyoto Protocol, and transactions, on the Party's registry website
(e) Any previous recommendations related to these aspects

Each SIAR has two parts. Part 1 evaluates the completeness of the reported information and Part 2 evaluates the content and substance of the information that the Parties make available for assessment. The main source of information for the ERT is the SIAR Part 2 "Summary of findings".

The SIAR findings and recommendations are provided to the CMP and Compliance Committee only through the ARR. Therefore, it is important that the ERT carefully considers the SIAR and follows up any problems identified therein

Table 7-4
Possible actions by the expert review team in its review of information on assigned amounts, KP units and national registry

Check	*Action by the ERT, task*
Information on KP units	Does the SIAR "Summary of findings" identify any problems regarding Standard Electronic Format (SEF) tables? If problems are identified, the ERT will want to check whether the SIAR, part 2 "Summary of findings" or chapter 2 "Identification of problems" includes related recommendations. If recommendations are included in the SIAR, the ERT will ask the Party a question to assess the current status of implementing of the recommendation. If there is insufficient progress, the ERT usually reiterates the SIAR recommendation in the ARR
Discrepancies	Does the SIAR "Summary of Findings" indicate discrepancies? If the "Summary of findings" or chapter 2 "Identification of problems" includes recommendations regarding discrepancies, the ERT may ask the Party a question to assess the current status of implementing the recommendation. If there is

Check	*Action by the ERT, task*
	insufficient progress, the ERT usually reiterates the SIAR recommendation in the ARR
Notifications and unfulfilled notifications (non-replacement)	Does the SIAR "Summary of findings", paragraph 4 indicate an unfulfilled notification? If the SIAR indicates an unfulfilled notification, ERT should request the ITL administrator to check whether the registry has subsequently undertaken the action required by the notification. If not, the ERT should recommend, in the ARR, that a correction be applied to the required action. The correction recommendation should specify the transaction type required (cancellation or replacement) and the number of units
Accounting of Kyoto Units	Does the SIAR "Summary of findings" identify problems in how the registry is accounting for Kyoto Units? If such problems are identified, the ERT should ask the Party a question to understand the situation regarding resolving the problem. The ERT may also consult the ITL administrator for support. Generally, unresolved problems in information on accounting of Kyoto Protocol units are listed by the ERT as a question of implementation. In addition, the ERT may consider to recommend, in the ARR, a thorough registry review for the following year
Publicly available information	Does the SIAR "Summary of findings" identify any problems with publicly available information? If problems are identified, the ERT may ask the Party a question to assess the current status of implementing the recommendation. If there is insufficient progress, the ERT usually reiterates the SIAR recommendation in the ARR

157. In its annual submission, a Party is required to report on changes in its national registry compared with the last submission. The ERT may also identify a change in a Party's national registry which was not reported by the Party. Table 7-5 includes possible actions by the ERT in its review of the reporting on changes in the national registry.

Table 7-5
Possible actions by the expert review team in its review of changes to the national registry

Check	*Action by the ERT, task*
Changes in the national registry reported in the NIR	Has the Party provided information on the changes in the national registry in its NIR? If so, is the information complete and transparent?
Changes in the national registry identified in the SIAR	Has the SIAR "Summary of findings" or the part P2.1.4 identified a significant change in the registry? If the SIAR includes a recommendation in relation to the change in the national registry, the ERT usually reiterates it in the ARR If SIAR identified a change in the national registry, has this change been described in the NIR? If a description in the NIR is not available, the ERT may send a question to the Party seeking clarification, and, as applicable, include a recommendation in the ARR for the Party to report on any changes in the national registry
Changes in the national registry identified by the ERT	Has the ERT identified changes in the following information, which have not been reported by the Party in its NIR? (a) Name and contact information of registry administrator (b) Names of other Parties with which the Party cooperates, if applicable (c) Description of the database structure (d) Description of the capacity of the national registry (e) Description of how the national registry conforms to the technical DES between registry systems (f) Description of the procedures employed in the national registry to minimize discrepancies in the transactions of Kyoto Protocol units (g) Description of the steps taken to terminate transactions where a Party is notified of a discrepancy and to correct problems in the event of a failure to terminate the transaction (h) An overview of security measures employed in the national registry to prevent unauthorized manipulations and operator error, and an overview of how these measures are kept up to date (i) A list of the information publicly accessible by means of the user interface to the national registry (j) The Internet address of the interface to the Party's national registry (k) A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster (l) The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the DES between registry systems If a description in the NIR is not available, the ERT may include a recommendation in the ARR to report on any changes in the national registry

Abbreviations: ARR = annual review report, DES = data exchange standards, ERT = expert review team, NIR = national inventory report, SIAR = standard independent assessment report.

5. Tasks for review of the commitment period reserve in KP reviews

158. Paragraph 18 of Article 7 reporting guidelines includes reporting requirements relevant for the commitment period reserve (CPR). Table 7-6 includes possible ERT actions for the review of information on the CPR.

159. If the Party provides a resubmission of its CRF tables during the review, for example in response to a Saturday Paper, the ERT will ask the Party to provide a revised CPR calculation. The ERT will review the revised CPR accordingly and include both the original and revised CPR in the ARR.

Table 7-6
Possible actions by the expert review team in its review of information on CPR

Check	*Action by the ERT, task*
Provision of information	Has the Party reported its calculation of the commitment period reserve in its NIR?
Correctness of calculation (no cancellation pursuant to article 3.7ter)	Is the calculation of the CPR correct? If the Party has not applied the cancellation pursuant to Article 3, paragraph 7ter (information available in the initial review report), the CPR shall be the lowest of the values below: (a) 90% of the Party's assigned amount calculated pursuant to Article 3, paragraphs 7 bis, 8 and 8 bis, of the Kyoto Protocol (as available in the Party's initial review report) (b) 100% of eight times its most recently reviewed inventory (i.e. the emissions excluding LULUCF and including indirect CO_2, in the submission currently under review) In making the calculation, has the Party considered the inventory submission currently being reviewed by the ERT as the "most recently reviewed" inventory. This CPR calculation must be based on the total emissions of the latest annual submission, not the most recently published ARR
Correctness of calculation (cancellation pursuant to article 3.7ter)	If the Party has applied a cancellation pursuant to Article 3, paragraph 7ter (information available in the initial review report), the CPR shall be the lowest of the values below, as described in paragraph 8 quinquies of the annex to decision 13/CMP.1 in conjunction with 3/CMP.11: (a) 90 % of eight times its average annual emissions for the first three years of CP1 (b) 100 per cent of eight times its most recently reviewed inventory (i.e. the emissions excluding LULUCF and including indirect CO_2, in the submission currently under review) In making the calculation, has the Party considered the inventory submission currently being reviewed by the ERT as the "most recently reviewed" inventory. This CPR calculation must be based on the total emissions of the latest annual submission, not the most recently published ARR

Abbreviations: ARR = annual review report, CMP = Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol, CPR = commitment period reserve, ERT = expert review team, LULUCF = land use, land use change and forestry, NIR = national inventory report.

6. Tasks for review of the information provided under article 3, paragraph 14 in KP reviews

160. Chapter H. of the annex to decision 15/CMP.1 in conjunction with 3/CMP.11 includes the reporting requirements for Annex I Parties regarding the minimization of adverse impacts in accordance with Article 3, paragraph 14. Table 7-7 includes possible ERT actions for the review of reporting under article 3, paragraph 14, of the Kyoto Protocol.

161. There is often confusion regarding how to review the Party's reporting of information related to minimization of adverse impacts. According to paragraph 25 of chapter H, where information on minimization of average impacts has been previously reported, the Party only has to report changes in its activities. Therefore, the ERT should specifically check how the Party describes the changes to its activities (or the fact that changes have not occurred).

Table 7-7
Possible actions by the expert review team in its review of information provided under article 3, paragraph 14

Check	*Action by the ERT, task*
Provision of information	Has the Party included in its NIR information regarding how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments mentioned in Article 3, paragraph 1 bis, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention?
Reporting of information for the first time	If the Party provided the above-mentioned information for the first time in the annual submission under review, is the provided information complete and submitted in a timely manner?
Information on changes	If the Party has provided, in its earlier submissions, information on minimization of adverse impacts, has the Party included information in its NIR on any changes that have occurred, compared with the information reported in its last submission?
Information on giving priority	If the Party is included in Annex II to the Convention, has it included in the NIR information on how it gives priority, in implementing its commitments under Article 3, paragraph 14, to the actions listed in paragraphs 24(a)-(f) of Article 7 reporting guidelines? If the information has been submitted earlier, has the Party provided information on any changes thereof?
Transparency	Is the information reported transparent?

Abbreviations: NIR = national inventory report.

C. Energy

1. Introduction

162. In the 2006 IPCC Guidelines, the energy sector has three main categories: fuel combustion; fugitive emissions from fuels; and CO_2 transport and storage. According to the UNFCCC Annex I inventory reporting guidelines, the reporting of the energy sector is organized in the CRF tables as follows:

(a) Fuel combustion activities (sectoral approach):

(i) Energy industries;

(ii) Manufacturing industries and construction;

(iii) Transport;

(iv) Other sectors;

(v) Other;

(b) Fugitive emissions from fuels:

(i) Solid fuels;

(ii) Oil and natural gas and other emissions from energy production;

(c) CO_2 transport and storage

(i) Transport of CO_2;

(ii) Injection and storage;

(iii) Other.

163. In addition, as a verification activity, the Parties should report CO_2 emissions calculated using the reference approach and compare the results of the sectoral and reference approaches.

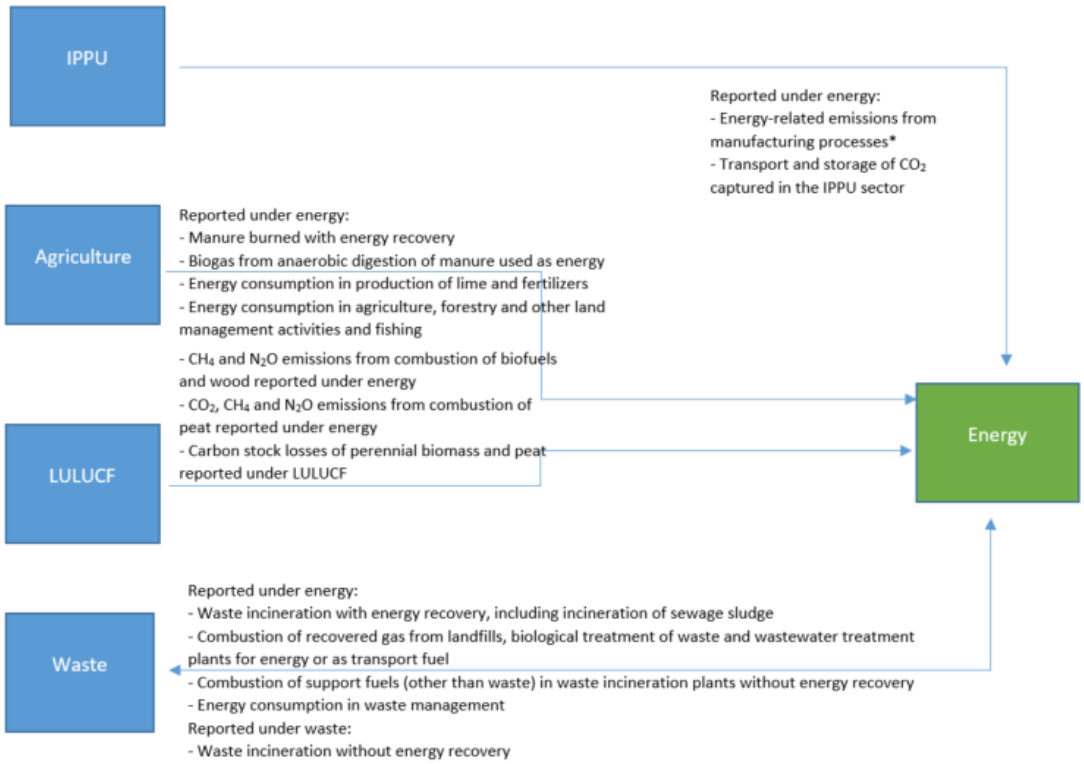
164. Memo items reported in the CRF tables for this sector include emissions from international aviation and navigation bunkers, multilateral operations, CO_2 emissions from biomass and amount of CO_2 captured. These memo items are not included in sectoral or national totals.

2. Sector-specific issues

Integration of the energy sector

165. The categories in the energy sector interact with the categories in other sectors (see figure 7-1).

Figure 7-1
Overview of the interaction of the energy sector with other inventory sectors



* Combustion emissions from fuels obtained directly or indirectly from the feedstock for an IPPU process will normally be allocated to the part of the category in which the process occurs. These categories are normally 2.B and 2.C. However, if the derived fuels are transferred for combustion in another source category, the emissions should be reported in the appropriate part of Energy Sector source categories (normally 1.A.1 or 1.A.2).

166. The methods in the 2006 IPCC Guidelines for the energy sector have been revised compared with the methods in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). The main differences are summarized in box 7-5 below. However, the list is not exhaustive and it is important that the review experts make sure that, for all categories, the inventory estimates are in line with the 2006 IPCC Guidelines.

Box 7-5
Main changes in the 2006 IPCC Guidelines from the Revised 1996 IPCC Guidelines and IPCC good practice guidance: energy

(a) Guidance for the estimation of methane (CH_4) emissions from abandoned coal mines is included

(b) Fugitive CH_4 emissions from degasification systems in coal mines are reported in the year in which they occur, and not in the year in which the coal seam is mined through

(c) Carbon dioxide capture and storage (CCS) is covered comprehensively, including fugitive losses from carbon dioxide (CO_2) capture and transport stages plus any losses from CO_2 stored

(d) Emissions from the category non-energy use of fuels are now included in the industrial processes and product use sector, rather than in the energy sector

(e) It is clarified that reference approach is to be used for quality assurance/quality control of the inventory, whereas the sectoral approach should be used for estimation of emissions

(f) Tier 1 methods for fuel combustion include carbon emitted in carbon monoxide or hydrocarbons (i.e. oxidation factor of 1 is included in default emission factors)

(g) New subcategories are included

167. Table 7-8 includes possible ERT actions common for several categories under fuel combustion activities. The energy expert may consider going through the list when reviewing the inventory for the energy sector.

Table 7-8
Possible actions by the expert review team in its review of emissions from fuel combustion

Check	*Action by the ERT, task*
Feedstocks and non-energy use	Has the Party provided information in the NIR and CRF table 1.A(d) on how and where feedstocks and non-energy use of fuels have been reported in the inventory? Is it possible to confirm, coordinating with the IPPU expert, that all relevant emissions have been included in the inventory (including natural gas used for hydrogen production) and that no double counting has occurred?
Reference and sectoral approach	Has the Party reported CO_2 emissions from the reference approach and compared these emissions with those calculated using the sectoral approach, for verification purposes? Have any differences been adequately explained?
Fuel combustion	Where the Party has reported use of "other fossil fuels" has it explained (in the documentation box for CRF table 1.A(a)s4) which fuels are included?
	Has the Party reported, as an information item in CRF table 1.A(a)s4, total emissions from waste incineration with energy recovery subdivided into biogenic and fossil emissions? Has the Party explained in the documentation box for CRF table 1.A(a)s4 under which fuel types those emissions are included? Check that the information is consistent with the reporting of fuel consumption by category, in particular in the categories energy industries and manufacturing industries and construction
	Has the Party included all fuel combustion activities in its inventory, reporting in the category "other" any activities not covered under other categories, such as military stationary and mobile fuel consumption?
Indirect emissions	Has the Party excluded from its sectoral and national totals any indirect N_2O from this sector?
	If the Party has decided to include indirect CO_2 in the national total, check whether possible double counting occurs, in particular if tier 1 is used. Tier 1 EFs include all carbon in the fuel (oxidation factor = 1), and therefore indirect emissions resulting from carbon monoxide or

Check	*Action by the ERT, task*
	hydrocarbons emitted during fuel combustion are already included in the EF and should not be double counted through the estimation of indirect CO_2

Abbreviations: CRF = common reporting format, EF = emission factor, ERT = expert review team, IPPU = industrial processes and product use, NIR = national inventory report.

Energy industries

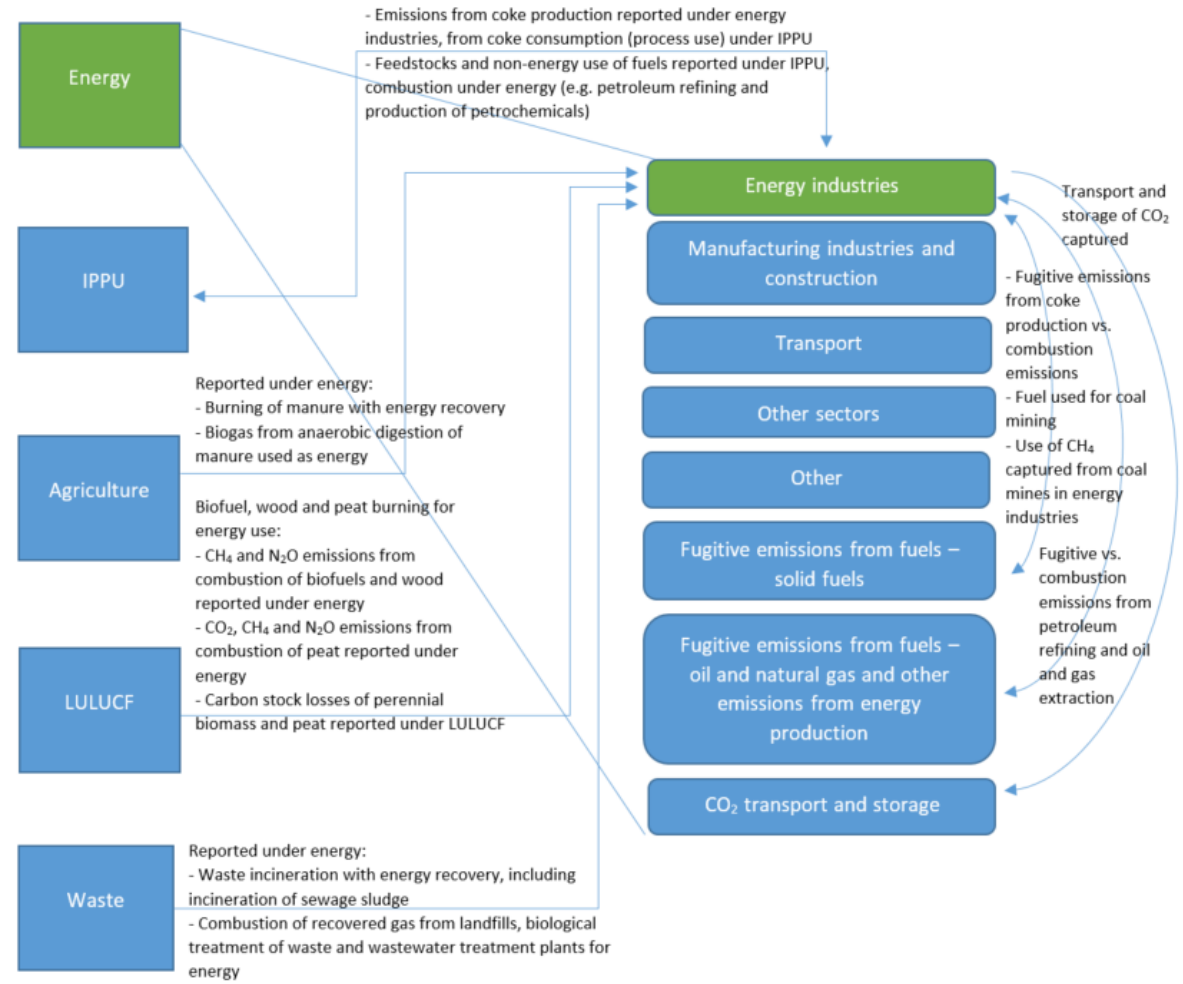
168. Table 7-9 provides a summary of key elements for the energy industries category, and figure 7-2 summarizes linkages between the energy industries category and the other categories in the energy sector and with other sectors.

Table 7-9

Summary of key elements of the energy industries category

Overview	*Category-specific information*	
Category name	Energy industries	
Reported in CRF table	Table 1.A(a)s1	
Main subcategories and GHGs to be reported	Public electricity and heat production	CO_2, CH_4, N_2O
	Petroleum refining	CO_2, CH_4, N_2O
	Manufacture of solid fuels and other energy industries	CO_2, CH_4, N_2O

Figure 7-2
Main linkages between the energy industries category and the other categories in the energy sector and other sectors



169. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the energy expert may consider going through the list of potential ERT actions in table 7-10 when reviewing emissions from the energy industries category.

Table 7-10
Possible actions by the expert review team in its review of emissions from the energy industries category

Subcategory	*Action by the ERT, task*
All	If country-specific EFs are used, how are they derived? Are they based on measurements at full boiler load or are start-up or partial load conditions appropriately taken into account?
	How are the EFs for waste and other unconventional fuels (such as refinery gas, fuel oils and residues in refineries) derived?
	If unconventional fuels are used, what factors, if any, has the Party used to convert the fuel amount to energy units?

Subcategory	*Action by the ERT, task*
	Are AD based on fuel combusted rather than fuel delivered, allowing for distinction between energy and non-energy use of fuels and appropriately taking into account changes in stocks?
	How does the Party consider the fuel stock held by enterprises in its inventory?
	Where both combustion and process emissions occur, has the Party correctly allocated the emissions between the energy and IPPU sectors following the guidance in the 2006 IPCC Guidelines (in particular box 1.1. of volume 3)? Has the Party transparently explained how it is ensured that no double counting or omission occurs?
	If the Party reports amount of CO_2 captured, is the estimate based on plant-specific data?
	If the Party reports amount of CO_2 captured, is the estimate consistent with the reporting under CO_2 transport and storage?
	If CO_2 is reported to be captured in processes involving both combustion and process emissions reported under the energy sector and the IPPU sector, respectively, how has the Party ensured that the amount captured is not double counted?
Petroleum refining	Is the reporting of emissions from petroleum refining consistently reflected under fuel combustion activities (1.A.1.b Petroleum refining) and fugitive emissions (e.g. 1.B.2.a.4 Refining and storage)?
	Has the Party appropriately distinguished emissions from petroleum refining and production of petrochemicals if conducted in the same facility, in particular ensuring that no double counting or omission occurs? Are there mass and carbon balances available to check that?
Manufacture of solid fuels and other energy industries	Has the Party reported under manufacture of solid fuels all emissions arising from fuel combustion for the production of coke, brown coal briquettes and patent fuel? Has the Party made a carbon balance in particular for coke production?
	Has the Party distinguished fugitive emissions from coke production from combustion emissions and reported fugitive emissions under the category solid fuel transformation? Note that the 2006 IPCC Guidelines does not provide a method to estimate fugitive emissions from coke production.
	Is the reporting of emissions from oil and gas extraction consistently reflected under fuel combustion activities (1.A.1.c.ii Oil and gas extraction) and fugitive emissions (e.g. 1.B.2.a Oil and 1.B.2.b Natural gas)?
	Has the Party reported under other energy industries all combustion emissions from own-energy use for the production of charcoal, bagasse, saw dust, cotton stalks and carbonizing of biofuels as well as fuel used for coal mining, and from pre-combustion processing for CO_2 capture and storage? Other energy industries may also include, if not reported elsewhere, fuel combustion in gas liquefaction plants, oil shale extraction and shale oil treatment, nuclear fuel reprocessing and manufacture of liquid and gaseous fuels from “in situ” primary fuels

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, IPPU = industrial processes and product use, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

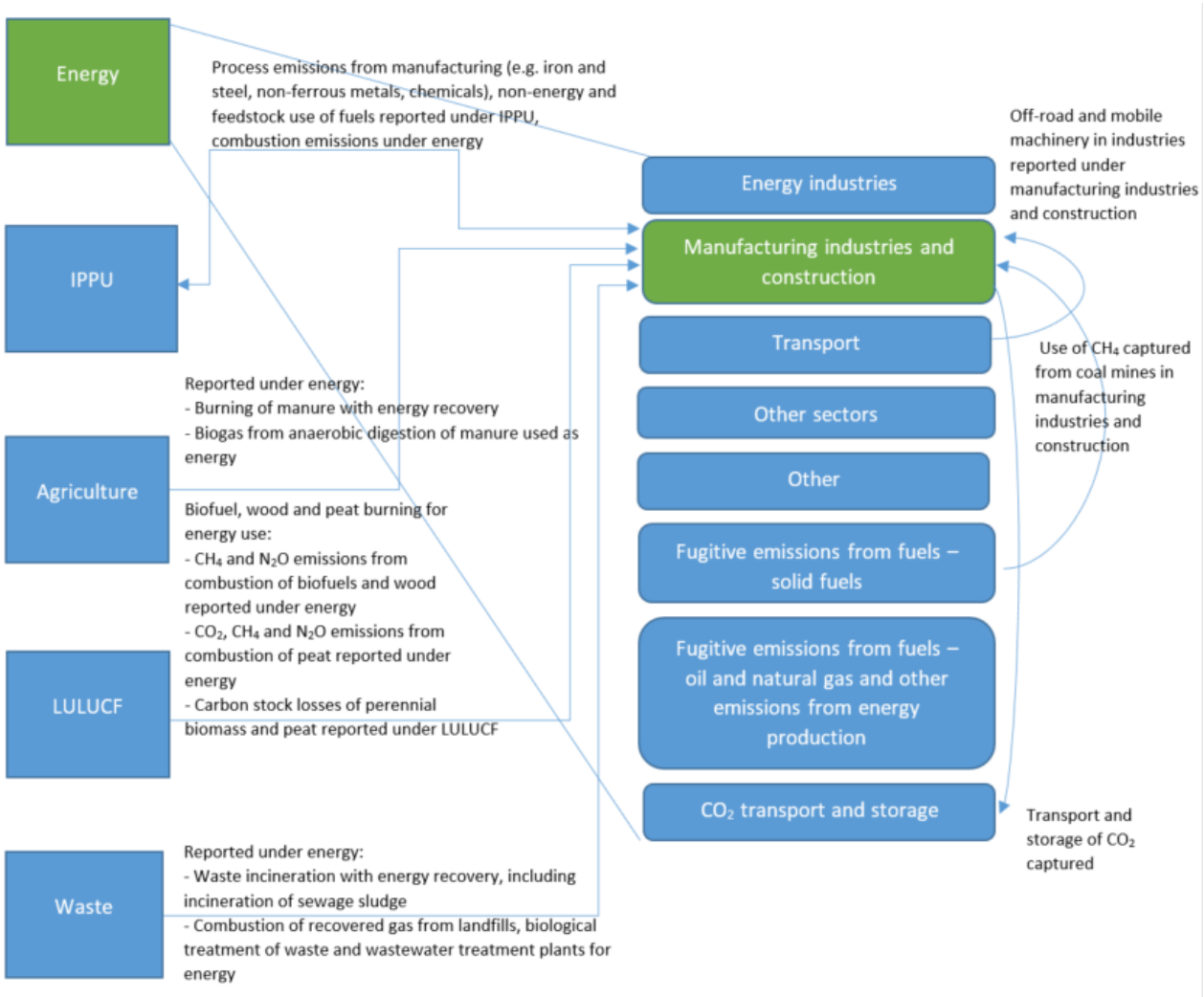
Manufacturing industries and construction

170. Table 7-11 provides a summary of key elements for the manufacturing industries and construction category, and figure 7-3 summarizes linkages between the manufacturing industries and construction category and the other categories in the energy sector and with other sectors.

Table 7-11
Summary of key elements of the manufacturing industries and construction category

Overview	*Category-specific information*	
Category name	Manufacturing industries and construction	
Reported in CRF table	Table 1.A(a)s2	
Main subcategories and GHGs to be reported	Iron and steel	CO_2, CH_4, N_2O
	Non-ferrous metals	CO_2, CH_4, N_2O
	Chemicals	CO_2, CH_4, N_2O
	Pulp, paper and print	CO_2, CH_4, N_2O
	Food processing, beverages and tobacco	CO_2, CH_4, N_2O
	Non-metallic minerals	CO_2, CH_4, N_2O
	Other	CO_2, CH_4, N_2O

Figure 7-3
Main linkages between the manufacturing industries and construction category and the other categories in the energy sector and other sectors



171. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the energy expert may consider going through the list of potential ERT actions in table 7-12 when reviewing emissions from the manufacturing industries and construction category.

Table 7-12
Possible actions by the expert review team in its review of emissions from the manufacturing industries and construction category

Subcategory	*Action by the ERT, task*
All	If country-specific EFs are used, how are they derived? Are they based on measurements at full boiler load or are start-up or partial load conditions appropriately taken into account?
	How are the EFs for waste and other unconventional fuels (such as refinery gas, fuel oils and residues in refineries) derived?
	If unconventional fuels are used, what factors has the Party used, if any, to convert the fuel amount to energy units?
	Are AD based on fuel combusted rather than fuel delivered, allowing for distinction between energy and non-energy use of fuels and appropriately taking into account changes in stocks?
	How does the Party consider the fuel stock held by enterprises in its inventory?
	Where both combustion and process emissions occur, has the Party correctly allocated the emissions between the energy sector and the IPPU sector following the guidance in the 2006 IPCC Guidelines (in particular box 1.1. in volume 3)? Has the Party transparently explained how it is ensured that no double counting or omission occurs?
	How has the Party ensured that double counting with non-energy use of fuels does not occur?
	If the Party reports amount of CO_2 captured, is the estimate based on plant-specific data?
	If the Party reports amount of CO_2 captured, is the estimate consistent with the reporting under CO_2 transport and storage?
	If CO_2 is reported to be captured in processes involving both combustion and process emissions reported under the energy sector and the IPPU sector, respectively, how is it ensured that the amount captured is not double counted?
	Are emissions arising from off-road and other mobile machinery in industries included?
Iron and steel (See also Box 7-6)	Is fuel combustion in coke ovens excluded from this category and reported under manufacture of solid fuels and other energy industries?
	Is the reporting on fuel consumption for iron and steel (1.A.2.a) consistent with the reporting of iron and steel production under IPPU (2.C.1) ensuring that no double counting or omission occurs?
	In case of integrated iron and steel plants with on-site coke production, has the Party appropriately distinguished between the emissions in the energy sector and the IPPU sector? In particular, the reviewer should ensure that no double counting or omission occurs. Carbon consumed in the form of coke oven gas at an iron and steelmaking facility and the resulting CO_2 and CH_4 emissions should be reported under IPPU, unless the coke oven gas is sold off site, in which case, emissions are reported under the energy sector. Carbon consumed in the form of blast furnace gas at an on-site coke production facility and the resulting CO_2 and CH_4 emissions should be reported under energy
	Are gases from basic oxygen steel furnaces recovered and included with blast furnace gas? If not, how are the emissions from this source reported?
Chemicals	If steam cracking of petrochemical feedstock occurs, what procedure has been employed to identify the quantities of by-products used as fuel?

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Box 7-6
Iron and Steel

In case of the review of the allocation of GHG emissions from iron and steel between the energy and IPPU sectors, The ERT should pay attention to:

- Are the total reported bottom-up calculated estimates of CO_2 emissions from non-energy use of fuels including uses as feedstock and reductant at different subcategory levels complete, consistent and transparent?
- Are the feedstock or reductant requirements of processes in balance with the non-energy use or feedstock supply recorded in the national energy statistics?

In particular, the ERT should request the Party to provide information for the purpose of verifying the estimated emissions from iron and steel industry and demonstrating that no double counting or omission has occurred, if this information was not provided in the NIR.

The ERT may encourage the Party to provide accurate information (e.g. a carbon balance) in the NIR to increase the transparency of its reporting. If the ERT identifies an issue of accuracy, in particular an underestimation of emissions, the ERT should recommend that the Party provide more transparent information to demonstrate that there has been no double counting or omission of emissions from iron and steel industry.

When the Party is using a different allocation of emissions from that recommended in the 2006 IPCC Guidelines and is reporting the emissions as "IE" under the energy or IPPU sectors, the ERT should check whether the Party has transparently reported where the emissions have been included and ensured the accuracy of the estimates. If this is not the case, the ERT should follow up with a relevant recommendation.

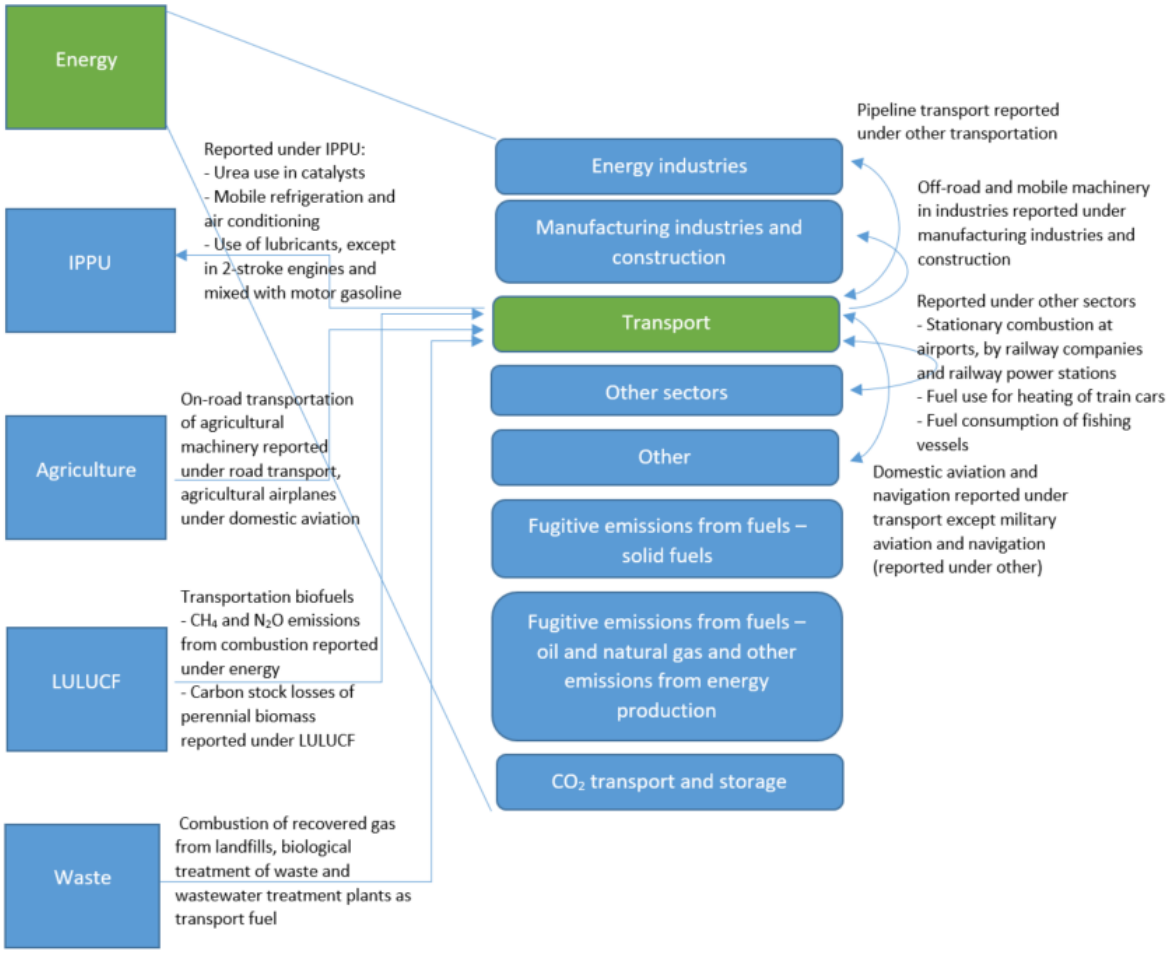
Transport

172. Table 7-13 provides a summary of key elements for the transport category, and figure 7-4 summarizes linkages between the transport category and the other categories in the energy sector and with other sectors.

Table 7-13
Summary of key elements of the transport category

Overview	*Category-specific information*	
Category name	Transport	
Reported in CRF table	Table 1.A(a)s3	
Main subcategories and GHGs to be reported	Domestic aviation	CO_2, CH_4, N_2O
	Road transportation	CO_2, CH_4, N_2O
	Railways	CO_2, CH_4, N_2O
	Domestic navigation	CO_2, CH_4, N_2O
	Other transportation	CO_2, CH_4, N_2O

Figure 7-4
Main linkages between the transport category and the other categories in the energy sector and other sectors



173. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the energy expert may consider going through the list of potential ERT actions in table 7-14 when reviewing emissions from the transport category.

Table 7-14
Possible actions by the expert review team in its review of emissions from the transport category

Subcategory	*Action by the ERT, task*
Domestic aviation	Is the Party able to separate domestic and international aviation in line with the 2006 IPCC Guidelines? Has the Party reported emissions from international aviation based on fuel sold to aircraft engaged in international transport and excluded this amount from domestic aviation?
	Has the Party excluded emissions from military aviation (should be reported under Other – mobile)?
	Has the Party excluded emissions from stationary combustion at airports (should be included under commercial/institutional) and fuel consumption for ground transport (should be included under other transportation)?

Subcategory	*Action by the ERT, task*
	Has the Party included non-scheduled flights and general aviation such as agricultural aeroplanes, private jets or helicopters? These should be included if the quantity of fuel consumed is significant
	Have flights to all parts of the national territory been classified as "domestic" according to the IPCC definition?
	Has the Party excluded the use of aviation fuels in applications other than aviation, such as engine and airframe testing?
Road transportation	Has the Party excluded CO_2 emissions from urea used as catalyst (should be reported under 2.D.3 Non-energy products from fuels and solvent use – other)?
	Does the AD used include on-road only and exclude off-road vehicles or machinery?
	If data on fuel sold is used, has the Party ensured that fuel sold for transportation uses is not used for other purposes? (For example, in some countries oil for residential heating is subsidized to lower its price and may be consumed as a transport fuel)
	If a Party has used EFs from the COPERT model to estimate CO_2 emissions from road transport has the Party transparently documented how the EFs applied are appropriate to the national circumstances of that Party, particularly when the category is key?
	Does the Party use in its calculations the carbon content of the fuels sold in the country to estimate CO_2 emissions?
	Has the Party carried out QA/QC activities by comparing CO_2 estimates using bottom-up (vehicle kilometre travelled) and top-down (fuel statistics) data? What are the conclusions of such a comparison?
	Are all fuels included, including liquefied petroleum gas, compressed natural gas and biofuels?
	If the Party reports use of biofuels, has it assessed the biofuel origin so as to identify and separate fossil from biogenic feedstocks? Biodiesel made from coal methanol with animal feedstocks is an example of biofuel with a fossil component
	Where cross-border transfers take place in vehicle tanks, do the emissions include all fuel loaded into the vehicles in the Party?
	If recovered gases from the waste sector (landfills, biological treatment or wastewater treatment plants) have been used as transport fuel, are emissions reported in the energy sector and is double counting with the waste sector emissions avoided?
	If wastes (such as waste cooking oil) are used to produce biofuels, is double counting with the waste sector avoided?
	How is the use of lubricants as an additive in 2-stroke engines reported? It should be included in the road transport fuel use, but may also be reported separately as a lubricant
Railways	Has the Party excluded emissions from stationary fuel consumption by railway companies and by railway power stations (should be reported under commercial/institutional)?
	If natural gas or coal is used for heating cars, are these emissions included under stationary combustion, in particular, is it ensured that no double counting or omission occurs?
	Are lubricants used in diesel locomotives included under IPPU?

Subcategory	*Action by the ERT, task*
Domestic navigation	Is the Party able to separate domestic and international navigation in line with the 2006 IPCC Guidelines? Has the Party reported emissions from international navigation based on fuel sold to ships engaged in international transport and excluded this amount from domestic navigation?
	Have journeys to all parts of the national territory been classified as "domestic" according to the IPCC definition?
	How does the Party ensure that no double counting or omission occurs, for example, regarding fuel consumption in passenger vessels, ferries, recreational watercraft, other inland watercraft and other gasoline-fuelled watercraft?
	Has the Party excluded emissions from military navigation (should be reported under Other – mobile)?
	Has the Party excluded emissions from fishing vessels and included them in category 1.A.4.c.iii Fishing?
Other transportation	Has the Party reported in this category all combustion emissions from all transport activities not included in other categories (including under transport, agriculture/forestry/fishing, manufacturing industries and construction or other – mobile (for military))?
	Has the Party included in fuel combustion data the lubricants that are mixed with motor gasoline and combusted, and reported other use of lubricants under IPPU?

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, GHG = greenhouse gas, GHG VTR = GHG virtual team room, ICR = in- country review, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, QA/QC =- quality assurance/ quality control, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

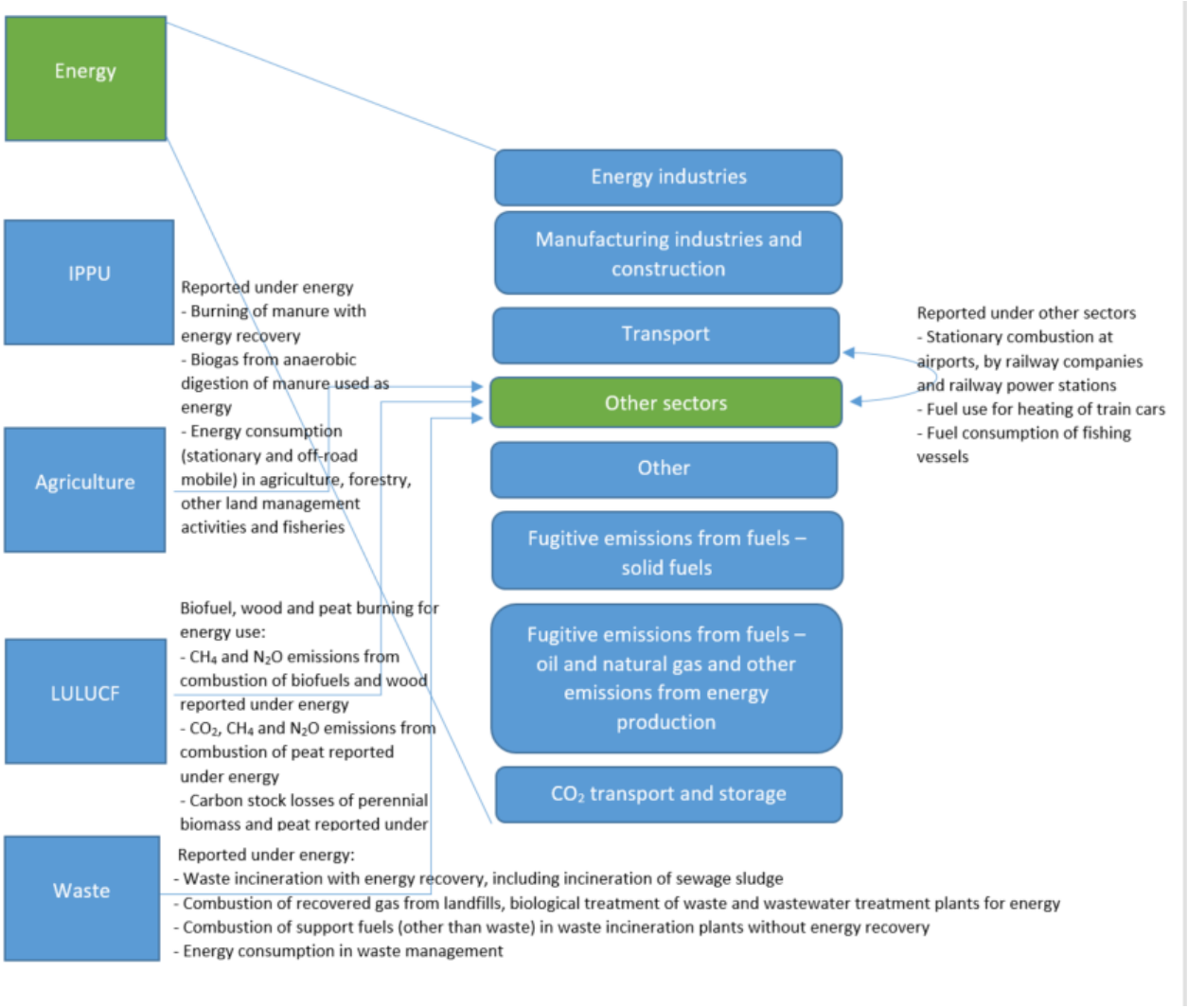
Other sectors

174. Table 7-15 provides a summary of key elements for the other sectors category, and figure 7-5 summarizes linkages between the other sectors category and the other categories in the energy sector and with other sectors.

