Review Comments by Governments on Second Order Draft of Volume 1 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5236	1	1	1	424	General comment for entire volume 1, chapter 1: This section neglects to also convey that compilation of a TACCC inventory report or document is an important foundation to facilitate preparation of future inventories. A well, documented inventory can more easily be updated and enable more efficient use of resources. Documentation of the compilation processes can facilitate work of future compilers as well.	United States of America	Accepted with modification	TCCCA is discussed in section 1.4 as the overarching goal of inventory arrangements. Opening paragraph text in 1.4A has been revised to better reflect the points in this comment.
806	1	1	34	35	Change a lower case letter to a capital letter for the word used at the beginning of the sentence	Thailand	Accepted	OK: Edited.
1786	1	1	58	242	In the approved outline, it has been set forth to update and clarify the concept of "anthropogenic emissions and removals". However, there are no relevant texts in this report. This part is what the inventory developers need to know about accurately, and represents the basic information to be given integrally and the basic concepts to be clearly stated in the volume of overview. It is suggested to add those texts and descriptions in accordance with the decision at the 44th Plenary Session of the IPCC.	China	Accepted	Text added to section 1.1 is re-added to the text that was in the FOD to address this issue, but was mistakenly excluded from the SOD: "The 2019 refinement provides supplementary good practice guidance for estimating and reporting anthropogenic greenhouse gas (GHG) emissions and removals resulting from land use, land-use change and forestry (LULUCF) activities in chapter 2 volume 4 intended to reduce the impacts of natural disturbances on trends capturing the impacts of human activities, building on chapter 2.3.5 of the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (KP Supplement)."

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
1788	1	1	58	242	The newly added “national GHG inventory arrangement” mainly refers to the relevant regulations required of developed countries for annual inventory preparation (the inventory preparation mechanism in the guidelines as seen in Decision 24/CP.19) under the existing Convention mechanism, with the examples taken only from UK and South Africa, which are not applicable for most developing countries. It is suggested to make it clear in the section “institutional arrangement” that various national circumstances should be respected, and highlight that most developing countries independently arrange inventory preparation mechanisms for and by themselves according to their own capacity, and thus delete such expressions as “single national entity” that only apply to the mechanism arrangements for developed countries. Additionally, the “datasets and flow”, in its current form, gives no substantial guidance to data collection by countries. To enhance flexibility, it is suggested to increase the number of cases from developing countries. Meanwhile taking into account the realistic data collection at national level, it is suggested to change “annual” to “regular” data collection to better guide developing countries in collecting data based on their national circumstances.	China	Accepted with modification	Concept of national circumstances is addressed already in section 1.4.1. Revised text in section 1.4.1.4 to remove some langauge introducing the role of SNE, but have not removed the term from the chapter. The SNE term is used as a generic term to define an important role needed in the design of GHG inventory activities. This role is in existence in a number of developed and developing countries even if it is called something different. Data collection is addressed in detail in Chapter 2, while section 1.4.2 addresses the managment of data collection process as part of the overall national GHG inventory arrangements.
5238	1	1	58	409	Throughout, be clear on what is good practice and what is just an example. It is difficult to tell in many places.	United States of America	Accepted	The term "good practice" is only used in the introduction to the chapter and it is explained there that the rest of the chapter provides only suggested approaches and examples for inventory arrangements.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5240	1	1	60	404	The information on national arrangements is misplaced, should be streamlined and reorganized. It should be reframed in the context of objectives of this document (methodological guidance), in particular data collection. The section could be reframed as "Practical Considerations in Developing Arrangements to Compile Inventories" or "Practical Considerations for Arrangements or Management System to Compile National GHG Inventories." The overall new information included on national arrangements should be streamlined. Streamlining suggestions: The intro text can be refined a proposed 1.5 integrating text from 1.5.1 and can list key considerations from other new headers as bullets (i.e. elements countries should consider in developing arrangements to support continuous inventory compilation for diverse uses, including domestic and international reporting. The bullets following a short intro as section 1.5 based on content inserted by authors, could be streamlined to include a bullet on roles and responsibilities, a bullet on uses of the inventory (replacing commitments), a bullet on documentation of arrangements and finally a bullet on Education, Awareness raising and Public Access to information." The bullets could integrate text that is now spread across those relevant subsection within the new section 1.5. For example roles and responsibilities would streamline and include text on inventory agency (1.5.1.5), compilation experts (1.5.3), and roles and responsibilities (1.5.3.1).	United States of America	Accepted with modification	Section reorganized to separate institutional arrangements from inventory management tools. Introduced overarching purpose of inventory arrangements as supporting achievement of TACCC. Title of section(s) has not been changed. Improved logical order of sections on inventory institutional arrangements (i.e., inventory roles) to all fall under section 1.4.1, including compiling experts. Section on inventory management tools has been separated into new section at end of chapter and labeled as being non-prescriptive and illustrative. Section on tools has not been moved to an annex (but instead a separate section). The revised structure of the text is more logical and less prescriptive.
5240 (cont.)					Further all examples inserted such as Tables 1.1-1.8) could be listed as management tools in a text box (i.e. providing list) and then inserted in an annex vs. in the content of section 1.5. While the intro indicates its intent to be non-prescriptive, as presented the examples and information does appear prescriptive and biased towards certain approaches to arrangements for one country. Concerns with specific language is noted below as other comments. The examples should be framed as management tools and moved to the annex and include links to other readily available materials.			

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5242	1	1	60	404	The inventory compilation steps in the current draft of the 2006 GL has been removed. The section on compiling an inventory was useful to convey general steps that are repeated in compiling an inventory each cycle. This information should be reinstated. The arrangements or inventory management system supports these overarching tasks, and associate procedures.	United States of America	Noted	Section 1.5 of original 2006 IPCC Guidelines has not been removed because there was no refinement, and so was not included in SOD.
5244	1	1	63	63	Insert “considered” before “prescriptive”	United States of America	Accepted	Text corrected.
9040	1	1	63	64	These sentences are difficult to read. Suggest changing the two lines to: This guidance provides suggested approaches and examples of national GHG inventory arrangements.	Canada	Accepted	Text rewritten and corrected.
808	1	1	63		Ambiguous texts “It instead, it provides..”	Thailand	Accepted	Text rewritten and corrected.
5246	1	1	66	67	The phrase in line 66-67 "…improves over time to a state that they can fully inform national and international stakeholders...and meet reporting requirements." as framed suggests that an inventory cannot be useful for some time, which is not true. An inventory applying basic methods (i.e. Tier 1) is still useful and informative. Would also say find alternative framing for "stakeholders" in particular in sentence 67-70 on "inform national and international assessments" vs. "national and international stakeholders" in this context.	United States of America	Accepted with modification	Revised sentence to remove mention of stakeholders and more generally refer to providing useful information.
5248	1	1	67	70	The sentence starting "It is therefore beneficial..." should be revised to say "It is beneficial for compilation teams to consider	United States of America	Accepted	Sentence deleted as part of rewriting paragraph.
5250	1	1	72	91	Text box does not highlight basic broader benefits. Seems that this box could also be placed in Ch. 2 on data collection. The data required to apply Tier 1 methods is also often basic economic data that should be collected regardless of the inventory. The inventory staff should also communicate important uses back to data providers/suppliers and this could also be placed in Ch. 2 vs. Ch. 1.	United States of America	Accepted with modification	Revised Box title to remove mention of benefits, which are discussed earlier in chapter and added section to box addressing linkages with national statistical systems. And added text that states how GHG inventory process should be developed in an integrated fashion with other national statistical activities.