Table 7-15
Summary of key elements of the other sectors category

Overview	*Category-specific information*	
Category name	Other sectors	
Reported in CRF table	Table 1.A(a)s4	
Main subcategories and GHGs to be reported	Commercial/institutional	CO_2, CH_4, N_2O
	Residential	CO_2, CH_4, N_2O
	Agriculture/forestry/fishing	CO_2, CH_4, N_2O

Figure 7-5
Main linkages between the 'other sectors' category and the other categories in the energy sector and other sectors



175. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the energy expert may consider going through the list of potential ERT actions in table 7-16 when reviewing emissions from the other sectors category.

Table 7-16
Possible actions by the expert review team in its review of emissions from the other sectors category

Subcategory	*Action by the ERT, task*
All	If country-specific EFs are used, how are they derived? Are they based on measurements at full boiler load or are start-up or partial load conditions appropriately taken into account?
	Are AD based on fuel combusted rather than fuel delivered, allowing for distinction between energy and non-energy use of fuels and appropriately taking into account changes in stocks?
	How does the Party consider the fuel stock held by enterprises in its inventory?

Subcategory	*Action by the ERT, task*
Commercial/ institutional	Are emissions from stationary combustion at airports, ports, by railway companies and by railway power stations included in this category?
	Are emissions from combustion of support fuels (other than waste) in waste incineration plants without energy recovery reported in this category?
Agriculture/ forestry/fishing	Are emissions from pumping fuel use, grain drying and horticultural greenhouses included?
	Are emissions from fuels combusted in traction vehicles on farmland and in forests included in this category? The use of agricultural vehicles on paved roads should be excluded and reported under road transportation
	Has the Party included coastal and deep-sea fishing in this category? Fishing should cover vessels of all flags that have refuelled in the country (including international fishing)
	How is it ensured that there is no double counting between this category and "other transportation"?

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change

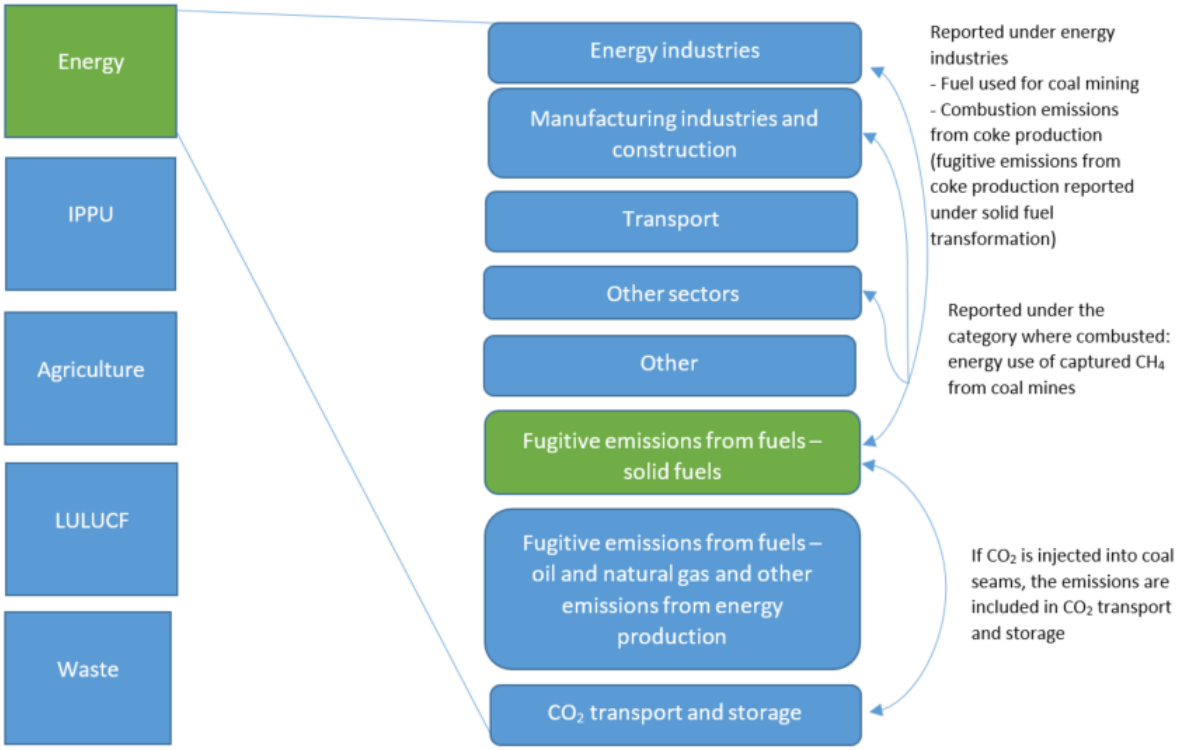
Fugitive emissions from fuels – solid fuels

176. Table 7-17 provides a summary of key elements for the solid fuels category, and figure 7-6 summarizes linkages between the solid fuels category and the other categories in the energy sector and other sectors.

Table 7-17
Summary of key elements of the solid fuels category

Overview	*Category-specific information*	
Category name	Solid fuels	
Reported in CRF table	Table 1.B.1	
Main subcategories and GHGs to be reported	Coal mining and handling	CH_4
	Solid fuel transformation	CH_4
	Other	–

Figure 7-6
Main linkages between the solid fuels category and the other categories in the energy sector and other sectors



177. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the energy expert may consider going through the list of potential ERT actions in table 7-18 when reviewing emissions from the solid fuels category.

Table 7-18
Possible actions by the expert review team in its review of emissions from the solid fuels category

Subcategory	*Action by the ERT, task*
Coal mining and handling	If the Party reports recovery/flaring of CH_4, has the Party explained whether CH_4 is flared? Are the associated emissions from flaring reported? This includes also CH_4 drained, or ventilation gas converted to CO_2 by an oxidation process
	If the Party reports recovery of CH_4 for energy production, are the related combustion emissions included in the energy industries category?
	Has the Party explained in the documentation box of CRF table 1.B.1 whether the fuel amount is based on the run-of-mine production or on the saleable production? Where AD are in the form of saleable coal, has the Party made an estimate taking into consideration the fraction lost through washing?
	Is the amount of fuel produced reported in CRF table 1.B.1 in accordance with the production reported in the reference approach CRF table 1.A(b)?
	If the Party reports emissions from mining activities, check whether post-mining activities and abandoned underground mines have been included. It could be expected that if coal mining is occurring in the Party, post-mining activities also occur, and if underground mining occurs, that abandoned underground mines are present

Subcategory	*Action by the ERT, task*
Coal mining and handling – Underground mines	Do the mining emissions include all seam gas emissions vented to the atmosphere from coal mine ventilation air and degasification systems?
	Do the post-mining emissions include CH_4 and CO_2 emitted after coal has been mined, brought to the surface and subsequently processed, stored and transported?
	If tier 3 methods are used, is CH_4 recovered from degasification systems that is subsequently vented to the atmosphere, added to the total emissions released from the ventilation systems?
Coal mining and handling – Abandoned underground mines	Has the Party reported emissions from abandoned underground mines (new category in the 2006 IPCC Guidelines)?
	The reporting in the CRF tables does not include the AD used for abandoned underground mines. Check from the NIR the units of AD and EFs used by the Party and assess whether the emission estimates are correctly reflected in the CRF tables
Coal mining and handling – Surface mines	Do the mining emissions include CH_4 and CO_2 emitted during mining from breakage of coal and associated strata and leakage from the pit floor and highwall?
	Do the post-mining emissions include all CH_4 and CO_2 emitted after coal has been mined, subsequently processed, stored and transported?
Solid fuel transformation	How has the Party ensured that there is no double counting between this category and other inventory categories, for example, in relation to coke production?

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, NIR = national inventory report, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

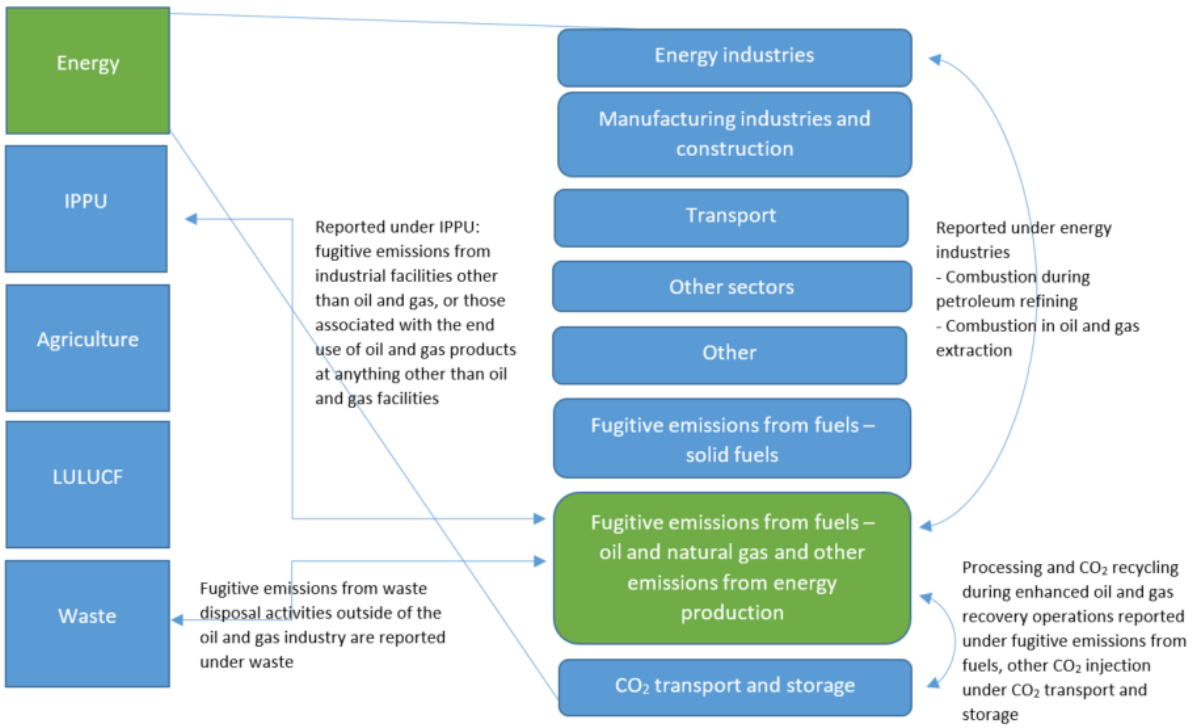
Fugitive emissions from fuels – oil and natural gas and other emissions from energy production

178. Table 7-19 provides a summary of key elements for the category oil and natural gas and other emissions from energy production, and figure 7-7 summarizes linkages between the oil and natural gas and other emissions from energy production category and the other categories in the energy sector and other sectors.

Table 7-19
Summary of key elements of the oil and natural gas and other emissions from energy production category

Overview	*Category-specific information*	
Category name	Oil and natural gas and other emissions from energy production	
Reported in CRF table	Table 1.B.2	
Main subcategories and GHGs to be reported	Oil	CO_2, CH_4, N_2O
	Natural gas	CO_2, CH_4
	Venting and flaring	CO_2, CH_4, N_2O
	Other	-

Figure 7-7
Main linkages between the oil and natural gas and other emissions from energy production category and the other categories in the energy sector and other sectors



179. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the energy expert may consider going through the list of potential ERT actions in table 7-20 when reviewing emissions from the oil and natural gas and other emissions from energy production category.

Table 7-20
Possible actions by the expert review team in its review of emissions from the oil and natural gas and other emissions from energy production category

Subcategory	*Action by the ERT, task*
All	Regarding data on the amount of fuel produced, has the Party explained whether the fuel amount is based on the raw material production or on the saleable production?
	Has the Party reported fugitive emissions during above-ground operations such as processing and CO_2 recycling during enhanced oil and gas recovery operations under this category instead of under CO_2 transport and storage?
Oil	Is the reported amount of oil production reported in CRF table 1.B.2 in accordance with the reported production data in the reference approach CRF table 1.A(b)?
	If combined oil and natural gas production occurs in the Party, has the Party reported the associated emissions (including from gas fields) under 1.B.2.a Oil?

Subcategory	*Action by the ERT, task*
	Are the AD for oil transport consistent with the AD for oil production? If not, is the reason for the difference described in the NIR?
Natural gas	Is the amount of natural gas production reported in CRF table 1.B.2 in accordance with the reported production data in the reference approach CRF table 1.A(b)?
	Are the AD for natural gas processing consistent with the AD for natural gas production? If not, is the reason for the difference described in the NIR?
	Are the AD for natural gas transmission and storage and from natural gas distribution reasonably in line with the reported amount of natural gas included under fuel combustion activities and used as feedstock?
	Compare the reported natural gas data with the values in the 2006 IPCC Guidelines, volume 2, table 4.2.8. Are CH_4 losses higher or lower than the benchmarks explained?
Natural gas; venting and flaring	Are the EFs expressed using the same units of measure and reference conditions as the AD, or if not, have appropriate conversion factors been applied?
Flaring	Do the flaring emissions reported here include only flaring emissions associated with oil/gas extraction and refining?
Other	Has the Party reported under fuel combustion activities the use of biogas? If so, has the Party reported fugitive emissions from biogas transmission/distribution? Once biogas enters the transmission/distribution network it is indistinguishable from natural gas and emissions should be calculated accordingly

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, NIR = national inventory report, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

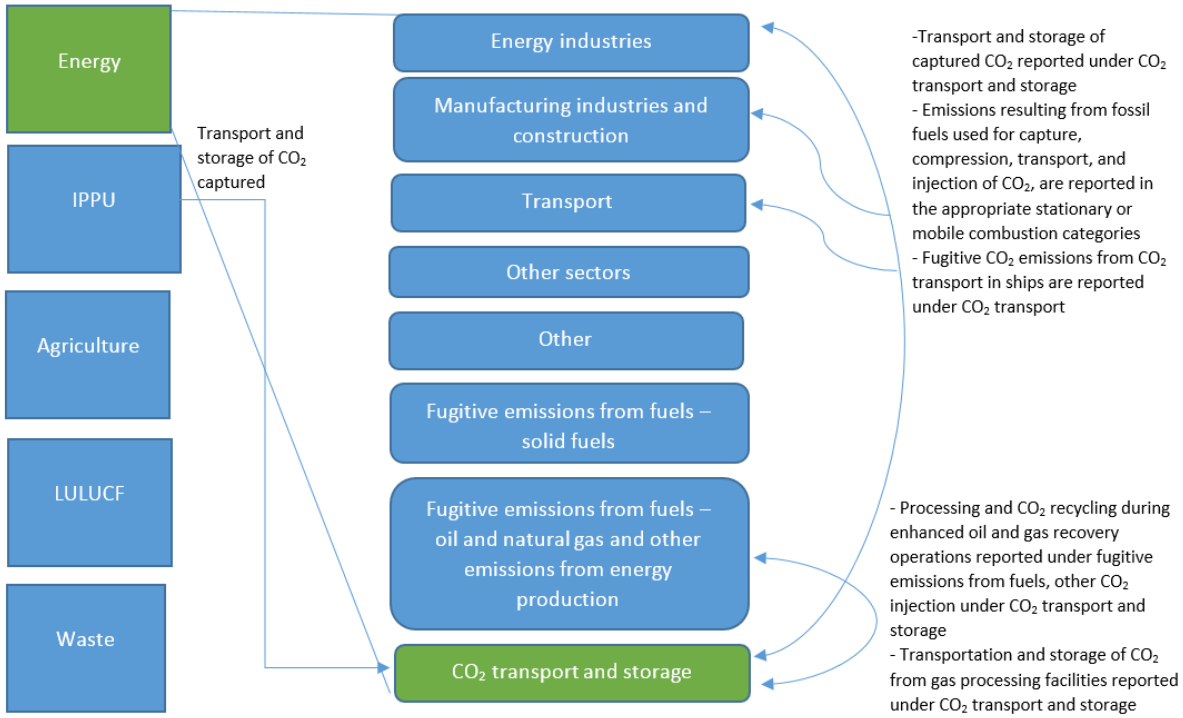
CO_2 transport and storage

180. Table 7-21 provides a summary of key elements for the CO_2 transport and storage category, and figure 7-8 summarizes linkages between the CO_2 transport and storage category and the other categories in the energy sector and other sectors.

Table 7-21
Summary of key elements of the CO_2 transport and storage category

Overview	*Category-specific information*	
Category name	CO_2 transport and storage	
Reported in CRF table	Table 1.C	
Main subcategories and GHGs to be reported	Transport of CO_2	CO_2
	Injection and storage	CO_2
	Other	-

Figure 7-8
Main linkages between the CO_2 transport and storage category and the other categories in the energy sector and other sectors



181. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the energy expert may consider going through the list of potential ERT actions in table 7-22 when reviewing emissions from the CO_2 transport and storage category.

Table 7-22
Possible actions by the expert review team in its review of emissions from the CO_2 transport and storage category

Subcategory	*Action by the ERT, task*
All	Has the Party reported emissions from CO_2 transport (a new category in the 2006 IPCC Guidelines)?
	Has the Party considered the transport and, if applicable, injection/storage of CO_2 not captured in the country, but imported?
	Has the Party excluded from the AD the recycled CO_2 for enhanced recovery in oil and gas fields?
	Do the emissions from CO_2 transport and storage include both fossil and biogenic CO_2? Note that biogenic CO_2 shall be included once reported as CO_2 captured
	Is the mass of CO_2 captured for storage plus CO_2 imported for storage ("Total A" in CRF table 1.C) equal to the amount of exports for storage plus CO_2 injected at storage sites plus total leakage from transport, injection and storage ("Total B" in CRF table 1.C)? If not, check the potential over- or underestimates for exports, imports and potential exclusion of enhanced oil recovery operations associated with storage following the guidance in the 2006 IPCC Guidelines, volume 2, section 5.9

Subcategory	*Action by the ERT, task*
Storage	In cases where CO_2 is captured in another country, have the countries communicated to ensure that there is no double counting of storage?
	Does a national regulatory framework exist for monitoring CO_2 emissions from geologic storage systems? If yes, has the Party described how emissions have been estimated and reported based on this system and how the approach is consistent with IPCC good practice?

Abbreviations: AD = activity data, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

D. Industrial processes and product use

1. Introduction

182. The 2006 IPCC Guidelines combine the industrial processes sector and solvent and other product use sector into the IPPU sector. The IPPU sector is the only inventory sector under which emissions from hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) are reported. The IPPU sector includes the following categories:

(a) Mineral industry;

(b) Chemical industry;

(c) Metal industry;

(d) Non-energy products from fuels and solvent use;

(e) Electronics industry;

(f) Product uses as substitutes for ODS;[23]

(g) Other product manufacture and use;

(h) Other.

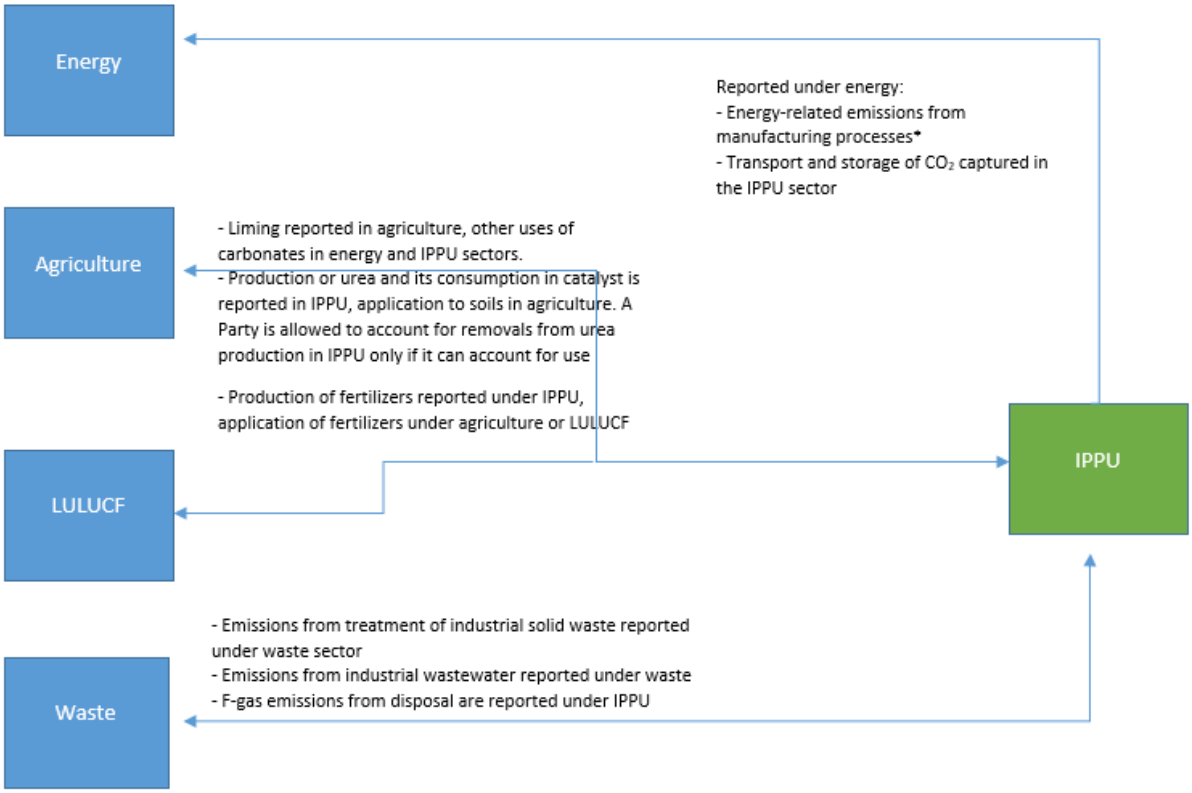
2. Sector-specific issues

Integration of the industrial processes and product use sector

183. The categories in the IPPU sector interact with the categories in other sectors (see figure 7-9).

[23] Ozone-depleting substances.

Figure 7-9
Overview of the interaction of the industrial processes and product use sector with other inventory sectors



* Combustion emissions from fuels obtained directly or indirectly from the feedstock for an IPPU process will normally be allocated to the part of the category in which the process occurs. These categories are normally 2.B and 2.C. However, if the derived fuels are transferred for combustion in another source category, the emissions should be reported in the appropriate part of Energy Sector source categories (normally 1.A.1 or 1.A.2).

184. The methods in the 2006 IPCC Guidelines for the IPPU sector have been revised compared with the methods in the Revised 1996 IPCC Guidelines and IPCC good practice guidance. The main differences are summarized in box 7-7 below. However, the list is not exhaustive and it is important that the review experts make sure that, for all categories, the inventory estimates are in line with the 2006 IPCC Guidelines.

Box 7-7
Main changes in the 2006 IPCC Guidelines from the Revised 1996 IPCC Guidelines and IPCC good practice guidance: industrial processes and product use (IPPU)

(a) The guidance has been restructured, and category names and codes have been changed for several categories

(b) More manufacturing sectors and product uses identified as sources of greenhouse gases (GHGs) have been included:

(i) Glass production (several Parties reported this previously under mineral products – other)

(ii) Ceramics

(iii) Non-metallurgical magnesia production

(iv) Caprolactam, glyoxal and glyoxylic acid production

(v) Titanium dioxide production

(vi) Petrochemical and carbon black production (most subcategories were previously reported under chemical industry – other)

(vii) Lead production

(viii) Zinc production

(ix) Non-energy products from fuels and solvent use (previously reported under the energy sector)

(x) Thin-film transistor flat panel displays

(xi) Photovoltaics

(xii) Heat transfer fluid

(c) Additional GHGs are included, such as nitrogen trifluoride (NF_3), hydrofluoroethers (HFEs), perfluoropolyethers (PFPEs), and trifluoromethyl sulphur pentafluoride (SF_5CF_3). According to the UNFCCC Annex I inventory reporting guidelines, only the reporting of NF_3 is mandatory. Estimation of the other additional GHGs included in the 2006 IPCC Guidelines is strongly encouraged, but these emissions should be reported separately from national totals

(d) Reporting of "potential emissions" for fluorinated compounds is no longer included in the 2006 IPCC Guidelines as an emission estimation method. Instead, tier 1 methods proposed are often based on default activity data where better data are not available, allowing the Parties to estimate emissions even if detailed country-specific data are not available. Potential emissions are included in the 2006 IPCC Guidelines as a quality control activity

(e) Methods to estimate indirect N_2O emissions from the IPPU sector have been included. However, according to the UNFCCC Annex I inventory reporting guidelines, indirect nitrous oxide (N_2O) emissions from categories other than in the agriculture sector and the land use, land-use change and forestry sector are not included in the national totals

(f) Guidance on demarcation between the energy sector and IPPU sector has been improved

(g) Emissions from non-energy uses of fossil fuels are now reported under IPPU, rather than under the energy sector;

(h) Emissions from the use of carbonates should be reported in the subcategories (industries) where they occur, and therefore "limestone and dolomite use" and "soda ash use" are no longer reported as separate categories

(i) CO_2 used in urea production may be deducted from CO_2 emissions from ammonia production. Any such deduction should be accompanied by the reporting of CO_2 emissions from the downstream use of urea where it occurs (e.g. in the agriculture sector for urea use as fertilizer)

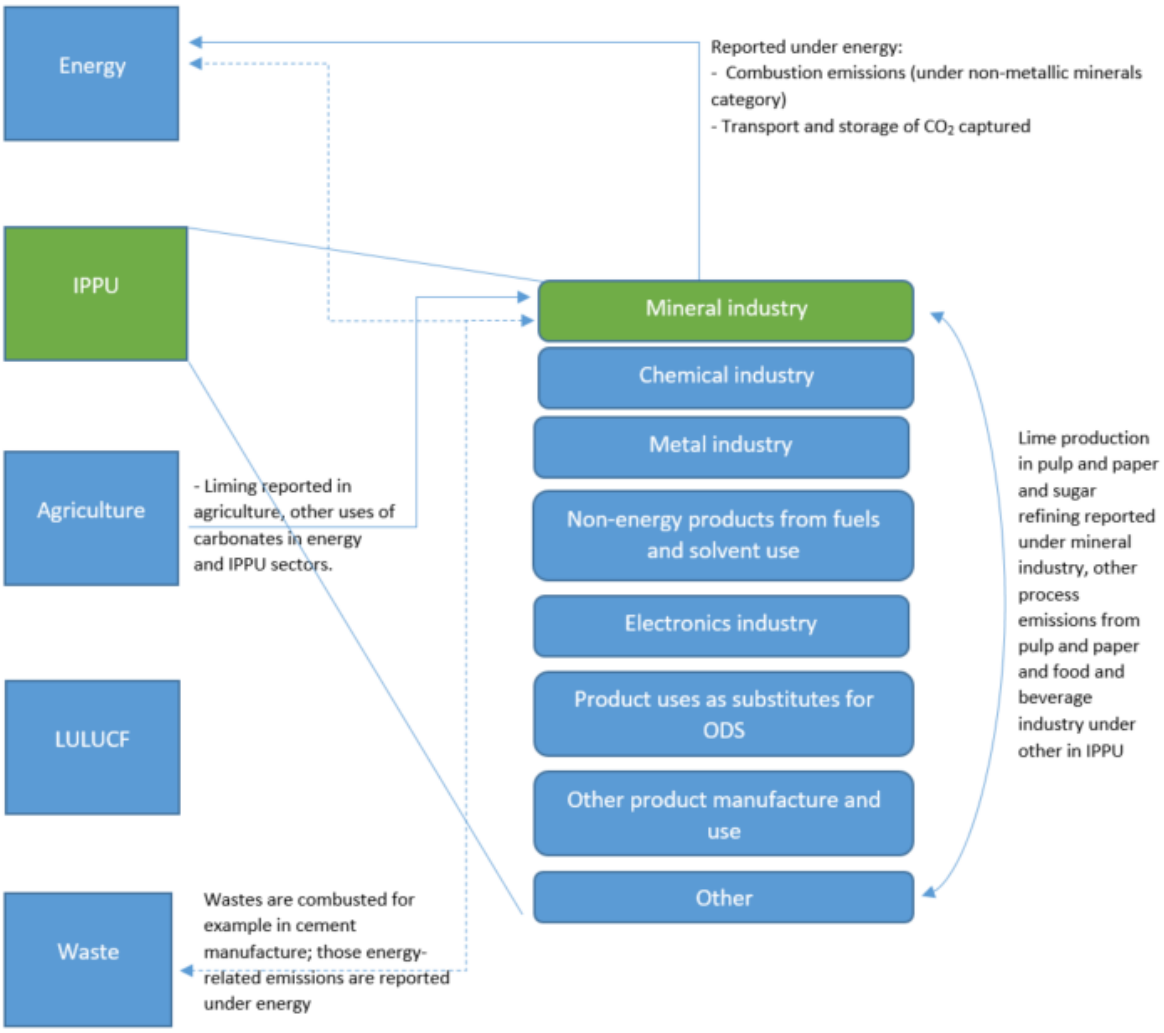
Mineral industry

185. Table 7-23 provides a summary of key elements for the mineral industry category, and figure 7-10 summarizes linkages between the mineral industry category and the other categories in the IPPU sector and with other sectors.

Table 7-23
Summary of key elements of the mineral industry category

Overview	*Category-specific information*	
Category name	Mineral industry	
Reported in CRF table	Table 2(I).A-Hs1	
Main subcategories and GHGs to be reported	Cement production	CO_2
	Lime production	CO_2
	Glass production	CO_2
	Other process uses of carbonates	CO_2

Figure 7-10
Main linkages between the mineral industry category and the other categories in the industrial processes and product use sector and other sectors



186. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the IPPU expert may consider going through the list of potential ERT actions in table 7-24 when reviewing CO_2 emissions from the mineral industry category.

Table 7-24
Possible actions by the ERT in its review of CO_2 emissions from the mineral industry category

Subcategory	*Action by the ERT, task*
All	Carefully check any deviations from IPCC defaults, because the emissions are due to chemical processes and large deviations should not occur
	Has the Party correctly reported only process emissions under IPPU and included the relevant energy-related emissions in the energy sector (under non-metallic minerals)? This is particularly relevant if company-provided data are used
	If the Party reports amount of CO_2 captured, is the estimate based on plant-specific data?
	If the Party reports amount of CO_2 captured, is the estimate consistent with the reporting under CO_2 transport and storage? If not, has the Party explained the reasons for any differences (e.g., there is commercial use of the CO_2?)
	If CO_2 is reported to be captured in processes involving both combustion and process emissions reported under the energy sector and the IPPU sector, respectively, has the Party ensured that the amount captured is not double counted?
	Are final emissions reported in CRF table 2(I).A-H after subtracting the amounts of emissions recovered, oxidized, destroyed or transformed?
Cement production	If the Party is using tier 1, are all imports and exports or clinker taken into consideration?
	Has the Party excluded any re-absorption of atmospheric CO_2 due to free lime released during the curing of concrete? Inclusion of such absorption is not in accordance with good practice
	Has the Party appropriately corrected for emission from cement kiln dust (CKD) production (added emissions from CKD if applying a tier 2 method and subtracting CKD if applying a tier 3 method)?
Lime production	Does the AD cover both marketed and non-marketed lime? Possible industries producing non-marketed lime are metallurgy (e.g. steel production and copper smelters), pulp and paper, sugar mills, production of calcium carbide, synthetic soda ash, magnesia and magnesium metal or artisanal production of lime for sanitation purposes or for whitewash
	Does the Party use AD separately for high-calcium, dolomitic and hydraulic lime? If not, are any assumptions well justified and in accordance with the 2006 IPCC Guidelines?
	If lime production is corrected for hydrated lime, has the Party first established whether the lime used to produce hydrated lime is included in total lime production statistics to avoid double counting?
	Has the Party excluded any removals of CO_2 which are due to the carbonation reaction that occurs when lime-based mortars used in construction gain their strength through the absorption of CO_2? Inclusion of such absorption is not in accordance with good practice
Glass production	Has the Party reported emissions from glass production separately (a new category in the 2006 IPCC Guidelines)?

Subcategory	*Action by the ERT, task*
	Has the Party included in this category emissions from the production of glass wool, and included emissions from natural rock-based wool production under 'other', if such production is emissive?
	Does the amount of recycled scrap glass (cullet) include both in-house return of glassware broken in process or other glass spillage or retention, and foreign (i.e. external to the plant) cullet from recycling programmes or cullet brokerage services?
	How has the Party ensured that soda ash used in glass production is not double counted with 'other uses of soda ash' reported under other process uses of carbonates?
Other process uses of carbonates	Has the Party separately reported emissions from ceramics and from non-metallurgical magnesia production?
	How has the Party ensured that no double counting or omission occurs in the estimation of CO_2 emissions from uses of carbonates? The 2006 IPCC Guidelines, volume, 3, table 2.7 gives an overview of which uses are emissive and where in the inventory they should be reported?

Abbreviations: AD = activity data, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

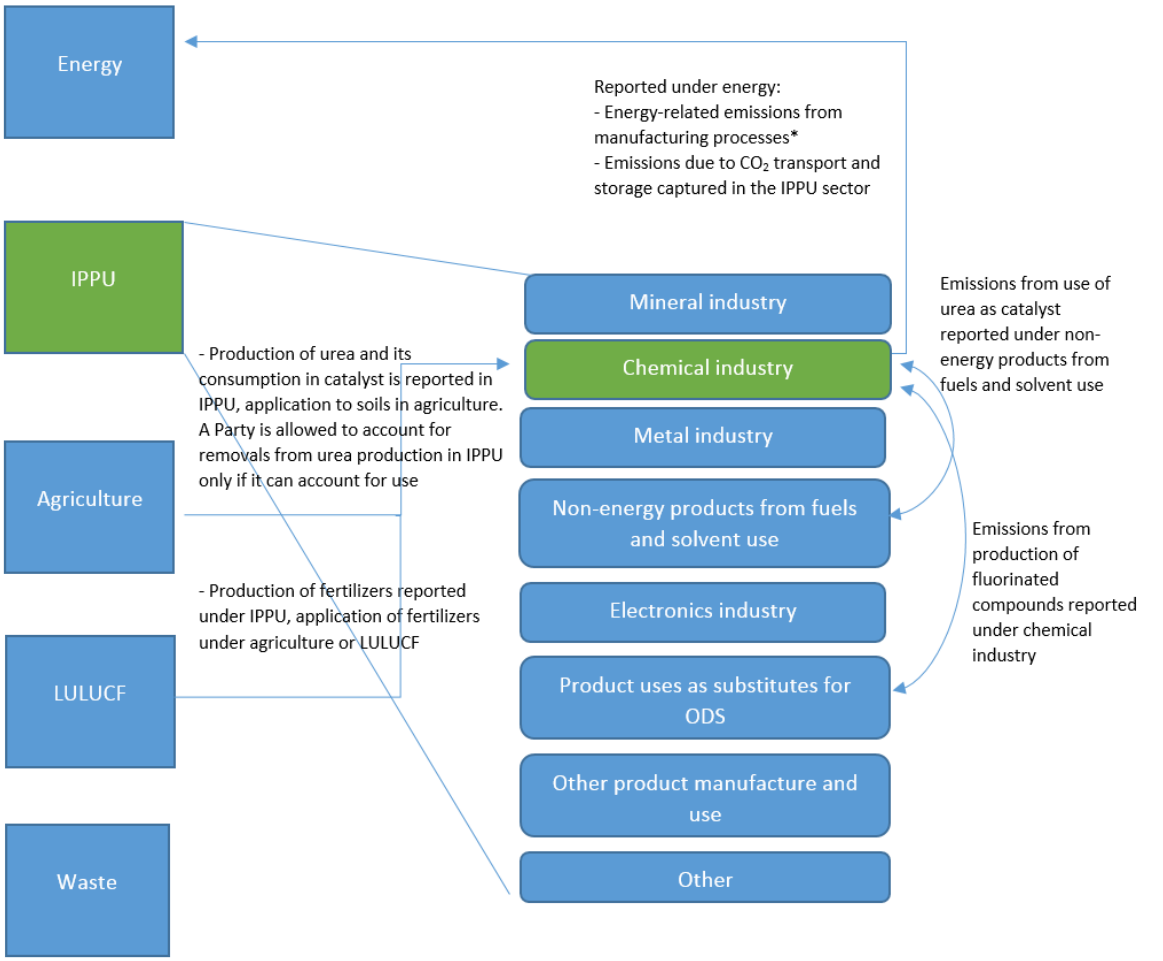
Chemical industry

187. Table 7-25 provides a summary of key elements for the chemical industry category, and figure 7-11 summarizes linkages between the chemical industry category and the other categories in the IPPU sector and with other sectors.

Table 7-25
Summary of key elements of the chemical industry category

Overview	*Category-specific information*	
Category name	Chemical industry	
Reported in CRF table	Table 2(I).A-Hs1, table 2(II)B-Hs1	
Main subcategories and GHGs to be reported	Ammonia production	CO_2
	Nitric acid production	N_2O
	Adipic acid production	N_2O
	Caprolactam, glyoxal and glyoxylic acid production	N_2O
	Carbide production	CO_2, CH_4
	Titanium dioxide production	CO_2
	Soda ash production	CO_2
	Petrochemical and carbon black production	CO_2, CH_4
	Fluorochemical production	HFCs, PFCs, SF_6, NF_3
	Other	–

Figure 7-11
Main linkages between the chemical industry category and the other categories in the industrial processes and product use sector and other sectors



* Combustion emissions from fuels obtained directly or indirectly from the feedstock for an IPPU process will normally be allocated to the part of the category in which the process occurs. These categories are normally 2.B and 2.C. However, if the derived fuels are transferred for combustion in another source category, the emissions should be reported in the appropriate part of Energy Sector source categories (normally 1.A.1 or 1.A.2).

188. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the IPPU expert may consider going through the list of potential ERT actions in table 7-26 when reviewing the emissions from the chemical industry category.

Table 7-26
Possible actions by the expert review team in its review of the emissions from the chemical industry category

Subcategory	*Action by the ERT, task*
All	If the Party reports amount of CO_2 captured, is the estimate based on plant-specific data?
	If the Party reports amount of CO_2 captured, is the estimate consistent with the reporting under CO_2 transport and storage? If not, has the Party explained the reasons for any differences (e.g. there is commercial use of the CO_2?)

Subcategory	*Action by the ERT, task*
	If CO_2 is reported to be captured in processes involving both combustion and process emissions reported under the energy sector and the IPPU sector, respectively, has the Party ensured that the amount captured is not double counted?
	Has the Party correctly allocated emissions between the IPPU and energy sectors ("chemicals" category) and, in particular, ensured that no double counting or omission occurs? In particular, for ammonia production all natural gas consumption should be included under the IPPU sector; and for petrochemical and carbon black plants there is a need to avoid double counting with the energy sector on the combustion of off-gases for energy recovery)
	Are final emissions reported in CRF table 2(I).A-H after subtracting the amounts of emissions recovered, oxidized, destroyed or transformed?
Ammonia production	If the Party uses a tier 1 method and has no information on the fuel type and/or process type, has it used the highest IPCC default emission factor in accordance with good practice?
	Has the Party included all natural gas consumption for ammonia production in the IPPU sector in accordance with the 2006 IPCC Guidelines?
	Is CO_2 from ammonia production that is recovered for downstream use excluded from the reporting in the ammonia production subcategory? If so, are the products and the purposes for which the CO_2 is used clearly explained in the NIR? Is it clear that all related CO_2 emissions from these products are reported in the relevant categories in the inventory if these emissions occur within the borders of the Party concerned? If the Party has not excluded from ammonia production the CO_2 for downstream use, check whether potential double counting occurs, in particular with urea fertilizers or urea used as catalyst. The ERT may wish to ask the Party for a urea balance
Nitric acid production	Has the Party used direct measurement data (preferred method)? If the measurement data are based on sampling, is sampling and analysis conducted whenever a plant makes any significant process changes that would affect the generation rate of N_2O?
	Does the AD cover all nitric acid produced in the Party, including nitric acid production that is integrated as part of larger production processes, where the nitric acid never enters into commerce and is therefore not included in the national statistics?
Adipic acid production	Has the Party used direct measurement data (preferred method)? If the measurement data are based on sampling, is sampling and analysis conducted whenever a plant makes any significant process changes that would affect the generation rate of N_2O?
Caprolactam, glyoxal and glyoxylic acid production	Has the Party reported emissions from caprolactam, glyoxal and glyoxylic acid production (a new category in the 2006 IPCC Guidelines)?
Calcium carbide	Are CO_2 emissions from combusting CO gas generated in the process of CaC_2 production included in the IPPU sector avoiding double counting with the energy sector?
	Has the petroleum coke used in calcium carbide production been indicated as non-energy use of petroleum coke and not double counted with the energy sector?
	Have the emissions from CaO (lime) production associated with the calcium carbide production been reported in the lime production category, ensuring that no double counting occurs?
	Have the emissions from the use of acetylene for welding applications, produced from calcium carbide, been included in emissions from calcium carbide production?

Subcategory	*Action by the ERT, task*
	Has the Party estimated emissions from the use of CaC_2 imported for acetylene production for use in welding applications; and are emissions from the use of CaC_2 that is exported by the Party not estimated?
	If acetylene produced from calcium carbide is used for production of carbon black (acetylene black process) are the emissions correctly included under petrochemical and carbon black production and not double counted under calcium carbide?
Titanium dioxide production	Has the Party reported emissions from titanium dioxide production (a new category in the 2006 IPCC Guidelines)?
	Do the emissions from titanium dioxide include production of all titanium dioxide products such as titanium slag, synthetic rutile (>90 per cent TiO_2) and rutile TiO_2?
Soda ash production	Has the Party excluded emissions from soda ash use and reported them in the categories where soda ash is consumed?
	Has the Party included all the soda ash production processes that occur in the Party, including natural processes, as well as the Solvay process?
	Has the Party reported all CO_2 emissions generated in the process of soda ash production in this category, including use of coke? Coke used in the production process should be deducted from the energy sector as a non-energy use of coke (2006 IPCC Guidelines, volume 3, box 3.7)
Petrochemical and carbon black production	Has the Party reported all the petrochemical production processes for which guidance is available, including production of methanol, ethylene, ethylene dichloride, ethylene oxide, acrylonitrile and carbon black?
	Has the Party correctly allocated emissions between the energy sector and the IPPU sector, in particular ensuring that no omission or double counting occurs? Combustion emissions from fuels obtained from the feedstocks should be allocated to the category in the IPPU sector. However, where the fuels are not used within the category but are transferred out of the process for combustion elsewhere (e.g. for district heating purposes) the emissions should be reported under energy
Petrochemical and carbon black production – methanol	If the Party used national methanol production statistics, has the Party considered potential production of biogenic methanol, and excluded any biogenic CO_2 emissions?
	If a methanol plant utilizes by-product CO_2 captured from other industrial processes as a feedstock for methanol production, has the Party avoided double counting by not reporting the amount of captured CO_2 as CO_2 emissions from the process from which it is captured?
Petrochemical and carbon black production – ethylene	Has the Party excluded emissions from ethylene produced in processes other than with steam crackers?
Petrochemical and carbon black production – ethylene dichloride and vinyl chloride monomer	If production statistics of ethylene dichloride are incomplete and the amount of vinyl chloride monomer production is used to estimate ethylene dichloride production, has the Party accounted for possible additional emissions from the production of ethylene dichloride used in the production of other products?

Subcategory	*Action by the ERT, task*
Petrochemical and carbon black production – ethylene oxide	Has the Party taken into consideration the potential incompleteness of ethylene oxide production data if ethylene oxide is converted directly to ethylene glycol or other products in an integrated plant?
Petrochemical and carbon black production – carbon black	Has the Party taken into consideration potential biogenic sources for the production of carbon black, which may be included in carbon black production statistics? Biogenic CO_2 should not be included
Fluorochemical production	If the Party accounts for abatement, are process records available at the plant level to support the subtraction of emissions?
	If recovery takes place (e.g. recovery of HFC-23 in HCFC-22 manufacture), has the Party ensured that subsequent emissions from the use/destruction/storage of the recovered gas are included in the inventory?
	Does the Party report all production and handling losses from F-gas production? These may include the telomerization process used in the production of fluorochemical fluids and polymers, photo oxidation of tetrafluoroethylene to make fluorochemical fluids, SF_6 production, halogen exchange processes to make low-boiling PFCs such as C_2F_6 and CF_4, HFC-134a and HFC-245fa, NF_3 manufacturing, and the production of uranium hexafluoride, of fluorinated monomers (e.g. tetrafluoroethylene and hexafluoropropylene), and of fluorochemical agrochemicals and/or anaesthetics
	Has the Party included emissions from recycling of used gas, during which emissions may occur as a result of handling and purification of used gas and handling of recycled gas?
	Has the Party used a national mass balance to identify small producers or recycling companies?

Abbreviations: ERT = expert review team, F-gas = fluorinated gas, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Metal industry

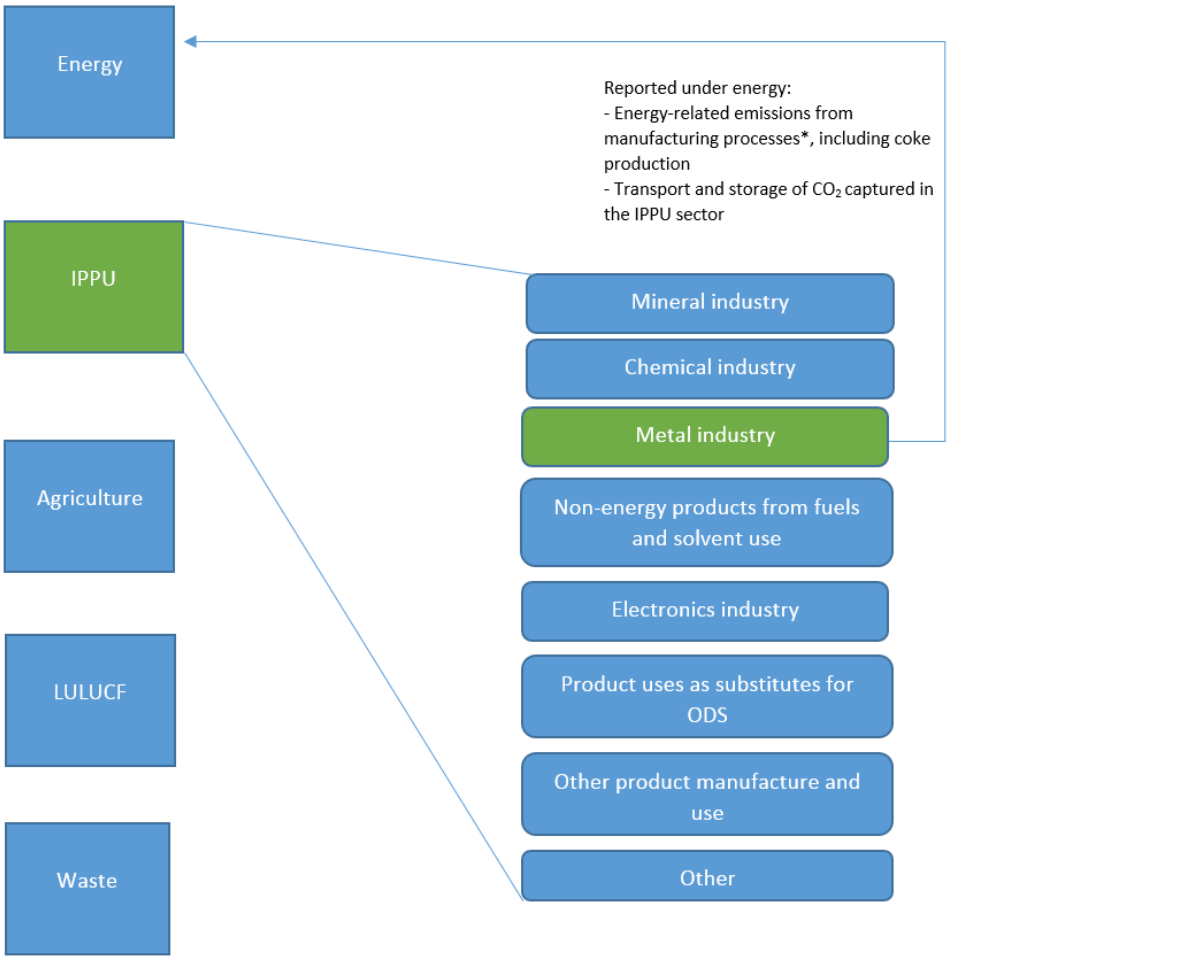
189. Table 7-27 provides a summary of key elements for the metal industry category, and figure 7-12 summarizes linkages between the metal industry category and the other categories in the IPPU sector and with other sectors.

Table 7-27
Summary of key elements of the metal industry category

Overview	*Category-specific information*	
Category name	Metal industry	
Reported in CRF table	Table 2(I).A-Hs2, table 2(II)B-Hs1	
Main subcategories and GHGs to be reported	Iron and steel production	CO_2, CH_4
	Ferroalloys production	CO_2, CH_4
	Aluminium production	CO_2, PFCs

Overview	*Category-specific information*	
	Magnesium production	CO_2, HFCs, PFCs, SF_6
	Lead production	CO_2
	Zinc production	CO_2
	Other	–

Figure 7-12
Main linkages between the metal industry category and the other categories in the industrial processes and product use sector and other sectors



* Combustion emissions from fuels obtained directly or indirectly from the feedstock for an IPPU process will normally be allocated to the part of the category in which the process occurs. These categories are normally 2.B and 2.C. However, if the derived fuels are transferred for combustion in another source category, the emissions should be reported in the appropriate part of Energy Sector source categories (normally 1.A.1 or 1.A.2).

190. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the IPPU expert may consider going through the list of potential ERT actions in table 7-28 when reviewing the emissions from the metal industry category.

Table 7-28
Possible actions by the ERT in its review of the emissions from the metal industry category

Subcategory	*Action by the ERT, task*
All	Has the Party ensured that no double counting or omission of CO_2 emissions occurs between the energy and IPPU sectors?
	If the Party reports amount of CO_2 captured, is the estimate based on plant-specific data?
	If the Party reports amount of CO_2 captured, is the estimate consistent with the reporting under CO_2 transport and storage? If not, has the Party explained the reasons for any differences (e.g. there is commercial use of the CO_2?)
	If CO_2 is reported to be captured in processes involving both combustion and process emissions reported under the energy sector and the IPPU sector, respectively, has the Party ensured that the amount captured is not double counted?
	Are the emissions from coke production (both on-site and off-site) excluded and reported under energy?
Iron and steel production	Are CO_2 emissions from limestone or dolomite use included in the estimates for this category?
	Are the emissions from use of carbon sources (predominantly coke, but also coal, oil, natural gas, limestone, etc.) used to produce pig iron reported in this category and not double counted in the energy sector?
	Has the Party ensured that double counting or omission is avoided, in particular for integrated production and iron and steel with on-site coke production? In such a case, there may be flows of by-products (e.g. coke oven gas, blast furnace gas, coke oven by-products) between the coke production facility and the iron and steel production facility. Carbon consumed in the form of coke oven gas at an iron and steelmaking facility and the resulting CO_2 and CH_4 emissions should be categorized as IPPU emissions and reported as such. Carbon consumed in the form of blast furnace gas at an on-site coke production facility and the resulting CO_2 and CH_4 emissions should be reported under energy
	Are emissions from sinter production included in this category and not double counted in the energy sector, even if the coke fines are produced at a coke plant within the facility, or if the coke breeze is otherwise accounted for as purchased coke?
	Has the Party ensured that blast furnace derived by-product gases such as blast furnace gas, or recovered basic oxygen furnace off-gas used for energy are not double counted in the energy sector, if they have been accounted for as process emissions?
	Do the emissions from electric arc furnaces (EAFs) include, in addition to the electrode consumption, any carbon-bearing materials added to the EAF for process control purposes or contained in the charged materials themselves as iron substitutes as well as natural gas used as a reducing agent to enhance reactions in an EAF?
	Check that the steel production AD used to estimate emissions do not include electric induction furnaces from which CO_2 or CH_4 emissions are not considered to occur
Ferroalloy production	Are CO_2 emissions from limestone or dolomite use included in the estimates for this category?
	Are all emissions from carbon sources (coal, coke, limestone, dolomite, etc.) reported in this category and not in the energy sector?

Subcategory	*Action by the ERT, task*
Aluminium production	Does the AD include only primary aluminium production?
	Are the trends of the estimates for CF_4 and C_2F_6 emissions per tonne aluminium production consistent?
	Does the Party report SF_6 or other F-gases used in foundries?
Magnesium production	Are all emissions associated with the calcination of carbonates (magnesite and dolomite) for primary magnesium production included in this category? Check that there is not double counting with other process uses of carbonates
	Does the Party report emissions from cover gases in the magnesium casting for both primary and secondary magnesium production?
Lead production	Has the Party reported emissions from lead production (a new category in the 2006 IPCC Guidelines)? Do CO_2 emissions include both primary and secondary production?
Zinc production	Has the Party reported emissions from zinc production (a new category in the 2006 IPCC Guidelines)? Does the Party include emissions from both primary and secondary zinc production?
	If a pyrometallurgical process involving the use of an Imperial Smelting Furnace is used for combined zinc and lead production, is the metallurgical coke/coal reductant used in this process allocated to lead and zinc production in order to avoid omissions or double counting?

Abbreviations: AD = activity data, ERT = expert review team, F-gas = fluorinated gas, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

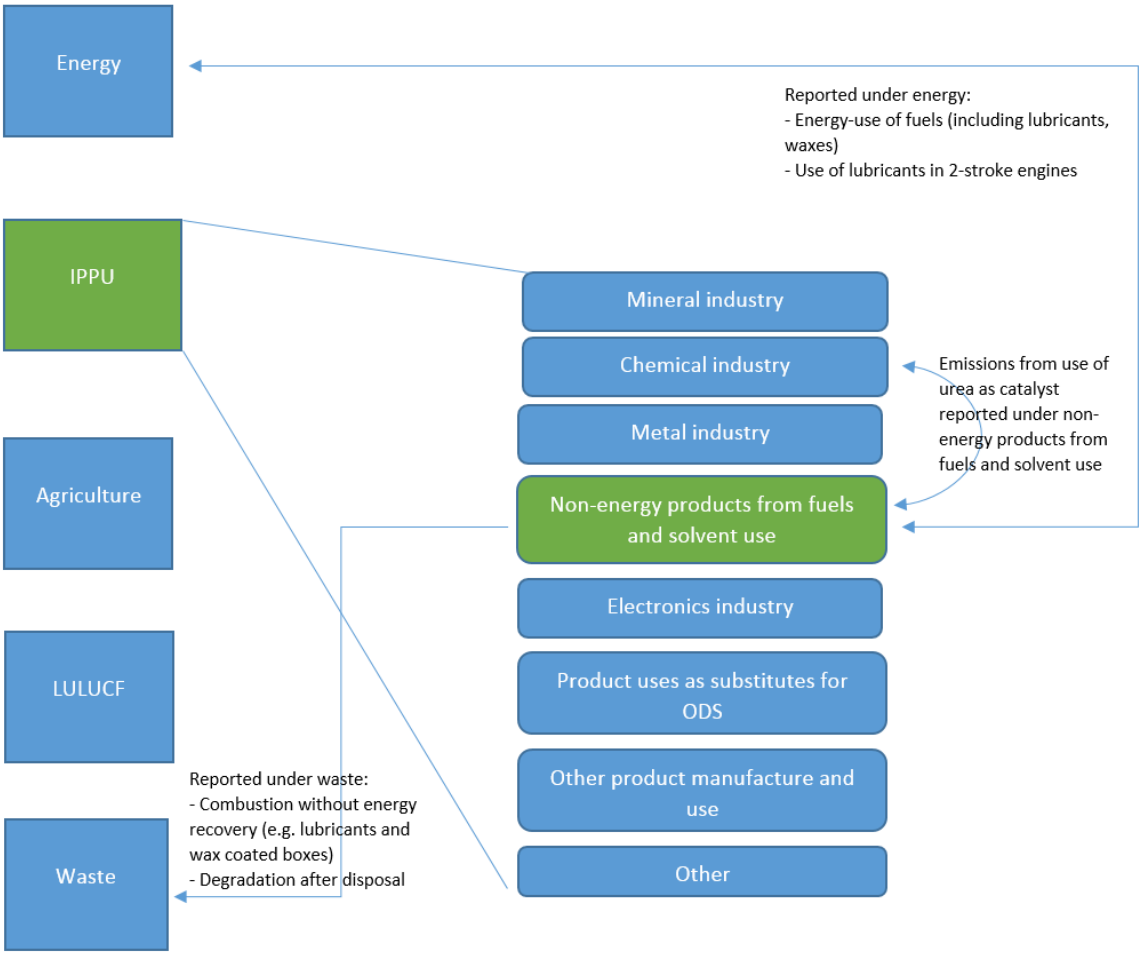
Non-energy products from fuels and solvent use

191. Table 7-29 provides a summary of key elements for non-energy products from fuels and solvent use, and figure 7-13 summarizes linkages between the non-energy products from fuels and solvent use category and the other categories in the IPPU sector and with other sectors.

Table 7-29
Summary of key elements of the non-energy products from fuels and solvent use category

Overview	*Category-specific information*	
Category name	Non-energy products from fuels and solvent use	
Reported in CRF table	Table 2(I).A-Hs2	
Main subcategories and GHGs to be reported	Lubricant use	CO_2
	Paraffin wax use	CO_2
	Other	CO_2

Figure 7-13
Main linkages between the non-energy products from fuels and solvent use category and the other categories in the industrial processes and product use sector and other sectors



192. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the IPPU expert may consider going through the list of potential ERT actions in table 7-30 when reviewing the CO_2 emissions from the non-energy products from fuels and solvent use category.

Table 7-30
Possible actions by the expert review team in its review of the emissions from non-energy products from fuels and solvent use category

Subcategory	*Action by the ERT, task*
All	Has the Party reported emissions from non-energy uses of fossil fuels under the IPPU sector, rather than in the energy sector?
Lubricants	Has the Party reported the emissions from lubricant use in 2-stroke engines, where the lubricant is mixed with another fuel and thus on purpose co-combusted in the engine, in the energy sector and excluded it from this category to prevent double counting?

Subcategory	*Action by the ERT, task*
	Are the emissions from lubricant combustion for energy or in waste incinerators without energy recovery included in the energy sector and the waste sector, respectively, and not included in this category?
	Are any emissions that occur as a result of degradation after disposal accounted for separately in the waste sector and not included in this category?
Paraffin wax use	Do the emissions from paraffin wax use cover petroleum jelly, paraffin waxes and other waxes, including ozokerite (mixtures of saturated hydrocarbons, solid at ambient temperature)?
	Are emissions from the incineration (without energy recovery) of wax-coated boxes reported under the waste sector?
	Are any emissions from paraffin waxes that are produced as a result of energy recovery included in the energy sector, and excluded from this category?
Other	Has the Party reported CO_2 emissions from urea used as a catalyst under non-energy products from fuels and solvent use – other?

Abbreviations: ERT = expert review team, IPPU = industrial processes and product use.

Electronics industry

193. Table 7-31 provides a summary of key elements for the electronics industry category. There are no direct interactions between this category and the other categories/sectors in the 2006 IPCC Guidelines.

Table 7-31
Summary of key elements of the electronics industry category

Overview	*Category-specific information*	
Category name	Electronics industry	
Reported in CRF table	Table 2(II).B-Hs1	
Main subcategories and GHGs to be reported	Integrated circuit or semiconductor	HFCs, PFCs, SF_6, NF_3
	Thin-film transistor (TFT) flat panel displays	PFCs, SF_6, NF_3
	Photovoltaics	PFCs, SF_6
	Heat transfer fluid	SF_6
	Other	–

194. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the IPPU expert may consider going through the list of potential ERT actions in table 7-32 when reviewing the emissions from the electronics industry category.

Table 7-32
Possible actions by the ERT in its review of the emissions from the electronics industry category

Subcategory	*Action by the ERT, task*
All	Does the Party include both evaporative losses and by-product emissions? In the case of by-product emissions, has the Party reported the emissions in a separate row in CRF table 2(II).B-Hs1 and included the information in the relevant AD in the documentation box?
	Does the Party have a process in place to identify any new chemicals not used by the industry before, and report all emissions from fluorinated substances that are used in the electronics industry and included in the UNFCCC Annex I inventory reporting guidelines?
	Has the Party estimated and reported emissions from research and development (e.g. university) scale plants and by tool suppliers? Has the Party included emissions resulting from the release of fluorinated compounds during gas handling (e.g. distribution)? These emissions are likely not significant, but should be considered and documented
	If the Party has implemented a tier 2 method and applied the default efficiency parameters for emissions control technology in table 6.6 of the 2006 IPCC Guidelines, has the Party demonstrated communication with the facility operators to ensure that the technologies are implemented according to manufacturers' specifications? If not, has the Party assumed a 0% destruction efficiency?
	If the Party has used a tier 1 method, has it only used tier 1 and not implemented a hybrid tier 1/tier 2? Emissions estimated with the tier 1 approach should not be combined with higher tiers
Thin-film transistor (TFT) flat panel display	Has the Party reported emissions from TFT flat panel displays (a new category in the 2006 IPCC Guidelines)?
Photovoltaics	Has the Party reported emissions from photovoltaics (a new category in the 2006 IPCC Guidelines)?
Heat transfer fluid	Has the Party reported emissions from heat transfer fluid (a new category in the 2006 IPCC Guidelines)?

Abbreviations: AD = activity data, ERT = expert review team, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

Product uses as substitutes for ODS

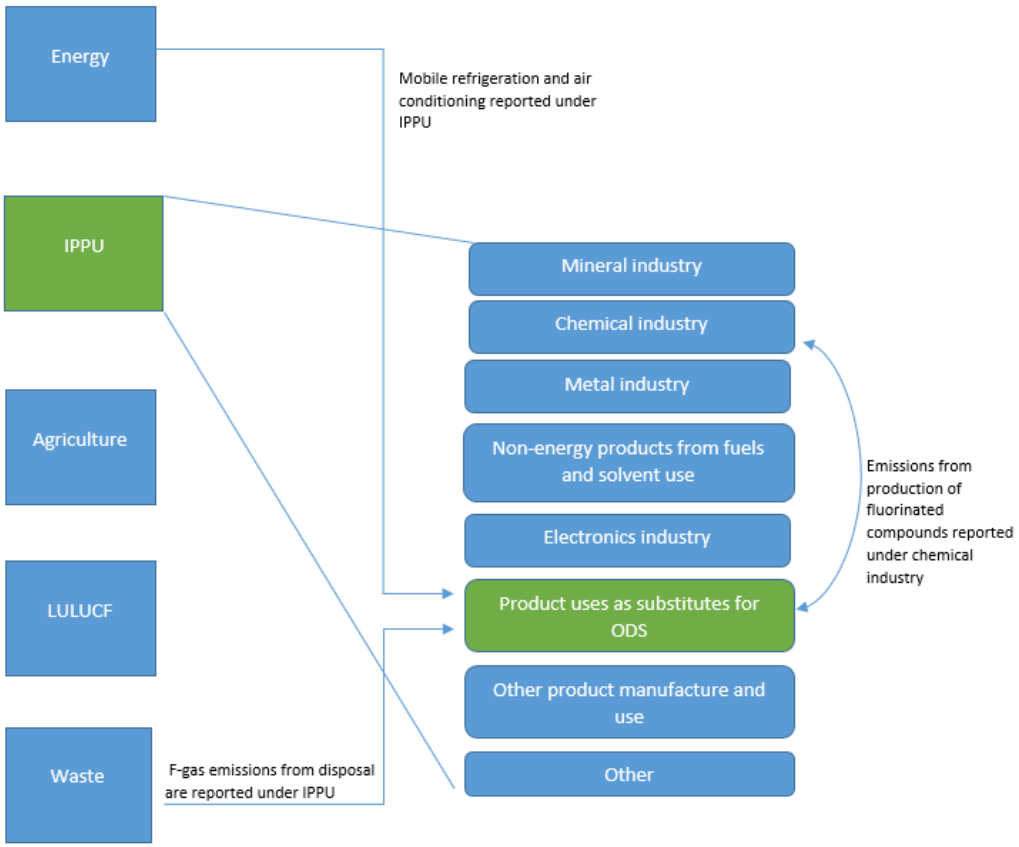
195. Table 7-33 provides a summary of key elements for the product uses as substitutes for ODS category, and figure 7-14 summarizes linkages between the product uses as substitutes for ODS category and the other categories in the IPPU sector and with other sectors.

Table 7-33
Summary of key elements of the product uses as substitutes for ODS category

Overview	*Category-specific information*
Category name	Product uses as substitutes for ODS
Reported in CRF table	Table 2(II)B-Hs2

Overview	*Category-specific information*	
Main subcategories and GHGs to be reported	Refrigeration and air conditioning	HFCs, PFCs
	Foam blowing agents	HFCs
	Fire protection	HFCs, PFCs
	Aerosols	HFCs, PFCs
	Solvents	HFCs, PFCs
	Other applications	HFCs, PFCs

Figure 7-14
Main linkages between the product uses as substitutes for ODS category and the other categories in the industrial processes and product use sector and other sectors



196. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the IPPU expert may consider going through the list of potential ERT actions in table 7-34 when reviewing the emissions from the product uses as substitutes for ODS category.

Table 7-34
Possible actions by the expert review team in its review of the emissions from the product uses as substitutes for ODS category

Subcategory	*Action by the ERT, task*
All	Compare the category–gas combinations reported by the Party with the main application areas for HFCs and PFCs as ODS substitutes in the 2006 IPCC Guidelines, volume 3, table 7.1, to identify potential gaps in the Party's reporting
	Has the Party included HFCs in blends and ensured that other gases not included in the UNFCCC Annex I inventory reporting guidelines such as CFCs and HCFCs in blends are not included in the amount reported for HFCs? See the 2006 IPCC Guidelines, volume 3, table 7.8, for the most common blends used in refrigeration and air conditioning
	Has the Party validated the AD across total chemical sales? What are the conclusions of any such validation?
	Where applicable (fire protection, refrigeration and air conditioning and foam blowing) has the Party appropriately accounted for banks of chemicals?
Fire protection	If the Party produces fire protection equipment, has the Party accounted for all emissions (unless the Party has documented bulk exports of the equipment)?
Refrigeration and air conditioning	How has the Party accounted for imports and exports of refrigerant and equipment (see the 2006 IPCC Guidelines, volume 3, box 7.3)?
Foam blowing agents	Compare the HFCs reported by the Party with the requirements of the 2006 IPCC Guidelines, volume 3, table 7.4, to identify potential gaps in the Party's reporting. What methods has the Party used to assess whether HFC blowing agents are used in each subapplication being practised in the country?
	Does the Party account for emissions from manufacturing, in-use, decommissioning and chemical destruction? The latter two phases are new in the 2006 IPCC Guidelines
	If it is not possible to collect AD for decommissioning, has the Party assumed that all blowing agent is lost over the lifetime of the foam?
Aerosols	Has the Party reported HFCs and PFCs acting as solvents contained in aerosols in this category and excluded them from the "solvents" category to prevent double counting?
	If there is no domestic aerosol production, how has the Party ensured completeness of AD considering that import statistics may be incomplete?
Solvents	What steps has the Party taken to prevent double counting between the use of HFCs and PFCs in solvents (e.g. in electronics cleaning) and in the electronics industry category?
	Does the Party properly account for recovery and recycling of solvents?

Abbreviations: AD = activity data, ERT = expert review team, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

Box 7-8

Further guidance on how to ensure consistency in the assessment of the completeness of the reporting of fluorinated gases (F-gases) as substitutes for ozone-depleting substances (ODS), as discussed in the 18th LRs meeting

(i)	Perform a comparison of the activity data (AD) used by the Party in its estimates with data from global or regional data sets (e.g. information reported under the Kigali Amendment to the Montreal Protocol[24] or the European Environment Agency[25]);
(ii)	If possible, compare the AD included in models applied to calculate F-gas estimates with data on total annual sales from chemical manufacturers or importers (provided by the Party) to understand trends and identify potential issues;
(iii)	If the mass balance approach is used (tier 2b), check, if possible, the calculation of the bank of F-gases and ensure that emissions are not underestimated or overestimated. Reviewers may ask the Party under review to provide the underlying calculations of the bank of F-gases;
(iv)	If the EF approach is used (tier 2a), review the EFs applied at the sub-application level and compare these with the IPCC default EFs.[26] Reviewers may ask the Party under review to provide the EFs by sub-application, if these are not available in the NIR;
(v)	Check the information provided by the Party in the column for reporting gases recovered at disposal in CRF table 2(II)B-H (sheet 2) by performing cross-checks between disposal and banks (AD in operating systems from previous years), considering the default lifetime by type of equipment;
(vi)	Check blends reported by a Party (not all blends are covered by the 2006 IPCC Guidelines) and the shares of different substances in such blends. Reviewers may ask the Party under review to provide the composition of new blends of gases reported and how the reported CO_2 eq emissions were calculated;
(vii)	Check how import or export in bulk or in products by F-gas species has been treated and if and how related AD and EFs were reported;
(viii)	Check the time series for category 2.F product uses as substitutes for ODS for each F-gas species and sub-application regarding the AD (e.g. filled into new manufactured products and average annual stocks in operating systems), EFs and other parameters (e.g. product manufacturing factor and product life factor) and emissions (from manufacturing and from stocks) to identify outliers or errors in inter-annual growth. Reviewers may ask the Party under review to provide information on AD of replenishments into the existing stock.

Other product manufacture and use

197. Table 7-35 provides a summary of key elements for the other product manufacture and use category. There are no direct interactions between this category and the other categories/sectors in the 2006 IPCC Guidelines.

Table 7-35

Summary of key elements of the other product manufacture and use category

Overview	*Category-specific information*	
Category name	Other product manufacture and use	
Reported in CRF table	Table 2(I).A-Hs2, table 2(II).A-Hs1	
	Electrical equipment	PFCs, SF_6

[24] Available at https://ozone.unep.org/countries/data.

[25] Available at https://www.eea.europa.eu/publications/fluorinated-greenhouse-gases-2020.

[26] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, vol. 3, chap. 7, table 7.9.

Overview	*Category-specific information*	
Main subcategories and GHGs to be reported	SF_6 and PFCs from other product use	PFCs, SF_6
	N_2O from product uses	N_2O
	Other	-

198. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the IPPU expert may consider going through the list of potential ERT actions in table 7-36 when reviewing the emissions from the other product manufacture and use category.

Table 7-36
Possible actions by the expert review team in its review of the emissions from the other product manufacture and use category

Subcategory	*Action by the ERT, task*
Electrical equipment	Under emissions from manufacturing, has the Party included emissions from the SF_6 uses listed in the 2006 IPCC Guidelines, volume 3, section 8.2.2.4 (Completeness)?
	Has the Party estimated emissions that occur during: new electrical equipment installations; leakage, refill, maintenance, and equipment failures; the disposal of discarded electrical equipment; the recycling or destruction of SF_6 recovered from equipment?
SF_6 and PFCs from other product use	Has the Party reported: SF_6 and PFCs used in military applications (e.g. in airborne radar systems and heat transfer fluids in high-powered electronic applications); SF_6 used in universities and research; SF_6 and PFCs from adiabatic uses and sound-proof glazing; and PFCs used as heat transfer fluids in commercial and consumer applications and in cosmetics and medical applications?
	If the Party uses distributor data, does the Party have a check in place to ensure that all SF_6 and PFC distributors are identified, and to assess the existence of new distributors?
	If the Party uses data per application on import, export and consumption from national SF_6 and PFC producers and distributors, has the Party: (a) Checked that domestic consumers only purchase SF_6 and PFCs from national suppliers; (b) Confirmed that imports and exports in products (e.g. sport attributes) are negligible?
N_2O from product uses	What steps has the Party taken to identify all relevant N_2O uses? At a minimum, use of N_2O in medical applications and as a propellant in aerosol products are likely to exist in the country
	If the Party uses data per application on import, export and consumption from national N_2O manufacturers and distributors, has the Party: (a) Ensured that all N_2O manufacturers and distributors are identified, including any new distributors? (b) Checked that domestic consumers only purchase N_2O from national suppliers? (c) Confirmed that imports and exports in products are negligible?

Abbreviations: ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

E. Agriculture

1. Introduction

199. The 2006 IPCC Guidelines combines the agriculture and LULUCF sectors into the agriculture, forestry and other land use (AFOLU) sector. However, the separation of the agriculture and LULUCF sectors in the CRF tables was maintained by the UNFCCC Annex I inventory reporting guidelines, and therefore they are also covered separately in this handbook. The separation also facilitates reporting and review under the KP, as agriculture sector is part of Annex A source categories, whereas Convention LULUCF sector is excluded from Annex A (see Box 7-9).

Box 7-9
Allocation issues between agriculture and LULUCF under KP

The agriculture sector is part of Annex A categories under the Kyoto Protocol, whereas Convention LULUCF sector is not. Therefore, in the KP reviews the ERT should keep in mind that any allocation issues between agriculture and LULUCF sectors may lead to under or overestimation of emissions from Annex A sources. In such cases, the ERT should carefully consider whether 2006 IPCC Guidelines includes grounds for the allocation used by the Party. If not, the ERT may raise a potential problem on such allocation issues. The ERT should also be mindful of potential double-counting of emissions between agriculture sector and KP-LULUCF activities

200. The agriculture sector includes the following categories:

(a) Enteric fermentation;

(b) Manure management;

(c) Rice cultivation;

(d) Agricultural soils;

(e) Prescribed burning of savannas;

(f) Field burning of agricultural residues;

(g) Liming;

(h) Urea application;

(i) Other carbon-containing fertilizers;

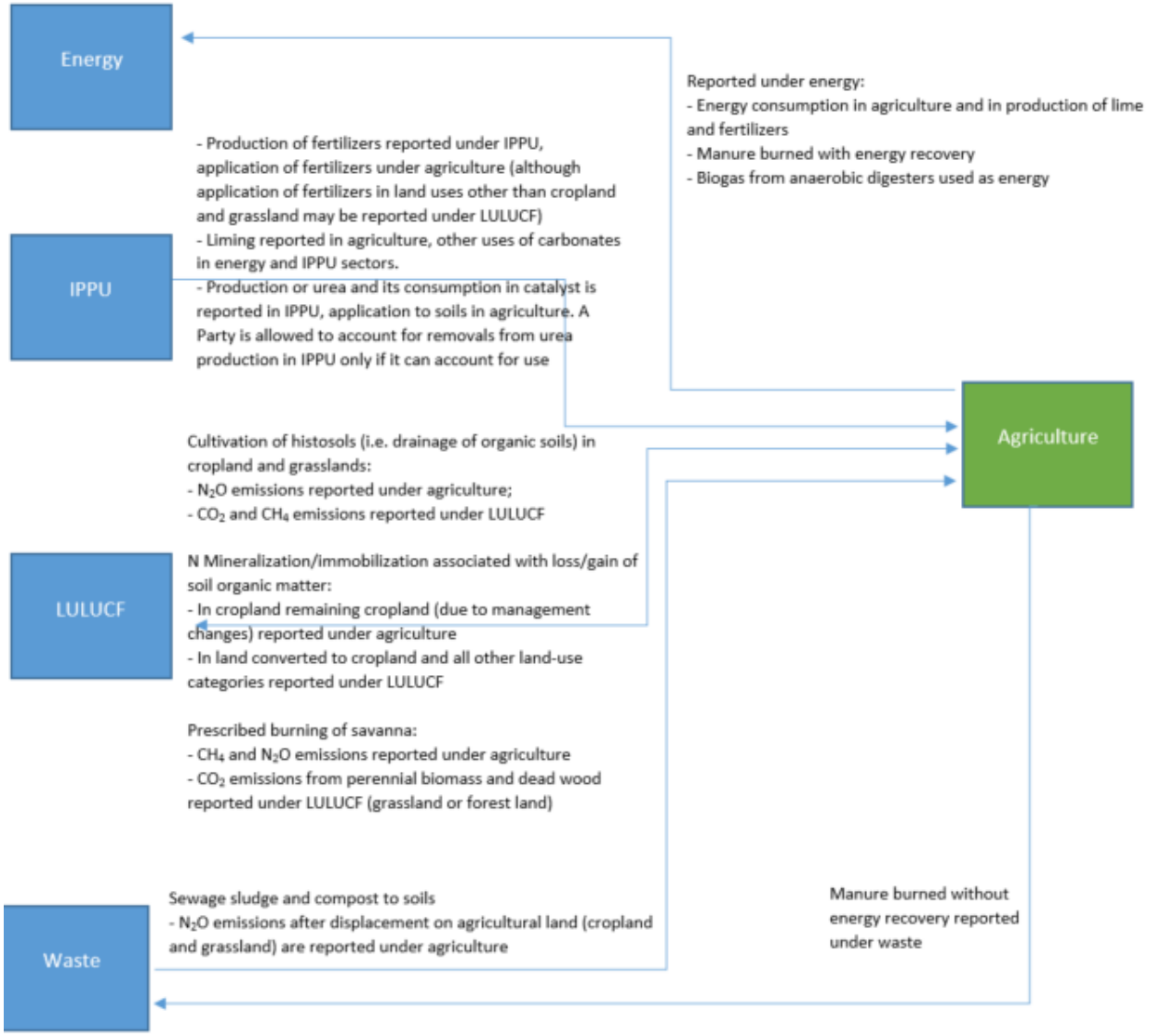
(j) Other (please specify).

2. Sector-specific issues

Integration of the agriculture sector

201. The agriculture sector has a high level of integration (see figure 7-15).

Figure 7-15
Overview of the interaction of the agriculture sector with other inventory sectors



202. The methods in the 2006 IPCC Guidelines for the agriculture sector have been significantly revised compared to the methods in the Revised 1996 IPCC Guidelines and IPCC good practice guidance. The main differences are summarized in box 7-10 below. However, the list is not exhaustive and it is important that the review experts make sure that, for all categories, the inventory estimates are in line with 2006 IPCC Guidelines.

Box 7-10
Main changes in the 2006 IPCC Guidelines from the Revised 1996 IPCC Guidelines, IPCC good practice guidance and IPCC good practice guidance for LULUCF: agriculture

(a) The agriculture sector and land use, land-use change and forestry (LULUCF) sectors have been combined into the agriculture, forestry and other land use (AFOLU) sector. However, the separation of the agriculture and LULUCF sectors is maintained in

the common reporting format (CRF) tables. Therefore, the changes in the 2006 IPCC Guidelines, as implemented by the latest UNFCCC Annex I inventory reporting guidelines, are not as significant. However, the differences between the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines may, to some extent, complicate the reporting and review in the agriculture sector. The footnotes in the CRF tables provide guidance to distinguish reporting between the agriculture sector and the LULUCF sector

(b) Some categories have been added (e.g. animal types such as deer and rabbit, and sewage sludge applied to soils) to the agriculture sector

(c) The manure management categories in the previous CRF tables, 4.B.10 Anaerobic, 4.B.11 Liquid systems and 4.B.12 Solid storage and dry lot used in the Revised 1996 Guidelines for the reporting of N_2O emissions, have been removed. The N_2O emissions from manure management are now reported under the appropriate animal type, which harmonizes the reporting of CH_4 and N_2O emissions from manure management

(d) Liming in all land-use categories is reported in the agriculture sector (previously reported in the LULUCF sector)

(e) Urea application in all land-use categories is included as a new category

(f) Indirect N_2O emissions from manure management is included as a new category

Livestock characterization

203. The methods for estimating methane (CH_4) and nitrous oxide (N_2O) emissions from livestock-related categories all require information on livestock subcategory definitions, annual populations and feed intake estimates. To ensure that these definitions and data are used consistently across the categories, Parties should have developed a single "characterization" for each species. A coordinated livestock characterization ensures consistency across the different categories.

204. In performing the characterization according to the appropriate level of detail, it is necessary to first identify the livestock species common to multiple categories. Subsequently, the emission estimation methods for each of the pertinent categories should be assessed (i.e. tier 1, tier 2 or tier 3) and the most detailed characterization required for each livestock species must be identified. Characterization may be achieved on either a basic or enhanced level. Generally, an enhanced characterization is required for categories if either enteric fermentation or manure management are estimated by the Party using tier 2 methods.

205. In the review of livestock population characterization, the review expert may consider going through the list of potential actions presented in table 7-37.

Table 7-37
Possible actions by the expert review team in its review of livestock population characterization

Check	*Action by the ERT, task*
General	How are young animals included in the livestock characterization? Is an assumption made about accompanying young animals that are otherwise not in the statistics?
	Has the Party used the same livestock characterization to estimate CH_4 emissions from enteric fermentation, CH_4 and N_2O emissions from manure management and direct and indirect N_2O emissions from manure applied to soils?

Check	*Action by the ERT, task*
	Do the annual population statistics take into account seasonal births or slaughters? Some countries must interpret the agricultural census data (e.g. seasonal births and slaughters are included or excluded, sometimes three-year averages are used)
	Has migration of livestock within or between countries led to double counting or under counting of animals?
	Is the feed intake calculated each year or is it based on assumptions?
	If the Party divides the country into regional subdivisions, are sufficient data on feeding characteristics and manure management systems available to support this regional disaggregation?
	If an enhanced characterization is used, is there an expected relationship between digestibility, feed intake and growth (e.g. low digestibility leads to lower feed intake and reduced growth)?
	Does the Party use live weight in accordance with the 2006 IPCC Guidelines instead of slaughter weight?
	Is average weight increase estimated? How?

Abbreviations: ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

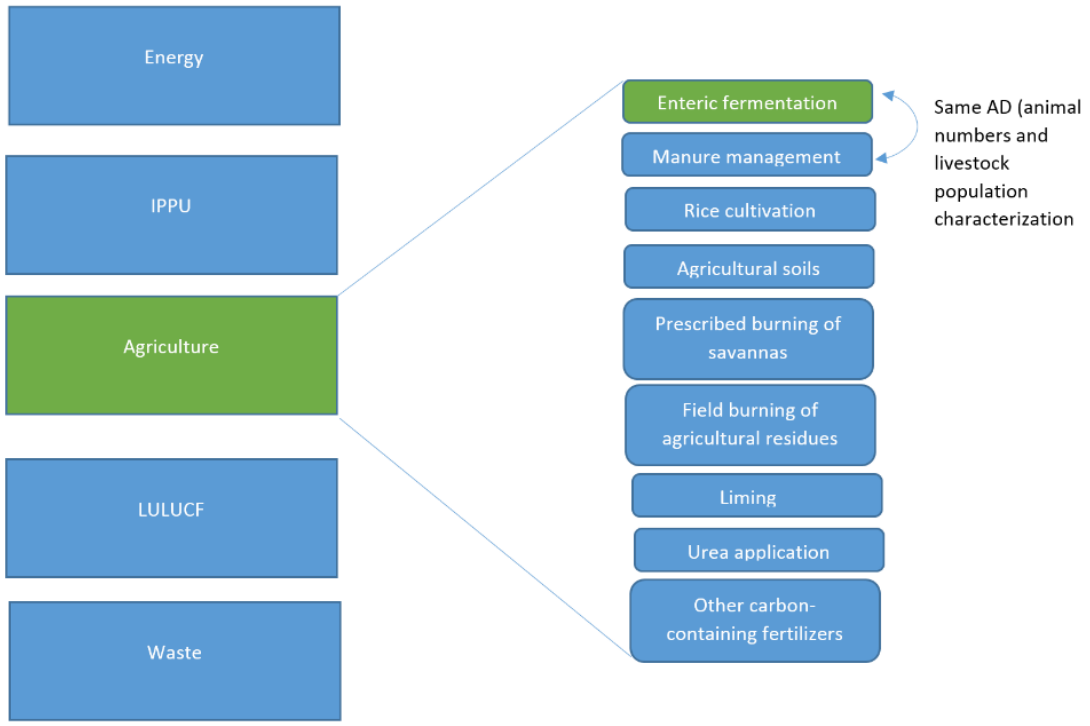
Enteric fermentation

206. Table 7-3 provides a summary of key elements for the enteric fermentation category, and figure 7-16 summarizes linkages between the enteric fermentation category and the other categories in the agriculture sector and with other sectors.

Table 7-38
Summary of key elements of the enteric fermentation category

Overview	*Category-specific information*	
Category name	Enteric fermentation	
Reported in CRF table	Table 3.A	
Main subcategories and GHGs to be reported	Cattle	CH_4
	Sheep	CH_4
	Swine	CH_4
	Other livestock	CH_4

Figure 7-16
Main linkages between the enteric fermentation category and the other categories in the agriculture sector and other sectors



207. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the list of potential ERT actions in table 7-39 when reviewing CH_4 emissions from the enteric fermentation category.

Table 7-39
Possible actions by the expert review team in its review of CH_4 emissions from the enteric fermentation category

Subcategory	*Action by the ERT, task*
All	Are the AD (based on livestock characterization) consistent between the enteric fermentation category and the manure management category?
	If a country-specific EF is used, are the data developed through the livestock characterization used for developing the EF?
	How are improvements in the herd (e.g. cattle types) followed in the inventory in order to update the AD (e.g. milk production) and EFs?
	How is the development of feeding practices (e.g. due to availability on the farms or through import) followed in the inventory in order to update the EFs accordingly?
	Has the Party included in the EF per adult animal an assumption about accompanying young animals that are not in the statistics?
Other livestock	Has the Party reported emissions from any new livestock categories? If yes, have appropriate methods been selected and has a consistent time series been reported?

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team.