5252	1	1	72	91	Box 1.1 is unnecessary, and suggests a broadening of GHG inventory arrangements that is not essential for the development of a GHG inventory and could be seen as overly burdensome. It could be helpful if it was instead characterized as examples of potential data sources and moved to later in this chapter or in the data collection chapter.	United States of America	Accepted with modification	Introduction to Box was added that clarified the discussion there is about linkages and integration of GHG inventory processes that will reduce the burden of inventory compliation.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9042	1	1	77	77	“(e.g. Cities)” has limited application; include states, provinces and territories.	Canada	Accepted	Text added as per comment.
5254	1	1	92	92	Use of "Governance" also goes beyond mandate of authors. See comment on reorganizing and streamlining. Information included here in 1.5.1 overlaps with and can be added to background in 1.5.	United States of America	Accepted	Word "governance" deleted from section title.
4672	1	1	92		Could the IPCC provide some discussion on the importance of the sustainability of the GHG inventory process? It is important for the IPCC to recognize that not all countries have the basis for establishing the necessary institutional arrangements, and they are very much ad hoc.	Japan	Accepted	Text added to section 1.4.1 on sustainable institutional arrangements.
9044	1	1	93	93	Wordy, suggest to remove “the different”.	Canada	Accepted	Phrase deleted.
9046	1	1	95	95	Change “examples common” by “examples of common”.	Canada	Accepted with modification	Sentence deleted as part of rewriting paragraph.
5256	1	1	105	105	Commitments can carry different meaning in the context of reporting. This content appears to focus on priority uses of the inventory (i.e. internal reporting obligations.	United States of America	Accepted with modification	Term "commitments" replaced with "GHG Inventory Objectives".
1790	1	1	105	105	It is suggested to change “commitments” to “obligations”, since the emphasis here lies on the reporting obligations, yet “commitments” is more like goals, which easily leads to ambiguity.	China	Accepted with modification	Term "commitments" replaced with "GHG Inventory Objectives".
5258	1	1	105	114	"Commitments" is not an appropriate term to use here. It is too narrow in its legal meaning and the intent of the section is not limited to describing internationally binding obligations, but rather activities that the national GHG inventory supports. As such we propose saying "activities that the national GHG inventory supports" instead of "commitments."	United States of America	Accepted with modification	Term "commitments" replaced with "GHG Inventory Objectives".
9048	1	1	105	404	The proposed new text, tables and figures are overly prescriptive; the linkage to principles of transparency, consistency, comparability and completeness is unclear. In addition, many topics are beyond the scope of actual methodological guidance. A similar comment on lines 131-137 examplifiy this issue.	Canada	Accepted with modification	Revised text in introduction to section 1.4a that refers to TACCC and ties inventory arrangements as contributing to achieving them and sustainable inventory preparation.
5260	1	1	106	106	There needs to be a comma (",") after the word "around" in line 106 to complete this thought.	United States of America	Accepted with modification	Text revised for readability.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9050	1	1	106	107	Wordy and difficult to understand, suggest to change sentence to: "A useful concept to introduce, coordinate and prioritise GHG inventory activities is a list of monitoring and reporting requirements, which may also help other decision making related to the GHG inventory data."	Canada	Accepted with modification	Text revised for readability.
5262	1	1	106	129	It is unnecessary to include a table on commitments. In addition, it is not good practice to use such a table to prioritize GHG inventory activities, as these should be prioritized based on IPCC good practice.	United States of America	Accepted with modification	Term "commitments" no longer used, and section refers to inventory objectives and how/if objectives interact/conflict/mesh with IPCC good practice. Discussion of prioritization has also been removed. But table has been retained as a useful example.
5264	1	1	108	108	There is reference to an "analysis" at the start of line 108, which an analysis has not been previously mentioned in this section. This paragraph begins by discussing how introducing and using monitoring/reporting commitments are useful. As such, to be consistent with phrasing from line 112, this is the analysis being referenced in line 108 should say "commitments analysis".	United States of America	Accepted with modification	Term "analysis" has been removed and text in this section has been rewritten.
810	1	1	114	114	Typing error on "…Table 1.1."	Thailand	Accepted	Cross references corrected.
6592	1	1	114	114	Editorial: Replace the "Table 1.1" with "Table1.2" in the end of line 114.	Russian Federation	Accepted	Cross references corrected.
9052	1	1	114	114	Change 1.1 to 1.2.	Canada	Accepted	Cross references corrected.
5266	1	1	116	116	For Table 1.1, in line 116, do other gases refer to precursor pollutants? (e.g., NMVOCs, NOx). If so, recommend specifying. If that was not the intend, recommend adding them as examples to line 116	United States of America	Accepted with modification	Precursors mentioned in note 2 under Table 1.1.
5268	1	1	118	118	Description of temporal resolution could be more clear with an example included in the footnote description on line 118. Recommend adding an example, (e.g. annual; March-December). It is somewhat confusion the distinct differences between elements lines 118 through 120 related to time	United States of America	Accepted with modification	A note under Table 1.1 clarifies with an example the meaning of temporal resolution. Explanations for 'time series span' and 'reporting frequency' are included in notes under Table 1.1.
6594	1	1	122	122	There is no reference to footnote 8 in the text of Table 1.1. It is proposed to delete the footnote 8 to the Table 1.1	Russian Federation	Accepted	Note numbering corrected and extra note deleted.
6596	1	1	123	124	Table 1.2, column "Reporting Frequency": Add "Every four years and..." in front of "...Biennial" in the cell for the row "UNFCCC: National Communication and Biennial Report".	Russian Federation	Accepted with modification	Table revised to separate NC from BUR reporting frequency.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9054	1	1	130	137	The section on the “Organization Structure” and its figure is overly prescriptive and does not provide useful guidance. At minimum, it is recommended to revamp and provide guidance on important elements of an effective organizational structure. Deletion of this section should also be considered unless the authors of the 2019 refinement can convincingly demonstrate that this guidance will improve the quality of GHG estimates being produced.	Canada	Accepted with modification	Refined language for section to be illustrative and not prescriptive.
5270	1	1	130	162	Should be noted under documentation of arrangements in proposed streamlined text for future compilation cycles to facilitate replication of compilation steps. The institutional diagram should be moved to annex to this chapter as way to document or illustrate the arrangements. The diagram is helpful for communication but does not relay the arrangements that connect various boxes to form roles and responsibilities.	United States of America	Rejected	The text in the box describes generic roles and responsibilities. Diagram retained in main box of chapter.
9056	1	1	135	135	Change “in the following section” by “in the section 1.5.1.3”.	Canada	Accepted	Cross references added.
9058	1	1	136	136	Text in the Management/Co-ordination box is incomplete.	Canada	Accepted	Text in figure corrected.
5272	1	1	136	137	This example should be simplified. A steering committee is not necessary and should be removed.	United States of America	Accepted with modification	Language added to section 1.4.1.2 to indicate that following discussion of components is optional, not prescriptive.
5274	1	1	138	143	Throughout, the way the term "stakeholder" is used is inconsistent with common use of the term. The national focal point is not a stakeholder to the GHG inventory. It would seem better to have a steering committee that is uninvolved in policy and decision making. The GHG inventory is meant to be policy-neutral, and therefore a policy advisor role also seems problematic.	United States of America	Accepted	Replaced "stakeholders" with "actors and stakeholders".
5276	1	1	141	141	Recommend adding a sentence describing that for some countries, various stakeholders may have multiple roles and require necessary capacities that span over various stakeholder types listed in Table 1.3. This is only a generic guide but not definitive per national circumstances.	United States of America	Rejected	It is not suggested in text that a particular entity cannot have more than one stakeholder or actor roles.
5278	1	1	142	143	Table 1.3: For stakeholder type "data providers", recommend also including "Specific national sectoral or sub-sectoral knowledge of practices and technologies employed, data sources, policies and key assumptions", as these data providers may have the best understanding of these items.	United States of America	Accepted with modification	Added text to data providers row that they are to have an understanding of data sets provided.