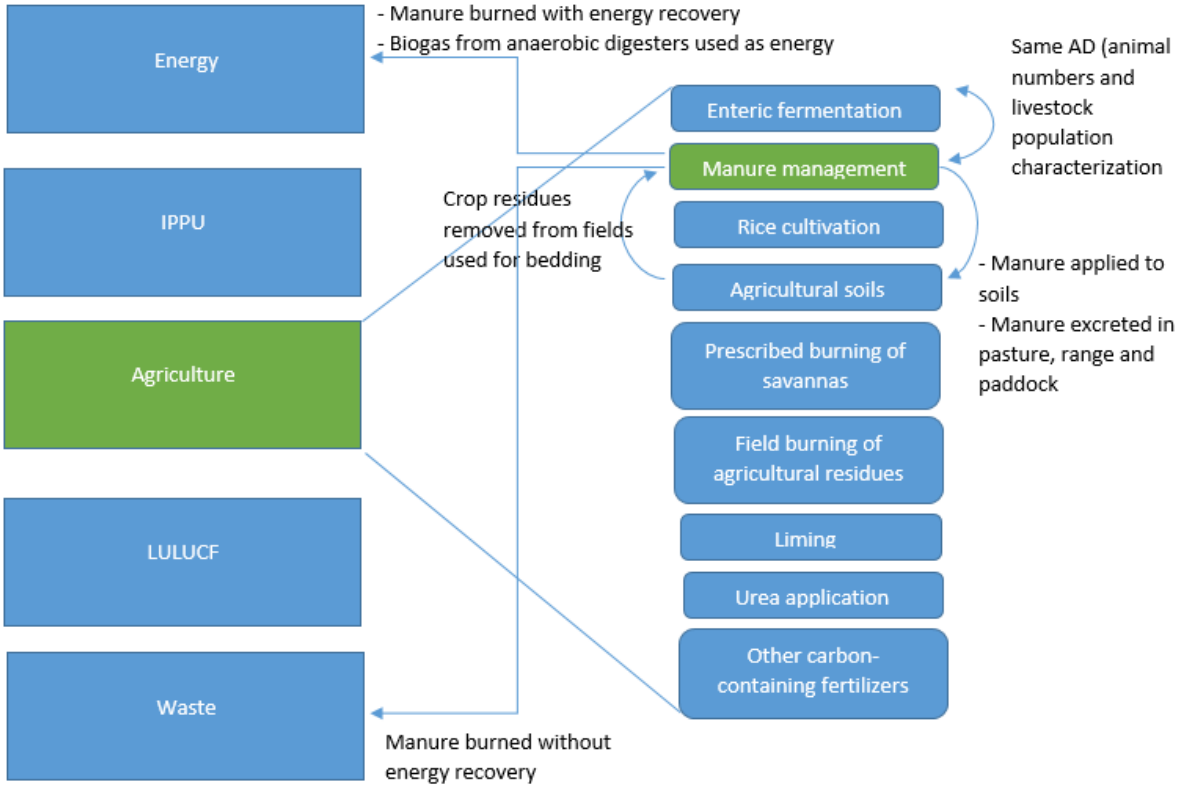
Manure management

208. Table 7-40 provides a summary of key elements for the manure management category, and figure 7-17 summarizes linkages between the manure management category and the other categories in the agriculture sector and with other sectors.

Table 7-40
Summary of key elements of the manure management category

Overview	*Category-specific information*	
Category name	Manure management	
Reported in CRF table	Table 3.B(a), 3.B(b)	
Main subcategories and GHGs to be reported	Cattle	CH_4, N_2O
	Sheep	CH_4, N_2O
	Swine	CH_4, N_2O
	Other livestock	CH_4, N_2O
	Indirect N_2O emissions	N_2O

Figure 7-17
Main linkages between the manure management category and the other categories in the agriculture sector and other sectors



209. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the list of potential ERT actions in table 7-41 when reviewing CH_4 and N_2O emissions from the manure management category.

Table 7-41
Possible actions by the expert review team in its review of CH_4 and N_2O emissions from the manure management category

Subcategory	*Action by the ERT, task*
Cattle, sheep, swine, other livestock	Is the information on the distribution of manure management systems based on statistics or other information? Is the distribution periodically updated to reflect changing practices?
	Is the manure management system distribution consistently used for estimation of CH_4 and N_2O emissions?
	If the Party reports treatment of manure in anaerobic digesters, is the amount subdivided into different categories considering the amount of biogas recovery, flaring and storage after digestion? If biogas is used for energy production, is it included in the energy sector?
	If the Party reports that manure is burned with or without energy recovery, is this included in the energy sector or the waste sector, respectively?

Subcategory	*Action by the ERT, task*
	If there are multiple climate zones in the country, has the Party estimated CH_4 emissions regionally, applying appropriate parameters?
	Are the assumptions on emissions from bedding in line with 2006 IPCC Guidelines (assumed no emissions from bedding during manure management, while emissions from bedding materials assumed to occur during manure application to soils)?
	Are direct N_2O emissions estimated based on total N excreted without subtracting the amount of N lost through leaching and/or volatilization?
Indirect N_2O emissions	Has the Party reported indirect N_2O emissions from volatilization of ammonia and NO_X during manure management (new mandatory category in the 2006 IPCC Guidelines)?
	Has the Party reported indirect N_2O emissions from leaching/run-off during manure management (new category with no tier 1 method available in the 2006 IPCC Guidelines)? If emissions are not estimated, the ERT should work with the Party to determine if it would be a key category and therefore to be estimated. It is important to note that failure to report indirect N_2O emissions from leaching/run-off does not lead to an underestimate of N_2O emissions, and therefore ERTs do not need to raise this issue as a potential problem, only a recommendation in the ARR
	If indirect emissions are estimated, are these emissions included in the national total? (Indirect N_2O emissions from agriculture and LULUCF must be included in the national total, whereas those from other sectors should not)
	Has the Party correctly allocated indirect emissions from manure excreted in pasture, range and paddock into the agricultural soils category?

Abbreviations: ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, LULUCF = land use, land use change and forestry, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

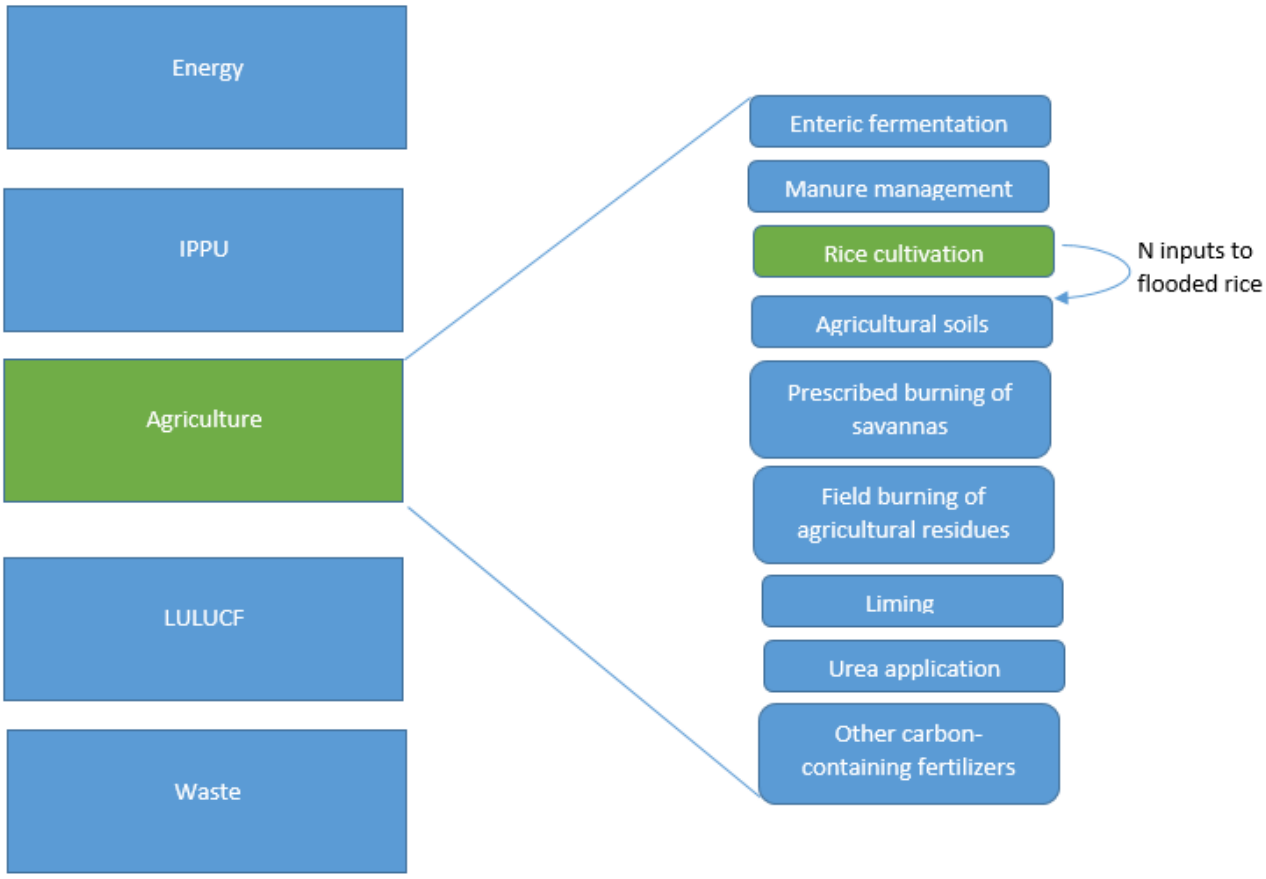
Rice cultivation

210. Table 7-42 provides a summary of key elements for the rice cultivation category, and figure 7-18 summarizes linkages between the rice cultivation category and the other categories in the agriculture sector and with other sectors.

Table 7-42
Summary of key elements of the rice cultivation category

Overview	*Category-specific information*	
Category name	Rice cultivation	
Reported in CRF table	Table 3.C	
Main subcategories and GHGs to be reported	Irrigated	CH_4
	Rain-fed	CH_4
	Deep water	CH_4
	Other	CH_4

Figure 7-18
Main linkages between the rice cultivation category and the other categories in the agriculture sector and other sectors



211. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the list of potential ERT actions in table 7-43 when reviewing CH_4 emissions from the rice cultivation category.

Table 7-43
Possible actions by the expert review team in its review of CH_4 emissions from the rice cultivation category

Subcategory	*Action by the ERT, task*
All	In case of multiple cropping during the same year, is the 'harvested area' equal to the sum of the area cultivated for each cropping?
	Is the total cultivated area consistent with international data sources such as the FAO and the International Rice Research Institute?
	Are daily (instead of seasonal) EFs used, in line with the 2006 IPCC Guidelines?
	If soil submergence is not limited to the actual rice growing season, are emissions outside of the rice growing season reported?

Abbreviations: EF = emission factor, ERT = expert review team, FAO = Food and Agriculture Organization of the United Nations, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

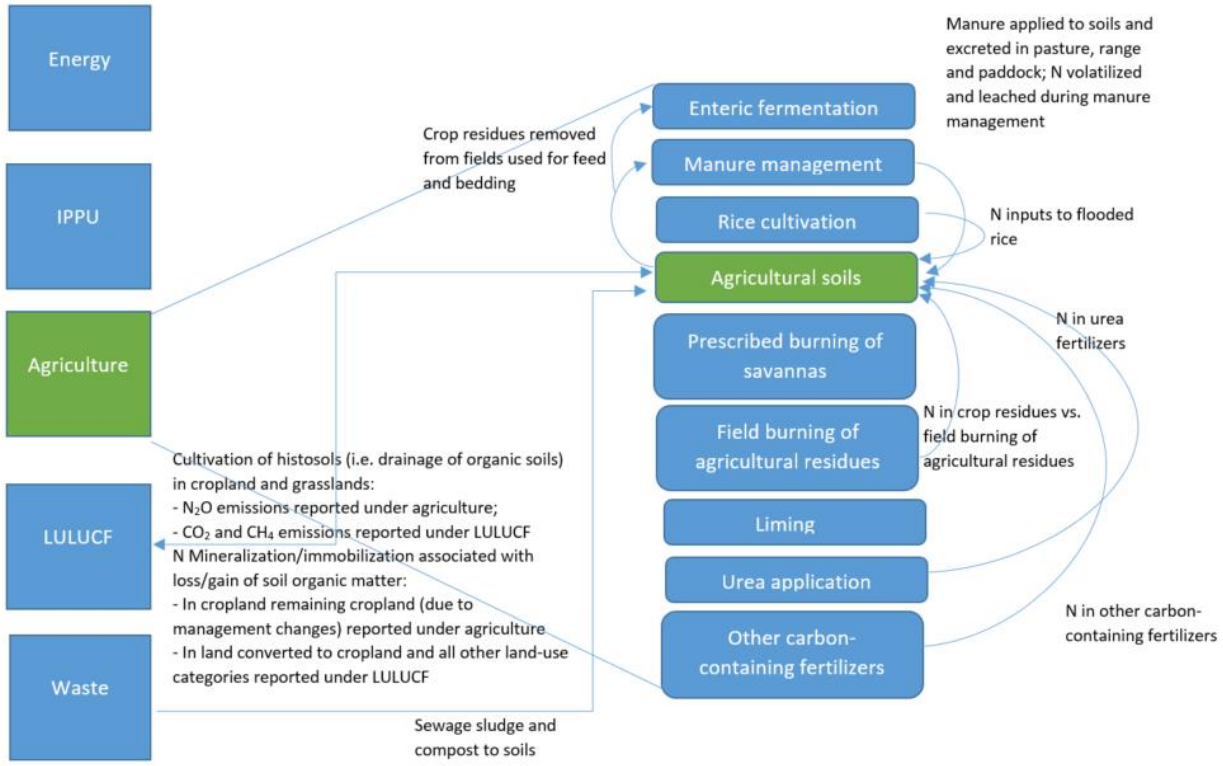
Agricultural soils

212. Table 7-44 provides a summary of key elements for the agricultural soils category, and figure 7-19 summarizes linkages between the agricultural soils category and the other categories in the agriculture sector and with other sectors.

Table 7-44
Summary of key elements of the agricultural soils category

Overview	*Category-specific information*	
Category name	Agricultural soils	
Reported in CRF table	Table 3.D	
Main subcategories and GHGs to be reported	Direct N_2O emissions from managed soils	N_2O
	Indirect N_2O emissions from managed soils	N_2O

Figure 7-19
Main linkages between the agricultural soils category and the other categories in the agriculture sector and other sectors



213. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the list of potential ERT actions in table 7-45 when reviewing N_2O emissions from the agricultural soils category.

Table 7-45
Possible actions by the expert review team in its review of N_2O emissions from the agricultural soils category

Subcategory	*Action by the ERT, task*
Direct N_2O emissions from managed soils – inorganic N fertilizers	Are the AD in line with the fertilizer data provided by FAO or the International Fertilizer Industry Association?
	If fertilizer data are provided disaggregated by fertilizer type, is the reporting of use of urea in line with that reported for the category "urea application"?
	If fertilizer data are provided disaggregated by fertilizer type, is the reporting of use of other carbon-containing fertilizers in line with that reported for the category "other carbon-containing fertilizers"?
	Is the Party able to separate out only fertilizers applied to cropland and grassland? If the application to other land categories cannot be identified, is this clearly described in the NIR?
Direct N_2O emissions from managed soils – organic N fertilizers – animal manure applied to soils	Are the AD in line with the data provided in CRF table 3.B(b) excluding manure in pasture, range and paddock, and taking into account manure used for feed, fuel and construction ($Frac_{FEED}$ + $Frac_{FUEL}$ + $Frac_{CNST}$) and loss of N from manure management systems?
	Is the estimated loss of N from manure management systems in line with the estimated N loss due to volatilization of ammonia and NO_X and, if reported, the loss of N through leaching from manure management? The total loss of N should be higher than (or equal to) losses due to volatilization and leaching
	If the Party assumes no leaching of N during manure management (not mandatory), is the estimate of total N loss before manure application to soils consistent with that approach?
	Is the Party able to separate out only organic fertilizers applied to cropland and grassland? If the application to other land categories cannot be identified, is this clearly described in the NIR?
Direct N_2O emissions from managed soils – organic N fertilizers – sewage sludge applied to soils	Is the reporting on sewage sludge applied to soils in line with data in the waste sector? (Cross-check with the waste sector to ensure there is no double counting of N_2O emissions from the N in sewage sludge.) What assumptions has the Party made regarding N content in sewage sludge, if the amount of sewage sludge in weight units is used as a basis for the calculation?
	If the Party reports "NO" or "NE", check with the waste expert whether there is an indication that sewage sludge application occurs. If so, the Party should report the emissions to ensure completeness
Direct N_2O emissions from managed soils – organic N fertilizers – other organic fertilizers applied to soils	Is the reporting on compost addition to soils in line with data in the waste sector? What assumptions has the Party made regarding N content in compost, if the amount of compost in weight units is used as a basis for the calculation? Has the Party ensured that compost N is not double counted?
Direct N_2O emissions from managed soils – urine and dung deposited by grazing animals	Is the N input the same as reported in CRF table 3.B(b) for pasture, range and paddock?
	If the Party uses default EFs, is the IEF equal to the weighted average of EFs in table 11.1 in the 2006 IPCC Guidelines, when weighted based on N input for

Subcategory	*Action by the ERT, task*
	cattle, poultry and pigs ($EF_{3PRP, CPP}$) and N input for sheep and other animals ($EF_{3PRP, SO}$)?
Direct N_2O emissions from managed soils – crop residues	Are the data on crop residues in line with the data reported for field burning of agricultural residues (i.e. is the amount of agricultural residues burned equal to or smaller than the amount of crop residues minus the amount used for feed, bedding or construction)?
	If the Party has no data on $Frac_{REMOVE}$, has it assumed no removal, in line with the 2006 IPCC Guidelines?
Direct N_2O emissions from managed soils – mineralization/immobilization associated with loss/gain of soil organic matter	Are losses of soil carbon in cropland remaining cropland (reported in the LULUCF sector) accompanied by N_2O emissions from mineralization associated with loss of soil organic matter reported in this category? Note that N_2O immobilization associated with a gain of organic matter resulting from the management of mineral soils can be reported only when a Party applies a tier 3 approach
	Are the emissions correctly allocated between the agriculture sector and the LULUCF sector, that is, only mineralization/immobilization in cropland remaining cropland included under the agriculture sector and the rest in the LULUCF sector CRF table 4(III)?
Direct N_2O emissions from managed soils – cultivation of organic soils (i.e. histosols)	Is the area of cultivated histosols in line with the area of organic soils reported in the LULUCF sector for cropland remaining cropland, land converted to cropland, grassland remaining grassland and land converted to grassland? Large differences (e.g. "NO" reported for this category although organic soils in cropland or grassland occur) in these data may indicate a problem in the inventory
Direct N_2O emissions from managed soils	Is the Party applying EFs for direct emissions to total N input to soils, before subtracting the amount of N lost through volatilization, leaching and run-off?
Indirect N_2O emissions from managed soils – atmospheric deposition	Does the atmospheric deposition include NO_X from burning of savannas and crop residues (these emissions should be excluded from this category)?
Indirect N_2O emissions from managed soils – N leaching and run-off	Does the Party consider, in its estimate of N losses by leaching/run-off only those areas where soil water-holding capacity is exceeded, as a result of rainfall and/or irrigation? Note that consideration of soil water-holding capacity is a new element in the 2006 IPCC Guidelines
Indirect N_2O emissions from managed soils – N leaching and run-off	Is the Party able to estimate the quantity of N mineralized from organic soils? If yes, is this included in the indirect N_2O emissions from leaching/run-off?

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, FAO = Food and Agriculture Organization of the United Nations, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, LULUCF = land use, land use change and forestry, NE = not estimated, NIR = national inventory report, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

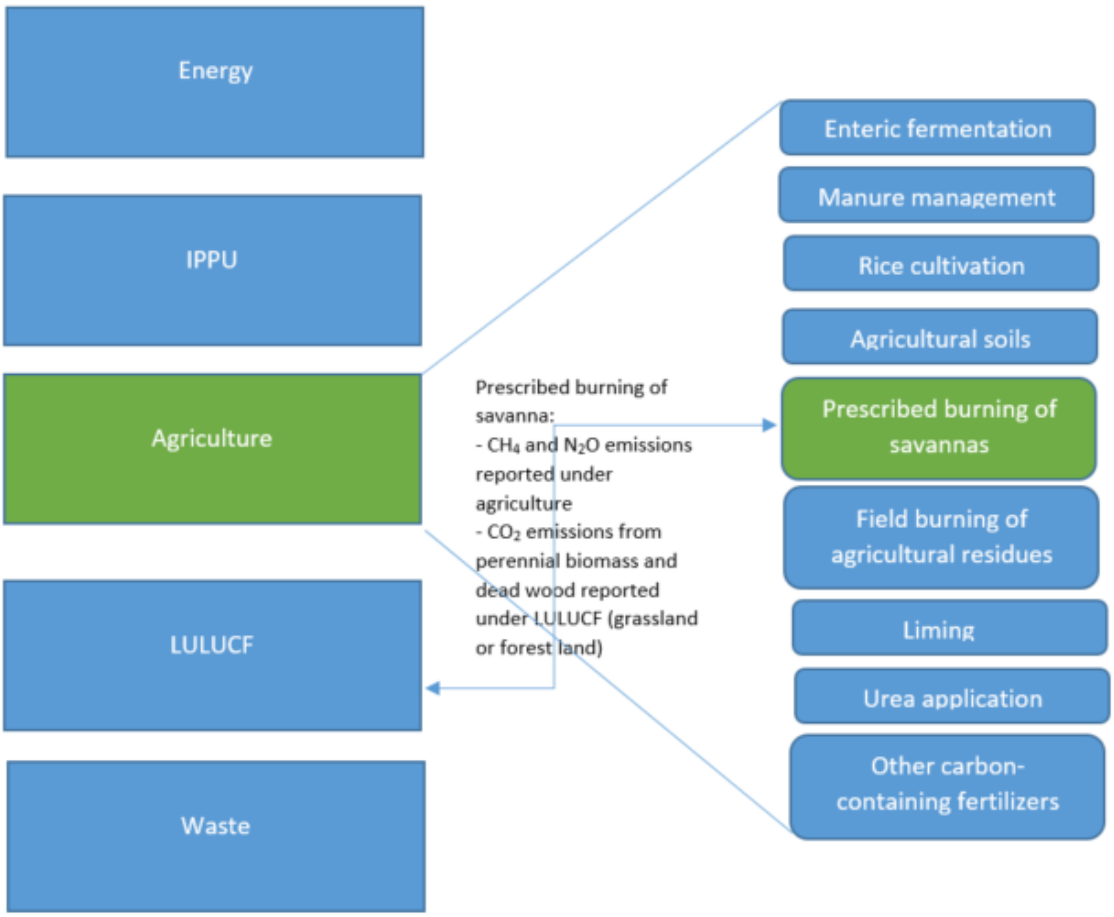
Prescribed burning of savannas

214. Table 7-46 provides a summary of key elements for the prescribed burning of savannahs category, and figure 7-20 summarizes the linkages between the prescribed burning of savannas category and the other categories in the agriculture sector and with other sectors.

Table 7-46
Summary of key elements of the prescribed burning of savannas category

Overview	*Category-specific information*	
Category name	Prescribed burning of savannas	
Reported in CRF table	Table 3.E	
Main subcategories and GHGs to be reported	Forest land	CH_4, N_2O
	Grassland	CH_4, N_2O

Figure 7-20
Main linkages between the prescribed burning of savannas category and the other categories in the agriculture sector and other sectors



215. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the following list of potential ERT actions in table 7-47 when reviewing CH_4 and N_2O emissions from the prescribed burning of savannas category.

Table 7-47
Possible actions by the expert review team in its review of CH_4 and N_2O emissions from prescribed burning of savannas

Subcategory	*Action by the ERT, task*
All	Has the Party reported CH_4 and N_2O emissions from prescribed burning of savannas separately from other fires in forest land and grassland (i.e. avoiding double counting with CRF table 4(V)), even though the guidance in the 2006 IPCC Guidelines has a common approach for all fires in forest land and grassland?
	If savanna burning is included in CRF table 4(V), has the Party provided a justification in the NIR?
	Has the Party correctly applied a combustion factor?
Forest land	Is the Party accounting for the burning of dead organic matter?

Abbreviations: CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, NIR = national inventory report, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

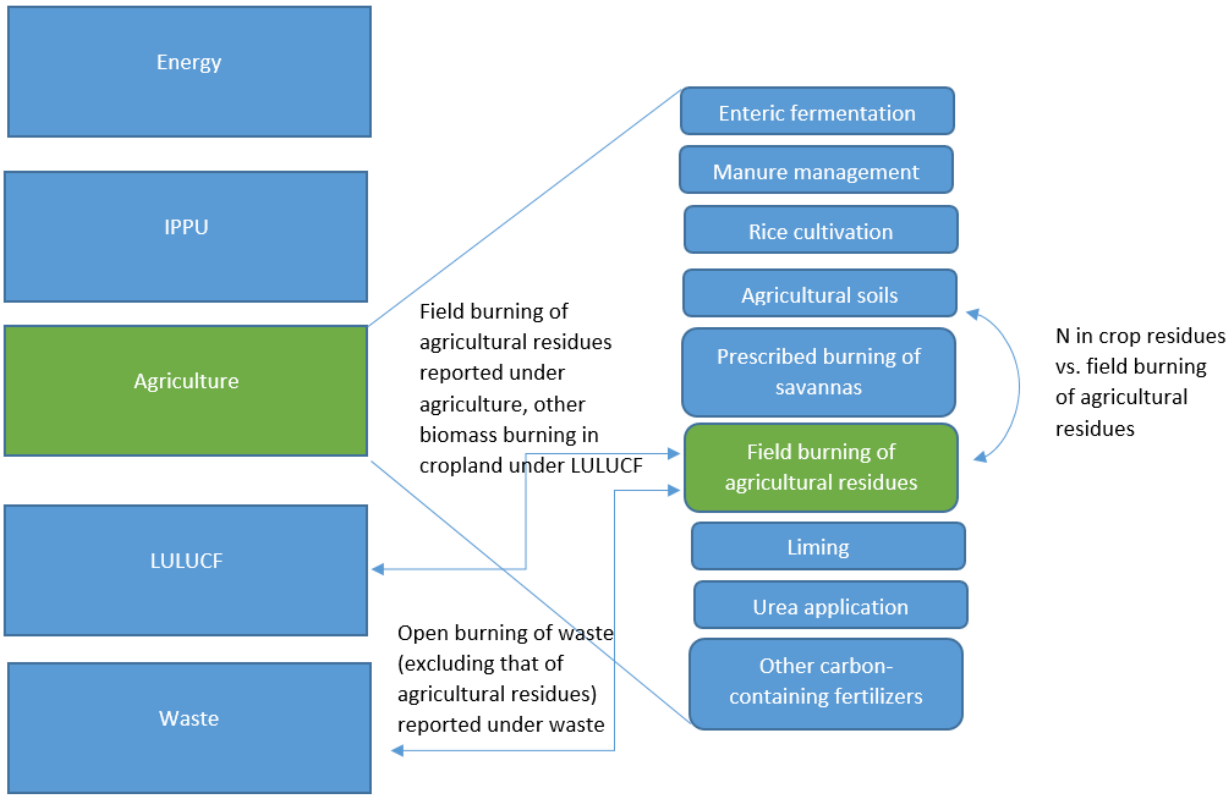
Field burning of agricultural residues

216. Table 7-48 provides a summary of key elements for the field burning of agricultural residues category, and figure 7-21 summarizes the linkages between the field burning of agricultural residues category and the other categories in the agriculture sector and other sectors.

Table 7-48
Summary of key elements of the field burning of agricultural residues category

Overview	*Category-specific information*	
Category name	Field burning of agricultural residues	
Reported in CRF table	Table 3.F	
Main subcategories and GHGs to be reported	Cereals	CH_4, N_2O
	Pulses	CH_4, N_2O
	Tubers and roots	CH_4, N_2O
	Sugar cane	CH_4, N_2O

Figure 7-21
Main linkages between the field burning of agricultural residues category and the other categories in the agriculture sector and other sectors



217. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the list of potential ERT actions in table 7-49 when reviewing CH_4 and N_2O emissions from the field burning of agricultural residues category.

Table 7-49
Possible actions by the expert review team in its review of CH_4 and N_2O emissions from the field burning of agricultural residues category

Subcategory	*Action by the ERT, task*
All	Has the Party adequately separated reporting of field burning of agricultural residues in the agriculture sector from biomass burning in cropland (reported in CRF table 4(V)), by avoiding omission or double counting of emissions? Note that the 2006 IPCC Guidelines has a common approach for estimation of fires in cropland
	Is the amount of agricultural residues burned consistent with the amount of crop residues minus the amount used for feed, bedding or construction?

Abbreviations: CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

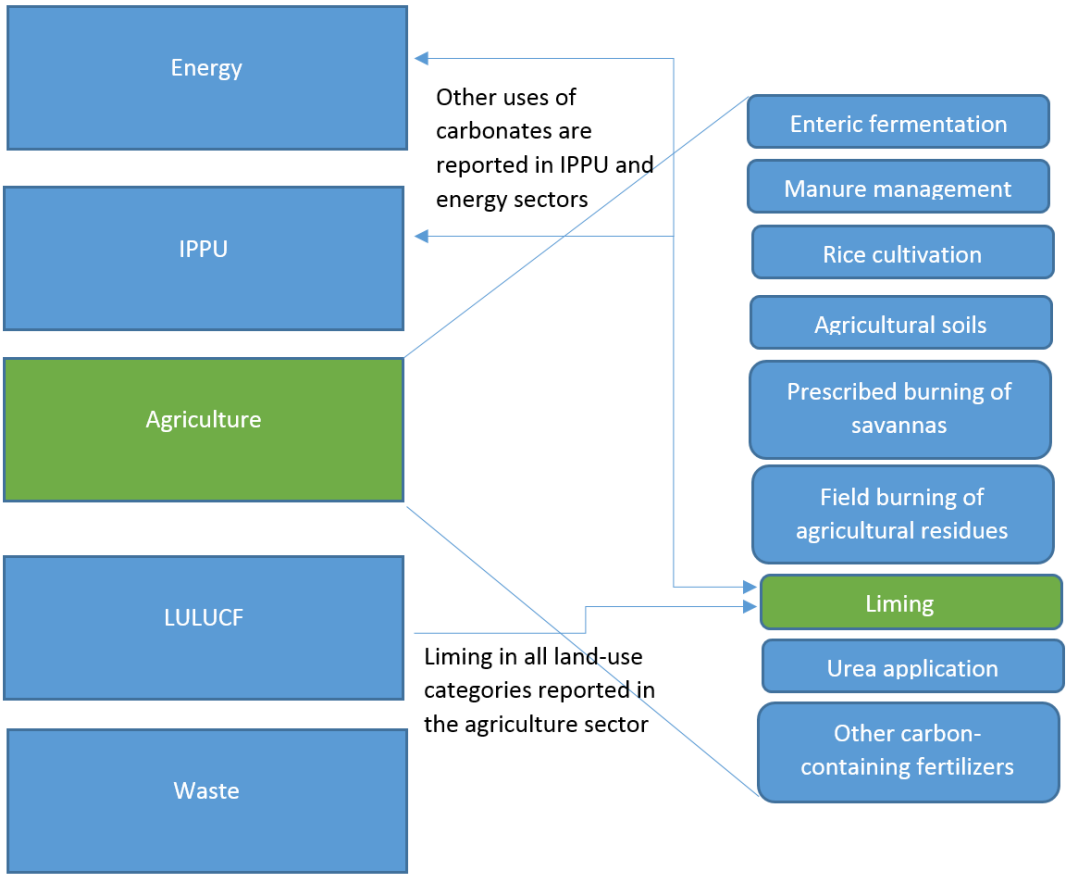
Liming

218. Table 7-50 provides a summary of key elements for the liming category, and figure 7-22 summarizes the linkages between the liming category and the other categories in the agriculture sector and other sectors.

Table 7-50
Summary of key elements of the liming category

Overview	*Category-specific information*	
Category name	Liming	
Reported in CRF table	Table 3.G-I	
Main subcategories and GHGs to be reported	Limestone $CaCO_3$	CO_2
	Dolomite $CaMg(CO_3)_2$	CO_2

Figure 7-22
Main linkages between the liming category and the other categories in the agriculture sector and other sectors



219. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the list of possible ERT actions in table 7-51 when reviewing CO_2 emissions from the liming category.

Table 7-51
Possible actions by the expert review team in its review of CO_2 emissions from the liming category

Category	*Action by the ERT, task*
All	Are AD based on actual usage statistics? If based on annual sales or estimated through a balance of production, imports and exports are data sufficient to estimate national emissions?
	Are the AD available separately for limestone and dolomite or have assumptions been made? Are any assumptions sufficiently justified and documented?

Abbreviations: AD = activity data, ERT = expert review team.

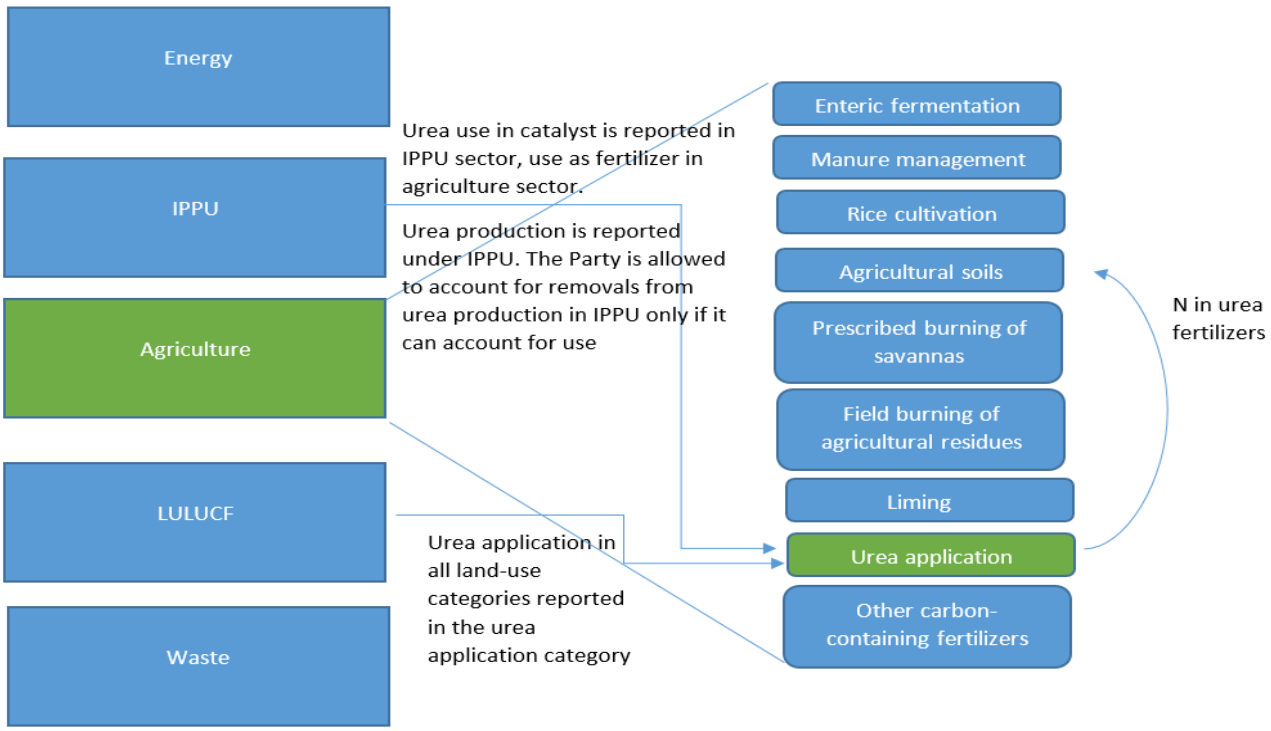
Urea application

220. Table 7-52 provides a summary of key elements for the urea application category, and figure 7-23 summarizes the linkages between the urea application category and the other categories in the agriculture sector and other sectors.

Table 7-52
Summary of key elements of the urea application category

Overview	*Category-specific information*	
Category name	Urea application	
Reported in CRF table	Table 3.G-I	
Main subcategories and GHGs to be reported	Urea application	CO_2

Figure 7-23
Main linkages between the urea application category and the other categories in the agriculture sector and other sectors



221. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the agriculture expert may consider going through the list of possible ERT actions in table 7-53 when reviewing CO_2 emissions from the urea application category.

Table 7-53
Possible actions by the expert review team in its review of CO_2 emissions from the urea application category

Category	*Action by the ERT, task*
All	Does the reporting on urea application cover all land uses?
	Are the AD (amount of urea fertilizers used) consistent with the data used in the category direct and indirect N_2O emissions from agricultural soils (category 3.D)?
	Are the AD based on fertilizer use or sales instead of production?
	If AD are estimated through a balance of production, imports and exports are data sufficient to estimate national emissions?

Abbreviations: AD = activity data, ERT = expert review team.

Other carbon-containing fertilizers

222. The 2006 IPCC Guidelines do not provide a specific method and EF for this category and therefore it is not considered as a mandatory category. However, it could be expected that the Parties report emissions from this category using a similar approach to that used for urea (i.e. use of fertilizer as AD, EF based on carbon content). If that is the case, reviewers could undertake the same checks outlined in table 7-53.

F. Land use, land-use change and forestry

1. Introduction

223. The 2006 IPCC Guidelines combines the agriculture and LULUCF sectors into the AFOLU sector. However, the separation of the agriculture sector and the LULUCF sector in the CRF tables was maintained by the UNFCCC Annex I inventory reporting guidelines, and therefore the two sectors are covered separately also in this handbook.

224. The LULUCF sector differs from other sectors in that it covers carbon stocks in carbon pools. Carbon stocks are composed of organic matter[27] which, through photosynthesis, removes CO_2 from the atmosphere and through mineralization/redox causes the emission to the atmosphere of CO_2, N_2O and CH_4 (nitrogen oxides (NO_X), carbon monoxide (CO) and non-methane volatile organic compounds do not add to total net emissions). Carbon stocks may:

(a) Increase, thus resulting in a net CO_2 removal from the atmosphere, and in the case of soil organic matter (SOM) also a net immobilization of nitrogen (N);

(b) Decrease, thus resulting in a net CO_2 emission to the atmosphere, and in the case of SOM also net N_2O emissions; further, in the case of redox of organic matter, CH_4 emissions could also be associated with carbon stock losses;

(c) Be in equilibrium, in this case carbon stock gains and losses are equal over a time period (e.g. a management cycle).

225. Further, since carbon stocks in carbon pools naturally vary across time, towards equilibrium levels, past carbon stock losses and gains have a legacy effect, affecting current trends of carbon stock changes.

226. The technical review of this sector requires the checking and assessment of both quantitative and qualitative data and information from the reporting of carbon stock changes and associated GHG emissions and removals owing to management and use of land and its conversion from one land-use category to another and/or from one management system to another.

227. **Special considerations for LULUCF inventories**: the LULUCF inventory is complicated by several considerations:

(a) Many Parties already have national programmes in place to estimate forest inventories, and produce agriculture censuses and land-use maps. In such a case, instead of implementing a new inventory process, some Parties choose to elaborate existing data to meet inventory reporting requirements. This may create apparent difficulties in the comparison of

[27] Carbon stocks in carbon pools are usually measured as "organic matter stock". To convert dry organic matter into carbon, the 2006 IPCC Guidelines provide default carbon fraction values for:

- Biomass:
  - Volume 4, table 4.3;
  - 0.5 for woody biomass and 0.47 for herbaceous biomass for grassland (volume 4, section 6.3.1.4);
  - 0.5 for flooded lands (volume 4, equation 7.10);
  - 0.5 for settlements (volume 4, section 8.2.1.2);
- Litter:
  - 0.37 (volume 4, equation 2.19);
  - 0.4 for cropland, grassland and settlements (volume 4, sections 5.2.2.4, 6.2.2.2 and 8.3.2.2);
- Dead wood:
  - 0.50 for cropland, grassland and settlements (volume 4, sections 5.2.2.4, 6.2.2.2 and 8.3.2.2);
- SOM mineral soils: 0.58 (volume 4, section 2.3.3.1);
- Peat: volume 4, table 7.5.

annual reports among countries and, if estimates are based on interpolation between periodic inventories, apparent inconsistencies in time series within countries;

(b) High levels of natural variability may exist, which may require additional information for properly quantifying, in terms of emissions and removals, the impact of human activities on ecosystems;

(c) Analysis of trends is complicated by: (a) the length of time over which activities and disturbances impact upon carbon dynamics; (b) changes in the methodologies employed by Parties as they rationalize accounting rules with existing inventory practices, including by enhancing the quality and quantity of information collected as well as the frequency of collection; and (c) gross changes in subcategories not singled out in CRF tables that can have significant effects on the time series of net values of a category, although being not singularly reported it is not evident what the cause of the trend in the time series is.

228. The review of the LULUCF sector requires good knowledge of the requirements in the UNFCCC Annex I inventory reporting guidelines and the UNFCCC Annex I inventory review guidelines as well as the methodologies and guidance contained in the 2006 IPCC Guidelines and the Wetlands Supplement.

229. The methods for the LULUCF sector in the 2006 IPCC Guidelines sector have been revised compared to the methods in the *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The main differences are summarized in box 7-11 below. However, the list is not exhaustive and it is important that the review experts make sure that, for all categories, inventory estimates are in adherence to the 2006 IPCC Guidelines.

Box 7-11
Main changes in the 2006 IPCC Guidelines from the IPCC good practice guidance for LULUCF

(a) The harvested wood products (HWP) pool is to be mandatorily reported as methods are provided in the 2006 IPCC Guidelines

(b) The good practice requirement to stratify the country area according to climate, soil and vegetation types has been made explicit

(c) At tier 1, below-ground biomass of perennial vegetation may be assumed to be at equilibrium if the land is not in a conversion to a new use or a new management system

(d) CO_2 emissions from burning of perennial biomass must be reported, even if CO_2 removals from subsequent regrowth would offset such emissions

(e) For wetlands, the 2006 IPCC Guidelines also contain tier 1 methods to estimate: off-site CO_2 emissions in managed peatlands; CO_2 and N_2O emissions in peatlands remaining peatlands; and N_2O emissions in land converted to peat extraction (lands converted to wetlands). The method for estimating CH_4 emissions in flooded lands is reported in the Appendix to volume 4 of the 2006 IPCC Guidelines

(f) For settlements, the 2006 IPCC Guidelines contain tier 2 methods for carbon stock changes in settlements remaining settlements

230. Table 7-54 provides a high-level overview of the review routines and tasks. Further details are provided in the remainder of this section.

Table 7-54
General steps that should be undertaken for the review of the land use, land-use change and forestry sector

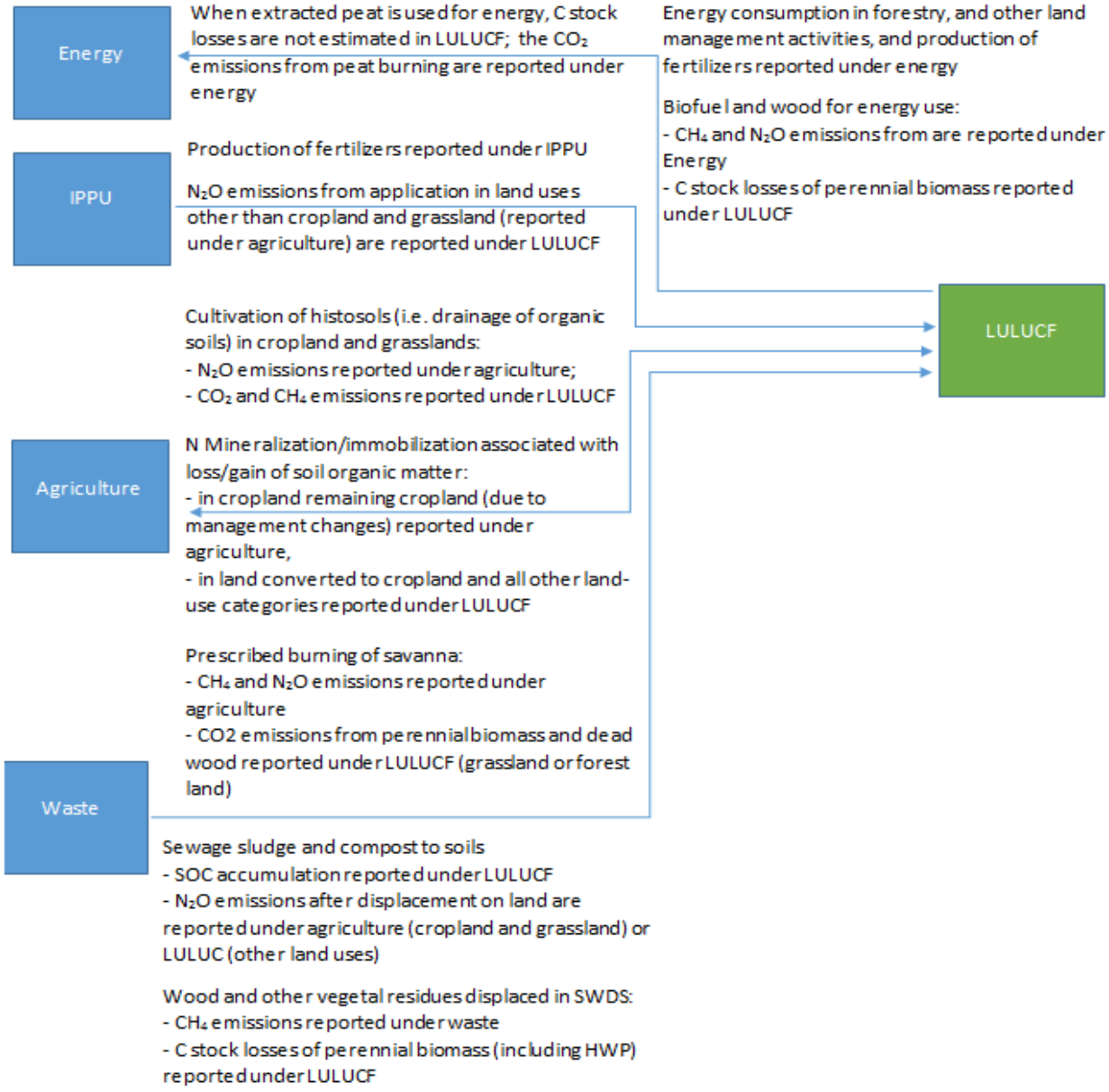
Check	*Action by the ERT, routine for the review of the LULUCF sector*
General	In coordination with the generalist on the ERT, assess whether the institutional, procedural and legal arrangements for the inventory preparation are robust enough to ensure TACCC of the LULUCF inventory
	Check whether categories, subcategories or subdivisions for which the Party has prepared estimates are appropriate and correspond to the national circumstances. The review should be implemented at the level of subdivisions reported
	Assess the consistency of the land representation, including whether lands have been correctly stratified into managed and unmanaged lands and if transition matrices have been reported in the NIR for years of the transition time period not reported in the CRF tables (in general for the period 1971–1989)
	Assess for which carbon pools the Party has reported estimates, considering that for some carbon pools under some categories, the IPCC assumes no net carbon stock changes in the absence of land-use/management changes; including whether disturbance matrices for significant carbon stock changes have been reported in the NIR
	Assess whether the Party has estimated all gains and losses for each pool reported (e.g. for biomass, growth rate, harvesting, natural mortality, disturbances e.g. fires, pests), noting whether each pool is mandatory in accordance with the UNFCCC Annex I inventory reporting guidelines
	Assess whether the Party has estimated all GHG emissions/removals associated with carbon stock changes and if the estimated GHG fluxes are consistent with each other

Abbreviations: CRF = common reporting format, ERT = expert review team, GHG = greenhouse gas, IPCC = Intergovernmental Panel on Climate Change, LULUCF = land use, land use change and forestry, NIR = national inventory report, TACCC = transparency, accurancy, consistency, comparability and completeness, UNFCCC Annex I inventory reporting guidelines = Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories.

2. Sector-specific issues

231. The LULUCF sector is highly integrated with the agriculture sector and, to a lesser extent, with the energy sector and the waste sector (see figure 7-24).

Figure 7-24
Linkages between the emissions/removals estimated in the land use, land-use change and forestry sector and the emissions estimated in other inventory sectors



232. The 2006 IPCC Guidelines provide default methods, EFs and other parameters for the estimation and reporting of carbon stock changes in carbon pools and associated GHG emissions and removals. It is mandatory for Parties to report an estimate for each inventory category for which the 2006 IPCC Guidelines provide methods and default EFs. Table 7-55 reports, for each inventory category, information on which carbon pools and subcategories are required to be reported, if significant, because an IPCC tier 1 method is available (the notation "M" is used). Table 7-56 reports, for each inventory key category, information on which carbon pools and subcategories are required to be reported, if significant, because an IPCC method is available (the notation "M" is used).

Table 7-55
Tier 1: mandatory reporting according to the 2006 IPCC Guidelines

Tier 1		Land use													
		FL		CL		GL		WL				SL		OL	
Carbon pool – GHG		FL-FL	L-FL	CL-CL	L-CL	GL-GL	L-GL	WL-WL		L-WL		SL-SL	L-SL	OL-OL	L-OL
								PL-PL	L-PE	FlL					
Living biomass	Above-ground	M	M	M [a]	M [b, c]		M [b, c]		M [c]	M [c]			M [c]		M [c]
	Below-ground		M		M [b, c]		M [b, c]		M [c]	M [c]			M [c]		M [c]
Dead organic matter	Deadwood		M [3]		M [c]		M [c]						M [c]		M [c]
	Litter		M		M [c]		M [c]						M [c]		M [c]
Soil organic matter	Mineral		M	M	M	M	M						M		M [d]
	Organic	M	M	M	M	M	M	M					M		N/A
HWP		M (may be assumed 0 if net carbon stock change is judged insignificant)													
N_2O	Direct – Fertilization [e]	M	M									M	M		
	Direct – N mineralization		M		M	M	M						M		Y
	Direct – Drainage	M	M					M				M	M		
	Direct – Burning	M	M	M	M	M	M	M	M			M	M		Y
	Indirect – Fertilization [e]	M	M									M	M		
	Indirect – N mineralization		M		M	M	M						M		Y
CH_4	Burning	M	M	M	M	M	M	M	M			M	M		M

Notes: M = mandatory, grey shading = not applicable, blank = not mandatory.

Abbreviations: CL = cropland, CL – CL= cropland remaining cropland, FL = forest land, FlL = flooded land, FL – FL = forest land remaining forest land, GHG = greenhouse gas, GL = grassland, GL – GL = grassland remaining grassland, HWP = harvested wood products, L – CL = land converted to cropland, L – FL = land converted to forest land, L – GL = land converted to grassland, L – OL = land converted to other land, L – PE = land converted to peat extraction, L – SL = land converted to settlements, L – WL = land converted to wetlands, OL = other land, OL – OL= other land remaining other land, PL = peatland, SL = settlements, SL – SL= settlements remaining settlements, WL = wetlands, WL – WL= wetlands remaining wetlands.

[a] To be reported only for perennial crops.

[b] Net carbon stock gain in biomass pool for annual crops is to be reported only once in the year after conversion.

c Only applicable if the Party has reported carbon stock changes or the IPCC provides default carbon stock values for the biomass or DOM carbon stock for the previous land use. In such a case carbon stock is to be reported as instantaneously oxidized in the year of conversion.

d Carbon stock level after conversion is to be set at 0.

e N_2O emissions from N fertilization in forest land and settlements are to be reported under the LULUCF sector and those in cropland and managed grassland are to be reported in the agriculture sector. If the Party is not able to separate emissions from N fertilization in different land-use categories, all emissions are to be reported under the agriculture sector.

Table 7-56
Tier 2: mandatory reporting according to the 2006 IPCC Guidelines

Tier 2			Land use													
			FL		CL		GL		WL				SL		OL	
Carbon pool – GHG			FL-FL	L-FL	CL-CL	L-CL	GL-GL	L-GL	WL-WL		L-WL		SL-SL	L-SL	OL-OL	L-OL
									PL-PL	L-PE	FlL					
Living biomass		Above-ground	M	M	M [a]	M [b]	M	M [b]		M	M		M	M		M
		Below-ground	M	M	M [a]	M [b]	M	M [b]		M	M		M	M		M
Dead organic matter		Deadwood	M	M	M	M	M	M		M			M	M		M
		Litter	M	M	M	M	M	M		M			M	M		M
Soil organic matter		Mineral	M	M	M	M	M	M					M	M		M
		Organic	M	M	M	M	M	M	M	M			M	M		N/A
HWP			M													
N_2O	Direct	Fertilization [c]	M	M									M	M		
		N mineralization	M	M		M	M	M					M	M		Y
		Drainage	M	M					M	M			M	M		
		Burning	M	M	M	M	M	M	M	M			M	M		Y
	Indirect	Fertilization [c]	M	M									M	M		
		N mineralization	M	M		M	M	M					M	M		Y
CH_4		Burning	M	M	M	M	M	M	M	M			M	M		M

Notes: M = mandatory, grey shading = not applicable, blank = not mandatory.

Abbreviations: CL = cropland, CL – CL= cropland remaining cropland, FL = forest land, FlL = flooded land, FL – FL = forest land remaining forest land, GHG = greenhouse gas, GL = grassland, GL – GL = grassland remaining grassland, HWP = harvested wood products, L – CL = land converted to cropland, L – FL = land converted to forest land, L – GL = land converted to grassland, L – OL = land converted to other land, L – PE = land converted to peat extraction, L – SL = land converted to settlements, L – WL = land converted to wetlands, OL = other land, OL – OL= other land remaining other land, PL = peatland, SL = settlements, SL – SL= settlements remaining settlements, WL = wetlands, WL – WL= wetlands remaining wetlands.

a To be reported only for perennial crops.

b Net carbon stock gain in biomass pool for annual crops is to be reported only once in the year after conversion.

[c] N_2O emissions from N fertilization in forest land and settlements are to be reported under the LULUCF sector and those in cropland and managed grassland are to be reported in the agriculture sector. If the Party is not able to separate emissions from N fertilization in different land-use categories, all emissions are to be reported under the agriculture sector.

233. In the UNFCCC Annex I inventory reporting guidelines, the COP has encouraged the use of the Wetlands Supplement, which contains additional methodologies and default factors associated with activities on organic soils, coastal wetlands and wetlands mineral soils (see the glossary of the Wetlands Supplement for complete definitions of activities). If the Party decides to report GHG emissions and removals from one category or activity for which methods are not contained in the 2006 IPCC Guidelines but they are contained in the Wetlands Supplement, the methods contained in the Wetlands Supplement establish: (1) the good practice the Party is expected to apply for preparing those estimates; and (2) the completeness of reporting, for example, if the Party decides to report GHG emissions from peat fires, it is mandatory to report CO_2 and CH_4 emissions (for N_2O the Wetlands Supplement does not provide default EFs) and EFs used by the Party have to be compared with the IPCC defaults in order to judge their accuracy.

234. The Wetlands Supplement contains additional methodologies and default factors (see the glossary of the Wetlands Supplement for complete definitions of activities) that Parties may decide to apply (see previous paragraph). If a Party decides to apply the Wetlands Supplement, Table 7-57 reports, for each inventory category, information on which carbon pools and which subcategories are required to be reported, if significant, because a tier 1 method is available in the Wetlands Supplement (the notation "Y" is used). Table 7-58 reports, for each inventory key category, information on which carbon pools and subcategories have to be reported, if significant, applying a method from the Wetlands Supplement (the notation "Y" is used).

Table 7-57
Tier 1: mandatory reporting, if following the Wetlands Supplement

Tier 1			Any land use and/or land-use change category							
			Drained inland organic soils		Rewetted organic soils		Coastal wetlands		Inland wetlands mineral soils	
Carbon pool – GHG			On site	Off site	On site	Off site	On site	Off site	On site	Off site
LB	CO_2	Forest management [b]					*Y*			
		Drainage [c]					*Y*			
		Extraction [d]					*Y*			
		Rewetting/ restoration [e]								
DOM	CO_2	Forest management [b]					*Y*			
		Drainage [c]					*Y*			
		Extraction [d]					*Y*			
		Rewetting/ restoration [e]								
SOM [1]	CO_2	Drainage [c]	*Y*	*Y*			*Y*		*Y*	
		Extraction [d]					*Y*			
		Rewetting/ restoration [e]			*Y*	*Y*	*Y*		*Y*	
		Burning	*Y*		*Y*		*Y*			
	N_2O (direct)	Drainage [c]	*Y*							
		Extraction [d]					*Y*			
		Rewetting/ restoration [e]								
		Aquaculture use					*Y*			
		Burning								
	CH_4	Drainage [c]	*Y*							
		Extraction [d]								
		Rewetting/ restoration [e]			*Y*		*Y*		*Y*	
		Burning	*Y*		*Y*		*Y*			

Notes: Y = default method and factors provided, grey shading = not applicable, blank = not mandatory.
Abbreviations: DOM = dead organic matter, GHG = greenhouse gas, LB = living biomass, SOM = soil organic matter.
[a] It may include DOM as well as LB of non-tree wooden vegetation.
[b] Forest management practices in mangroves.
[c] Conversion from saturated to drained soils by establishing a net of ditches and removing original vegetation.
[d] Excavation to enable port, harbour and marina construction, including aquaculture and salt production.
[e] Conversion from drained to saturated soils by restoring hydrology and reestablishment of vegetation.

Table 7-58
Tier 2: mandatory reporting, if following the Wetlands Supplement

Tier 2			Any land use and/or land-use change category							
			Drained inland organic soils		Rewetted organic soils		Coastal wetlands		Inland wetlands mineral soils	
Carbon pool – GHG			On site	Off site	On site	Off site	On site	Off site	On site	Off site
LB	CO_2	Forest management [b]					Y			
		Drainage [c]					Y			
		Extraction [d]					Y			
		Rewetting/restoration [e]								
DOM	CO_2	Forest management [b]					Y			
		Drainage [c]					Y			
		Extraction [d]					Y			
		Rewetting/ restoration [e]								
SOM [a]	CO_2	Drainage [c]	Y	Y			Y		Y	
		Extraction [d]					Y			
		Rewetting/ restoration [e]			Y	Y	Y		Y	
		Burning	Y		Y					
	N_2O (direct)	Drainage [c]	Y							
		Extraction [d]					Y			
		Rewetting/restoration [e]			Y					
		Aquaculture use					Y			
		Burning	Y		Y		Y			
	CH_4	Drainage [c]	Y						Y	
		Extraction [d]								
		Rewetting/ restoration [e]			Y		Y		Y	
		Burning	Y		Y		Y			

Notes: Y = default method and factors provided, grey shading = not applicable, blank = not mandatory.
Abbreviations: DOM = dead organic matter, GHG = greenhouse gas, LB = living biomass, SOM = soil organic matter.
[a] It may include DOM as well as LB of non-tree wooden vegetation.
[b] Forest management practices in mangroves.
[c] Conversion from saturated to drained soils by establishing a net of ditches and removing original vegetation.
[d] Excavation to enable port, harbour and marina construction, including aquaculture and salt production.
[e] Conversion from drained to saturated soils by restoring hydrology and reestablishment of vegetation.

235. For each land category, carbon stock changes and associated GHG emissions/removals to be reported have been listed (together with references to equations to be used) in tables 7-59 through to 7-65. Note that all references to methods provided in the Wetlands Supplement are to be considered only if the Party decides to report GHG emissions and removals from one category or activity for which methods are not contained in the 2006 IPCC Guidelines but they are contained in the Wetlands Supplement. In other cases, reference to the Wetlands Supplement is for information purposes only.

Table 7-59
Carbon stock changes in pools and associated GHG emissions/removals that have to be estimated for forest land

<table>
<tr><th colspan="8">Estimations at the tier 1 level</th></tr>
<tr><td></td><td colspan="2">Biomass (B)[a]</td><td colspan="2">Dead organic matter (DOM)</td><td colspan="2">Soil organic matter (SOM)</td><td>Harvested wood products (HWP)</td><td rowspan="2">Other emissions</td></tr>
<tr><td></td><td>Above (AB)</td><td>Below (BB)</td><td>Dead wood (DW)</td><td>Litter (L)</td><td>Mineral soils (MS)</td><td>Organic soils (OS)</td><td>HWP</td></tr>
<tr><td>FL-FL</td><td>Net carbon stock change (2.7)

Carbon stock gain (2.9, 2.10)

Carbon stock losses (2.11, 2.12, 2.13, 2.14)</td><td>0</td><td colspan="2">0</td><td>0</td><td rowspan="2">CO_2 emissions from drained organic soils (2.26)

CO_2 emissions from drained organic soils (2.2)

On-site CO_2 emissions from drained organic soils (2.3)

Off-site CO_2 emissions from drained organic soils (2.4, 2.5, 2A.1)

CO_2 emissions from burning of drained organic soils (2.8)

CO_2 emissions from rewetted organic soils (3.3)

On-site CO_2 emissions from rewetted organic soils (3.4)</td><td rowspan="2">Assumed 0, if judged insignificant (i.e. annual net carbon stock change in HWP pool, is less than the size of any key category), otherwise default tier 1 methods provided in the 2006 IPCC Guidelines (volume 4, chapter 12)

Note that HWP are reported altogether regardless of the land of origin of wood</td><td rowspan="2">CH_4 and N_2O emissions from biomass burning (2.27)

N_2O emissions from drained organic soils (11.1)

N_2O emissions from N inputs (11.1 11.3)

N_2O emissions from SOM mineralization (11.8)[d]

indirect N_2O emissions (11.9, 11.10)

CH_4 emissions from drained organic soils (2.6)

N_2O emissions from drained organic soils (2.7)

CH_4 emissions from burning of drained organic soils (2.8)[e]

CH_4 emissions from rewetted organic soils (3.8)</td></tr>
<tr><td>L-FL</td><td colspan="2">Net carbon stock change (2.4)

Carbon stock gain (2.9, 2.10)

Carbon stock losses (2.11, 2.12, 2.13, 2.14)[b]</td><td>0[c]</td><td>Net carbon stock change (2.23)</td><td>Net carbon stock change (2.25)</td></tr>
</table>

<table>
<tr><th colspan="8">Estimations at the tier 1 level</th></tr>
<tr><td></td><td colspan="2">Biomass (B)[a]</td><td colspan="2">Dead organic matter (DOM)</td><td colspan="2">Soil organic matter (SOM)</td><td>Harvested wood products (HWP)</td><td rowspan="2">Other emissions</td></tr>
<tr><td></td><td>Above (AB)</td><td>Below (BB)</td><td>Dead wood (DW)</td><td>Litter (L)</td><td>Mineral soils (MS)</td><td>Organic soils (OS)</td><td>HWP</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td></td><td></td><td>Off-site CO_2 emissions from rewetted organic soils (3.5, 3.6)

CO_2 emissions from burning of rewetted organic soils (2.8)

CO_2 removals for revegetation/creation of mangroves (4.7)</td><td></td><td>N_2O emissions from rewetted organic soils (3.9)

CH_4 emissions from burning of rewetted organic soils (2.8)[e]

CH_4 emissions from drained inland mineral soils (5.1)

CH_4 emissions for revegetation/creation of mangroves (4.9)

N_2O emissions from aquaculture in mangroves (4.10)</td></tr>
<tr><th colspan="8">Estimations at the tier 2 level</th></tr>
<tr><td>FL-FL</td><td colspan="2">As tier 1, <u>plus</u> below-ground biomass carbon stock changes estimated</td><td>Net carbon stock change (2.17, 2.18) or (2.17, 2.19)

Carbon stock gain (2.20, 2.21, 2.22, 2.14)</td><td rowspan="2">As tier1, <u>plus</u> dead wood carbon stock changes estimated</td><td rowspan="2">Net carbon stock change (2.25)</td><td rowspan="2">As tier 1

As tier 1</td><td rowspan="2">As tier 1, <u>but</u> instantaneous oxidation not applicable</td><td rowspan="2">CH_4 and N_2O emissions from biomass burning (as tier 1)

N_2O emissions from drained organic soils (as tier 1)

N_2O emissions from N inputs (as tier 1)

N_2O emissions from SOM mineralization (as tier 1)</td></tr>
<tr><td>L-FL</td><td colspan="2">Net carbon stock change (2.15, 2.16)

Carbon stock gain (as tier 1)

Carbon stock losses (as tier 1)</td></tr>
</table>

Estimations at the tier 1 level								
	Biomass (B)[a]		Dead organic matter (DOM)		Soil organic matter (SOM)		Harvested wood products (HWP)	Other emissions
	Above (AB)	Below (BB)	Dead wood (DW)	Litter (L)	Mineral soils (MS)	Organic soils (OS)	HWP	Indirect N_2O emissions (11.10, 11.11)
								As tier 1, plus N_2O emissions from burning of SOM in organic soils estimated

Notes: 0 indicates that the tier 1 methodology assumes no net carbon stock change. The IPCC equations to be applied are provided in parentheses (those from the Wetlands Supplement are given in italics) Note that where AD land-use categories do not allow for the separation of FL-FL and L-FL, for the IPCC default, L-FL does not apply. Note that, in land under conversion from categories for which the IPCC does not provide default values for the biomass or DOM pools, reporting of carbon stock changes is nevertheless mandatory (to ensure accuracy) if the Party has reported carbon stock changes in the pool under the previous land use.

Abbreviations: AD = activity data, EF = emission factor, FL – FL = forest land remaining forest land, IPCC = Intergovernmental Panel on Climate Change, L – FL = land converted to forest land, SOC = soil organic carbon.

[a] Where the 2006 IPCC Guidelines and its Supplements provide default biomass stocks for one or both the land use categories involved, and the country has an approach 2 or 3 land representation, then equation 2.15 and 2.16 must be applied.

[b] Where IPCC default values are available for the two land use categories in conversion (i.e. cropland converted to forest land and grassland converted to forest land), equations 2.15 and 2.16 apply.

[c] Tier 1 does not provide for forest dead wood default values in the 2006 IPCC Guidelines, volume 4, table 2.2, although the Wetlands Supplement, table 4.7, does provide default values for dead wood in mangrove forests.

[d] Only in case an SOC loss is reported.

[e] Note that N_2O emissions from fires on organic soils are not estimated at tier 1, because the Wetlands Supplement does not provide default EFs.

Table 7-60
Carbon stock changes in pools and associated GHG emissions/removals that have to be estimated for cropland and grassland

<table>
<tr><th colspan="8">Estimations at the tier 1 level</th></tr>
<tr><th></th><th colspan="2">Biomass (B)[a]</th><th colspan="2">Dead organic matter (DOM)</th><th colspan="2">Soil organic matter (SOM)</th><th>Harvested wood products (HWP)</th><th rowspan="2">Other emissions</th></tr>
<tr><th></th><th>Above (AB)</th><th>Below (BB)</th><th>Dead wood (DW)</th><th>Litter (L)</th><th>Mineral soils (MS)</th><th>Organic soils (OS)</th><th>HWP</th></tr>
<tr><td>CL-CL
GL-GL</td><td>Carbon stock change (2.7)[b]
Carbon stock gain (2.9)
Carbon stock losses (2.12)[c]</td><td>0</td><td colspan="2">0</td><td rowspan="2">Carbon stock change (2.25)</td><td>CO_2 emissions from drained organic soils (2.26)
CO_2 emissions from drained organic soils (2.2)
On-site CO_2 emissions from drained organic soils (2.3)
Off-site CO_2 emissions from drained organic soils (2.4, 2.5, 2A.1)
CO_2 emissions from burning of drained organic soils (2.8)
CO_2 emissions from rewetted organic soils (3.3)
On-site CO_2 emissions from</td><td rowspan="2">Assumed 0, if judged insignificant (i.e. annual net carbon stock change in HWP pool, is less than the size of any key category), otherwise default tier 1 methods provided in the 2006 IPCC Guidelines (volume 4, chapter 12)
Note that HWP are reported altogether regardless of the land of origin of wood</td><td rowspan="2">Non-CO_2 emissions from biomass burning (2.27)
N_2O emissions from SOM mineralization (11.8)[f]
Indirect N_2O emissions (11.10)[h]
CH_4 emissions from drained organic soils (2.6)
CH_4 emissions from burning of drained organic soils (2.8) [g]
CH_4 emissions from rewetted organic soils (3.8)
CH_4 emissions from burning of rewetted organic soils (2.8)[g]</td></tr>
<tr><td>L-CL
L-GL</td><td colspan="2">Carbon stock change (2.4)[d]
Carbon stock gain (2.9)
Carbon stock losses (2.12)[c]</td><td>0</td><td>Carbon stock change (2.23)[e]</td></tr>
</table>

Estimations at the tier 1 level								
	Biomass (B)[a]		**Dead organic matter (DOM)**		**Soil organic matter (SOM)**		**Harvested wood products (HWP)**	**Other emissions**
	Above (AB)	**Below (BB)**	**Dead wood (DW)**	**Litter (L)**	**Mineral soils (MS)**	**Organic soils (OS)**	**HWP**	
						rewetted organic soils (3.4) *Off-site CO_2 emissions from rewetted organic soils (3.5, 3.6)* *CO_2 emissions from burning of rewetted organic soils (2.8)*		*CH_4 emissions from rewetted mineral soils (5.1)*
Estimations at the tier 2 level								
CL-CL GL-GL	**Carbon stock change (2.7)** **Carbon stock gain (2.9, 2.10)** **Carbon stock losses (2.11, 2.12, 2.13, 2.14)**		**Carbon stock change (2.18) or (2.19)** **Carbon stock gains (2.20, 2.21, 2.22, 2.14)**		**Carbon stock change (2.25)**	**As tier 1** *As tier 1*	**Default methods provided in the 2006 IPCC Guidelines (volume 4, chapter 12)**	**As tier 1** *As tier 1, <u>plus</u> N_2O emissions from burning of SOM in organic soils estimated*
L-CL L-GL	**Carbon stock change (2.15, 2.16)** **Carbon stock gain (2.9, 2.10)** **Carbon stock losses (2.11, 2.12, 2.13, 2.14)**							

Notes: 0 indicates that tier 1 methodology assumes no net carbon stock change). The IPCC equations to be applied are provided in parentheses (*those from the Wetlands Supplement are given in italics*). Note that where AD land-use categories do not allow for the separation of CL-CL and C-FL or GL-GL and C-GL, for the IPCC default, L– FL does not apply. Note that in land under conversion from categories for which IPCC does not provide default values for the biomass or DOM pools, reporting of carbon stock changes is nevertheless mandatory (to ensure accuracy) if the Party has reported carbon stock changes in the pool under the previous land use.

Abbreviations: AD = activity data, CL – CL= cropland remaining cropland, GL – GL = grassland remaining grassland, HWP = harvested wood products, L – CL = land converted to cropland, L – GL = land converted to grassland, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[a] Where the 2006 IPCC Guidelines and its Supplements provide default biomass stocks for one or both the land use categories involved, and the country has an approach 2 or 3 land representation, then equation 2.15 and 2.16 must be applied.

[b] Changes in biomass pools are calculated only for perennial crops.

[c] All biomass harvested is assumed to be oxidized in the year of removal.

[d] The tier 1 method assumes below-ground biomass carbon stocks in cropland to be constant and only accounts for losses from the previous land use for L-CL categories. Where IPCC default values are available for the two land use categories in conversion (i.e. cropland converted to forest land and grassland converted to forest land), equations 2.15 and 2.16 apply.

[e] The tier 1 method assumes DOM stocks to be constant for cropland and grassland and only accounts for losses from previous land use for the conversion categories from forest land (FL-CL and FL-GL).

[f] Note that for CL-CL, N_2O emissions are reported in the agriculture sector (CRF table 3.D).

[g] Note that N_2O emissions from fires on organic soils are not estimated at tier 1.

[h] Limited to N mineralization associated with loss of SOM resulting from change of land use or management on mineral soils in all land-use categories except for cropland remaining cropland.

Table 7-61
Carbon stock changes in pools and associated GHG emissions/removals that have to be estimated for wetlands – peatlands

Peatlands						
Estimations at the tier 1 level						
	Biomass (B)[a]		**Dead organic matter (DOM)**		**Soil organic matter (SOM)**	**Other emissions**
	Above (AB)	**Below (BB)**	**Dead wood (DW)**	**Litter (L)**		
WL-WL	**0**		**0**[(b)]		**CO_2 from managed peatlands (7.3)** **On-site CO_2 emissions from managed peatlands (7.4)** **Off-site CO_2 emissions from managed peatlands (7.5)**[(d)] *CO_2 emissions from drained organic soils (2.2)* *On-site CO_2 emissions from drained inland organic soils (2.3)* *Off-site CO_2 emissions from drained inland organic soils (2.4, 2.5, 2A.1)*[(e)] *CO_2 emissions from fires on drained inland organic soils (2.8)* *CO_2 emissions from rewetted organic soils (3.3)* *On-site CO_2 emissions from rewetted organic soils (3.4)*	**N_2O emissions from peatlands (7.7)** **non-CO_2 emissions from fires (2.27)** *CH_4 emissions from drained inland organic soils (2.6)* *N_2O emissions from drained inland organic soils (2.7)* *CH_4 emissions from burning of drained inland organic soils (2.8)*[(f)] *CH_4 emissions from rewetted organic soils (3.8)* *N_2O emissions from rewetted organic soils (3.9)* *CH_4 emissions from burning of rewetted organic soils (2.8)*[(f)] *CH_4 emissions from rewetting of coastal wetlands (4.9)*
L-WL	**Carbon stock losses from biomass clearing only (2.4)**[(b)]					

<table>
<tr><th colspan="6">Peatlands</th></tr>
<tr><th colspan="6">Estimations at the tier 1 level</th></tr>
<tr><td rowspan="2"></td><td colspan="2">Biomass (B)[a]</td><td colspan="2">Dead organic matter (DOM)</td><td rowspan="2">Soil organic matter (SOM)

Off-site CO_2 emissions from rewetted organic soils (3.5, 3.6)

CO_2 emissions from burning of rewetted organic soils (2.8)

CO_2 emissions/removals from rewetting of coastal wetlands (4.7)

CO_2 emissions from drainage of coastal wetlands (4.8)</td><td rowspan="2">Other emissions</td></tr>
<tr><td>Above (AB)</td><td>Below (BB)</td><td>Dead wood (DW)</td><td>Litter (L)</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="2"></td><td></td><td></td></tr>
<tr><th colspan="6">Estimations at the tier 2 level</th></tr>
<tr><td>WL-WL</td><td colspan="2">0</td><td colspan="2">0</td><td>CO_2 from managed peatlands (7.3)

On-site CO_2 emissions from managed peatlands (7.6)

Off-site CO_2 emissions from managed peatlands (7.5)[(d)]

As tier 1</td><td>As tier 1

As tier 1, <u>plus</u> N_2O emissions from burning of SOM in organic soils (2.8)</td></tr>
</table>

Peatlands						
Estimations at the tier 1 level						
	Biomass (B)[a]		**Dead organic matter (DOM)**		**Soil organic matter (SOM)**	**Other emissions**
	Above (AB)	**Below (BB)**	**Dead wood (DW)**	**Litter (L)**		
L-WL	**CO_2 emissions from peatland being drained for peat extraction (7.8)** **Carbon stock losses from biomass clearing (2.16)**		**CO_2 emissions from peatland being drained for peat extraction (7.8)** **Carbon stock losses from DOM (2.23)**		**CO_2 emissions from peatland being drained for peat extraction (7.8)** **On-site CO_2 emissions from managed peatlands (7.9)** **Off-site CO_2 emissions from managed peatlands (7.5)**[(d)] *As tier 1*	**As tier 1** *As tier 1, plus N_2O emissions from burning of SOM in organic soils (2.8)*

Notes: 0 indicates that tier 1 assumes no net carbon stock change. The IPCC equations to be applied are provided in parentheses (*those from the Wetlands Supplement are provided in italics*). Where AD land-use categories do not allow for the separation WL-WL and L-WL, for the IPCC default, L – WL does not apply. Note that in land under conversion from categories for which IPCC does not provide default values for the biomass or DOM pools, reporting of carbon stock changes is nevertheless mandatory (to ensure accuracy) if the Party has reported carbon stock changes in the pool under the previous land use.

Abbreviations: AD = activity data, IPCC = Intergovernmental Panel on Climate Change, L – WL = land converted to wetlands, WL –WL = wetlands remaining wetlands.

[a] Where the 2006 IPCC Guidelines and its Supplements provide default biomass stocks for one or both the land use categories involved, and the country has an approach 2 or 3 land representation, then equation 2.15 and 2.16 must be applied.

[b] C gains are sassumed to be zero

[c] Note that tier 1 does not consider carbon stock changes in the DOM pool.

[d] All carbon in horticultural peat is assumed to be emitted during the extraction year. All CO_2 emissions from peat used for energy are reported in the energy sector.

[e] Does not include carbon losses associated with horticultural use of peat.

[f] Note that tier 1 does not estimate N_2O emissions from peatlands burning.

Table 7-62
Carbon stock changes in pools and associated GHG emissions/removals that have to be estimated for wetlands – flooded lands

Flooded lands							
Estimations at the tier 1 level							
	Biomass (B)[a]		**Dead organic matter (DOM)**		**Soil organic matter (SOM)**		**Other emissions**
	Above (AB)	**Below (BB)**	**Dead wood (DW)**	**Litter (L)**	**Mineral soils (MS)**	**Organic soils (OS)**	
WL-WL	**2006 IPCC Guidelines do not provide guidance on carbon stock changes in flooded land remaining flooded land**						**2006 IPCC Guidelines do not provide guidance on CH_4 emissions in flooded land remaining flooded land[(b)]** **N_2O emissions from flooded land are included in the estimates of indirect N_2O from agricultural or other run-off and wastewater**
L-WL	**Carbon stock change (7.10)**		**2006 IPCC Guidelines do not provide guidance on carbon stock changes in DOM and SOM pools in land converted to flooded land**				
Estimations at the tier 2 level							
WL-WL	**2006 IPCC Guidelines do not provide guidance on carbon stock changes in flooded land remaining flooded land**						**as tier 1**
L-WL	**as tier 1**		**as tier 1**				**as tier 1**

Notes: The IPCC equations to be applied are provided in parentheses (*those from the Wetlands Supplement are provided in italics*). Where AD land-use categories do not allow separation of WL-WL and L-WL, for the IPCC default, L – WL does not apply. In land under conversion from categories for which IPCC does not provide default values for the biomass or DOM pools, reporting of carbon stock changes is nevertheless mandatory (to ensure accuracy) if the Party has reported carbon stock changes in the pool under the previous land use.

Abbreviations: AD = activity data, IPCC = Intergovernmental Panel on Climate Change, L – WL = land converted to wetlands, WL –WL = wetlands remaining wetlands.

[a] Where the 2006 IPCC Guidelines and its Supplements provide default biomass stocks for one or both the land use categories involved, and the country has an approach 2 or 3 land representation, then equation 2.15 and 2.16 must be applied.

[b] Methodology provided in the 2006 IPCC Guidelines, volume 4, appendix 3.

Table 7-63
Carbon stock changes in pools and associated GHG emissions/removals that have to be estimated for wetlands – other

Aquaculture ponds, salt production ponds, rewetting/creation of coastal wetlands							
Estimations at the tier 1 level							
	Biomass (B)[a]		**Dead organic matter (DOM)**		**Soil organic matter (SOM)**		**Other emissions**
	Above (AB)	**Below (BB)**	**Dead wood (DW)**	**Litter (L)**	**Mineral soils (MS)**	**Organic soils (OS)**	
WL-WL L-WL L-SL L-OL	*Initial carbon stock change with extraction (4.2)* *Initial biomass carbon stock change with extraction (4.4)* *Initial carbon stock change with excavation (4.3)* *CO_2 from rewetting/creation of coastal wetlands (4.7)*		*Initial carbon stock change with extraction (4.2)* *Initial DOM carbon stock change with extraction (4.5)* *Initial carbon stock change with excavation (4.3)* *CO_2 from rewetting/creation of coastal wetlands (4.7)*		*Initial carbon stock change with extraction (4.2)* *Initial DOM carbon stock change with extraction (4.6)* *Initial carbon stock change with excavation (4.3)* *CO_2 from rewetting/creation of coastal wetlands (4.7)*		*CH_4 from rewetting/creation of coastal wetlands (4.9)* *N_2O from aquaculture (4.10)*
Estimations at the tier 2 level							
WL-WL L-WL L-SL L-OL	*As tier 1*		*As tier 1*		*As tier 1*		*As tier 1*

Notes: 0 indicates that tier 1 assumes no net carbon stock change. The IPCC equations to be applied are provided in parentheses (*all provided in the Wetlands Supplement*). Note that in land under conversion from categories for which the IPCC does not provide default values for the biomass or DOM pools, reporting of carbon stock changes is nevertheless mandatory (to ensure accuracy) if the Party has reported carbon stock changes in the pool under the previous land use.

Abbreviations: IPCC = Intergovernmental Panel on Climate Change, L – OL = land converted to other land, L – S = land converted to settlements, L – WL = land converted to wetlands, WL – WL= wetlands remaining wetlands.

[a] Where the 2006 IPCC Guidelines and its Supplements provide default biomass stocks for one or both the land use categories involved, and the country has an approach 2 or 3 land representation, then equation 2.15 and 2.16 must be applied.

Table 7-64

Carbon stock changes in pools and associated GHG emissions/removals that have to be estimated for settlements

<table>
<tr><th colspan="8">Estimations at the tier 1 level</th></tr>
<tr><th></th><th colspan="2">Biomass (B)[a]</th><th colspan="2">Dead organic matter (DOM)</th><th colspan="2">Soil organic matter (SOM)</th><th>Harvested wood products (HWP)</th><th rowspan="2">Other GHG emissions</th></tr>
<tr><th></th><th>Above (AB)</th><th>Below (BB)</th><th>Dead wood (DW)</th><th>Litter (L)</th><th>Mineral soils (MS)</th><th>Organic soils (OS)</th><th>HWP</th></tr>
<tr><td>SL-SL</td><td>0</td><td>0</td><td colspan="2">0</td><td>0</td><td rowspan="2">CO_2 emissions from drained organic soils (2.26)
CO_2 emissions from drained organic soils (2.2)
On-site CO_2 emissions from drained organic soils (2.3)
Off-site CO_2 emissions from drained organic soils (2.4, 2.5, 2A.1)
CO_2 emissions from burning of drained organic soils (2.8)</td><td rowspan="2">Assumed 0, if judged insignificant (i.e. annual net carbon stock change in HWP pool, is less than the size of any key category), otherwise default tier 1 methods provided in the 2006 IPCC Guidelines (volume 4, chapter 12)
Note that HWP are</td><td rowspan="2">CH_4 and N_2O emissions from biomass burning (2.27)
N_2O emissions from drained organic soils (11.1)
N_2O emissions from N inputs (11.2, 11.3)
N_2O emissions from SOM mineralization (11.8)[c]
Indirect N_2O emissions (11.9, 11.10) [c]
CH_4 emissions from drained organic soils (2.6)
N_2O emissions from drained organic soils (2.7)</td></tr>
<tr><td>L-SL</td><td colspan="2">Carbon stock losses from biomass clearing only (2.4) [e]</td><td>0</td><td>Carbon stock change (2.23)[b]</td><td>Carbon stock change (2.25)</td></tr>
</table>

<table>
<tr><th colspan="8">Estimations at the tier 1 level</th></tr>
<tr><td></td><td colspan="2">Biomass (B)[a]</td><td colspan="2">Dead organic matter (DOM)</td><td colspan="2">Soil organic matter (SOM)</td><td>Harvested wood products (HWP)</td><td rowspan="2">Other GHG emissions</td></tr>
<tr><td></td><td>Above (AB)</td><td>Below (BB)</td><td>Dead wood (DW)</td><td>Litter (L)</td><td>Mineral soils (MS)</td><td>Organic soils (OS)</td><td>HWP</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td></td><td></td><td>CO_2 emissions from rewetted organic soils (3.3)

On-site CO_2 emissions from rewetted organic soils (3.4)

Off-site CO_2 emissions from rewetted organic soils (3.5, 3.6)

CO_2 emissions from burning of rewetted organic soils (2.8)</td><td>reported altogether regardless of the land of origin of wood</td><td>CH_4 emissions from burning of drained organic soils (2.8)[b]

CH_4 emissions from rewetted organic soils (3.8)

N_2O emissions from rewetted organic soils (3.9)

CH_4 emissions from burning of rewetted organic soils (2.8)[b]

CH_4 emissions from drained inland mineral soils (5.1)</td></tr>
<tr><th colspan="8">Estimations at the tier 2 level</th></tr>
<tr><td>SL-SL</td><td colspan="2">Carbon stock change (2.4, 8.1)

Carbon stock gain (8.2 or 8.3)[d]</td><td colspan="2">Carbon stock change (2.17, 2.18 or 2.17, 2.19)

Carbon stock gain (2.20, 2.21, 2.22, 2.14)</td><td rowspan="2">Carbon stock change (2.25)</td><td rowspan="2">As tier 1

As tier 1</td><td rowspan="2">As tier 1</td><td rowspan="2">CH_4 and N_2O emissions from biomass burning (as tier 1)

N_2O emissions from drained organic soils (as tier 1)</td></tr>
<tr><td>L-SL</td><td colspan="2">Carbon stock change (2.15, 2.16, 8.1)

Carbon stock gain (8.2, 8.3)</td><td colspan="2">As tier 1</td></tr>
</table>

Estimations at the tier 1 level								
	Biomass (B)[a]		Dead organic matter (DOM)		Soil organic matter (SOM)		Harvested wood products (HWP)	Other GHG emissions
	Above (AB)	Below (BB)	Dead wood (DW)	Litter (L)	Mineral soils (MS)	Organic soils (OS)	HWP	
								N_2O emissions from N inputs (as tier 1) **N_2O emissions from SOM mineralization (as tier 1)** **Indirect N_2O emissions (11.10, 11.11)** *As tier 1, plus N_2O emissions from burning of SOM in organic soils estimated*

*Notes***:** 0 indicates that tier 1 methodology assumes no net carbon stock change). The IPCC equations to be applied are provided in parentheses (*those from the Wetlands Supplement are given in italics*). Note that where AD land-use categories do not allow for the separation of SL-SL and L-SL, for the IPCC default, L – SL does not apply. Note that in land under conversion from categories for which the IPCC does not provide default values for the biomass or DOM pools, reporting of carbon stock changes is nevertheless mandatory (to ensure accuracy) if the Party has reported carbon stock changes in the pool under the previous land use.

Abbreviations: AD = activity data, L –SL = land converted to settlements, IPCC = Intergovernmental Panel on Climate Change, SL – SL = settlements remaining settlements.