9060	1	1	149	149	Change “stakeholder” to “stakeholders”.	Canada	Accepted with modification	Language in paragraph has been revised.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5280	1	1	149	161	Consider use of "individuals involved in the compilation of the GHG Inventory" instead of stakeholder?	United States of America	Accepted with modification	Language revised to refer to "actors and stakeholders".
9062	1	1	176	202	The purpose of Section 1.5.1.5 (The Inventory Agency) is unclear and should be re-written to focus on providing concrete guidance on elements of effective organizational structures. Currently this section combines organizational structure with competence.	Canada	Accepted with modification	Revised introduction to section 1.4 to focus specifically on types of institutions that could serve as SNE.
5282	1	1	198	202	An example to provide for this paragraph is a sectoral "compiler's manual". This document outlines the specific source/sector, data needs/sources, methods, and the compilation processes (including estimates, QA/QC, uncertainty analysis, archiving, etc.). This sort of document allows for easier transitions between staff turnover in the event institutional knowledge is lost. The manual can serve as a basic starting point for new staff.	United States of America	Noted	Concept captured under existing concept of "provisions" for inventory compilation. Further information can be found in chapter 6. No changes have been made to the text.
5284	1	1	203	212	Use of a "steering committee" or "working group" seems to be again a very prescriptive example approach or arrangement to support approval of estimates. This also seems more appropriate to Ch. 6 for QA/QC and improvement planning based on findings, etc. No other approaches are included for supporting processes indicated.	United States of America	Accepted with modification	Language added to beginning of chapter to clearly state that guidance is not prescriptive.
5286	1	1	203	212	It is difficult to distinguish here between essential "stakeholders" and other stakeholders. For instance, an inventory needs to have an inventory agency, but does not need a steering committee, but they are treated the same here.	United States of America	Accepted with modification	Edited text in steering committee section 1.4.1.5 to more clearly indicate that steering committee is optional.
5288	1	1	213	279	Section 1.5.2 and subsections should move to section on data collection 2.1 or 2.2 for tracking data collection	United States of America	Rejected	The text in this section addresses the management of the inventory process not the technical aspects of data collection.
5290	1	1	219	232	Box 1.2 is a helpful example.	United States of America	Noted	Thank you.
9064	1	1	222	223	“This data flow diagram is underpinned by a list of all datasets used in the GHG inventory (see above in 1.5.1.2)” Section 1.5.1.2 does not discuss a list of all dataset used in the GHG inventory. This section is likely to be 1.5.2.1 LIST OF DATASETS.	Canada	Accepted with modification	Text in box revised to clearly indicate it only provides an example from South Africa and cross references to other sections have been removed from box.
9066	1	1	223	223	(see Table 1.1c). There is no “Table 1.1c”. It is likely that the author wants to refer to Table 1.5.	Canada	Accepted	Text deleted.
9068	1	1	224	224	The following reference is unclear and is not included in “Reference section on page 20, lines 410 to 424”: in South Africa’s “National System for GHG Estimation and Reporting”.	Canada	Accepted	Quotations removed, and reference to the BUR added.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
8312	1	1	232	232	Forest should be defined with more details such as, Forest cover and Forest density	Iran	Rejected	Box presents a short summary of the data in South Africa's GHG inventory. It is a general term for the relevant data included. We do not want to go into details of all of the specific variables included.
5292	1	1	238	238	While there is mention of institutional memory, there is no mention of how lists of datasets improve the capacity of archiving and achieve the overall goals of archiving, which facilitate future inventories. Recommend adding language related to this in paragraph between lines 237 and 239.	United States of America	Accepted	Text revised to comment on the beneift to archiving. Title also revised to "Archive of Datasets".
5294	1	1	239	240	GHGIs require hundreds of databases. This is already tracked through archiving process, so please clarify why is this necessary.	United States of America	Accepted	Revised section to clearly indicate this guidance is part of the archiving process.
9070	1	1	243	243	Change" following section" to "section 1.5.2.2".	Canada	Accepted	Cross reference added.
9072	1	1	277	278	The following reference is unclear and is not included in "Reference section on page 20, lines 410 to 424": National Greenhouse Gas Inventory Templates developed by the United States Environmental Protection Agency and United States Agency for International Development hosted by the LEDs group3". There is no footnote #3 at the end of this page nor on any other page of this document.	Canada	Accepted	Footnote replaced with reference to EPA templates in reference section.
5296	1	1	283	285	Recommend adding to this sentence that it is advantageous for compilation experts to understand specific national sectoral or sub-sectoral knowledge of practices and technologies employed, data sources, policies and key assumptions. In addition, recommend adding explicit mention of knowledge of the UNFCCC reporting guidelines, it is not explicitly referenced.	United States of America	Accepted with modification	Added text to section on compilation experts to refer to understanding of sectoral processes and practices. And moved compliation experts section up to section 1.4.1.7 with the other sections on roles.
6598	1	1	288	288	Editorial: There is no Table 1.1c in the text of Section 1.5. It is proposed to cross-check the relevance of the reference to the Table 1.1c, otherwise remove it form the text.	Russian Federation	Accepted	Table, Figure, and section numbering were corrected in editorial process.
9074	1	1	288	288	There is no "Table 1.1c". It is likely that the author wants to refer to Table 1.3.	Canada	Accepted	Table, Figure, and section numbering were corrected in editorial process.
5298	1	1	301	301	Recommend adding and "and technical analysis" to "Participation in international review processes" starting on line 301, to cover the basis of all UNFCCC processes.	United States of America	Rejected	Language in the section is intended to be neutral and not refer to any particular UNFCCC or other negotiated process. "peer review" is intended to be generic and covers technical analysis.
9076	1	1	303	303	Change the first "training" to "Countries".	Canada	Accepted	Text corrected and sentence revised for readibility.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5300	1	1	309	318	Section1.5.4.1 on workplans can be integrated into the existing 1.5 and box 1.1 that the authors deleted on compiling an inventory. This could have been integrated as part of a "start and plan" step	United States of America	Accepted with modification	Section on inventory management tools has been moved to come after section on inventory compiling, to present a more logical order of 1) arrangements, 2) process, and then 3) execution tools.
5302	1	1	310	318	Recommend adding a sentence to this 1.5.4.1 section paragraph on workplans to include more explicit dates of deadlines. While Table 1.6 includes a week by week snapshot of the inventory cycle, recommend that the authors recommend that workplans and their included deadlines/milestones during the inventory cycle be as explicit as possible, including specific dates. This will allow for greater transparency, coordination, and understanding to the team that is compiling the Inventory.	United States of America	Accepted	Footnote added to table column on milestones.
5304	1	1	317	318	Table should emphasize archiving. Table can also note that these steps will take less time as experience is gained with developing GHG inventories.	United States of America	Accepted	Concept of archiving added to table.
812	1	2	37		Text format error “References 38” (Change to “Reference …… 2.38”)	Thailand	Accepted	Corrected by formatting.
814	1	2	68		Text error “Data collection is … system a country puts…”	Thailand	Accepted	Paragraph rewritten.
816	1	2			No association of Figure 2.1 in text	Thailand	Accepted	Reference provided.
818	1	2			No association of Figure 2.2 in text	Thailand	Accepted	Reference provided.
820	1	2			No arrowhead for a feedback line in Figure 2.2 to show proper direction of the flow and no “N” for “NO” in the diagram.	Thailand	Accepted	Modification made.
1792	1	2	817	819	To enhance flexibility, it is suggested to reformulate "Standard software tools should be used for data management." as "Standard software tools could be used for data management".	China	Accepted with modification	This paragraph was deleted as data reporting is dealt with in Chapter 1.