[a] Where the 2006 IPCC Guidelines and its Supplements provide default biomass stocks for one or both the land use categories involved, and the country has an approach 2 or 3 land representation, then equation 2.15 and 2.16 must be applied.

[b] The tier 1 method assumes DOM stocks to be constant for Settlements and only accounts for losses from previous land use for the conversion category from forest land (FL-SL).

[c] N_2O emissions from N mineralization in mineral soils in SL-SL are assumed to be zero as the carbon stock change is also assumed to be zero. Therefore, N_2O emissions from N mineralization only occur in land converted to settlements.

[d] For average age of the tree population less than or equal to 20 years, tier 2 assumption is that the biomass carbon stock losses are equal to zero. Over tree population over 20 years gains and losses are assumed to be equivalent and biomass net carbon stock changes are equal to 0.

[e] C gains are assumed to be zero

Table 7-65

Carbon stock changes in pools and associated GHG emissions/removals that have to be estimated for other land

Estimations at the tier 1 level								
	Biomass (B)[d]		**Dead organic matter (DOM)**		**Soil organic matter (SOM)**		**Harvested wood products (HWP)**	**Other emissions**
	Above (AB)	**Below (BB)**	**Dead wood (DW)**	**Litter (L)**	**Mineral soils (MS)**	**Organic soils (OS)**	**HWP**	
OL-OL								
L-OL[(a)]	**Carbon stock losses from biomass clearing only (2.4)[(b)]**		**0**	**Carbon stock change (2.23)[(e)]**	**Carbon stock change (2.25)[(c)]**	**0[(1)(2)]**	**Assumed 0, if judged insignificant (i.e. annual net carbon stock change in HWP pool, is less than the size of any key category), otherwise default tier 1 methods provided in the 2006 IPCC Guidelines (volume 4, chapter 12)** **Note that HWP are reported altogether regardless of the land of origin of wood**	**CH_4 and N_2O emissions from biomass burning (2.27)** **N_2O emissions from SOM mineralization (11.8)[(d)]** **Indirect N_2O emissions (11.10)**
Estimations at the tier 2 level								
OL-OL								

Estimations at the tier 1 level						
L-OL	**Carbon stock change (2.15, 2.16)[(c)]**	**Carbon stock change (2.23)[(e)]**	**As tier 1**	**As tier 1**	**As tier 1**	**As tier 1**

Notes: Grey shading indicates the cell is not applicable. 0 indicates that the tier 1 methodology assumes no net carbon stock change. The IPCC equations to be applied are provided in parentheses. Where AD land-use categories do not allow for the separation of OL-OL and L-OL, for the IPCC default, L –O does not apply. In land under conversion from categories for which the IPCC does not provide default values for the biomass or DOM pools, reporting of carbon stock changes is nevertheless mandatory (to ensure accuracy) if the Party has reported carbon stock changes in the pool under the previous land use.

Abbreviations: AD = activity data, L – OL = land converted to other land, OL – OL= other land remaining other land.

[a] Where the 2006 IPCC Guidelines and its Supplements provide default biomass stocks for one or both the land use categories involved, and the country has an approach 2 or 3 land representation, then equation 2.15 and 2.16 must be applied.

[b] C gains are assumed to be zero

[c] Both tier 1 and tier 2 methods assume complete loss of biomass/DOM carbon stocks following conversion while only tier 1 method assumes complete loss of SOM (although default SOC stock for organic soils are not provided by the IPCC).

[d] Stock changes in organic soils are assumed to be insignificant as drainage is unlikely in other land. If such an assumption is not proven to be true, CO_2 and N_2O emissions have to be estimated and also CH_4 emissions are estimated if the Party applies the Wetlands Supplement.

[e] The tier 1 method assumes DOM stocks are insignificant for other land and only accounts for losses from the previous land use for the conversion category from forest land (FL-OL).

3. Key components of a land use, land-use change and forestry inventory

Consistent representation of land areas

236. Land representation is a cross-cutting issue among LULUCF categories, so it is generally described in a section at the beginning of the LULUCF chapter in the NIR, including:

(a) Land-use definitions and the correspondence of the classification systems used to the LULUCF categories;

(b) How managed and unmanaged land are distinguished;

(c) How country-specific sub-subcategories/sub-subdivisions are appropriate to national circumstances;

(d) Land databases used for the inventory preparation, and how they are consistent across time and space:

(i) With each other; and

(ii) With land categories (including subcategories/subdivisions);

(e) Approaches used for representing land areas, and how consistency across time and categories, and subcategories/subdivisions, has been ensured;

(f) Verification of land representation (e.g. through an independent time series of plots).

237. The key to an accurate LULUCF inventory is to have good data for land stratification. The historical importance of land use and management change complicates the process, because it is crucial that land representation remains consistent over time. Consequently, the use of accurate land data from the current year may be hampered by the quality of historic data in some categories/subcategories/subdivisions.

Review of the land representation

238. The 2006 IPCC Guidelines present three approaches for representing land areas. The choice of approaches used will depend on the national circumstances of the Party, including technical capacity and financial capability and availability of data. The approaches complement each other and different approaches can be used for different LULUCF categories, as well as for different portions of the country. The main potential source of errors, especially when using approaches 2 and 3, is the lack of consistency in information and in methodologies applied across time. Therefore, reviewers should check the sources of data, classification methodology used and QA/QC and verification procedures applied (e.g. to avoid subjectivity in classification) throughout the time series, as well as the methods a Party has applied to ensure time-series consistency when different data sets and methods have been applied across the time series and across the country area. Table 7-66 describes the approaches to land representation that may be applied by a Party.

Table 7-66
Approaches to land representation

Check	*Considerations*
Approach 1	Usually uses a combination of land area data sets (likely prepared for other purposes) such as forestry and agricultural statistics. When several databases are combined, overlaps and/or omissions might occur. In such cases, a Party should establish a relationship among definitions used in the various databases, as well as among those used in the databases and the definitions of the six IPCC land-use categories, with the aim of avoiding double counting and omissions.

	Approach 1 does not allow the identification and tracking of land-use/management changes, although net changes in land use/management may be identified
Approach 2	Includes information regarding conversions among land categories between two points in time only. The result of approach 2 can be presented as a land transition matrix representing the areas where land use did not change and the areas that have undergone conversions among any land-use categories. However, approach 2 does not allow for the tracking of land use and management, as well as of their changes, of specific parcels of land across the entire time series
Approach 3	Identifies and tracks cover, use and management of lands across a time series, either through sampling of geographically located points or by wall-to-wall mapping, or a combination of the two. Approach 3 is therefore capable of providing all the required information, and tracking it across time, on conditions of a specific parcel of land, including on the occurrence of specific management activities, temporal sequence of practices and disturbance events

239. Table 7-67 includes the checks that a reviewer should undertake to assess if the land representation is consistent (*note that when a land subcategory is further stratified (subdivided) the consistency of land representation needs to be ensured/checked starting from the lowest level of stratification*).

Table 7-67
Possible actions by the expert review team in its review of land representation

Check	*Action by the ERT, task*
General	Is total area reported constant across the time series and does it correspond to the total national territory?
	Does a gross increase in a land-use category X (e.g. forest land) correspond to an identical gross increase in the area of its subcategory "land converted to land-use category X" (e.g. land converted to forest land)?
	Does a gross increase in the subcategory "land-use category X remaining land-use category X" (e.g. forest land remaining forest land) correspond to an identical gross decrease in the subcategory "land converted to land-use category X" (e.g. land converted to forest land)?
	Does a gross decrease in the "land-use category X" (e.g. forest land) correspond to an identical aggregate gross increase in the areas of subcategories of "land-use category X converted to other land-use categories" (e.g. forest land converted to cropland + forest land converted to grassland + forest land converted to settlements + forest land converted to wetlands + forest land converted to other land)?

240. Owing to the multiplicity of stratifications that vary by land category and carbon pools (among others), it is extremely important to review the consistency of areas reported according to different stratifications. Therefore, reviewers should carefully assess the consistency of land representation for each year and across the time series. Table 7-68 illustrates checks to review the consistency of land representation for different stratifications:

Table 7-68
Possible actions by the expert review team in its review of the consistency of land representation for different stratifications

Check	*Action by the ERT, tasks*
General	Are land areas transferred among land categories according to the previous and current year's land use (e.g. in any given year the total area converted from forest land to non-forest land uses should be equivalent to the loss of area counted in the category forest land)?
	Does the Party divide areas under forest land, grassland and wetlands into managed and unmanaged lands, as necessary?
	Does the Party report definitions relevant to determining the extent of the managed land included in the inventory, together with evidence that these definitions have been applied consistently over time?
	If the Party's land classification scheme[a] does not match the six broad land categories given in the 2006 IPCC Guidelines, has the Party combined and/or disaggregated its own land categories so that it can use the IPCC categories for estimating and reporting emissions and removals?
	Is managed land that is subsequently left unmanaged reported as either: (a) Managed for the entire transition period (i.e. until the carbon stocks reach the new equilibrium level characteristic of the unmanaged land)? And therefore its carbon stock changes and associated emissions/removals are reported under managed land, possibly as a subdivision of, for the entire transition period; or (b) Unmanaged? Note that, in this case, carbon stock changes and associated emissions/removals have to be reported, possibly in a subdivision of unmanaged land, for the entire transition period. If the Party is not reporting those carbon stock changes and associated emissions/removals, reviewers should consider this as incompleteness in the GHG inventory
	If an unmanaged land area is subsequently managed but the land category does not change (for example, an unmanaged forest land that becomes subject to forest management activities), is the land reported under in the land remaining under the same land category (e.g. under forest land remaining forest land)?[b]

Abbreviations: CRF = common reporting format, ERT = expert review team, GHG = greenhouse gas, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines= 2006 IPCC Guidelines for National GHG inventories.

[a] The following requirements should be noted for a country-specific classification scheme: (1) There is a hierarchical order in the classification of land. The hierarchical order ensures that no double counting of land occurs; (2) To avoid gaps in the land classification, and irrespective of the country-specific definitions, the country-specific category(ies) included in "other land" have to have the lower hierarchical order and be defined in a way that includes lands without significant carbon stocks that cannot be classified under any other land-use category. The definition of a category should be based on objective criteria consisting of quantitative elements as well as the classification system, in order to avoid subjectivity in land classification.

[b] The 2006 IPCC Guidelines, volume 4, chapter 4, suggest that it is good practice to report unmanaged land (e.g. unmanaged forest land) that is subsequently managed (e.g. managed forest land) under the category "land converted to another land use" (e.g. forest land converted to forest land). However, since this is not feasible with the current structure of CRF tables, Parties will report such converted land under the category "land remaining under the same use" (e.g. "forest land remaining forest land").

241. If a Party has applied a classification system for climate, soil, vegetation, management, age class and biomass density that is different than the one provided in the 2006 IPCC Guidelines, reviewers should check the issues in table 7-69.

Table 7-69
Possible actions by the expert review team in its review of the different classification systems

Check	*Action by the ERT, tasks*
General	Is the classification system properly described in the NIR, and the raw data published, so that its replicability is ensured (transparency)? This includes the citation of relevant peer-reviewed literature
	Does the classification system cover the entire variability of the population (the Party's territory and ecosystem classes) to be classified (completeness)?
	For each level of stratification, does the classification system classify any element of the population under one and only one stratum which is to be achieved by establishing a hierarchical order (accuracy/comparability)?
	What measures (e.g. verification, reclassification of previous years' data) are applied to ensure consistency in classification across the time series (consistency)? Are they appropriate?
	Has the appropriateness of the application of the IPCC default factors to the country-specific classification scheme been assessed and have suitable adjustments to the factors been made, as necessary? This includes checking the quantitative or qualitative evidence justifying the use of the IPCC default factors and/or any adjustment of them reported in the NIR

Abbreviations: ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, NIR = national inventory report.

242. When reviewing land area data in CRF tables 4.1, 4.A–F and 4(II), 4(III) and 4(V) in the CRF, and land matrices for the years 1971–1989 as reported in the NIR, you should consider the issues included in table 7-70.

Table 7-70
Possible actions by the expert review team in its review of land area in the common reporting format tables for land use, land-use change and forestry

Check	*Action by the ERT, tasks*
CRF table 4.1, and land matrices reported in the NIR	Is the total area reported constant across the time series? Does it correspond to the total national territory?
	Does "Final area" match the sum of total areas reported for each category in the corresponding CRF tables 4.A–F?
	Are area change values reported in this table annual? (Note that cumulative areas are reported in background tables while in this table annual area changes have to be reported)
	For each activity, is the total area value reported at the end of the year (row 17) the same as the area reported for that activity in the background tables?
	For each activity, is the total area value reported at the end of the year (row 17) the same area reported for that activity in the following year as the total area of the activity at the end of the previous year (column L)?
CRF tables 4.A–F – check for any reported year *n*	Is the total area under each land-use change category equal to the sum of areas reported (in CRF table 4.1, for each inventory year, and in the NIR for years before the base year) as converted to that land category during a time period equivalent to the transition period, minus the areas further converted to other land-use categories (if countries track land transition in a way that allows gathering this information)?

Check	*Action by the ERT, tasks*
	Is the total area of a land-use category X remaining land-use category X equal to the area of the previous year plus the areas converted to that category in the year $n - T$ (e.g. for 1991, the year 1971) minus the areas of that land-use category converted to other categories in the year *n*
	For any reported year *n*, do reported areas of total forest land and agricultural land (cropland + managed grassland) compare with data reported to other international organizations (mainly FAO at FAOSTAT)? If not, is an appropriate explanation provided in the NIR?
CRF table 4.(II) – check for any reported year n	Does the sum of areas of drained organic soils under cropland and managed grassland match the area reported under "cultivation of organic soils" in the agriculture sector in CRF table 3.D?

Abbreviations: CRF = common reporting format, ERT = expert review team, FAO = Food and Agriculture Organization of the United Nations, NIR = national inventory report.

Carbon pools and carbon stock changes

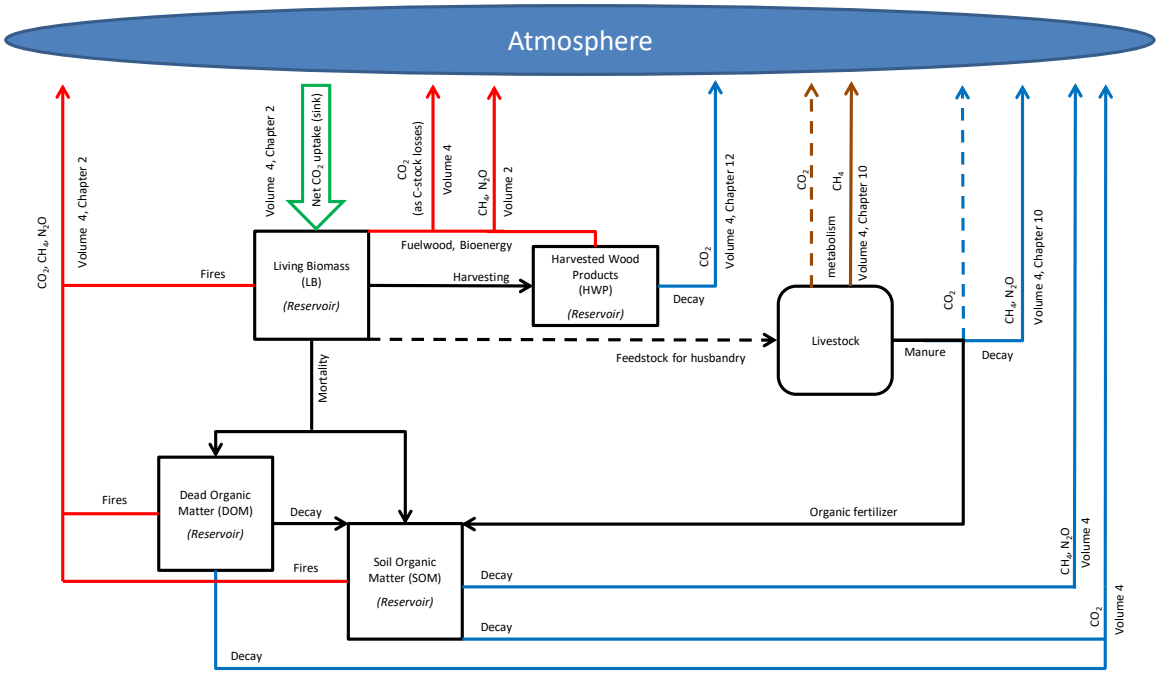
243. With the exclusion of N_2O emissions from fertilization,[28] all GHG emissions and removals from the LULUCF sector originate from carbon stock changes. This is the reason why the IPCC uses carbon stock changes as a proxy to infer GHG emissions and removals.

244. Figure 7-25 illustrates the carbon stocks in carbon pools, transfers of carbon stocks among pools and GHG fluxes to and from the atmosphere, in the AFOLU sector. The relevant volumes and chapters of the 2006 IPCC Guidelines where further guidance can be found are provided for each carbon pool, carbon stock transfer and GHG flux associated with biological sinks and reservoirs. (The dashed lines are fluxes and stocks not explicitly counted by IPCC methods). Be aware that Parties may further stratify carbon pools in sub-pools to which different methods may be applied.

[28] See the section on agriculture in this Review handbook for guidance on reviewing this source reported in CRF table 4(I).

Figure 7-25

Carbon stocks, carbon stock transfers and GHG fluxes to and from the atmosphere



Note: Net uptake = photosynthesis + autotrophic respiration. Mortality = turnover + mortality due to disturbances.

Review of carbon stock change estimates

245. Carbon stock changes are estimated by applying the gain–loss approach or the stock-difference approach or a combination of these methodological approaches. Also, tier 3 methods may be classified according to these two main methodological approaches. If tier 3 methods are used, the following elements in table 7-71 may help reviewers in the assessment of whether the inclusion/exclusion of carbon pools and the quantification of carbon stock changes is consistent with good practice:

Table 7-71

Possible actions by the expert review team in its review of tier 3 approaches for estimating carbon stock change

Check	*Action by the ERT, tasks*
Symmetry	(a) For a pool, if carbon stock gains are estimated are carbon stock losses also estimated and vice versa (b) For equivalent but inverse processes (e.g. grassland converted to cropland and cropland converted to grassland within the same land stratum), are total net carbon stock changes across the transition period equal in magnitude but opposite in sign?

Check	*Action by the ERT, tasks*
General	For a carbon pool, is long-term carbon stock at equilibrium consistent with environmental conditions and management practices?
	Are net carbon stock changes assumed to be 0 only in cases where the carbon stock can be assumed to be at its long-term average?
	If the carbon stock cannot be assumed to be at its long-term average, are annual carbon stock changes equal to the value calculated by dividing the difference between the long-term carbon stock at equilibrium and the actual carbon stock by the number of years of the transition period needed for the carbon pool to achieve its long-term carbon stock at equilibrium?

Abbreviation: ERT = expert review team.

246. It is of the utmost importance to check completeness and consistency of carbon stock transfers among pools, in order to ensure the completeness and accuracy of estimates, particularly when different methods are applied for estimating carbon stock changes in different pools (i.e. the carbon stock transfer from a pool X to another pool Y (i.e. C loss in pool X) should be equivalent to the carbon transfer into the other pool (i.e. C gain in pool Y).

247. The 2006 IPCC Guidelines provide a "disturbance matrix" (volume 4, table 2.1) that can be used to track carbon stock transfers as well as emissions to the atmosphere (i.e. mass balance), noting that it is good practice to report these, if possible, for key categories. When reviewing a disturbance matrix, check whether the Party has been filled in all its part and whether the data provided are credible and consistent with the carbon stock changes and emissions reported.

248. Table 7-72 includes issues a reviewer should assess regarding the Party's reporting of carbon stock change estimates in the LULUCF inventory.

Table 7-72
Possible actions by the expert review team in its review of carbon stock change estimates

Check	*Action by the ERT, tasks*
Documentation: definitions	(a) *Has the Party reported definitions of carbon pools as well as information on ancillary data, EFs and carbon stock change factors and how these correspond to the IPCC definitions and defaults, including: (b) The differences in the definitions of the carbon pools compared with those provided in the 2006 IPCC Guidelines; (c) Consistency of the definitions with the stratification applied by the Party and their appropriateness to national circumstances
Documentation: methodologies and data for estimating carbon stock changes	(a) *Has the Party provided information on the methods it has used for preparing estimates of carbon stock change and other emissions, including: (b) Verification of the results of tier 3 methods (e.g. by comparison with results of IPCC default methods); (c) Disturbance matrices for all carbon stock losses/transfers associated with disturbances (including harvesting), if possible
	(a) *Has the Party provided information on all AD, EFs and other parameters used for inventory preparation including: (b) Sources of information; (c) Descriptions of sampling protocols; (d) How any inconsistencies between different data sets (e.g. with regard to coverage, definitions etc.) have been addressed?

Check	*Action by the ERT, tasks*
	(e) *Has the Party constructed consistenta time series of annual data where non-annual measurements are used to estimate emissions?
Methodologies and data for estimating carbon stock changes	**For each carbon pool**: (a) Has the Party estimated all carbon stock gains and losses for each significant pool for which no assumption of zero net carbon stock change has been taken? (b) For each reported carbon stock gain, has the Party also estimated losses of carbon stock due to its subsequent decay or disturbances? (c) Unless the input carbon pool is estimated to be at equilibrium by applying tier 1 method, for each carbon stock loss that is transferred to another carbon pool is there an equivalent carbon stock gain in the other pool? (d) *Are all trends across time in gains/losses/net change explained? (e) If there is a change in land use/management, have both processes been reported (i.e. (a) the abrupt change that occurs in a single year, where it does occur and (b) the continuous change that occurs over a transition period)?
	For fuelwood: Are the estimates of fuelwood consumption reported in the energy sector consistent with the fuelwood collection reported for biomass as well as with data on fuelwood import/export?
	For HWP:[b] (a) Have all HWP been included? (Note that if the Party applies Kyoto Protocol reporting, imported HWP as well as HWP produced with imported wood are not included in the calculation of the HWP contribution); (b) Are the input data and variables applied consistent with the methodology applied? (c) *Are all CO_2 emissions associated with HWP carbon stock losses reported in the LULUCF sector, including those from HWP displaced in solid waste disposal sites and those for energy use?
When the stock-difference methodological approach is applied	(a) Has the Party correctly applied the time period between two consecutive carbon stock estimates or the transition period between two equilibrium stock levels when calculating annual carbon stock changes? (b) Has the calculation been done by using the same area at the two points in time (i.e. the carbon stock at times t1 and t2 has been calculated based on the area of the stratum at time t2)? (c) Have carbon stocks been estimated applying the same definitions at the two points in time (t1 and t2), or has a correction been applied to ensure consistency between definitions?

*Mandatory element.

Abbreviations: EF = emission factor, ERT = expert review team, HWP = harvested wood products, ICSCF = implied carbon stock change factor, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[a] Be aware that the consistency of ICSCFs may be affected by:

- ✓ Asynchrony among AD and associated carbon stock changes (e.g. in forest land converted to cropland, the AD are the latest 20 years cumulated areas, while the annual biomass loss is the biomass lost in the land converted in the year only);
- ✓ Variability in environmental conditions, especially for tier 3 methods.

Consequently, when assessing consistencies in the time series of ICSCFs the impact of the two above-mentioned elements should be excluded.

[b] A Party may report the HWP contribution as zero if the inventory compiler judges that the annual change in carbon in HWP stocks is insignificant. A Party may separately judge if the annual change of HWP carbon in SWDSs is significant, and report it as zero if it is not significant, although the HWP contribution is significant. Some HWP may be produced with recycled wood. Therefore, comparison between harvest and fuelwood quantities used for estimating biomass carbon stock changes with those used in reporting HWP carbon stock changes should only be done for the variable H (carbon in annual harvest of roundwood for products versus wood removed from harvest sites in the reporting country, including fuelwood).

Emissions/removals in land use, land-use change and forestry categories associated with carbon stock changes

249. In general, carbon stock gains and losses in pools are considered as CO_2 removals from/emissions to the atmosphere respectively; although for non-biomass pools such gains/losses are considered to be a carbon immobilization (i.e. an avoided emission). Also, other GHG fluxes are associated with losses and gains of carbon stocks:

(a) CH_4 and N_2O from combustion of organic matter[29] (all carbon pools);

(b) N_2O emissions from N mineralization associated with loss of organic carbon (in mineral soils), as well as N immobilization with carbon stock gain (measured as a net negative N_2O emission,[30] although technically it is an avoided emission);

(c) CH_4 emissions from anaerobic decomposition of organic matter (soil organic matter).

250. The GHG estimates for the LULUCF sector are reported in 15 CRF tables. Table 7-73 provides specific checks to be undertaken when reviewing the information reported by the Party, by CRF table.

Table 7-73
Specific checks of the estimates for the land use, land-use change and forestry sector, by CRF table

Checks	*Action by the ERT, tasks*
One summary table, CRF table 4	This table is automatically filled and does not require specific checks by the ERT
One land transition matrix, CRF table 4.1	This table reports areas, and changes in areas, between the previous and the current inventory year. Check the consistency of the information reported in this table with AD reported in CRF tables 4.A–F, taking into consideration that area changes reported in this table are annual while those reported in tables 4.A–F are cumulative
Six background tables, CRF tables 4.A–F	These tables report carbon stock changes and associated CO_2 emissions/removals. Check: (a) Completeness of reporting; (b) Correct reporting of signs; (c) Consistency in the time series of ICSCFs
One background table, CRF table 4(I)	This table reports direct N_2O emissions from fertilization. Check: (a) Completeness of reporting; (b) Consistency within the time series of ICSCFs; (c) Consistency with the information reported in the NIR for agriculture, determined by the use of the same EFs or, if different EFs are applied, that differences are explained by studies or measurements the Party has reported; (d) Omissions or double counting with estimates reported in CRF table 3.D
One background table, CRF table 4(II)	This table reports CO_2, CH_4 and direct N_2O emissions and removals from drainage and rewetting and other management of organic and mineral soils. Check: (a) Completeness of reporting (b) Consistency within the time series of ICSCFs

[29] Be aware that the IPCC default method calculates the GHG emissions by applying default factors (see 2006 IPCC Guidelines, volume 4, table 2.5) directly to the mass of fuel burned. However, Parties may estimate these GHG emissions directly from the carbon stock loss using appropriate emission ratios and C/N ratios (for N_2O).

[30] Note that a negative emission mathematically corresponds with a removal.

Checks	*Action by the ERT, tasks*
	(c) Consistency with the information reported in CRF table 3.D (agricultural soils) for drainage of organic soils in agricultural lands, and in CRF tables 4.B and 4.C for CO_2 emissions/removals as well as for AD (d) Consistency of the EFs between CO_2 and N_2O emissions/removals, explained by the carbon to nitrogen ratio (C/N ratio) and the EF (e) Omissions or double counting with estimates reported in CRF tables 4.A–F and CRF table 3.D (f) Consistency is determined by: (i) The use of same AD (ii) Linking, if possible, CO_2 and N_2O emissions by the C/N ratio, to determine how much N is released for each tonne of carbon emitted, as well as by linking N released and N_2O emissions by the EF (kg N_2O-N/kg N)
One background table, CRF table 4(III)	This table reports direct N_2O emissions and N immobilization (i.e. negative emissions) from SOM mineralization/accumulation in mineral soils. Check: (a) Completeness of reporting (b) Consistency within the time series of ICSCFs (c) Consistency with information reported for agricultural land (d) Consistency in the EFs between CO_2 and N_2O emissions/removals (e) Omissions or double counting with estimates reported in CRF tables 4.A–F and CRF table 3.D (f) Consistency is determined by: (i) Applying the same methodology, including parameters, for estimating these emissions in CL-CL, reported under agriculture, and L-CL reported under LULUCF; (ii) Linking CO_2 and N_2O emissions/removals by the C/N ratio of the soil organic carbon loss/gain, to determine how much N is released/immobilized for each tonne of carbon emitted, as well as by linking N released/immobilized and N_2O emissions/removals by the EF (kg N_2O-N/kg N)
One background table, CRF table 4(IV)	This table reports indirect N_2O emissions. Check: (a) Completeness of reporting (b) Consistency within the time series of ICSCFs (c) Consistency with the information reported in CRF tables 4(I), 4(III) and 3.D (indirect emissions from agricultural soils) (d) Omissions or double counting with estimates reported in CRF table 3.D (e) Consistency is determined by: (i) Applying the same methodology, including parameters, for estimating these emissions in agriculture and LULUCF (ii) Using the same AD in table 4(I), for N inputs from fertilization, in table 4(III), for N mineralization, and this table

Checks	*Action by the ERT, tasks*
One background table, CRF table 4(V)	This table reports CO_2, CH_4 and N_2O emissions from burning. Check: (a) Completeness of reporting (b) Consistency within the time series of ICSCFs as well as among ICSCFs (c) Consistency with the information reported in CRF table 3.E (savannah burning), for CH_4 and N_2O emissions, and in CRF tables 4.A–F for CO_2 emissions (d) Omissions or double counting with CO_2 emissions reported in CRF tables 4.A and/or 4.C and CH_4 and N_2O emissions reported in CRF table 3.D (e) Consistency is determined by: (i) Applying the same methodology, including parameters, for estimating these emissions in agriculture, CH_4 and N_2O, and LULUCF, CO_2 (ii) Linking GHG emissions by the C/N ratio of carbon stock loss by the EFs
Two background tables, CRF tables 4.G s1 and 4.G s2	These tables report carbon stock changes in the HWP pool. Check: (a) Completeness of reporting; (b) Consistency within the time series of gains, losses, and net contribution, as well as in AD; (c) Consistency of half-life values with IPCC default values; (d) Consistency of AD with FAO data and with data on wood harvesting reported in the NIR and in CRF tables 4.A–F; (e) Omissions of CO_2 emissions reported in CRF tables 4.A–4.F

Abbreviations: AD = activity data, CL-CL = cropland remaining cropland, CRF = common reporting format, EF = emission factor, ERT = expert review team, FAO = Food and Agriculture Organization of the United Nations, GHG = greenhouse gas, ICSCF = implied carbon stock change factor, IPCC = Intergovernmental Panel on Climate Change, L-CL = land converted to cropland, LULUCF = land use, land use change and forestry, NIR = national inventory report, SOM = soil organic matter.

Review of emissions/removals in land use, land-use change and forestry categories associated with carbon stock changes

251. This section covers some of the issues that reviewers should assess during the review of GHG emissions/removals associated with carbon stock changes in the LULUCF inventory. Generally, for each estimate you should carry out the tasks included in table 7-74.

Table 7-74
Possible actions by the expert review team in its review of each carbon stock change estimate

Check	*Action by the ERT, tasks*
General	(a) Conduct the review at the level of disaggregation in subcategories/subdivisions
	(b) Assess the appropriateness of the Party's choice of methodological tiers, AD, EFs and other parameters according to the significance of categories/subcategories and national circumstances and their proper documentation in the submission
	(c) Check the completeness
	(d) Check time-series consistency
	(e) Check the accuracy of calculations

Check	*Action by the ERT, tasks*
	(f) Check whether, for each carbon stock change estimated, corresponding GHG emissions and removals have been reported in the appropriate CRF table
	(g) Check consistency among estimates for different GHG emissions and removals resulting from the same stock change, particularly when different methodologies and EFs are applied for estimating different GHGs

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, GHG = greenhouse gas.

252. A main task prior to and during the review week is to clarify with the Party any outstanding questions regarding how the inventory estimates have been prepared, and ensuring the transparency, accuracy, consistency, completeness and comparability (TACCC) of the LULUCF estimates. Box 3-1 provides guidance for the type of questions which can provide valuable input to the ERT during the review process to ensure that the Party is meeting the reporting requirements, as well as general guidance for formulating clear and precise preliminary and follow-up questions. In addition to the general guidance provided in Box 3-1, some LULUCF-specific questions are suggested for consideration by the ERT in table 7-75.

Table 7-75
Possible questions related to transparency, accuracy, completeness, comparability, or consistency

Check	*Action by the ERT, tasks*
General	(a) Has the Party stratified the land categories according to IPCC default stratification, or has it applied a country-specific classification? (b) Is the stratification applied consistent with national circumstances?
	(c) Has the Party provided a transparent description of the methodologies used (i.e. input data and data sources, assumptions and inferences)?
	(d) Are the methodologies consistent with guidance in the 2006 IPCC Guidelines on completeness, consistency and accuracy of GHG estimates?
Methods: are the methods, AD, factors and parameters appropriate to national circumstances and correctly applied	(a) Has the Party used appropriate IPCC default parameters in preparing the estimates? If so: (i) Are the choices consistent with the information provided on the climate zone, forest/tree/crop/vegetation types and soil types in the country? (ii) Is the appropriateness of IPCC default factors demonstrated (including through expert adjustment, as appropriate, if IPCC default factors are applied to country-specific stratification)? (iii) Could country-specific values be developed based on national or regional data and research?

Check	*Action by the ERT, tasks*
	(a) Has the Party used higher-tier methods? If so: (i) Has proper documentation on the values of country-specific parameters been provided? (ii) Are the country-specific values within the range of IPCC defaults and comparable to those used by other countries with similar conditions? If not, does the documentation give justification for any differences? (iii) Has the Party used models? If so, has the Party described the assumptions (principles, equations, etc.) and key parameters used in the model and provided information on any validation and/or peer review of the model? (iv) Have model outputs been verified across time by comparison with independent measurements (i.e. a model does not replace the need for monitoring carbon stock changes with direct measurements, although it significantly reduces costs and increases the accuracy of estimates)? (v) Is there any verification of estimates (e.g. by comparison with data reported by the country to the FAO, or with estimates made using the stock-difference method, or vice versa)? (vi) If a transition period longer than 20 years has been applied, has the Party reported in subdivisions under the category "Land remaining under the same use" those lands converted that have not yet achieved the new carbon stock equilibrium level?
	(a) Is the inventory methodology based on a stock inventory (e.g. NFI) (tier 2 or tier 3)? If so: (i) Has proper documentation on the forest inventory methodology, coverage (complete coverage or only for a subset) and frequency been provided in the NIR? (ii) Is the sampling procedure appropriate and unbiased? (iii) Are methodologies and definitions used the same throughout the time series? (iv) Is the carbon stock change calculated at plot level? Or is it calculated by taking the difference of average densities (on a per hectare basis) or total carbon stocks? (v) Is the carbon stock change calculated every X years (X being the time period between two complete successive inventories) across the entire area? Or is calculated each year with data on parts of forest area collected in the two given years? If it is the latter, are annual data representative of the entire national forest area? (vi) Are data from the stock inventory representative of the entire land category or do they need to be integrated/corrected?
Biomass	(a) For whichever methodology is applied: (i) Has below-ground biomass been included or excluded symmetrically in carbon stock gains and carbon stock losses? (ii) Has the Party calculated biomass gain? (iii) Has the Party estimated the annual carbon loss due to wood removals ($L_{wood\text{-}removals}$)? (iv) Has the Party estimated the annual carbon loss due to fuelwood removal ($L_{fuelwood}$)? (v) Has the Party estimated the annual carbon loss due disturbance ($L_{disturbance}$)?

Check	*Action by the ERT, tasks*
	(vi) If a change in land use/management occurred in the inventory year, has the Party calculated initial biomass loss ($\Delta C_{CONVERSION}$) associated with the land use/management conversion?
	(b) If the Party has applied biomass equations, are they representative of the area for which they are applied?
	(c) If the Party has applied BCEF/BEF-D factors, do they differ from the IPCC defaults?
	(d) If a Party is applying BEF/BCEF, does it use separate values for stock, increment and losses?
	(e) Are the BCEF/(BEF, D) values used based on local measurements? Are the values within the default range of the 2006 IPCC Guidelines?
	(f) If the stem volume reported in the NFI includes non-commercial volume, has this been taken into account by modifying the BEF/BCEF or using a separate factor?
	(g) If the stem volume reported in the NFI does not include bark, has the Party taken it into account by modifying the BEF/BCEF or with the use of a separate factor?
	(h) Has all biomass affected by disturbance been reported as a carbon stock loss in the biomass pool (i.e. released to atmosphere or transferred to dead wood/litter/SOM), and as a proportional carbon stock gain in the dead wood/litter/SOM pools (unless carbon stock in the dead wood/litter/SOM is reported to be at equilibrium)?
	(i) Are the values of biomass density (i.e. biomass per hectare) consistent across the inventory (i.e. are the biomass stock values used to calculate carbon stock losses from different types of disturbances as well as for conversion to other use/management of land consistent)?
	(j) Has the Party used IPCC default values for carbon content? If it is using a value that differs significantly from the default value, has it provided a justification for that in the NIR (references to research, measurements, etc.)?
	(k) If the Party applies a country-specific method: (i) Is the carbon stock increment a net gain (i.e. gross gain minus carbon stock losses by mortality) or a gross gain? a. In the former case, have carbon stock losses from mortality been double counted? b. In the latter case, have carbon stock losses from mortality been counted? (ii) Has the Party reported increases and decrease in biomass carbon stocks separately?
Dead organic matter	(a) What is the length of the transition period selected by the Party for each pool? Is it appropriate to its national circumstances and equal to or longer than 20 years?
	(b) Has the Party applied the same stratification for DOM and SOM as for biomass?
	(c) Are the values of DOM density (t dm per hectare) consistent across the inventory (i.e. are the DOM stock values used to calculate carbon stock losses from different types of disturbances as well as for conversion to other use/management of land consistent)?
	(d) Has the Party provided separate estimates for mineral and organic soils?
	(e) Has the Party used country-specific SOC_{REF} values (i.e. SOM carbon stock under native vegetation, typically forest and unmanaged grassland), and if so, has it calculated the SOC_{REF} value according to the stratification applied by the country (e.g. climate, geographical and/or administrative regions)?

Check	*Action by the ERT, tasks*
	(f) Has the Party used country-specific SOC_0 values, and if so, has it calculated such SOC_0 values according to the stratification applied by the country (e.g. climate, soil type, geographical and/or administrative regions)? Have data from paired sites been used?
	(g) Are the EF (or removal factor) values used based on local measurements? Are the values within the default range of the 2006 IPCC Guidelines?
	(h) If the Party has used a country-specific modelling approach for DOM or SOM: (i) Has the Party validated it taking into consideration measurements of litter and dead wood production from above-ground (for DOM) and below-ground (for SOM) biomass along with decomposition parameters? (ii) Has the Party calculated N_2O emissions from drainage of organic soils and mineralization of organic matter by taking into consideration the C/N ratio of organic matter? stratifying SOM according to the N content (i.e. nutrient-rich versus nutrient-poor)

Abbreviations: AD = activity data, BCEF = biomass conversion and expansion factor, BEF = biomass expansion factor, D, = basic wood density, DOM = dead organic matter, EF = emission factor, ERT = expert review team, FAO = Food and Agriculture Organization of the United Nations, GHG = greenhouse gas, IPCC = Intergovernmental Panel on Climate Change, NFI = national forest inventory, NIR = national inventory report, SOC = soil organic carbon, SOM = soil organic matter, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[a] The IPCC Wetlands Supplement provides emission EFs for estimating GHG emissions/removals from SOM in organic soils. Table 7-76 provides references to where these details can be found in the 2006 IPCC Guidelines and the Wetlands Supplement.

Table 7-76
Sources of information on emission factors for estimating emissions/removals from soil organic matter in organic soils

To estimate	Information	2006 IPCC Guidelines	2003 Supplement on Wetlands
C stock changes in mineral soils of land converted to a new category	Default reference values for organic carbon content of mineral forest soils under native vegetation	table 2.3	
	Revised values of wetlands mineral soils		table 5.2
CO_2 emissions/removals from drained organic soils	Default values	table 4.6	
	Revised values		tables 2.1 and 2.2
CH_4 emissions/removals from drained organic soils	Default values		tables 2.3 and 2.4
CH_4 emissions/removals from rewetted mineral wetlands soils	Default values		table 5.4
N_2O emissions/removals associated with mineralization of SOM in mineral soils	Default values	table 11.1	
N_2O emissions/removals from drained organic soils	Default values	table 11.1	
	Revised values		table 2.5
CO_2 emissions/removals from rewetted organic soils	Default values		tables 3.1 and 3.2
CH_4 emissions/removals from rewetted organic soils	Default values		table 3.3
CO_2 and CH_4 emissions from burning of SOM of organic soils	Default values for fuel and emissions		tables 2.6 and 2.7

Abbreviations: IPCC = Intergovernmental Panel on Climate Change, SOM = soil organic matter.

Cross-cutting issues related to land use, land-use change and forestry

253. There are six major cross-cutting issues related to the estimation of emissions and removals from the LULUCF sector, which experts should be aware of when reviewing the LULUCF inventory.

254. **Uncertainty assessment**: Estimates of uncertainty need to be developed for all categories in the LULUCF inventory and for the inventory as a whole. Estimated carbon stock changes, emissions and removals arising from LULUCF activities have uncertainties associated with area or other AD, and estimation parameters such as biomass growth rates, expansion factors and other coefficients. In addition to general guidance provided above, reviewers should check EFs to determine whether the uncertainty has been calculated using:

(a) The standard deviation of the distribution (population), for example if the mean value is used to represent a single element of the population (e.g. carbon loss from deforestation); or

(b) The standard deviation of the mean (i.e. the standard error), for example, if the mean value is used to represent the entire population (e.g. the average increment rate of biomass in a stratum).

255. **Sampling**: Data for the LULUCF sector are often obtained from sample surveys. It is of the utmost importance that the reviewers ensure that estimates are unbiased, and therefore they should check whether:

(a) Samples are selected randomly within strata;

(b) Data collected are representative of the entire variability of the population sampled.

256. **KCA**: For the LULUCF sector, the KCA is performed for each gas at the level of land remaining in the same land-use category and land converted to another land-use category. In addition, the LULUCF reviewers have to give consideration as to how the Party has identified significant carbon pools. In general, according to the 2006 IPCC Guidelines, those subcategories/pools which, together, contribute more than 60 per cent to the key category should be treated as significant.[31] Thus in practice, in most cases, the biomass carbon pool (in particular the above-ground biomass pool), remains the only significant pool. Further, since the conversion of forest land is spread over different land-use change categories, countries should identify and sum the estimates of net emissions associated with forest conversion to any other land category and compare the magnitude of the sum to that of the smallest category identified as key. If it is larger than the magnitude of the smallest category identified as key deforestation should be considered to be key.

257. **QA, QC and verification**: There are five important features of LULUCF inventory methods that generally affect QA/QC. Reviewers should consider:

(a) Reliance on periodic sampling and its influence on the representativeness of input data; by checking how from periodic data unbiased annual estimates have been inferred;

(b) The need for sufficient historical data (presented as land transition matrices for the years before 1990), because past land-use activities affect current CO_2 emissions and removals, and should check whether and how lagged emissions/removals have been calculated;

(c) The need to use sophisticated models in which the data, assumptions and inferences of the model may not always be transparent, and should check the completeness of documentation (see footnote in decision 24/CP.19, annex, paragraph 50(a), on elements to be

[31] Note that in the IPCC good practice guidance for LULUCF, the threshold for each carbon pool or subcategory was given as 25–30 per cent of total net GHG emissions or removals, and that the same threshold is reported for carbon pools in the 2006 IPCC Guidelines, volume 4, figure 1.2.

checked) as well as by checking the suitability of the selected methods to the national circumstances;

(d) The need to verify the higher-tier estimates as the estimated model outputs; by comparison with lower-tier estimates;

(e) The multiple impacts of various natural and management variables; by tracking in disturbance matrices carbon stock transfers, carbon stock losses and associated emissions.