4674	1	2	1287		Could the IPCC include a discussion on "collaboration with national statistics data agencies" for developing countries with a view to provide practical guidance to the inventory agencies on developing a program to collect basic statistics that may not exist in the country? The additional information provided is useful, but does not lead to improvement of the domestic data which should be used for inventories.	Japan	Noted	This concept is already reflected in the main text of Chapter 2 and in the annex as well.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5314	1	2	1	1	Overarching comment related to volume 1, chapter 2. There is not enough discussion on archiving of collected data. This is an important step regarding data collection that facilitates inventory compilation, future inventories, and improvements to inventories and data. It would be useful to emphasize this in relation to institutional arrangements/governance, particularly for countries who are performing their first inventories. Establishing data and inventory archiving as part of their data collection activities will allow for easier transitions to performing future inventories. Recommend adding language that addresses this key cross-cutting element.	United States of America	Accepted	Text has been revised and comment considered in the revision. Some text added referencing Chapter 6 guidance on archiving.
5316	1	2	68	81	Perhaps note somewhere that it's possible that a lot of the necessary data may be available over the internet and can be directly accessed by the source leads. It could be helpful to note that not all data are very complicated to collect, require MOUs, etc.	United States of America	Noted	The concept has been included in the revised text.
5318	1	2	74	74	Use of stakeholders is unclear in this sentence or phrase that "interactions between the inventory compilers and stakeholders will take place may require the most time". Seems the intent is data providers but it is not stated clearly with use of "stakeholders".	United States of America	Accepted with modification	Paragraph rewritten.
5320	1	2	77	77	Households will be expected to provide information on an annual basis?	United States of America	Accepted with modification	The word "households" deleted.
5322	1	2	95	99	Reword to read: "In these cases, it is good practice to make an initial estimate of if the source or sink strength is of similar magnitude to key categories in order to assess and prioritize the effort required. Such initial estimates can be very rough and may be based on expert judgement as they are intended to guide resource use and not contribute to the final inventory totals. If a new source or sink is estimated to be on a scale similar to the key categories then it is good practice to use Tier 2 or 3 methods."	United States of America	Accepted with modification	Modified to improve english.
5324	1	2	95	99	If a Tier 2 or 3 initial estimate of a source is expected to be "very rough," would it be better for the estimate to initially be made at Tier 1 and then improved in future GHGIs?	United States of America	Accepted with modification	Sentence changed already.
5326	1	2	101	103	Figure 2.1 is added but not referenced in the text anywhere. Paragraph on lines 82-91 could be modified to reference Figure 2.1 and match the steps in the figure.	United States of America	Accepted	Reference included.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5328	1	2	101	103	The process diagram for data collection should clarify or find alternate language to replace what "precise the inventory" period means for non-English speakers, such as identify years to be included or reported in the national inventory.	United States of America	Accepted with modification	Diagram redrawn.
5330	1	2	106	106	Suggest deleting "that are the largest." Other factors impact prioritization such as trends.	United States of America	Accepted	Deleted.
5332	1	2	110	111	Archiving should be a part of data collection activities that facilitate improvements. Recommend adding.	United States of America	Accepted	Added.
5334	1	2	167	168	Add: does it include the full time series to this bullet.	United States of America	Accepted	The concept of complete time series was added.
5336	1	2	174	174	"A" feedback mechanism. Correcting beginning of the sentence.	United States of America	Accepted	Corrected.
5338	1	2	178	178	Remove "the" after "documented together with".	United States of America	Accepted	Removed.
5340	1	2	183	185	Figure 2.2 is added but not referenced in the text. Can add some introductory text to explain the figure.	United States of America	Accepted	Reference to the figure added.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5342	1	2	209	231	The new guidance in "Restricted data and confidentiality" needs to be better integrated into the existing guidance. Currently, the section includes both unclear and redundant guidance. The very strong statement at the beginning, "Confidential data can lead to an inventory lacking transparency and wherever possible the use of confidential data should be avoided," makes it unclear whether the subsequent guidance relates to avoiding use of confidential data altogether (even in aggregated form) or to successfully balancing confidentiality with transparency. The discussion of aggregation in paragraphs 2 and 3 is partly redundant with the discussion of aggregation 236-243, and it is not clear how the two discussions are related. Recommend deleting paragraph 2 and moving the discussion in paragraph 3 to the discussion at line 240 to read: "Sometimes, depending on the size and structure of the original sample, raw data can be aggregated in a way that protects confidentiality and yet produces useful information for emission inventory purposes. Aggregation techniques should be selected to avoid the possibility that the confidential data could be reconstructed using the published inventory. On the other hand, care should also be taken to minimize the aggregation as much as possible so as to be as transparent as possible. If, however, there is a need to preserve confidentiality the NSA, or the body that originally collected the data, are normally the only ones that can carry out this additional treatment of the raw data."	United States of America	Accepted with modification	The comment has been taken into account in the revision of the text.
5344	1	2	209	231	It is not clear which part of the refinement TOC is being implemented by this refinement to the section on "Restricted data and confidentiality." Confidentiality is not mentioned at all in the TOC for Volume 1, Chapter 2, and the IPCC Scoping Meeting Report included only the following recommendation regarding confidentiality guidance in Chapter 2: "Additional guidance to activity data collection: Provide clarity on representative sample Confidential data: o Example of agreement for disclosure confidential information o Provisions of examples for incorporating confidential data" Neither of these examples appear to have been provided in this section.	United States of America	Accepted	Example of Confidentiality agreement form and illistrative examples of aggregation of confidential data have been provided in Boxes 2.0a and 2.0b respectively.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5346	1	2	210	211	"Wherever possible the use of confidential data should be avoided." This statement is overly broad. Often, data that is critical to the development of precise and accurate inventories is confidential at the level of individual facilities or other entities. However, it can still be used with little loss of transparency if it can be aggregated so that the facility-specific data are masked. The old text from the 2006 Guidelines includes good guidance on this point.	United States of America	Rejected	The text is clear "where ever possible" "However, this is not always possible" etc.
5348	1	2	229	231	Confidential data is often required for higher Tier, more accurate estimates. Therefore, rather than replacing estimates based on confidential data with less accurate estimates based on non-confidential data, inventory compilers should be urged to verify estimates based on confidential data with estimates based on non-confidential data. The compilers can then provide transparent verification without sacrificing accuracy.	United States of America	Rejected	The inventory compiler has to balance transparency with accuracy etc (TCCCA). Comparisons with confidential data are not transparent and usually not possible if the confidential data is not released. Many countries produce complete inventories with little or no confidential data.
5350	1	2	275	276	Insert the word "be" into "there may (be) cases".	United States of America	Accepted	Inserted.
5352	1	2	280	280	Change "extrapolating from" to "estimating based on"	United States of America	Rejected	"Extrapolating from" is better as the estimate will not be "based " on the other country will be used as a guide.
5354	1	2	288	314	Within this list, GHGRP seems an approach to list if this list is referring to global data sets that all countries may want to consult, etc. Doesn't seem appropriate to call out GHGRP in this section. It is only 1 example of a facility-level data sets for 1 country.	United States of America	Accepted with modification	Moved from the separate bullet to bullet on facility level data. Separate bullet is deleted.
5356	1	2	292	293	Unclear why it is unlikely that registry data could not be used directly in an emission inventory, recommend deleting that language.	United States of America	Accepted with modification	Language is changed to the following sentence: "may sometimes be used for estimating emissions from industrial installations but usually could not be directly reported in the GHGs emission inventory".
5358	1	2	306	306	How is GHGRP different from facility level data discussed in second bullet (lines 291-293) recommend combining.	United States of America	Accepted	The list has been updated and bullets combined.
5360	1	2	306	306	This should say "The U.S. EPA Greenhouse Gas Reporting Program (GHGRP) Greenhouse Gas (GHG) data. "	United States of America	Accepted with modification	"the Greenhouse Gas Reporting Program (GHGRP) EPA USA" - used as an example in bullet on facility data. The list has been updated in the revised text.