258. **Time-series consistency and recalculations**: In general, obtaining a consistent time series for the LULUCF sector presents challenges to inventory compilers because AD are very often not available on an annual basis. Complex models and higher-tier methods are sometimes used in the LULUCF sector for dealing with the lack of annual data. Therefore, reviewers should pay particular attention on the methods applied to compile a complete time series of AD and verify whether and how consistency has been achieved.

259. As shown in figure 7-24, the LULUCF sector has multiple links with the agriculture sector: it is important to verify the proper allocation of emissions between the agriculture and LULUCF sectors, as illustrated in table 7-77.

Table 7-77
Checks to verify the allocation of reporting between the agriculture sector and the land use, land-use change and forestry sectors

Check	*Action by the ERT, tasks*
CO_2	(a) CO_2 emissions from wildfire and prescribed burning of perennial organic matter in any land use are reported either in CRF table 4(V) or in the CRF table for the carbon stock changes of the relevant land use category. Note that if the stock-difference method has been applied to a carbon pool, the CO_2 emissions associated with combustion are included in the carbon stock change estimated for the carbon pool and consequently these emissions shall not be reported in CRF table 4(V), where the notation key "IE" will be reported
CH_4 and N_2O	(a) CH_4 and N_2O emissions from burning of crop residues and from savannah burning are reported in the agriculture sector, CRF tables 3.E and F
	(b) CH_4 emissions from wetland rice fields are reported under agriculture (CRF table 3.C) and N_2O emissions from organic or mineral soils used for cultivation are reported under agriculture (CRF table 3.D). Any other CH_4 and direct N_2O emission from wetlands are reported in the LULUCF sector, including CH_4 emissions from ditches in drained organic soils under cropland and/or managed grassland, which are to be reported in CRF table 4(II)
N_2O	(a) Direct and indirect N_2O emissions from fertilization of cropland and managed grassland are reported in the agriculture sector in CRF table 3D. Direct N_2O emissions from fertilization of other land uses may be reported either in CRF table 3.D or in CRF table 4(I) while avoiding double counting. Consistently, associated indirect N_2O emissions will be reported either in CRF table 3.D or in CRF table 4(IV) 'Indirect N_2O emissions from managed soils'. In all cases, the allocation used by the Party should be clearly documented in the NIR
	(b) Direct net N_2O emissions from N mineralization/immobilization associated with loss/gain of SOM resulting from changes of land use or management of mineral soils in managed forest land, managed grassland, managed wetlands, in settlements and resulting from changes in land use to cropland or to other land are reported in CRF table 4(III), while those occurring on cropland remaining cropland are reported under agriculture in CRF table 3.D
	(c) Indirect N_2O emissions from managed soils, excluding those from agricultural lands, are reported in CRF table 4(IV)

Check	*Action by the ERT, tasks*
	(d) Check on the use of notation keys: when carbon loss occurs as a result of land-use/management change, the ERT should check that an estimate of associated direct and indirect N_2O emissions has been reported under the agriculture sector or whether the notation key "NE" (not estimated) has been used together with the justification that these emissions fall under the insignificance threshold If the Party does not estimate soil organic carbon changes in mineral soils under cropland remaining cropland, the ERT should recommend that the Party estimate such changes as well as the associated N_2O emissions from nitrogen (N) mineralization If a Party reports data in CRF table 3.D for N mineralization, they should be consistent with loss of soil carbon under cropland remaining cropland reported in CRF table 4.B.

Abbreviations: CRF = common reporting format, ERT = expert review team, IE = included elsewhere, NIR = national inventory report, SOM = soil organic matter.

G. Waste

1. Introduction

260. In the 2006 IPCC Guidelines, the waste sector includes five categories:

(a) Solid waste disposal;

(b) Biological treatment of solid waste;

(c) Incineration and open burning of waste;

(d) Wastewater treatment and discharge;

(e) Other.

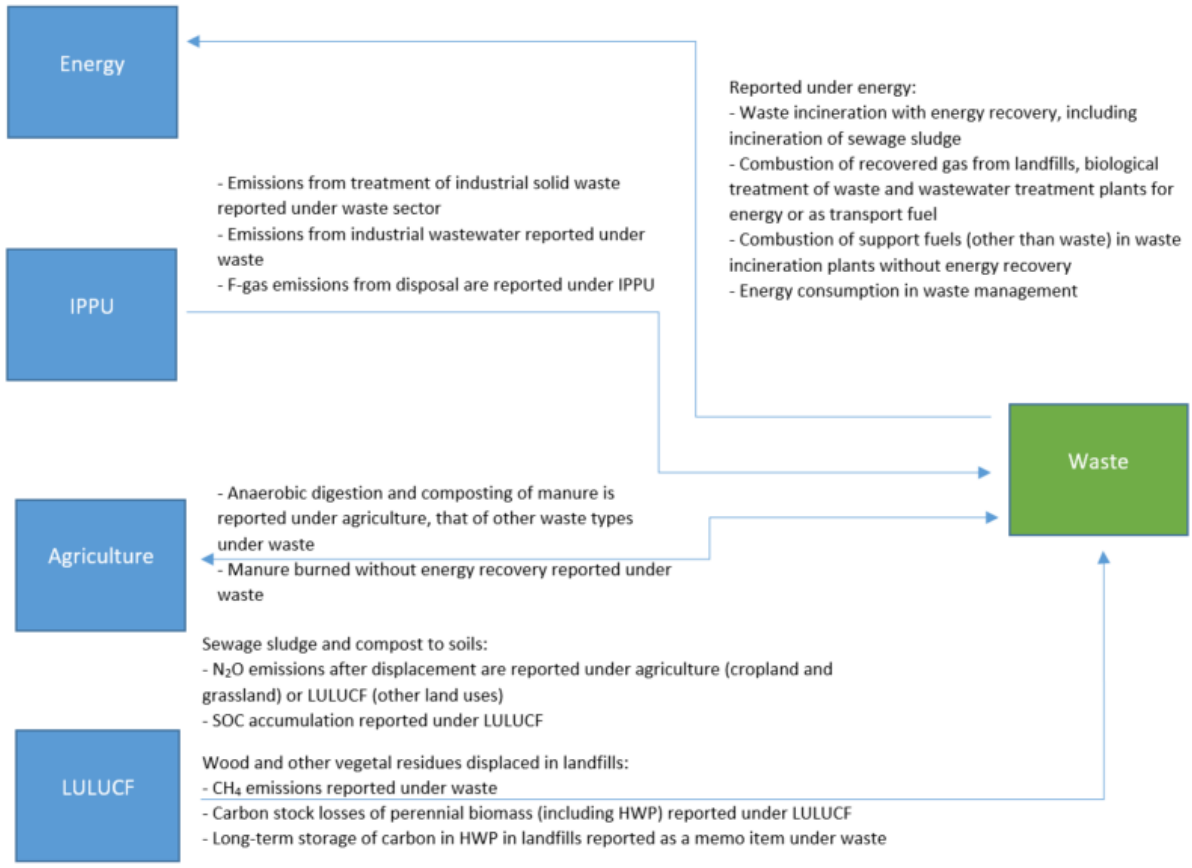
261. Additional information on long-term storage of carbon in waste disposal sites is reported as a memo item in CRF table 5.

2. Sector-specific issues

Integration of the waste sector

262. Several categories in the waste sector interact with the categories in other sectors (see figure 7-26).

Figure 7-26
Overview of the interaction of the waste sector with other inventory sectors



263. The methods in the 2006 IPCC Guidelines for the waste sector have been revised compared to the methods in the Revised 1996 IPCC Guidelines and IPCC good practice guidance. The main differences are summarized in box 7-12 below. However, the list is not exhaustive and it is important that the review experts make sure that, for all categories, the inventory estimates are in line with the 2006 IPCC Guidelines.

Box 7-12
Main changes in the 2006 IPCC Guidelines from the Revised 1996 IPCC Guidelines and IPCC good practice guidance: waste

(a) A simple first order decay model, accompanied by regional defaults and country-specific data on waste generation, composition and management, is provided. The mass balance approach included in the Revised 1996 IPCC Guidelines is no longer included in the 2006 IPCC Guidelines

(b) Guidance on open burning of waste has been included and this can now be reported separately from incinerators

(c) Guidance on biological treatment of solid waste (composting and anaerobic digestion) is included

Waste generation, composition and management data

264. The methods for estimating CH_4 and N_2O emissions from solid waste disposal, biological treatment and incineration and open burning of soil waste relies on the compilation of AD on waste generation, composition and management. AD should be collected separately for municipal solid waste (MSW), sludge, industrial and other waste. If data are only available for certain types of waste, the Party should indicate how it is making efforts to complement this data to include all types.

265. In the review of waste generation, composition and management data, the review expert may consider going through the list of potential actions presented in table 7-78.

Table 7-78
Possible actions by the expert review team in the review of waste generation, composition and management data

Check	*Action by the ERT, task*
General	Have AD on all types of solid waste been collected (MSW, sludge, industrial and other waste)?
	Is the Party able to provide an overview of waste generation and treatment?
	Is there a regional difference in the country in waste generation and treatment practices? If yes, have regional data been collected?
	If the Party has conducted waste stream analyses (following the streams of waste from one treatment type to another) has the Party verified the data using separately collected data on MSW generation, treatment and disposal?
Industrial waste	Is it clear where industrial waste streams are included (e.g. is this waste reported separately, included in MSW or reported elsewhere)?
	Do the industrial waste statistics include only that waste which contains degradable organic carbon and fossil carbon?
	Do the industrial waste statistics adequately account for recycling?
	If country-specific information on industrial waste management is not available, has the Party assumed the same practices as with MSW?
Waste composition	How has the Party ensured that the composition of MSW applied is sufficiently representative of national circumstances?
	Has the Party clarified whether waste composition data are based on “as generated” or “as received at the SWDS”? If the former, have the statistics used to estimate emissions from landfilling been adjusted to account for the impact of recycling and/or biological treatment?
	Has the Party made a distinction between the composition of wastes incinerated/open-burned and the composition of waste delivered to other waste management systems?

Abbreviations: AD = activity data, ERT = expert review team, MSW = municipal solid waste, SWDS = solid waste disposal sites.

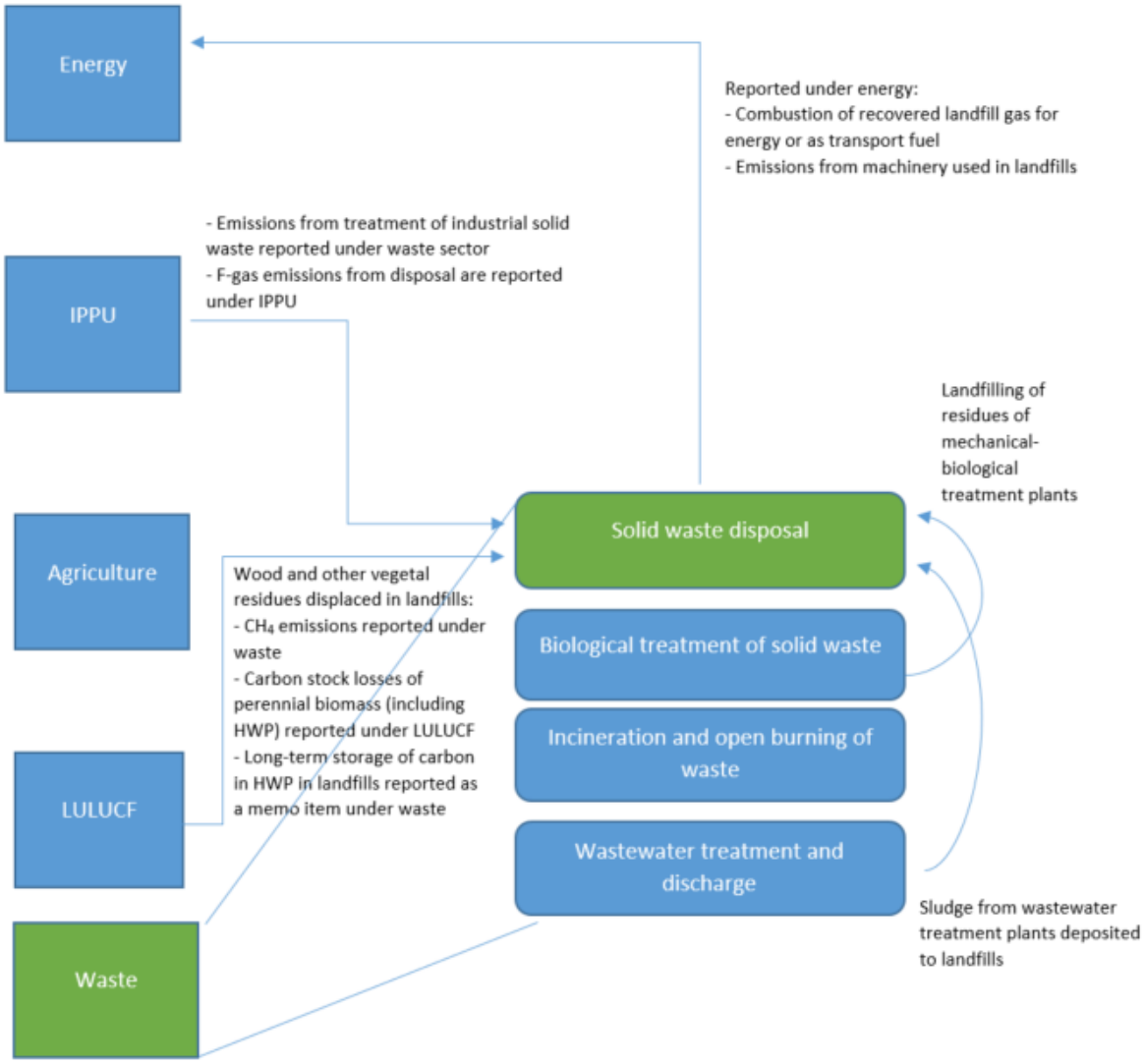
Solid waste disposal

266. Table 7-79 provides a summary of key elements for the solid waste disposal category, and figure 7-27 summarizes linkages between the solid waste disposal category and the other categories in the waste sector and other sectors.

Table 7-79
Summary of key elements of the solid waste disposal category

Overview	*Category-specific information*	
Category name	Solid waste disposal	
Reported in CRF table	Table 5.A	
Main subcategories and GHGs to be reported	Managed waste disposal sites	CH_4
	Unmanaged waste disposal sites	CH_4
	Uncategorized waste disposal sites	CH_4

Figure 7-27
Main linkages between the solid waste disposal category and the other categories in the waste sector and other sectors



267. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the waste expert may consider going through the list of potential ERT actions in table 7-80 when reviewing the emissions from the solid waste disposal category.

Table 7-80
Possible actions by the expert review team in its review of the emissions from the solid waste disposal category

Subcategory	*Action by the ERT, task*
All	Does the Party use a first-order decay (FOD) model to estimate emissions? Note that other methods (such as direct measurements) are generally not consistent with good practice
	Has the Party used disposal data covering at least 50 years? If not, has the Party estimated emissions for the additional time period using an alternative approach?
	Is the allocation of waste among managed, unmanaged and uncategorized waste disposal sites transparent?
	Has the Party reported CO_2 emissions in this category? If so, are they owing to the combustion of disposed waste at the disposal site as a management practice (other CO_2 emissions should not be reported here)? Are the CO_2 emissions derived from non-biological or inorganic waste sources?
	Has the Party reported in CRF table 5 the memo item regarding the annual change in total long-term carbon storage in HWP waste? Is the reporting in accordance with the reporting of HWP in CRF table 4.Gs1?
	If the Party reports CH_4 and N_2O from flaring, are these correctly reported under 5.E Other?
	If recovered landfill gas is used for energy (stationary combustion or as transport fuel), are CH_4 and N_2O emissions from combustion correctly included under the energy sector?
	If the Party reports CH_4 recovery or flaring in SWDSs, is the amount recovered/flared based on documented references, such as metering of all gas recovered? If reporting of gas recovery is based on the monitoring of produced amount of electricity from the gas, has the Party considered the availability of load factors, heating value and corresponding heat rate, and other factors that have an impact on the amount of gas used to produce the monitored amount of electricity? If the Party uses other methods to estimate the amount of CH_4 recovered/flared, the reviewer should pay particular attention to the risk of a potential overestimation of recovery. The IPCC default for recovery is zero, and if the CH_4 recovery is estimated on the basis of the number of SWDSs with landfill gas recovery a default estimate of recovery efficiency would be 20 per cent
	If the oxidation factor is different from the IPCC default (see 2006 IPCC Guidelines, volume 5, table 3.2), is it correctly justified and documented? (Note that field and laboratory studies which determine oxidation of CH_4 only through uniform and homogeneous soil layers may lead to over-estimations of oxidation in landfill cover soils)
	Are several half-lives (e.g. three to five) and k values specified? Are the k values consistent with the half-lives specified?
	Is the reported methane correction factor consistent with the type of site?
	If the Party uses default IPCC values for parameters, are they from the 2006 IPCC Guidelines (where several values have been updated compared with the IPCC good practice guidance)?

Abbreviations: CRF = common reporting format, ERT = expert review team, HWP = harvested wood products, IPCC good practice guidance= Intergovernmental Panel on Climate Change Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, SWDS = solid waste disposal sites, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories

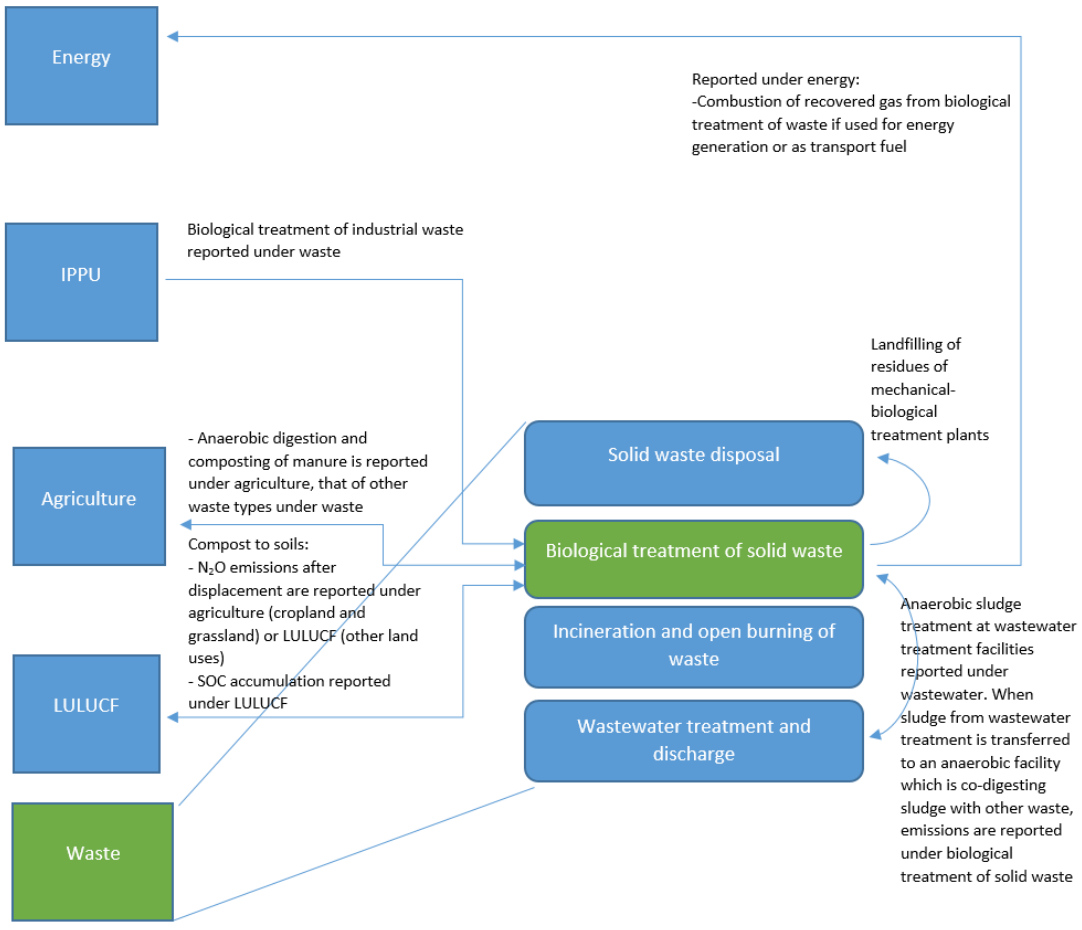
Biological treatment of solid waste

268. Table 7-81 provides a summary of key elements for the biological treatment of solid waste category, and figure 7-28 summarizes linkages between the biological treatment of solid waste category and the other categories in the waste sector and other sectors.

Table 7-81
Summary of key elements of the biological treatment of solid waste category

Overview	*Category-specific information*	
Category name	Biological treatment of solid waste	
Reported in CRF table	Table 5.B	
Main subcategories and GHGs to be reported	Composting	CH_4, N_2O
	Anaerobic digestion at biogas facilities	CH_4, N_2O

Figure 7-28
Main linkages between the biological treatment of solid waste category and the other categories in the waste sector and other sectors



269. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the waste expert may consider going through the list of potential ERT actions in table 7-82 when reviewing CH_4 and N_2O emissions from the biological treatment of solid waste category.

Table 7-82
Possible actions by the expert review team in its review of emissions from the biological treatment of solid waste category

Subcategory	*Action by the ERT, task*
All	If composting or anaerobic digestion of manure is conducted together with other waste fractions (e.g. agricultural residues), does the Party's inventory cover all material composted and digested while ensuring that no double counting occurs?
	Are the estimated CH_4 and N_2O emissions from composting or anaerobic treatment of sludge consistent with the reported emissions from treatment of sludge in the wastewater treatment and discharge category? Has the Party ensured that no omission or double counting occurs?
	If the Party has used the IPCC default EFs, has it correctly applied the EF for wet or dry waste depending on the original AD?
	If recovered CH_4 is used for energy, are the emissions from combustion correctly included under the energy sector? Has the Party provided a reference to the category in the energy sector where the emissions are included?
	If residues from mechanical-biological treatment are landfilled, are the emissions included in the solid waste disposal category?
	If mechanical-biological treatment of waste occurs, has the Party used the methods for composting and anaerobic digestion to estimate emissions from biological treatment steps?
Composting	Has the Party reported emissions from composting (a new category in the 2006 IPCC Guidelines)?
	Are all composted waste fractions, other than MSW and manure (included in agriculture), reported under 'other'?
	If home composting is included in the AD, has this been clarified in the NIR? It is not mandatory to report CH_4 and N_2O emissions from home composting activities.
Anaerobic digestion at biogas facilities	Has the Party reported emissions from anaerobic digestion at biogas facilities (a new category in the 2006 IPCC Guidelines)?
	Has the Party estimated emissions of CH_4 from anaerobic digestion at biogas facilities that result from unintentional leakages during process disturbances or other unexpected events, in case the unintentional CH_4 is not flared?
	Are all digested waste fractions, other than MSW and manure (included in agriculture), reported under 'other'?

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, MSW = municipal solid waste, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

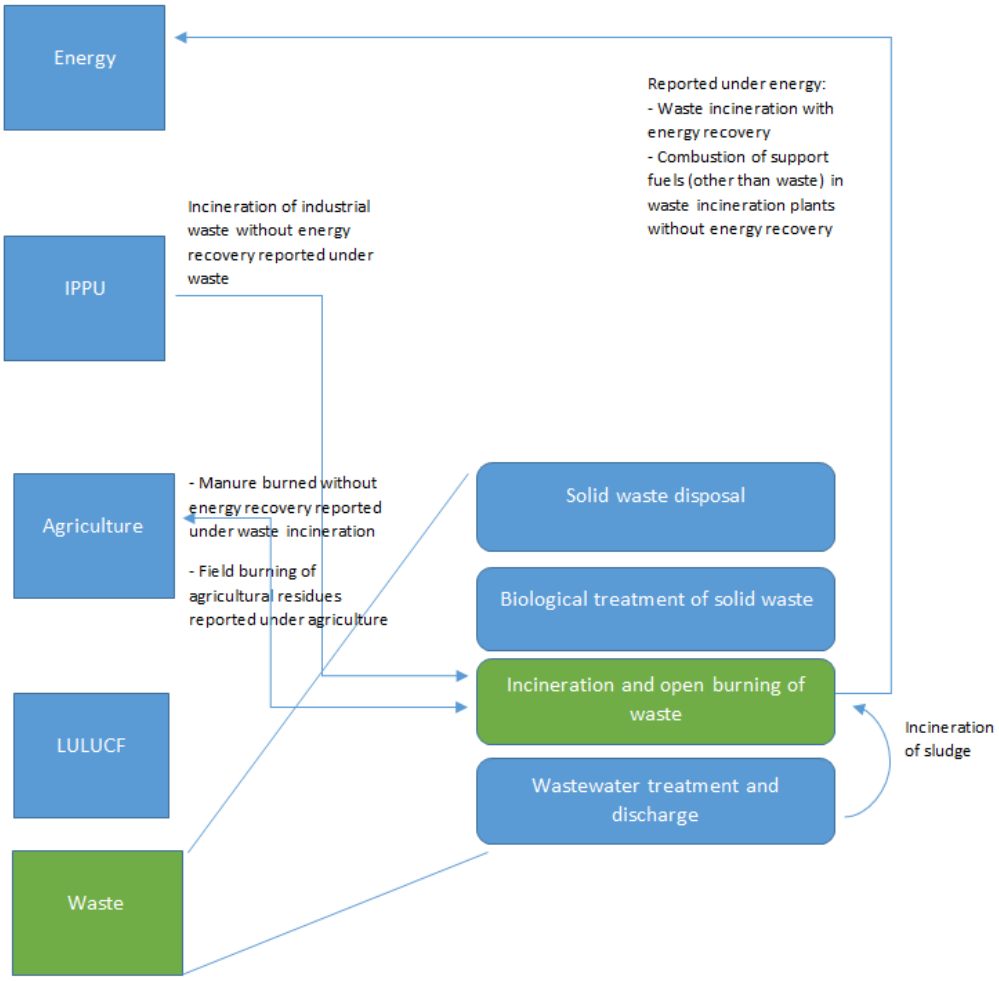
Incineration and open burning of waste

270. Table 7-83 provides a summary of key elements for the incineration and open burning of waste category, and figure 7-29 summarizes linkages between the incineration and open burning of waste category and the other categories in the waste sector and other sectors.

Table 7-83
Summary of key elements of the incineration and open burning of waste category

Overview	*Category-specific information*	
Category name	Incineration and open burning of waste	
Reported in CRF table	Table 5.C	
Main subcategories and GHGs to be reported	Waste incineration	CO_2, CH_4, N_2O
	Open burning of waste	CO_2, CH_4, N_2O

Figure 7-29
Main linkages between the incineration and open burning of waste category and the other categories in the waste sector and other sectors



271. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the waste expert may consider going through the list of potential ERT actions in table 7-84 when reviewing the emissions from incineration and open burning of waste category.

Table 7-84
Possible actions by the expert review team in its review of emissions from the incineration and open burning of waste category

Subcategory	*Action by the ERT, task*
All	Are all CO_2 emissions reported of fossil origin? Note that biogenic CO_2 should not be reported
	Have the EFs been applied correctly (i.e. regarding wet or dry weight)?
Waste incineration	Has the Party reported only emissions from waste incineration without energy recovery in this category?
	Has the Party reported under 'fossil liquid waste' any combustion, without energy recovery, of lubricants, solvents and waste oil, if not included in other types of waste (e.g. industrial or hazardous waste)?
	Are the estimates for carbon content in incinerated waste fractions consistent with the estimates in the energy sector regarding waste incineration with energy recovery?
	If gas, oil or any other fuels are combusted in the waste incinerator as a support fuel (e.g. to start the incineration process or to maintain the required temperature), are those emissions correctly included under the energy sector? This can be particularly relevant for hazardous waste incineration
	When sludge from wastewater treatment facilities is incinerated, has the Party ensured that no double counting with the wastewater treatment category occurs? Note that emissions should be reported under waste incineration
	If the Party has used default CH_4 EFs for continuous incineration of MSW and industrial waste, has it used the EFs in volume 2 (Energy) of the 2006 IPCC Guidelines?
	If the measurement data indicates that CH_4 concentration in the exhaust gas of the furnace is below the CH_4 concentrations in the intake gas of the incinerator, has the Party applied an EF of zero in accordance with good practice?
	Does the inventory cover all waste incineration facilities as well as all waste types?
	If waste is used as a substitute fuel in industrial plants other than waste incineration plants (e.g. in cement and brick kilns, and blast furnaces), are the emissions reported under energy and not double counted?
Open burning	Has the Party demonstrated that national statistics reliably estimate total waste burned? If household waste is open-burned in rural areas, is this considered?

Abbreviations: EF = emission factor, ERT = expert review team, MSW = municipal solid waste, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

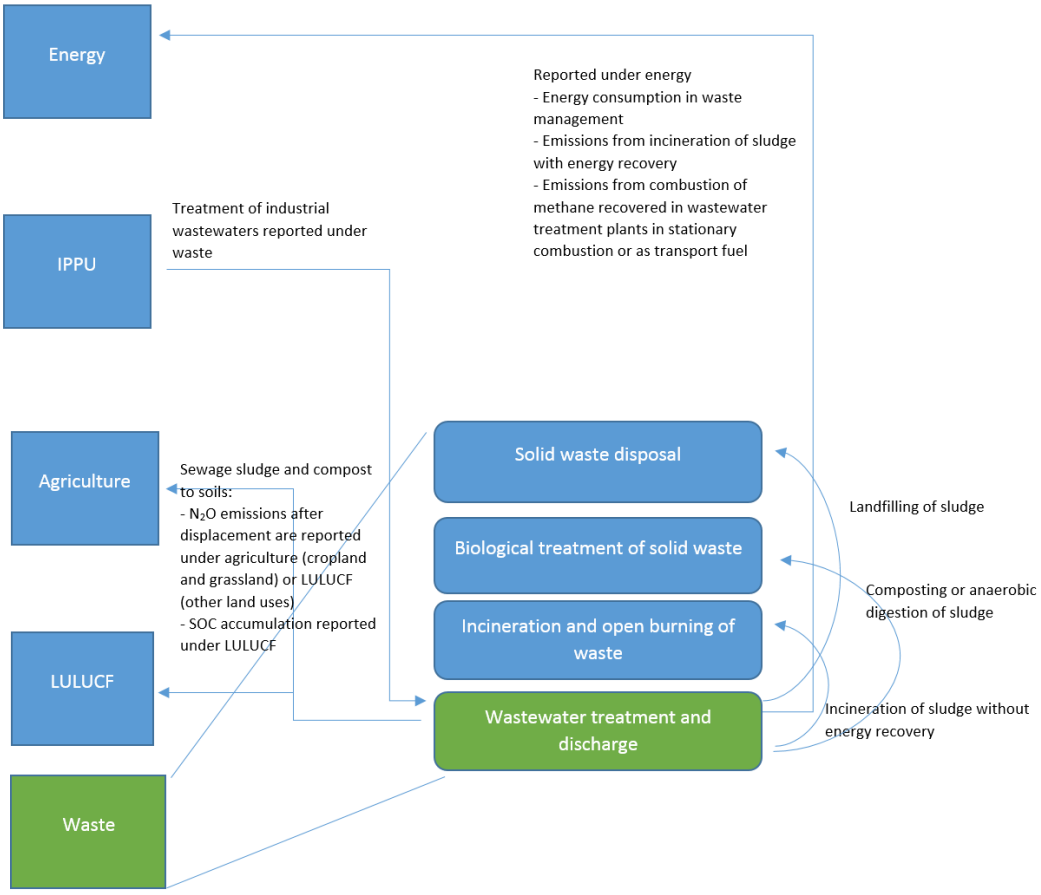
Wastewater treatment and discharge

272. Table 7-85 provides a summary of key elements for the wastewater treatment and discharge category, and figure 7-30 summarizes linkages between the wastewater treatment and discharge category and the other categories in the waste sector and other sectors.

Table 7-85
Summary of key elements of the wastewater treatment and discharge category

Overview	*Category-specific information*	
Category name	Wastewater treatment and discharge	
Reported in CRF table	Table 5.D	
Main subcategories and GHGs to be reported	Domestic wastewater	CH_4, N_2O
	Industrial wastewater	CH_4, N_2O
	Other	CH_4, N_2O

Figure 7-30
Main linkages between the wastewater treatment and discharge category and the other categories in the waste sector and other sectors



273. In addition to the possible ERT actions included in chapter VI of this handbook related to cross-cutting issues, the waste expert may consider going through the list of potential ERT actions in table 7-86 when reviewing the emissions from the wastewater treatment and discharge category.

Table 7-86
Possible actions by the expert review team in its review of emissions from the wastewater treatment and discharge category

Subcategory	*Action by the ERT, task*
All	If the Party reports CH_4 and N_2O from flaring (which is not required for good practice), are they correctly reported under 5.E Other?
	Has the Party correctly applied the fraction of non-consumed protein added to the wastewater ($F_{NON-CON}$) and reported it in the additional information table of CRF table 5.D, if appropriate for the method used?
	Has the Party correctly applied the fraction of industrial and commercial co-discharged protein into the sewer system ($F_{IND-COM}$) and reported it in the additional information table of CRF table 5.D, if appropriate for the method used? Have the emissions from co-discharged protein in sewer systems been reported under domestic, rather than in industrial, wastewater?
	If the Party includes sludge removal in its estimate of the emissions from wastewater, is it based on sludge removal data (the IPCC default for sludge removal is zero)? Is the estimate of removed sludge consistent with the estimates for sludge applied to agricultural soils, sludge incinerated, composted or digested and sludge deposited in solid waste disposal sites?
	Have CH_4 emissions from sludge sent to landfills, incinerated or used in agriculture been excluded from the wastewater treatment and discharge category?
	If the Party reports CH_4 recovery/flaring, is the estimate based on documented references? The IPCC default for recovery is zero
	If recovered CH_4 is used for energy, are the emissions from combustion correctly included under the energy sector? Has the Party provided a reference to the category in the energy sector where the emissions are included?
	Has the Party included AD for total organic product as degradable carbon in accordance with the 2006 IPCC Guidelines: chemical oxygen demand for industrial wastewater and biochemical oxygen demand for domestic/commercial wastewater/sludge?
	If sludge from wastewater treatment is transferred to an anaerobic facility which is co-digesting sludge with other waste fractions, are any related CH_4 and N_2O emissions reported under biological treatment of solid waste?
Domestic wastewater	Has the Party distinguished income group fractions (e.g. rural, urban high income and urban low income populations) to estimate CH_4 emissions, if appropriate to the method used?
	Regarding the estimates for N_2O from human sewage, has the Party specified whether total or urban population is used in the calculations and the rationale for doing so?
	Has the Party estimated emissions from uncollected wastewater?
	If the Party has advanced centralized wastewater treatment plants with nitrification and denitrification steps, have N_2O emissions been estimated?
Industrial wastewater	Has the Party identified the major industrial sectors with large potentials for CH_4 emission from wastewater and estimated emissions for them? Is the coverage of industries consistent across the entire time series?
	Does this category include only industrial wastewater treated on-site (emissions from industrial wastewater released into domestic sewer systems should be addressed and included with domestic wastewater)?

Abbreviations: AD = activity data, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines = 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

H. Reviewing the KP-LULUCF activities under the KP

1. Reporting and accounting for KP-LULUCF activities under the KP

274. The Kyoto Protocol limits the reporting and accounting of emissions and removals from the LULUCF sector to those activities defined under Article 3, paragraphs 3 and 4 (KP-LULUCF activities). For the 2nd commitment period the following activities need to be mandatorily reported and accounted: deforestation (D), afforestation & reforestation (AR), forest management (FM); while the following activities may be voluntarily reported and accounted: cropland management (CM), grazing land management (GM), revegetation (RV) and wetland drainage and rewetting (WDR); although each voluntary activity already elected in the 1st commitment period must be mandatorily reported and accounted for in the 2nd commitment period.

275. In addition to CMP decisions already referenced in chapter 2.C, the CMP decisions in tables 7-87 – 7-90 apply for the reporting and accounting of KP-LULUCF activities:

Table 7-87
Understanding reporting requirements under decision 16/CMP.1

Decision 16/CMP.1 *"LULUCF"*	
para 1	Notes that the following principles govern treatment of LULUCF activies: ✓ Sound science for reporting and accounting ✓ Consistency over time of methodologies ✓ Sustainability of implemented LULUCF activities ✓ Reversal of removals to be accounted for at the appropriate point in time ✓ Removals due to CO_2 and N_2O fertilization effects and to the dynamic effects of age structure resulting from activities and practices before the reference year are to be excluded from accounting
Annex – para 1	Provides the definitions of forest and of the following activities: D, AR, FM, CM, GM, R. *NB if a Party excludes from FM (or ARD) land that meets the thresholds of the forest definition, in order to ensure transparency, it is good practice that the Party:* ✓ *Documents the criteria used to exclude that land from forest, and how these criteria have been applied consistently across the country and commitment periods;* ✓ *Reports the areal extent of the land excluded, describing the consequences of this exclusion for the reported emissions and removals; and* ✓ *Ensures that any HWP from timber harvested from that land is not included in the reporting of C stock changes in the HWP pool.If the forest definition does not coincide with the one used to report information to FAO, is a justification provided for the difference ?*

Table 7-88
Understanding reporting requirements of decision 2/CMP.6

Decision 2/CMP.6. *"LULUCF"*	
Appendix II	✓ Part I: Guidelines for submissions of information on forest management reference levels ✓ Part II: Guidelines for review of submissions of information on forest management reference levels ✓ To assess whether the Party has provided transparent, complete, consistent, comparable and accurate information a. on a) net removals or emissions from forest management as shown in the inventories and relevant historical data; (b) age-class structure; (d) projected forest management activities under a 'business as usual' scenario; b. to facilitate reviews of methodological consistency; *According to articles 14 and 15 of decision 2/CMP.7, the annual review of the GHG inventory under the Kyoto Protocol focuses on point b only, since the FMRL has been already subject to a dedicated technical assessment*

Table 7-89
Understanding reporting requirements of decision decision 2/CMP.7

Decision 2/CMP.7. *"LULUCF"*	
Annex – para 1	✓ Definitions of WDR and of natural disturbances (ND)
Annex – para 3	✓ Spatial unit for assessing ARD activities should not be larger than 1 ha *The 2013 IPCC KP Supplement (section 2.2.6.2) provides guidance on how to derive from coarse spatial data area estimates compliant with this requirement*
Annex – para 4	✓ Temporary loss of forest cover must not be reported as deforestation and vice versa. *However, being that FM is mandatorily accounted for, an error in reporting would not impact the accounting if the emissions from harvesting have not been included in the FMRL*
Annex – para 5	✓ Conversion of natural forest to planted forest has to be reported and accounted *This should occur under FM, as forest land remaining forest land. A projected FMRL may include emissions and removals from such conversion if expected under a BAU scenario*
Annex – paras 6-12 and 22-23	✓ Accounting for elected and mandatory KP-LULUCF activities *For each year of the commitment period, the emissions and removals accounted for:* ✓ *D, are those occurred across the cumulated area of land subject to the activity since 1 January 1990* ✓ *AR, are those occurred across the cumulated area of land subject to the activity since 1 January 1990 that has not been subsequently deforested* ✓ *FM, are those occurred across the area of land subject to the activity, since 1 January 1990, or since the onset of activity (the latter applies when a narrow definition is applied and to the newly forested land under the CEF provision), that has not been subsequently deforested, minus the emissions and removals included in the FMRL* ✓ *CM and GM, are those occurred across the area of land subject to the activity since the base year or the onset of activity that has not been subsequently converted to another KP-LULUCF activity with a higher hierarchical order, minus the emissions and removals occurred on the area subject to the activity in the base year. Note that areas subject to CM and GM may be reported together under one single activity (i.e. the one with higher hierarchical order), although methods applied should be those appropriate to the actual land use* ✓ *RV, as CM and GM* ✓ *WDR are those occurred across the area of land subject to the activity since the base year or the onset of activity that has not been subsequently converted to another KP-LULUCF activity, minus the emissions and removals occurred on the same area in the base year.*
Annex – para 13	✓ Cap (3.5% of base year emissions, excluding LULUCF and including indirect CO_2 emissions, times 8 years) on credit accountable under FM. The FM cap is fixed upon conclusion of the review of the report to facilitate the calculation of the assigned amount and does not need to be subsequently reviewed. *In case Article 3.7 applies, although deforestation net GHG emission (i.e. net GHG emission* reported in the base year from the cumulated deforested areas in the period 1971-1990 in the categories: forest land converted to cropland, forest land converted to grassland, forest land converted to wetlands, forest land converted to settlements, forest land converted to other land) are included in the assigned amount of the country, they are not included in the base year GHG emissions used to calculate the cap.* ** Note that net GHG emission from Deforestation includes not only CO_2 emissions and removals associated to C stock changes, it also includes N_2O and CH_4 emissions from deforested lands as estimated according to IPCC categories and that are not reported under Agriculture*
Annex – para 14	✓ Methodological consistency between the FMRL and actual GHG estimates ✓ Technical correction of the FMRL to ensure consistency *See section VII.H.2*
Annex – para 15	✓ Methodological consistency between the FMRL and historical GHG estimates (when recalculated) ✓ Technical correction of the FMRL to ensure consistency *See section VII.H.2*
Annex – para 16	✓ Emissions from HWP originated before the 2nd commitment period must be accounted for. However, in case of a projected FMRL those HWP may be excluded from accounting.