5362	1	2	307	313	Recommend combining these international datasets with bullet on lines 299-300	United States of America	Accepted	List of international organisations is combined with bullet on international organisations.
5364	1	2	314	314	Recommend making remote sensing its own bullet / data category	United States of America	Accepted	Separate bullet included.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5366	1	2	360	361	Add that when crosschecking national and international data sets you should account for any adjustments made to national totals for inventory purposes (e.g., removal of bunker fuels).	United States of America	Accepted	Suggested sentence included in the text.
5368	1	2	446	447	Clarifying that "adapting data for inventory use" will still be a separate heading / section.	United States of America	Accepted	Separate section.
5370	1	2	559	559	Change last word to below:	United States of America	Accepted	Text revised (refer to comment id: 5372).
5372	1	2	561	561	Reword to read: "Consider the main parameters effecting emission or removal rates as shown in Table 2.2"	United States of America	Accepted with modification	line 561 is re-written as "Consider the main parameters affecting emission or removal rates as shown in Table 2.1a".
5374	1	2	569	573	It seems that this has already been noted, but this is the clearest summary of the information so I would keep this one and delete others.	United States of America	Noted	Texts relevant to the comment from line 568-573 are deleted.
5376	1	2	577	578	Page 2.18, Table 2.2: These comments relate to the “EF Sensitive Parameters” under Manure Management. The bullets on timing of storage, length of storage and time and temperature distribution between indoor and outdoor storage all seem similar, in addition to the seasonal and daily temperature variation and climate bullets. Seems like some sort of consolidation of bullet points could be made to improve clarity.	United States of America	Accepted with modification	Text revised after discussing with AFOLU sector experts, Table 2.2 Manure management, as: "Time and length of storage", "Climate - Seasonal and daily temperature variation". However we deleted three bullet points "Length of storage", "Climate", Time and Temperature distribution between indoor and outdoor storage". Deletion was due to revision and merging of text in this Manure management.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5378	1	2	577	578	Page 2.18, Table 2.2: These comments relate to the “EF Sensitive Parameters” under Agricultural Soils. For the second bullet on animal manure applied to soils, should this also include “deposition of urine and dung by pasture, range and paddock livestock”, which can be a significant source of N2O under this category. Or possibly this could be a separate bullet. For the bullet on “Organic soil cultivation”, should this be changed to “Drainage of organic soils” since it’s mainly the drainage that causes the N2O emissions rather than the cultivation. Also, by emphasizing “cultivation” it could preclude drained organic soils on grassland where cultivation may not even take place, but where the drainage is certainly causing N2O emissions. For the bullet on “Soil type” I question whether this should be included. Soil type (other than the split between mineral and organic soils) is not a factor in the methods for Agricultural Soils from the 2006 IPCC Guidelines and from a review of the changes being proposed in the 2019 refinement, I don’t see any reference to soil type. For the bullet on “Type of AWMS (solid storage, anaerobic lagoons, etc.)”, I think this should be removed. While use of different AWMS systems could have an impact on the amount of manure applied to soils, seems like that would be covered under the second bullet “Animal manure applied to soils”. For the bullet on “Soil management practices”, I’m not sure what practices this would include that are not already covered by this list. There are no additional practices I’m aware of that are part of the methodology and aren’t already covered by this list.	United States of America	Accepted with modification	Text revised after discussing with AFOLU sector experts, Table 2.2 AFOLU/Agricultural soils/Direct and indirect N2O emissions from managed soils, as: 1) we added separate bullet as " Urine and dung deposited on pasture, range and paddock by grazing animals", 2) bullet "Organic soil cultivation" is replaced with "Drainage / management of organic soils", 3) bullet "soil type" is deleted, 4) bullet “Type of AWMS (solid storage, anaerobic lagoons, etc.)” is deleted, 5) bullet "Soil management practices" is replaced with "Soil cultivation management practices".
5380	1	2	577	577	Table 2.2: Change EF Sensitive parameters for stationary to read: "CO2: Variable attributes of fossil fuels including carbon content" and add / control technologies to CH4 and N2O. For mobile add Variable attributes of fuels including carbon content. (differences in heating values could also impact results).	United States of America	Accepted with modification	Text revised in Table 2.2, EF Sensitive parameters for stationary as: added "CO2: Variable attributes of fossil fuels including carbon content" and added "control technologies" to CH4 and N2O. Also, for Mobile we added "Variable attributes of fossil fuels including carbon content".

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5382	1	2	577	578	Table 2.2: add carbon contents of waste components to waste incineration EF sensitive parameters	United States of America	Accepted with modification	Comment id 5382, 2504, and 1270 are replied after discussing with Waste sector experts, as: Solid waste - 1) bullet "waste component" is replaced with "waste composition", 2) New bullet added as "Climatic conditions", 3) New bullet added as "Type and management of landfills", 4) bullet "Life of product is deleted"; A bullet "Population of the country" in Wastewater handling is deleted; A bullet "Amount of incinerated waste per year" in Waste incineration is deleted.
5384	1	2	577	577	For oil and gas, add "equipment types and practices"	United States of America	Accepted with modification	Text revised in Table 2.2 Fugitive emissions/ Oil and Gas, as: added "Equipment type and practices".
5386	1	2	588	588	Change sentence to “These factors must be carefully evaluated to ensure they are applicable to the national circumstances where they are being utilized.”	United States of America	Accepted with modification	Text revised in line 588 as "These factors should reflect national circumstances as far as possible".
5388	1	2	819	819	Provide a link to US EPA inventory management tools	United States of America	Accepted with modification	This paragraph was deleted as data reporting is dealt with in chapter 1.
5390	1	2	821	821	2.3 Use of Facility Data in Inventories could use some restructuring and editing. The guidance is repetitive in many places.	United States of America	Accepted	Text revised.
5392	1	2	821	821	2.3 could be improved with a mention that there are sometimes multiple choices for which activity data to use to scale emissions to the national level, and that the compiler should work with industry and other stakeholders to determine which best relates to emissions (e.g. petroleum well counts or petroleum production data). In addition, more detail could be included on the time series question, where again the compiler should work with industry and other stakeholders to determine what technologies/practices were in place in years without FRD and how to take that into account in the time series.	United States of America	Accepted with modification	Text modified.
5394	1	2	824	830	I would also add to this section that facility data from a reporting program (if collected regularly) can greatly improve trend information in a GHGI, e.g., in a way that use of a constant EF and annually updated AD cannot.	United States of America	Accepted with modification	Text modified.
5396	1	2	831	832	How is the data collected in this sentence different from the data collected in the above paragraph. Seems it is in the same category and the write up can be combined.	United States of America	Noted	Revised sentence.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5398	1	2	837	838	"…that additional reporting requirements, OR ADJUSTMENTS TO THE REPORTED DATA" Edit suggested in the case that the reporting program cannot be changed, but the data is from a mix of emissions sources. The compiler could use expert judgment to assign emissions to e.g. landfills versus fossil fuel combustion.	United States of America	Accepted with modification	Modification was made to text although not to support 'adjustment to the reported data' but to note that enhance reporting elements may be needed to support the use of FRD for GHG inventories purposes from pre-existing programmes.
5400	1	2	842	843	Consider rephrasing the sentence. The fact that default emission factors are used does not mean that the reported data cannot be used to improve GHG inventories. For example, the facility-level data might provide useful activity data that could be used to improve the national inventory.	United States of America	Noted	Clarified text on the use of IPCC default factors. The various uses of facility data (where relevant) are discussed in section 2.3.2 and also noted in the first paragraph to this section.
5402	1	2	843	843	Consider rephrasing the sentence. Measurement does not necessarily mean that the data are "better" than data calculated by other means. For example, engineering calculations can provide very precise ways of calculating emissions for certain industries.	United States of America	Noted	This line (& paragraph) acknowledged potential improvement to inventory based on facility reported data. It does not state that 'measured' data are 'better'. Section 2.3.2.1 tries to outline Quality elements to consider in ensuring that reported data may be of use by inventory compilers. Also it in the reporting specification and methods (which will allow industrial facility to apply engineering approaches as compared to default factors along with calibrated metering) that will drive the quality of the information for consideration by inventory compilers. It is up to each country to identify their specific requirements such as allowing the use of engineering approaches with supporting documentation of facility approaches.
5404	1	2	843	845	Note that it is also a possibility that the compiler may include some aspects but not all from the FRD. For example, a compiler could use annual activity data from FRD, but improved EFs from the literature.	United States of America	Noted	Various usage of FRD is presented throughout section 2.3.3.
5406	1	2	848	850	Suggest deleting "direct" as there are other uses of FRD that could be considered and are discussed in this section.	United States of America	Accepted	Deleted 'direct' from sentence.
5408	1	2	850	852	Currently, this sentence focuses exclusively on limiting burden. To better emphasize the need to balance limiting burden with meeting inventory needs, recommend revising to: "Inventory compilers and legislative groups developing reporting systems are encouraged to work together to design an efficient system that meets inventory goals while limiting burden."	United States of America	Accepted with modification	Revised sentence to state: '…to streamline and design an efficient system that also meets inventory goals while limiting burden.'

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5410	1	2	858	859	The term "reporting criteria" is not clear. Does this mean the quantities to be reported (data elements) or the factors used to determine when reporting is required (scope)? If the former, recommend revising sentence to begin "Specifying the data to be reported (such as fuel quantity, carbon content, heat content, etc.) and methods appropriately. . ." If the latter, recommend revising sentence to begin "Appropriately defining the scope (such as emission or consumption thresholds) and methods for reporting . . ."	United States of America	Accepted with modification	Modified statement to: "Specifying the information to be reported…'.
5412	1	2	871	873	Suggest adding "and correct interpretation and use of FRD by the inventory compiler"	United States of America	Accepted with modification	The idea of a common interpretation of data has been incorporated into lines 871-873 (SOD).
5414	1	2	881	882	Here and in Table 2.5, recommend also mentioning that estimates across facilities in the same source category should be comparable. That is, they should cover the same sources within that category and be based on comparable (though not necessarily identical) methods.	United States of America	Accepted with modification	Comment has been considered and concept included in the revised text "facility GHG estimation methods to be applied must be at least comparable with .."
5416	1	2	883	887	May be helpful to add an example here. E.g. "For each category reporting, assess which related elements are available at the national level (e.g. quantity of petroleum produced) and be sure that that data element is collected along with the FRD (e.g. quantity of petroleum produced by the facility). This will allow the compiler to assess coverage of the reporting program and scale up emissions to the national level."	United States of America	Noted	This concept is presented in section 2.3.2.2 and in Table 2.5 along with a sample equation for activity data (Equation 2.3).
5418	1	2	892	893	For the inventory principle of Consistency, the current text implies that facility level data should be statistically similar over the time series based on size, operating conditions, etc. However, there may be legitimate reasons for there to be outlier data due to site specific circumstances. Outlier facility data do not necessarily mean that the data are not reliable.	United States of America	Accepted with modification	Added footnote to the second bullet to note break in time series may be reasonable with supporting explanation from facilities.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5420	1	2	892	893	In Table 2.5, the bullets to the right of "Consistency" are not clear. In the first bullet, it is reasonable to advise that activity data should be reported in consistent units; however, it is not clear what "corrected to the same operating condition" means. In fact, because "operating conditions" (for example, process efficiency and capacity utilization) vary across facilities and have a real impact on emissions, it may not be desirable to "correct" activity data to the same operating conditions. In the second bullet, several ideas appear to have been combined. Recommend breaking this bullet out into two bullets, one of which focuses on time series consistency, and the other of which focuses on consistency of aggregated facility data with other industry statistics for comparable facilities. (The end of the bullet appears to have extra or missing words.)	United States of America	Accepted with modification	Modification made in Table 2.5 to increase clarity.
5422	1	2	892	893	In Table 2.5, in "Consistency" row, recommend adding the following in the bullet regarding time series consistency: "Time series consistency is addressed by including provisions to allow splicing of data in the event of methodological or data changes."	United States of America	Accepted with modification	Clarification provided via a footnote.
5424	1	2	892	893	In Table 2.5, in "Completeness" row, recommend replacing "facilities" with "emissions" in third line. It is the fraction of emissions, not facilities, covered that determines the completeness of the reported emissions. In many cases, a high percentage of emissions can be covered even if a relatively low percentage of facilities is covered (the "80/20 rule").	United States of America	Rejected	The first bullet is to cover more than just emission information (this will allow for comparison with national statistics to help compilers assess and account outstanding data due to reporting threshold and de minimis).
5426	1	2	892	892	For completeness, add "Emissions coverage-reporting should cover all emissions occurring at a facility and in cases where it does not, it should be clear which sources are included and which are not."	United States of America	Accepted with modification	This idea is presented in Table 2.6. Accepted recommendation by including a bullet in Table 2.6 to provide a list of sources not reported due to de minimis allowance.
5428	1	2	899	902	The use of engineering calculations, site specific emission factors, and default emission factors can also be ways of obtaining high quality facility level data	United States of America	Noted	Modification included as a footnote (line 888). Footnote #22 (in draft mode of work document).
5430	1	2	913	914	CEMS may not be appropriate in all settings	United States of America	Noted	Concept reflected in the text.
5432	1	2	913	914	Recommend deleting the bullet regarding setting a de minimis threshold. A de minimis threshold is not a necessary prerequisite to a facility-level reporting program. Or alternatively, it should be described as optional.	United States of America	Accepted with modification	Text modified.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5434	1	2	913	914	In Table 2.6, recommend adding other parameters that affect emissions, including "Activity level (e.g., production, feedstock consumption;" "By-product generation rate (if applicable);" "Level to which emissions are controlled (e.g., destruction efficiency in percent);" and a generic "Other parameters that affect emissions."	United States of America	Accepted with modification	Modification made to Table 2.6.
5436	1	2	913	913	Add "activity data that corresponds to the national level data set" (so that it is possible to assess coverage and use data in the GHG inventory" and "activity data on emission controls in place"	United States of America	Noted	This requirement is specified (with added modification) by the following bullet in Table 2.5: '• Activity data (such as quantity of each fuel and process feedstock) which contributes to emissions measured based on the CEM system.'
5438	1	2	913	913	On de minimus, I would rephrase this so that it does not appear to be a recommendation (from an inventory compiler's perspective, it's preferable to not have a de minimus), but to instead state that if the program does have a de minimus, it should be specified and applied based on X,Y,Z. I would also move this from the box into the main text.	United States of America	Accepted with modification	Point noted and text has been revised to 'Consider …' so not to appear as requirement but for consideration when developing a reporting regime.
5440	1	2	916	916	If the situation is different in developing countries, specify how here, and note the implications. If it is not, delete "developed." Could also consider rephrasing as "In many countries, national statistics datasets…"	United States of America	Accepted with modification	Deleted 'developed countries' and modified text.
5442	1	2	934	935	Aligning facility data with national statistics "as much as possible and to the extent possible". It is not guaranteed that they will line up exactly, or even line up well depending on the coverage of them. At some point, it may not be worth the resources required to get them to line up exactly but can still follow TACCC principles.	United States of America	Noted	Text modified.
5444	1	2	939	944	This is veering a bit off topic. Data needs of agencies not involved in inventory compilation should not be within the scope of these guidelines.	United States of America	Noted	Clarified that collaboration is applicable for those with 'related data elements'.