Decision 2/CMP.7. *"LULUCF"*	
	✓ Emissions from HWP originated in the 1st commitment period must be excluded from accounting if already accounted in the 1st commitment period on the basis of instantaneous oxidation. *When consistency between the FMRL and the actual GHG estimates is ensured, failure in following the two above-listed accounting requirements has no impact on accounted quantities. In such a case an adjustment would not be needed.* ✓ For a projected FMRL, HWPs must be accounted for by applying the default method reported in para 29. Instantaneous oxidation is not allowed
Annex – para 24	✓ Once a land is accounted for, it must be accounted for in subsequent commitment periods *This to ensure permanence of accounted quantities. Although for land subject to cropland management or grazing land management in the base year only (i.e. only in 1990) the GHG emissions and removals may be zeroed during the commitment period. When a country applies such option, the impact in terms of emissions and removals excluded from the accounting by such zeroing, must be reported and is subject to review.*
Annex – para 25	✓ Areas subject to KP activities must be identifiable *Paras 24 and 25 determine that the national system has to have a spatial and temporal resolution adequate to identify and track areas subject to KP-LULUCF activities as well as areas within the KP-LULUCF activities that are subject to specific provisions (e.g. ND)*
Annex – para 26	✓ C pools that are not a source may be excluded from accounting, except for HWP *Consequently, a decreasing sink may not account for a debit. Although consistency in the treatment of pools between actual GHG estimates and FMRL must be ensured. Further, the HWP pool may be accounted for at tier 1 with instantaneous oxidation, which in practice means excluding it from accounting, even if it is a source.*
Annex – para 29	✓ Default methodology (*first order decay function*) to be applied for accounting for HWP *Although for AR (and D lands) and for FM if a projected FMRL is not applied, the default method is instantaneous oxidation and the firset order decay function is a tier 2 level*
Annex – para 31	✓ HWP made of wood originated from deforestation events must be accounted for always on the basis of instantaneous oxidation
Annex – para 32	✓ HWP discarded in SWDS or used for bioenergy, where accounted for separately from other HWP, must be accounted for always on the basis of instantaneous oxidation
Annex – para 33	✓ Where ND provision are applied, calculation of the background level (BL) of emissions associated with ND and of its margin is necessary to avoid the expectation of net credits or net debits from the application of the ND provision. *The ND provision must have a neutral impact on accounted quantities, which means that:* *- for FM, the amount of emissions excluded from accounting must not exceed the amount of emissions associated with disturbances included in the FMRL, and the amount of removals included in the accounting shall not exceed the amount of removals associated with disturbances included in the FMRL;* *- for AR, the amount of emissions and removals excluded from the accounting should sum up to zero*
Annex – para 34	✓ Safeguards on applying the ND provision: ✓ Does not apply to emissions associated with salvage logging and to emissions in deforested land *Any harvesting cannot be considered as a ND event and associated emissions must therefore always be entirely accounted for. Similarly, in case of deforestation associated with the ND event, all emissions must be considered anthropogenic, and therefore not excluded from accounting, since the land has changed its use.* ✓ The Party has made practicable efforts to prevent, manage or control the occurrences that led to the application of the ND provision *Events may be considered ND only if beyond the control of the country. Although some types of events, e.g. geological disturbances, are not under human control, others, e,g. fires, may have a relevant anthropogenic component. Countries must demonstrate, by reporting information, that it has in place policies and measures and systems to control them (e.g. the fire suppression system). Consequently, occurrences of such types of disturbances (e.g. fires) may be considered ND when their magnitude overcomes the established systems. The default method (para 33) identifies overcoming occurrences as ND if their magnitude exceeds the 95% confidence interval of a normal distribution built with historical data.* ✓ The Party has made efforts to rehabilitiate the ladn with forest cover

Decision 2/CMP.7. *"LULUCF"*	
	This means that the use of the disturbed land must not be changed after the ND events and that all practices and legal and technical prescriptions to which the land was subject before the ND remain valid. In addition, the country may have specific practices and legal and technical prescriptions for the lands subject to disturbances aimed at preventing their further degradation and at helping the regrowth of the forest cover. *Such information is to be reported if the country applies the ND provisions.*
Annex – paras 37-39	✓ Cleared and converted forest plantations, that are not older than 30 years at 1 January 1990 or that have been planted on non-forest land before 1 January 1990, may be reported under FM instead of under D if: ✓ an area of non-forest land (as of December 31 1989), at least equivalent to that cleared, is converted to forest land ✓ the new forest plantation achieves, within the harvesting cycle of the cleared plantation, a C stock content at least equivalent to that that the cleared land had at the time it was cleared. *Which means that an afforested area is to be reported under FM instead of under AR* *If this does not happen:* ✓ *in case of a projected FMRL a debit would result in accounting since the projected C stock in the planted area will be higher than the actual C stock* ✓ *in case of a historical FMRL the debit, as it is for the credit, would be counted as a consequence of the comparison of the FMRL, that does not contain the expected emissions/removals from both the cleared and the planted land, with the actual GHG estimates that contain emissions and removals from both lands the cleared and the planted.*

Table 7-90
Understanding reporting requirements of decision 2/CMP.8, Annex II

Decision 2/CMP.8, annex II. "*Information on land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in annual greenhouse gas inventories"*	
Para 2a	Description of all methodologies used is provided (in the NIR). *Information for each methodology should include: method, assumptions on the basis of the method, input data and factors, and how data and factors have been collected and/or estimated, any verification of the output data, and of factors and input data, if any*
Para 2b	Report the geographical location and identification of lands (in all CRF tables; the methodology is to be provided in the NIR)
Para 2c	Report the spatial assessment unit (in the NIR). *It must be equal for FM, D and AR*
Para 2d	Information reported includes: (a) Annual C stock changes, from AR, (in CRF table 4(KP-I)A.1), D, (in CRF table 4(KP-I)A.2), FM (in CRF table 4(KP-I)B.1), and elected activities (in CRF Tables, 4(KP-I)B.2 (CM), 4(KP-I)B.3 (GM), 4(KP-I)B.4 (RV), 4(KP-I)B.5 (WDR)) and other GHG emissions from all activities (in CRF Tables, 4(KP-II)1, 4(KP-II)2, 4(KP-II)3, 4(KP-II)4), since the beginning of the commitment period or since the onset of the activity (b) The land classifications and conversions in NIR-2 and NIR-2.1 (c) Additional information in table NIR 1 (summary), NIR1.1 (forest definition), and NIR 3 (key categories), as well as in the recalculation and in the accounting tables *Only those GHG emissions and removals occurring as of the beginning of the 2nd commitment period must be reported, even though the activity may have started before the beginning of the 2nd commitment period.* *Note that all land-related emissions that need to be reported under Agriculture (see chapter 7.H and figure 7-24) must not be reported under the KP LULUCF activity to which the land is subject.*
Annex – para 2e	Justification to be provided that a pool is not a net source when omitting any carbon pool (in the NIR) *In addition to exclusions from reporting based on this paragraph, net emissions from pools that are a source may be omitted from accounting if the C pool is demonstrated to be insignificant, i.e. net emissions do not exceed 0.05% of national total emissions (excluding LULUCF) and are smaller than 500 kt CO_2 eq. The total of all sources excluded must remain below 0.1% of total national emissions*

Decision 2/CMP.8, annex II. "*Information on land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in annual greenhouse gas inventories"*	
Annex – para 2f	When the natural disturbance provision is applied, information is to be provided: (a) Showing that all lands subject to natural disturbances are identified (in the CRF tables) (b) On how annual emissions resulting from natural disturbances and subsequent removals during the commitment period are estimated and excluded from the accounting (in the NIR; trigger test in CRF tables 4(KP-I)A.1.1 and 4(KP-I)B.1.3) (c) Demonstrating that the events or circumstances were beyond the control of, and not materially influenced by the Party (in the NIR) (d) Demonstrating efforts taken to rehabilitate, where practicable, the land (in the NIR) (e) Showing that emissions associated with salvage logging were not excluded from accounting (in CRF tables 4(KP-I)A.1.1 and 4(KP-I)B.1.3) (f) Showing that no land-use change has occurred during the 2nd commitment period on lands for which the provision is applied (in CRF tables 4(KP-I)A.1.1 and 4(KP-I)B.1.3) and explaining the methods and criteria for identifying any future land-use changes on those land areas ✓ *See section on Natural Disturbances (see section VII.H.3)*
Annex – para 2g	On HWP, information is provided on: (a) Activity data (i.e. industrial roundwood) removed from domestic forests, for domestic consumption and for export (in CRF table 4(KP-I)C) (b) Note that also country-specific methods must implement the so-called Production Approach (c) Methodologies and half-lives applied (in the NIR; half-lives in CRF table 4(KP-I)C) (d) If the FMRL is based on a projection, whether emissions from HWP originating from forests prior to the start of the 2nd commitment period, have been included in the accounting (in the CRF table 4(KP-I)C) (e) How emissions from HWP accounted for the 1st commitment period have been excluded from the accounting of the 2nd commitment period (in the CRF table 4(KP-I)C) (f) Showing that HWP originating from deforestation are accounted for on the basis of instantaneous oxidation (in the CRF table 4(KP-I)C) (g) Showing that CO_2 emissions from HWP in solid waste disposal sites, where these emissions are separately accounted for, and CO_2 emissions from wood harvested for energy purposes, fuelwood and charcoal, have been accounted on the basis of instantaneous oxidation (in the CRF table 4(KP-I)C) Showing that HWP imported or originated from imported industrial roundwood are not accounted for (in the CRF table 4(KP-I)C)
Annex – para 3	Information to be provided on factoring out of removals (in the NIR) *For Article 3.4 activities, the net-net accounting addresses the factoring out of removals from accounting since the removals are included in both the actual GHG estimates of the current year and the base year/reference level. For Article 3.3 activities no methods are available to factor out removals due to N and CO_2 fertilization, if any.*
Annex II – paras 4a, 5a and 5b	Provide in the NIR, information demonstrating that each ARD activity has occurred since 1 January 1990 and is direct human-induced; and that FM and each elected activity has occurred since 1 January 1990 and is human-induced *As per good practice the national definitions of each activity and the hierarchy among the following elected activities: CM, GM and RV should be reported.* *Further, in case the country definition of FM excludes managed forest areas from accounting, e.g. when a narrow definition of FM is applied, information should be reported on whether the exclusion of managed forest areas results in an unbalance in accounting e.g. the emissions in forest areas excluded from FM increase more (/decrease less) than in forest areas included in FM*
Annex – para 5c	Information demonstrating that GHG emissions and removals accounted for under Article 3 para 3 activities are not accounted for also under any Article 3 para 4 activities (in CRF table 4(KP-I)A.2.1) *Such demonstration is achieved when the national system is proven to avoid any double counting of areas*

Decision 2/CMP.8, annex II. "*Information on land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in annual greenhouse gas inventories"*	
Annex – para 5d	How all emissions arising from the conversion of natural forests to planted forests are accounted for (in table NIR2.1) *This means that the national system has to be capable of identifying and tracking conversion of natural forests to planted forests, if any*
Annex – paras 5e and f	Information on how methodological consistency, including in historical GHG estimates[32], has been ensured between the FMRL and actual GHG emissions and removals, including by means of technical corrections (in the NIR) *See section on FMRL VII.H.2*
Annex – para 5g (i) and (ii)	If Carbon Equivalent Forests are reported, information to be provided on: a) all lands and associated carbon pools subject to CEF, including the geo-referenced location and year of conversion (in CRF table 4(KP-I)B.1.2); *Clearing and conversion of paired lands need not occur in the same year. Further, the conversion may be either antecedent or posterior to the clearing, although it must occur in the same commitment period.* b) Demonstrating that the forest plantation was first established through direct human-induced planting and/or seeding of non-forest land before 1 January 1990, or re-established after 1 January 1960 (in the NIR) *This means that in the 2nd commitment period the cleared forest plantation must be younger than 8 years, in case it has been first established on non-forest land after 1 January 1990, or younger than 60 years, in case it has been re-established* c) Demonstrating that a new forest of at least an equivalent area to the cleared forest plantation is established through direct human-induced planting and/or seeding of non-forested land that did not contain forest on 31 December 1989 (in the CRF table 4(KP-I)B.1.2) *This means that lands already reported under AR or D are not eligible for CEF* d) Demonstrating that the newly established forest will reach at least the equivalent carbon stock that was contained in the cleared forest plantation at the time of harvest, within the normal harvesting cycle of the cleared forest plantation, or, if not, a debit has been generated in FM (in the CRF table 4(KP-I)B.1.2) *C equivalence needs not to be achieved in the same commitment period in which the forest plantation is cleared.*

Table 7-91 provides checks that reviewers should consider in the review of KP-LULUCF activities in the CRF tables.

Table 7-91
Checks for Consistency Among the KP-LULUCF CRF Tables

Checks	*Action by the ERT, tasks*
CRF table NIR-1	In table NIR-1, check for completeness in reporting of C pools and associated GHG emissions and removals and consistency in the coverage reported in table NIR-1 and the activity-specific reporting tables
CRF table NIR-2	Check for each activity if, (a) area change values refer to changes occurring in the reported year only (note that cumulative values of area changes are reported in the background tables) (b) the total area reported at the end of the year (row 18) is equal to that reported for that activity in the background tables. (c) the total area reported at the end of the year (row 18) is equal to the area reported for that activity in the following year, as the total area of the activity at the end of the previous year (column J).
	Further, note that: (a) D lands cannot be transferred to any other activity (b) AR and FM lands may only be transferred to D (c) CM, GM, RV, WDR lands: (i) Cannot be transferred to D (because they do not contain forest)

[32] Historical GHG estimates refer to estimates of historical years used for constructing the FMRL.

Checks	*Action by the ERT, tasks*
	-(ii) Can be converted to forest through transfer to AR, or to FM only in cases where the CEF provision is applied (i) Can be transferred to another 3.4 activity, except WDR (d) Forest land not subject to ARD or FM is reported under "Other" and its conversion to (i) Another land use is reported as a transfer of area from "Other" to "Deforestation" (ii) Anothermanagement activity is reported as a transfer of area from "Other" to "Forest management"
CRF tables 4(KP-1)A.1, 4(KP-1)B.1 and 4(KP-1)B.3	In tables 4(KP-I)A.1 and 4(KP-I)B.1 check if the total area reported in column C, for land subject to natural disturbances is equal to the total area reported in column E in tables 4(KP-I)A.1.1 and 4(KP-I)B.1.3, respectively (if the Party has applied the ND provisions). Further, check if the value reported in column Z (Net carbon stock change in HWP) is equal to the value reported in column L (net change) of table 4(KP-I)C for the respective activity
	In tables 4(KP-I)A.1.1 and 4(KP-I)B.1.3 check if the disturbances reported are of the same type (e.g. wildfires, pests, extreme weather events, geologic disturbances) as those included in the BL and margin calculation, for AR and FM respectively. (Note that if the disturbance type was not included, you should investigate if emissions associated with that type of disturbance have been included in the FMRL. In case the disturbance type has been included in the FMRL, it cannot be excluded from accounting because it will result in an expectation of credits. If this type of disturbance was not included in the FMRL, it can be excluded from accounting because such an exclusion will not result in an expectation of credits)
	Also, check if: (a) A recalculation of GHG emissions has determined a different result of the trigger test in any of the commitment period years; (b) The background level and margin values have been recalculated and in such a case check if the trigger test has a different result in any of the commitment period years. (c) Burnt areas are consistent with areas disturbed in the year reported for the same activity in tables 4(KP-I)A.1, 4(KP-I)A.1.1, 4(KP-I)B.1, 4(KP-I)B.1.3, respectively. *Further, check if, in tables 4(KP-I)A.1.1 and 4(KP-I)B.1.3:* (d) The area in column D corresponds to the AR/FM land disturbed each year (from 2013 up to the current inventory year); (e) The area in column E corresponds to the AR/FM land disturbed each year from which GHG emissions and removals associated with disturbances are estimated for the current inventory year. Note also that an area disturbed two or more times during the commitment period will be reported in this column only once, i.e., under the latest year in which it has been disturbed.(See box 7-12 for an example on how to report emissions from natural disturbances)
CRF table 4(KP-1)B.1.2	*In table 4(KP-I)B.1.2, for each subdivision, check if:* (a) The area of the new plantation/established forest (column G) is equivalent, or exceeds, the area of the corresponding plantation harvested and converted (column B). If the area is smaller, the country must either report, under FM, additional area converted to new forest; or to move under D the area of the forest plantation harvested and cleared and under AR the area of the new plantation (b) the age of the new plantation (column H) is equal, or exceeds, the normal harvesting cycle of the corresponding plantation harvested and converted (column C), and in such a case check if the carbon stock accumulated (column I) is equal or larger than the carbon stock at harvesting (column C). If the C stock is smaller, the country must either report, under FM, additional area converted to new forest containing additional C stock or account for a debit equivalent to the difference between the two carbon stocks (column D minus column I) in row 22 of the accounting table. The one exception to this scenarios, is in the case the expected C accumulation in the forest plantation has been included in the projected FMRL no values must be reported in row 22 of the accounting table
CRF table 4(KP-I)C	In table 4(KP-I)C, check if the harvested quantity for each of the following five categories: wood originating from land subject to AR; wood originating from land subject to D; wood originating from land subject to FM; wood originating from land deforestation events; and wood originating from other treed lands (e.g. cropland)); has been correctly reported, and if the quanitites reported, and the total harvest, correspond to the quantitites (as reported in the NIR) used for estimating C stock changes in biomass.

Checks	*Action by the ERT, tasks*
	- Note that if HWP from AR or FM cannot be differentiated, it is conservative and in line with good practice to assume that all HWP originate from FM. Further, check consistency with HWP data reported to FAO[33] and if HWP produced with imported industrial roundwood have been excluded from accounting, which is consistent with good practice?
CRF table 4(KP-II)3	In table 4(KP-II)3, check if indirect N_2O emissions have been included (Indeed, this table does not limit reporting to direct N_2O emissions, although does not refer to indirect N_2O emissions
CRF table 4(KP-II)4,	In table 4(KP-II)4, check if CO_2 emissions have been reported, and in such a case check that these emissions have not been included as C stock losses in the relevant background table and therefore double counted
Other	Check that, with the exception of CH_4 emissions from rice cultivation, which needs to be reported under the agriculture sector, all CH_4 emissions from drained and rewetted organic soils are reported in CRF table 4(KP-II)2 under the relevant KP LULUCF activity occurring on the land Direct and indirect N_2O emissions from soil organic matter in cropland and grazing land are reported under the agriculture sector, while other KP LULUCF activities are reported in CRF table 4(KP-II)2 (organic soils) and in CRF table 4(KP-II)3 (mineral soils)

Box 7-13
Calculating GHG emissions and removals from natural disturbances

The following describes how to calculate GHG emissions from natural disturbances. For example, in inventory year 2015, a country that considered only forest fires as natural disturbances will report in CRF table 4(KP-I)A.1.1. and/or 4(KP-I)B.1.3:

(a) In column D, row 16, the area of AR/FM land burnt in the year 2015 (as a single total or disaggregated in additional rows) and, in column E, the same area

(b) In column D, row 14, the area of AR/FM land burnt in the year 2014 (as a single total or disaggregated in additional rows) and in column E, the area that has not been disturbed again in 2015 and from which emissions (column J), as well as subsequent removals, associated with disturbances, are estimated also for the current year

(c) In column D, row 12, the area of AR/FM land burnt in the year 2013 (as a single total or disaggregated in additional rows) and, in column E, the area that has not been disturbed again, neither in 2014 nor in 2015, and from which emissions (column J), as well as subsequent removals, associated with disturbances, are estimated also for the current year)

2. The FMRL and its technical correction

276. FM is accounted for by using a Forest Management Reference Level (FMRL) as a benchmark value to assess credits and debits resulting from FM. The FMRL corresponds to the average annual net emissions from FM in the commitment period, against which the net emissions reported for FM in the commitment period are compared.

277. Parties have calculated their FMRL value which, after review, has been inscribed in the Appendix to the annex to decision 2/CMP.7. The FMRLs have been calculated by either projecting historical emissions and removals or simply using their historical level as the business as usual (BAU) scenario of expected emissions and removals in absence of the mitigation action. This has materialized in three approaches applied for the definition of the FMRL, as indicated in table 4(KP-I)B.1.1:

(a) "Business-as-usual projections"

(b) "Base year"

(c) "Zero at 1st January 2013 (*Note that, applied to a BAU scenario, this means that forest land is assumed at equilibrium, as for a normal forest i.e. a forest where annual C stock losses equal to annual C stock increments*).

[33] Consistency between the activity data reported in CRF table 4(KP-I)C and the data reported to international organizations, particularly FAO (see http://www.fao.org/faostat/en/#home).

278. Where the FMRL is based on a projection, it is good practice for the country to provide in the NIR the following information:

(a) The main factors responsible for a higher (or lower) sink during the commitment period, as compared to the FMRL and whether the accounting quantity (AQ = FM - FMRL) is consistent with them, with the aim to show that the AQ can be explained as deviations in policy assumptions compared to those included in the FMRL, rather than in differences in the factors/parameters, including increments, used in the FMRL and in the actual GHG emissions and removals (see page 2.97 of the *2013 IPCC KP Supplement*);

(b) Showing that the model used to calculate the FMRL can reproduce the data for FM (or FL-FL) for the historical period reported in the FMRL submission, i.e. a time period not affected by deviations from policy assumptions under the BAU scenario (see page 2.98 of the *2013 IPCC KP Supplement*).

279. In case of methodological inconsistencies between the FMRL and the GHG estimates of FM or of FL-FL, if data from FL-FL have been used to calculate the FMRL, a technical correction (TC) has to be applied to the FMRL to ensure the methodological consistency. The TC is a net value of emission/removal that is added to the original FMRL **at the time of accounting** to ensure that the accounted emissions/removals do not include the impact of methodological inconsistencies: Technical Correction (TC) = FMRLcorr – FMRL.

280. Although the TC is to be applied when accounting (i.e. annually or at the end of the commitment period, depending on the period for accounting selected by the Party), it is good practice for Parties to assess annually the need for a TC by following the checklist provided in **table 2.7.1** of the *2013 IPCC KP Supplement*[34]. Further, in the initial review the ERT has to assess if any inconsistencies noted in the FMRL TAR has been addressed through a TC (see table 7-92).

281. If the Party has not applied a TC, although a methodological inconsistency is noted by the ERT, a condition in table 2.7.1 is met, or has been noted in the FMRL TAR, the ERT should either provide a recommendation to address the issue (if the review does not occur in an accounting year) or list the issue as a potential problem (if the review is in an accounting year) that, if unresolved at the end of the review, leads to a question of implementation (see box 3-4). This is because although the ERT cannot apply an adjustment to the FMRL, the Party has not fulfilled its reporting requirement i.e. to apply a TC to ensure methodological consistency between the FMRL and actual GHGI estimates.

282. If the Party has applied a TC, although the TC does not ensure methodological consistency because it is incorrect or incomplete (i.e. does not address all issues noted by the ERT and/or in the FMRL TAR), the ERT should either provide a recommendation to address the issue (if the review does not occur in an accounting year) or list the issue as a potential problem (if the review is in an accounting year) that, if unresolved at the end of the review, leads to an adjustment (see box 3-3).

Table 7-92
Checks Related to Identification of a Technical Correction

Checks	*Action by the ERT, tasks*
Is a TC needed?	Any methodological issues/inconsistencies (e.g. the FMRL model's outputs are not capable of reproducing the historical data reported for FM or FL-FL in the FMRL – see pages 2.95, 2.97 and 2.98 of the *2013 IPCC KP Supplement*) have been identified in the FMRL TAR[35] (applicable to the initial review only);
	Has the Party identified in the NIR any methodological inconsistency between the FMRL and its reporting on FM?

[34] Check list to detect methodological inconsistencies and the need for technical correction.
[35] http://unfccc.int/bodies/awg-kp/items/5896.php.

Checks	*Action by the ERT, tasks*
	Does the ERT identify a methodological inconsistency between the FMRL and the Party's reporting on FM?
Has a methodological inconsistency been identified between the FRML and the current estimates?	In the context of the FMRL, **methodological consistency** refers to the need for consistency between the methodological elements used in the FMRL construction and those used in the FM reporting Does one of the following conditions apply, in which case a TC is needed: (a) **Method used to construct the FMRL (models or elaboration of historical time series).** The method for constructing the FMRL has been already assessed in the FMRL TAR and needs not to be assessed again during annual reviews of the 2nd commitment period. However, a TC has to be applied by the Party for any inconsistency reported by the ERT in the FMRL TAR between the method/model outputs, i.e. the FMRL and the GHG inventory data. *If the Party has not addressed the inconsistency either by reporting in the NIR information that demonstrates the suitability of the model/method and/or data used to construct the FMRL the ERT should conclude that a TC is needed and will suggest how a TC can be calculated. E.g., by calculating the $FMRL_{corr}$ value using the model/methods used for FM or FL-FL in the current GHG inventory while applying the same policy assumptions used when constructing the FMRL.* (b) **Use of different methods/models for reporting GHG estimates[36] for FM or forest land remaining forest land after the adoption of the FMRL.** *If the method applied for estimating the actual GHG estimates for FM or FL-FL is not consistent with that used for constructing the FMRL the ERT should conclude that a TC is needed \. Note that the use of a new model may have required recalculation of the time series of historical data used for the construction of the FMRL. This brings you to the next issue of methodological inconsistency* (c) **Recalculation of historical data used to construct the FMRL.** If any of the data used in the construction of the FMRL (e.g. forest area, harvest amount, age-class structure, growth rate, species composition, rotation lengths, management practices etc.) have been recalculated, this will require the application of a TC. *Note that changes in the data values for years subsequent to the submission of the FMRL (i.e. 2010) do not require a TC since those changes may have been determined by the impact of policies and measures instead of by the method used for recalculating the time series* (d) **Changes in the reporting of pools/gases**. Inclusion in the reporting in the 2nd commitment period of a C pool or GHG source that was excluded from the FMRL construction requires a TC to include the pool or source in the FMRL. Due to the need to ensure methodological consistency, C pools included in the FMRL cannot be subsequently excluded, even if it is demonstrated that they are not a source of emissions during the 2nd commitment period (e) **Changes in the treatment of HWP**. A different treatment of HWP in the GHG reporting in the 2nd commitment period as compared to that applied in the construction of the FMRL, triggers a TC. *Note that because accounting rules for HWP have been decided after the submission of the FMRL, all Parties are expected to submit a TC to ensure methodological consistency in the treatment of HWP between the FMRL and the reporting in the 2nd commitment period*

[36] Including estimates of the HWP contribution and of the BL and actual GHG emissions and removals associated with disturbances.

Checks	*Action by the ERT, tasks*
	(f) **Treatment of ND**. A different treatment of ND in the GHG reporting in the 2nd commitment period as compared to that applied in the construction of the FMRL, may trigger a TC. *Because accounting rules for ND have been decided after the submission of the FMRL, Parties are expected to submit a TC. In particular:* *(i) If the Party has not elected to apply the ND provision and it has not excluded any emissions associated with ND from the FMRL, even though this may result in an expectation of net credits, a TC is neither needed nor applicable* *(ii) If the Party has not elected to apply the ND provision and it has excluded from the FMRL a portion of (or all) emissions associated with ND a TC is needed since the treatment of ND between the FMRL and the actual estimates differs. However, in case the Party does not make a TC to address the different treatment of ND an adjustment is neither needed nor applicable since the exclusion of ND emissions from the FMRL results in a conservative accounting* (iii) *If the Party has elected to apply the ND and the amount of emissions associated with ND included in the FMRL is smaller than the BL the Party has an expectation of net debits, a TC is needed since the treatment of ND between the FMRL and the actual estimates differs. However, in case the Party does not make a TC to address the different treatment of ND an adjustment is neither needed nor applicable since it results in a conservative accounting* (iv) *If the Party has elected to apply the ND and the amount of emissions associated with ND included in the FMRL is larger it has an expectation of net credits and therefore a TC is needed since the treatment of ND between the FMRL and the actual estimates differs. Further, in case the TC does not address the different treatment of ND an adjustment is needed*
Ensure that a TC is <u>not</u> applied under the following circumstances are met	By contrast, a deviation in **policy assumptions** from those assumed in the construction of the FMRL does not represent a methodological inconsistency. Also for CEF, given that emissions and removals from plantation harvesting and replanting of CEF are already included in the FMRL, although not associated to a change from the CEF_{hc} to the CEF_{ne} lands, and given that the GHG reporting of FM, which includes the effects of the CEF provision, will be accounted for against the FMRL, the decision to apply the CEF provision does not in itself trigger a TC
Is the TC correctly calculated?	Considering that the aim of the TC is to ensure consistency between the FMRL and the actual GHG estimates, including in the treatment of HWP and ND, the ERT should check: (a) If the method applied to the actual GHG inventory estimates has been applied also to the TC (b) If the same factors and parameters have been used for the actual GHG inventory estimates and the TC In case a different method is applied or a factor or parameter assumes different values under the same conditions, the ERT should check whether the difference in methods or factors/ parameter determines a difference in the level and/or trend of emissions. To perform such a check, the ERT has to compare GHG estimates for historical years as calculated for the GHG inventory and the TC. In case information on the TC does not include GHG estimates for historical data, the ERT should request the Party to provide such information. Then, if the historical GHG estimates for the GHG inventory and the TC do not coincide the ERT will request the Party to recalculate the TC or to ensure

Checks	*Action by the ERT, tasks*
	consistency of the TC and the GHG inventory, including by applying IPCC methods for ensuring time-series consistency (e.g. overlap with historical data) *Example 1: A Party applies the gain and loss method for actual GHG inventory estimates and the stock difference method for the TC. The actual GHG inventory estimates and the TC give different estimates for the time series 2000-2009. Under such a scenario, the ERT should ask the Party to either apply the stock difference method to the inventory or to apply the overlap method to reconcile the two historical GHG estimate time series, and consequently to ensure consistency between the GHG inventory and the TC* *Example 2: A Party uses increment factors stratified by age class and forest type as derived from historical forest inventories for the TC. However, for the actual GHG inventory estimates it uses increment factors derived from the latest GHG inventory. The two sets of increment factors are different, in particular the increment factors used for the GHG inventory are, on average, 10% higher for the same age class and forest type. Under such a scenario, the ERT should ask the Party to recalculate its TC by using the same set of increment factors used for the actual GHG inventory estimates*
Has the Party reported a consistent time series?	If the need for a TC has been identified, but a new model run could not be done by the Party, has time-series consistency been achieved by using one of the data-splicing methods in the 2006 IPCC Guidelines (e.g. using the "overlap" method (see para 14 of the annex to decision 2/CMP.7) between models results and data from the historical period (before the FMRL submission usually the time period 2000–2009)
Is reporting of the TC transparent?	Where a TC to the FMRL is calculated, has the Party reported the following information: (a) The rationale for calculating FMRLcorr (b) The methods used to calculate FMRLcorr (including all background data and parameters used) (c) The results (i.e. the FMRLcorr and the Technical correction value) and discussion of the differences between the FMRLcorr and the FMRL (causes and, where possible, for each cause the percent impact). And, where applicable, a comparison of recalculated estimates with previous estimates (see table 2.7.2 of the 2013 IPCC KP Supplement) (d) Complete information that demonstrate methodological consistency between FMRLcorr and FM GHG estimates

3. Natural Disturbances

283. Natural Disturbances (ND) are non-anthropogenic events or non-anthropogenic circumstances that cause significant emissions in forests and are beyond the control of, and not materially influenced by, the country. ND may include wildfires, insect pests and disease infestations, extreme weather events and geological disturbances. ND exclude harvesting and prescribed burning.

284. Emissions, and subsequent removals, associated with ND may be excluded from accounting because considered non-anthropogenic.

285. Because the FMRL has been established before the ND provision was agreed, Parties that have included in the FMRL an amount of emissions from disturbances to which it wishes to apply the ND provision, must substitute that amount of emissions from the ND with the BL corresponding to the disturbance types to which the ND provision will be applied. This is done through a TC of the FMRL (see table 7-93).

Table 7-93
Checks Related to Calculation of Emissions from Natural Disturbances

Checks	*Actions by the ERT, tasks*
Information on BL and margin	Has the following information been reported: (a) The BL[37] associated with annual natural disturbances that have been included in its FMRL (and/or BL associated with annual natural disturbances in AR lands) (b) How the BL has been estimated, and its consistency with the FMRL and the actual GHG inventory estimates (c) The type of natural disturbances included in the BL calculation[38] Information on how the BL avoids the expectation of net credits or net debits during the CP, including through the use of a margin, where a margin is needed. *Note that the avoidance of expectation may be tested by applying to the trigger test the same time series of data used for calculating the BL and the margin*
Methodologies to calculate emissions from ND	Regarding the methodologies to estimate the carbon stock changes and associated GHG emissions and removals associated with disturbances, is the Party consistent with the methods and tier level applied to each of the pools under FM and/or AR reported under KP. In case of an inconsistency, has the Party applied a technical correction to the BL included in the FMRL?
Legacy emissions	Are emissions from a disturbance event that are emitted in years subsequent to the year of the occurrence of the event included in the BL and margin calculation? Are those included in the trigger test? *For example, the Party has included the lagged emissions in the BL and has not included them in the emissions input for the trigger test. In such a case, there is an expectation of net credits and therefore the BL needs to be recalculated through a TC.* *Vice versa, if the Party has not included the lagged emissions in the BL although it does in the emissions input in the trigger test the Party has an expectation of net credits. In such a case, the lagged emissions must be excluded from the emissions input in the trigger text.* Are legacy emissions from an equivalent time period included in the BL and in the CP's estimates?
	For example, the time series of historical emissions from ND (e.g. 1990-2009) used for calculating the BL include the legacy emissions on lands disturbed from 1990 till 2008. On the other hand, the emissions reported in a year of the commitment period, e.g., 2017, include the legacy emissions in lands disturbed from 2013 to 2016 (4 years only). In such a case, to avoid the expectation of net debits during the commitment period, the Party may either:

[37] The BL is a single value that sum up all emissions associated with all natural disturbances subject to the ND provision.

[38] Note that the fact that the historical series used to construct the FMRL does not include the impact of a specific disturbance should not prevent the Party from applying the ND provision for the exclusion of emissions from that type of disturbance during the CP. Indeed, in this case the level of emissions included in the FMRL (and in the BL) from the specific type of disturbance is zero. On the other hand, if for a specific disturbance, some emissions have been included in the FMRL but not in the BL calculation, then future emissions from such disturbance cannot be excluded from accounting.

Checks	*Actions by the ERT, tasks*
	(a) *Limit the legacy emissions to be included in the calculation of the BL to those occurring from land disturbed during an 8 years period (e.g., 2002-2009). Although also all remaining legacy emissions are included in the FMRL; or* (b) *Exclude all legacy emissions from the BL calculation; although all legacy emissions are included in the FMRL (this option fully avoids any expectation of net debits)*
Assumption in the BL	Has the Party applied an appropriate assumption for the BL? *A 0 (zero) value for the BL implies that the Party assumes that all disturbances are considered out-of-human control. Such an assumption is reasonable for geological disturbances and partially for weather disturbances, however, it is not reasonable for natural disturbances where the human influence may be significant (e.g. forest fires). In the latter case, the ERT should recommend the Party to recalculate its BL since such assumption cannot be considered consistent with the definition of natural disturbances provided by decision 2/CMP.7*
Calculation of the BL and margin	The BL and the margin are calculated by using a historical time series of emissions associated with disturbances[39], Consequently the reviewer should check: (a) Is the time series complete, with no missing values, otherwise missing values may influence calculation of the BL/margin (b) Have the time series of different types of disturbances included in the BL have the same length (c) Has a recalculation of the historical time series been done? If yes, have the BL and/or the margin been recalculated through a TC? (d) If a recalculation of the BL has been done, has a technical correction to the FMRL been made to include the updated BL
Trends in ND	Are there any trends in the emissions from natural disturbances during the calibration period, or expected during the commitment period? Does the method applied for calculating the BL and its margin avoid the expectation of net credits or net debits? *For instance, in case there is an expectation that the area under AR or FM may change during the commitment period or between the calibration period and the commitment period, the BL and the margin need to be calculated on a per area basis. See example of such a calculation in Box 2.3.8 in the 2013 IPCC KP Supplement.*
Is reporting on ND transparent?	Further, when assessing the ND reporting, has the Party reported in the NIR the following information to enable the ERT to confirm: (a) If and how all AR and/or FM lands where the ND provision is applied are identified (section 2.3.9.2 of the 2013 IPCC KP Supplement) (b) How annual emissions resulting from disturbances and subsequent removals are estimated (section 2.3.9.3 of the 2013 IPCC KP Supplement) (c) No land-use occurred on lands for which the ND provision has been applied (section 2.3.9.5 of the 2013 IPCC KP Supplement)

[39] Note that in a country specific method, the time series to calculate the BL and the margin may also include the removals subsequent to disturbances. Such inclusion may better avoid the expectation of net credits or net debits.

Checks	*Actions by the ERT, tasks*
	(d) Subsequent removals during the commitment period have been excluded from accounting on the lands where emissions from ND have been excluded (section 2.3.9.5 of the 2013 IPCC KP Supplement) (e) ND were beyond the control of, and not materially influenced by, the Party (section 2.3.9.1 of the 2013 IPCC KP Supplement) (f) Efforts have been taken to rehabilitate, where practicable, the land for which emissions from ND have been accounted for (section 2.3.9.8 of the 2013 IPCC KP Supplement) (g) Emissions associated with salvage logging were not excluded from accounting (see section 2.3.9.3 of the 2013 IPCC KP Supplement)

4. Adjustment of KP-LULUCF activities

286. Adjustments for a KPLULUCF activity can be applied only at the point of time when it is accounted: annually, or at the end of the commitment period.

287. Adjustments cannot be applied retroactively for estimates that have been reviewed and accounted for, unless the emissions/removals have been recalculated.

288. Consequently, in the case of:

(a) Annual accounting:

i. Base year estimates may be adjusted:

a. In the review of the first year of the 2nd commitment period,

b. and in any year in which the Party submits recalculated estimates of the base year;

ii. Commitment period year estimates may be adjusted:

a. During the first review of that year;

b. and in any year in which the Party submit recalculated estimates of that year.

(b) Commitment period accounting: Base year and commitment period years are adjusted during the review of the last year of the commitment period only.

289. Commitment period years estimates, may be adjusted only if emissions are underestimated or removals are overestimated, while base year estimates may be adjusted if the emissions are overestimated or removals underestimated (which means that the adjustment is applied only if it results in more conservative estimates).

290. To ensure conservativeness of adjusted estimates the general principle, see the section VII.H, is to calculate the adjusted estimates using the methods given in Table 1 of Technical guidance on methodologies for adjustments under Article 5.2 of the Kyoto Protocol (Annex to Decision 20/CMP.1) and multiply the estimate with the appropriate conservativeness factor given in Tables 3, 4, 5 and 6 of Annex II to Decision 4/CMP.4. Tables 3 and 4 are for the review of the initial report (i.e. the calculation of the assigned amount). Tables 5 and 6 are for estimates of Base year, FMRL and CP years.

291. The FMRL cannot be subject to adjustment while the TC can be adjusted only if:

(a) Historical data (i.e. pre-2010 data) on FM or forest land remaining forest land used to establish the FMRL are recalculated and the recalculation has not resulted in a TC to the FMRL,

(b) A methodological inconsistency was detected in the initial TC of the FMRL that has not been addressed in the implemented TC.

292. Further, the TC can be adjusted only if the inconsistency has been determined to lead to the issuance of more credits or less debits than a consistent accounting would have determined (conservativeness).

293. Adjustments should be applied at the level at which the problem is identified: for KP-LULUCF activities consideration should be given to the spatial disaggregation of the estimates, where relevant or applicable. Specific elements to be considered when applying adjustments to LULUCF activities are given in section IV.D in the Technical guidance on methodologies for adjustments under Article 5.2 of the Kyoto Protocol (annex to decision 20/CMP.1, as updated by decision 4/CMP.11).

294. Adjustments for LULUCF activities only impact on the issuance of removal units from these activities, or the cancelling of other accounting units if the activity is a net source, not the eligibility of the Party to use the mechanisms of the Kyoto Protocol. The criteria for cases of failure to submit information relating to GHG estimates of activities under Article 3.3 and 3.4, of the Kyoto Protocol are given in decision 18/CMP.1 as modified by decision 4/CMP.1. A Party cannot issue removal units for a LULUCF activity if the adjustment exceeds 9 per cent of the absolute value of the "adjusted net estimate for that activity minus the submitted net estimate for the activity, divided by the sum of the absolute values for all submitted components for that activity, multiplied by 0.18" (the formula is given in the annex to decision 18/CMP.1).

Annex I

Reference documents

"Definitions, modalities, rules and guidelines relating to land use, land-use change and forestry activities under the Kyoto Protocol". Annex to decision 2/CMP.7. Available at http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf#page=11.

"Good practice guidance and adjustments under Article 5, paragraph 2, of the Kyoto Protocol". Annex to decision 20/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=21.

"Guidance for reporting information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol." Decision 6/CMP.9. Available at http://unfccc.int/resource/docs/2013/cmp9/eng/09a01.pdf#page=15.

"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14.

"Guidelines for review under Article 8 of the Kyoto Protocol". Annex to decision 22/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex to decision 15/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54.

Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories". Annex to decision 24/CP.19. Available at http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=4.

"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention". Annex to decision 13/CP.20. Available at http://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf#page=6.

"Implications of the implementation of decisions 2/CMP.7 to 4/CMP.7 and 1/CMP.8 on the previous decisions on methodological issues related to the Kyoto Protocol, including those relating to Articles 5, 7 and 8 of the Kyoto Protocol, part I: implications related to accounting and reporting and other related issues". Decision 3/CMP.11. Available at http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf#page=5.

"Implications of the implementation of decisions 2/CMP.7 to 4/CMP.7 and 1/CMP.8 on the previous decisions on methodological issues related to the Kyoto Protocol, including those relating to Articles 5, 7 and 8 of the Kyoto Protocol, part II: implications related to review and adjustments and other related issues". Decision 4/CMP.11. Available at http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf#page=30.

"Information on land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in annual greenhouse gas inventories". Annex II to decision 2/CMP.8. Available at http://unfccc.int/resource/docs/2012/cmp8/eng/13a01.pdf#page=14.

Intergovernmental Panel on Climate Change. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories.* Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html.

Intergovernmental Panel on Climate Change. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. Available at http://www.ipcc-nggip.iges.or.jp/public/kpsg.

Intergovernmental Panel on Climate Change. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. Available at http://www.ipcc-nggip.iges.or.jp/public/wetlands/index.html.

Kyoto Protocol to the United Nations Framework Convention on Climate Change. Available at: http://unfccc.int/resource/docs/convkp/kpeng.pdf.

"Modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol." Annex to decision 13/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=23.

The Cancun Agreements: Land use, land-use change and forestry". Decision 2/CMP.6. Available at http://unfccc.int/resource/docs/2010/cmp6/eng/12a01.pdf#page=5.

Annex II

Acronyms and abbreviations

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
AFOLU	agriculture, forestry and other land use
Annex I Parties	Parties included in Annex I to the Convention
AR	afforestation and reforestation
ARD	afforestation, reforestation and deforestation
ARR	annual review report
BAU	business as usual
BL	background level
C	confidential
CaO	calcium oxide
CEF	carbon equivalent forests
CKD	cement kiln dust
CH_4	methane
CM	cropland management
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
C/N ratio	carbon to nitrogen ratio
CO	carbon monoxide
CO_2	carbon dioxide
COP	Conference of the Parties
CP	commitment period
CR	centralized review
CRF	common reporting format
D	deforestation
DOM	dead organic matter
DR	desk review
EAF	electric arc furnace
EF	emission factor
ERT	expert review team
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
F-gas	fluorinated gas
FM	forest management
FMRL	forest management reference level
FMRLcorr	corrected forest management reference level
FOD	first-order decay
GHG	greenhouse gas
GM	grassland management
HFCs	hydrofluorocarbons
HWP	harvested wood products
ICR	in-country review
ICSCF	implied carbon stock change factor
IE	included elsewhere

IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
iVTR	GHG inventory virtual team room
KCA	key category analysis
LR	lead reviewer
LULUCF	land use, land-use change and forestry
MSW	municipal solid waste
NA	not applicable
ND	natural disturbances
NE	not estimated
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
N_2O	nitrous oxide
NFI	national forest inventory
NO_X	nitrogen oxide
Non-Annex I Parties	Parties not included in Annex I to the Convention
ODS	ozone-depleting substances
PFCs	perfluorocarbons
PMF	provisional main findings
QA	quality assurance
QC	quality control
QO	quality officer
RITS	review issues tracking system
RV	revegetation
RO	review officer
SEF	Standard Electronic Format
SF_6	sulphur hexafluoride
SIAR	Standard Independent Assessment Report
SP	Saturday Paper
SOC	soil organic carbon
SOM	soil organic matter
SP	Saturday Paper
SWDS	solid waste disposal site
TACCC	transparency, accuracy, completeness, comparability, consistency
TAR	technical assessment report
TC	technical correction
UNFCCC	United Nations Framework Convention on Climate Change
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*