5446	1	2	961	1097	The discussion appears to be missing time series considerations when facilities resubmit reported data from prior years	United States of America	Noted	Text modified.
5448	1	2	962	967	This section discusses approaches for use of reported facility data but there is no mention of volume 1, chapter 5 or ensuring time-series consistency. Recommend adding at least a sentence referencing this.	United States of America	Noted	Text modified.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5450	1	2	976	977	Suggest deleting this equation. This is not always the case, and if this guidance is getting into how to design a FRP, the recommendation should be to have disaggregated emissions reported (in addition to aggregate of course). Edit to say that ideally, emissions are reported in a disaggregated manner, such that they can be directly assigned to comparable IPCC categories. The equation is implying that the reported information is the total emissions, but is not providing any guidance on how to handle that situation.	United States of America	Accepted with modification	Modified text in introduction to 2.3.3.1.
5452	1	2	1027	1028	Consider editing this equation to replace the EF term with E(subscript)FRP/AD(subscript)FRP to clarify in general terms how the EF is developed from the FRP. Also, clarify that the AD(subscript)NSS term is "national activity data" to avoid confusing it with FRP AD.	United States of America	Accepted with modification	1) The subscript 's' is intended to refer to a specific emission source (i.e., fuel combustion by fuel type or by each type of feedstock use, etc). 2) Clarification is provided in the description of the notation to indicate EFs_{FRD} is developed based on facility specific data. 3) Provided clarification in notation to include 'national activity data'.
5454	1	2	1039	1041	Not sure what the value is of doing this for comparison purposes if it's not aligned with IPCC reporting sectors.	United States of America	Accepted with modification	Revision made to add clarity.
5456	1	2	1091	1094	Is it possible that experts from developing countries or from other sectors (e.g. waste, agriculture) will not be familiar with these codes (ISIC, SIC, NAICS)? If so, please provide clarification or please make this guidance more general (it appears geared towards industrial processes, but other countries may have reporting on waste sector or ag, where the relevant national stats may be quantity of waste disposed, number of cows, etc. and not be aligned with industrial codes) and list those codes as examples.	United States of America	Accepted with modification	Generalized statement and presented as example.
5458	1	2	1095	1096	Confusing sentence. I think that if the FRD is meeting all of the previously specified requirements, it should be common practice to use the FRD to update EFs for the inventory, and this appears to be what is suggested by the preceding text.	United States of America	Noted	FRD must meet quality goals (Table 2.4). Modified sentence.
5460	1	2	1097	1100	I think the more common scenario will be where a FRP is new, and as such no FRP data are available in previous years of the time series.	United States of America	Accepted with modification	Removed repetitive statement.
5462	1	2	1135	1144	This information is already provided above. It may better to have one section on how to address cases of incomplete data availability, since the guidance is the same whether reporting was designed specifically for GHG inventories or not.	United States of America	Accepted with modification	Revision made.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5464	1	2	1146	1146	Incorporate the comment bubbles to the side of the "Start. All data meet quality checks" box into the decision tree. E.g. "Is QA/QC information available?" Yes or no….	United States of America	Accepted	Generalized decision tree updated (see Figure 2.3).
5466	1	2	1146	1146	What does the note mean? Is this presenting a decision tree or an example of the decision process?	United States of America	Accepted	Clarified that this is just an example. Revised heading.
5468	1	2	1146	1146	For ease of use of the guidance, could consider restructuring so that each box in the decision tree has a corresponding header with guidance in the chapter.	United States of America	Accepted	Generalized decision tree updated (see Figure 2.3).
5470	1	2	1170	1170	"and how the data have been incorporated into the GHG inventory"	United States of America	Accepted with modification	Revised text as follows: '...and how the data/information have been incorporated into the GHG inventory for transparency purposes and facilitate…'
5472	1	2	1351	1352	Add that BP's "Statistical Review of World Energy" provides a time series of data by country on oil and gas production, consumption and refining, all of the inputs necessary for fugitive emissions for this source. https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf	United States of America	Accepted	Suggestions included in the text.
6600	1	2	68	68	To maintain consistency with theother chapters of the volume, it is proposed to replace "system" with "arrangements".	Russian Federation	Accepted	Term changed.
6602	1	2	101	102	Figure 2.1: There is no reference to Figure 2.1 in the text. It is proposed to provide the reference and a brief description of the Figure 2.1 in the text.	Russian Federation	Accepted	Reference to the table added.
6604	1	2	183	184	Figure 2.2: There is no reference to Figure 2.2 in the text. It is proposed to provide the reference and a brief description of the Figure 2.2 in the text. It is further proposed to increase the size of Figure 2.2, to enhance its readability.	Russian Federation	Accepted with modification	Modification implemented with additional text.
6606	1	2	360	361	The guidance in the last sentence of the paragraph is unclear. It is proposed that the authors should clarify, if the international data could be used for QA/QC of the national data sets, otherwise the international data could be used for inventory purposes in case the national data are sparse or unavailable. However, if the latest option is a case, then this guidance should be moved in the data section, because it is not appropriate to keep it here.	Russian Federation	Accepted with modification	Suggestion considered in the revision of the text.
6608	1	2	446	446	The last sentence in the paragraph seems inappropriate. It is proposed to edit, otherwise delete the last sentence in the paragraph.	Russian Federation	Noted	This is already reflected in the main text of Chapter 2.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
6610	1	2	602	603	Table 2.3: It is proposed to indicate, which of the literature data sources included in the Table 2.3 could be used as a source of activity data, emission factors or other parameters used in the inventory. These clarifications would be useful for inventory compilers.	Russian Federation	Accepted with modification	Table 2.2 has been revised.
6612	1	2	817	817	It is proposed to make the statement in line 817 more general by deletion of the text "to developing countries"	Russian Federation	Accepted	Text deleted.
6614	1	2	939	961	General: for consistency purposes, it is proposed to maintain the use of the same abbreviation for facility reported data (FRD) both in the text and in the section title	Russian Federation	Accepted	Same abbreviation used.
6616	1	2	979	981	Equation 2.1: The equation seems confusing, because facility emissions regularly comprise source categories that relate to different IPCC sectors. The examples are direct and indirect energy emissions and emissions related to waste management attributed to the same facility. It is proposed to clarify what the Equation 2.1 is intended for.	Russian Federation	Accepted	Equation modified.
6618	1	2	995	1001	The statement in paragraph is not necessarily correct, because the facility emissions comprise source categories that may be allocated to different IPCC sectors. The example is the combination of direct and indirect energy emissions and the emissions related to waste management for a specific facility. It is proposed that the authors clarify what they intend to say, otherwise remove the text in paragraph within lines 995 to 1001.	Russian Federation	Accepted with modification	Text added to clarify situations relevant to a particular subsector and the influence of reporting thresholds.
6620	1	2	1057	1072	Equation 2.3: It is not clear, what intention of the equation is. Especialy unclear the concept of subtraction of facility reported data from national statistical data, because the latter may have a potential for underestimation of national emissions. It is proposed that the authors explain the rational behind the Equation 2.3	Russian Federation	Accepted with modification	Modification implemented with additional text.
6622	1	2	1149	1150	Figure 2.4: It is proposed to increase the size of the figure. Otherwise it is difficult to read it in the hard copy.	Russian Federation	Accepted	The size of the figure was increased.
6624	1	2	1465	1484	General: It is proposed that in the description of the reference sources, the clarification is provided which international publications could be used as the sources of activity data and parameters necessary for inventory in the forestry sector. This clarification is especially important for countries, where data are sparce or not available.	Russian Federation	Noted	This is already reflected in the main text of Chapter 2.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
8314	1	2	88	88	Should be added after "forest management", reforestation, afforestation, deforestation, …	Iran	Accepted with modification	The text was modified as follows: "...major fossil fuel consumption, major agriculture activities, forests and major industries".
8316	1	2	1467	1467	Foote note under "national forest monitoring": FAO should facilitate to access national related data provided in international and regional levels by different organizations	Iran	Noted	No action can be taken because comment is out of scope of 2019 Refinement.
8320	1	2	105	115	Regarding the importance of the database, it is necessary to find specific format and instructions to provide an integrated the data sources for the countries. This require capacity building and training.	Iran	Noted	Comment considered in the revised text.
8322	1	2	166	168	Providing instruction to complete the data and estimate the missing data	Iran	Noted	Comment considered in the revised text.
8324	1	2	173	174	Introduction of similar measurement tools and methods, specially for developing countries and capacity building and training methods	Iran	Noted	Comment considered in the revised text.
9094	1	2	156	160	Given that using remote sensing data and geospatial products are possible ways to obtain new data, these methods should be mentioned in this list. Suggest to add new item (iv) as "Use remote sensing data and geospatial products (volume 4, chapter 3)".	Canada	Accepted with modification	Remote sensing is listed under bullet 1 "Use existing data".
9096	1	2	183	183	Figure 2.2: Second box on the left that says "Can the data be collected through measurements, surveys or census, considering existing resources?" should mention remote sensing and geospatial as possible method for data collection. Suggest to modify text as: "Can the data be collected through measurements, surveys, census, remote sensing or geospatial products, considering existing resources?".	Canada	Accepted with modification	Text modified to read: "Can the data be collected through measurements, remote sensing, surveys or census, considering existing resources?"
9098	1	2	574	577	Table 2-2: AFOLU is not mentioned at all in this table. If this was on purpose given that specific guidance for AFOLU is provided in volume 4, this should be clearly noted either within the text referring to this table 2-2 in line 575, or as a footnote to the table. Parameters and variables related to for example: forest characteristics (age-structure, tree densities, etc.), harvested wood products (e.g. carbon conversion factors, half-life parameters) and land management practices (e.g. rotation length, thinning frequency, etc.) can greatly affect the emissions/removals in AFOLU and this should be acknowledged or at least briefly noted in this table applicable to all sectors.	Canada	Noted	
9100	1	2	892	892	Table 2.5: Third bullet of Comparability, NAICs should be NAICS (all capital letters).	Canada	Accepted	Addressed in FD.
9102	1	2	927	930	For consistency, use FRP (facility-reporting programme) instead of GHG reporting program.	Canada	Accepted	Addressed in FD.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9104	1	2	950	950	For consistency, use FRP instead of GHG reporting program.	Canada	Accepted	Addressed in FD.
9106	1	2	1031	1035	Equation 2.2: order description of variables according to when it first appears (from left to right) in the equation. EICs appears first, then IC.	Canada	Accepted	Addressed in FD.
9108	1	2	1061	1070	Equation 2.3: order description of variables according to when it first appears. EICs, IC, ADNS, ADfac, Efs.	Canada	Accepted	Addressed in FD.
9110	1	2	1087	1156	For consistency, use **FRD (facility-reported data)** instead of facility GHG emission reporting program data throughout the text.	Canada	Accepted	Addressed in FD.
828	1	3	1004		Where is the number 20.2% uncertainty come from?	Thailand	Accepted	The basis for obtaining the result 20.2% when applying approach 1 has been added.
6638	1	3	1013	1014	It is proposed to increase the size of the Sensitivity Chart, because it is difficult to read it in a hard copy	Russian Federation	Accepted	Implemented.
6626	1	3	167	168	Figure 3.1: It is proposed to increase the size of the Figure 3.1, as it is difficult to read it in a hard copy.	Russian Federation	Accepted	Implemented.
6628	1	3	192	194	Figure 3.2: It is proposed to increase the size of the Figure 3.2, as it is difficult to read it in a hard copy.	Russian Federation	Accepted	Implemented.
5474	1	3	200	208	This section should provide guidance on how to identify the causes of uncertainty, since it has made the point that the identification step is critical.	United States of America	Rejected	Section refers to the 2006 IPCC Guidelines. It is not the intention to change the guidance already there. To be clear, text has been deleted and "No refinement" label added under this section.
6446	1	3	231	234	This addition adds clarity, is an important point, and should not be removed	United Kingdom (of Great Britain and Northern Ireland)	Noted	No change needed.
6448	1	3	238	240	It is perhaps worth noting that there is diminishing returns with this, and at a certain point the cost of additional sample may outweigh any potential benefit gained. Suggest the text is changed to: "Uncertainty associated with random sampling error can be reduced by increasing the sample size, although there are diminishing returns so it is worth considering any increase in sample size against additional cost and burden."	United Kingdom (of Great Britain and Northern Ireland)	Rejected	Not relevant in this context. This section focuses on how to reduce, not in the cost/benefit. In addition, Chapter 2 covers good practice guidance in relation to sampling size.
5476	1	3	312	329	Suggest moving these out of the box. These are important points that can be made more general (though still helpful to point to example in the box) and haven't been made elsewhere in this chapter.	United States of America	Accepted with modification	The sentences are appropriately related to the example and would not fit outside the box. However the first sentence has been removed, and this point has been clarified in the paragraph in the introductory section.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5478	1	3	329	329	I would also add somewhere in this section that sometimes collecting improved data to move to higher tiers also results in improved understanding of uncertainty and improved data to quantify uncertainty. Using this new data to quantify uncertainty could actually result in an increase in calculated uncertainty. In this case, it does not mean that the compiler should consider using a lower tier.	United States of America	Noted	The paragraph has been deleted in response to other reviewer comment.
5480	1	3	337	885	The uncertainty guidance appears very complicated for someone new to GHG Inventories or with limited statistical background. However, in the worksheet, it appears quite straightforward, and that all that is needed for an approach 1 calculation is the uncertainty of the AD and uncertainty of the EF. It would be helpful to make that clearer in the guidance, and to show more clearly and succinctly how those two elements could be obtained/calculated.	United States of America	Noted	Effort has been made to provide a more user-friendly guidance in Chapter 3 of the MR in addition to the guidance in the 2006 IPCC Guidelines. Specific guidance on how to calculate the uncertainty of AD and EF should be considered in sectoral chapters.
6450	1	3	462	467	It might want to be made explicit that sampling error does not exist in a census, by definition.	United Kingdom (of Great Britain and Northern Ireland)	Rejected	Sampling error in a census is not mentioned in the text and there is no reason to modify the existing text.
6630	1	3	534	578	Equations 3.0 to 3.0c: It is notclear, what one is going to derive from the equations, because the equal sign is missing there. Furthermore, the preceding text is unclear on difference between the equations as well as options for their use for variance calculations. It is proposed that the authors explain conditionalities for application each of the equations proposed.	Russian Federation	Accepted	The formulas have been deleted based on comments from another reviewer.
6632	1	3	588	590	Editorial: It is proposed to revise the paragraph to reduce the redundancies in the text	Russian Federation	Accepted	The paragraph has been streamlined.
6634	1	3	596	596	The Figure 3.2 is referred to as a flowchart, wherease it is a decission tree. It is proposed to cross-check the reference for appropriateness.	Russian Federation	Accepted with modification	Text changed from "Figure 3.2 flowchart shows a basic step-by-step suggestion on how the choice of" to "Figure 3.1a in Section 3.1.2 shows a basic step-by-step process for choosing an".
822	1	3	656		Inconsistency and unclear definition of Equation 3.1 while Equation 3.2 use Un.	Thailand	Accepted	Corrected.
824	1	3	665		Equation 3.2 use “U1, U2, …Un” for Ui. However, xn not xi.	Thailand	Accepted	Terms using Ui and xi were included in the equation.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
6636	1	3	665	672	In some cases, when the sum of negative quantities is equal to the sum of positive ones, the denominator in the Equation 3.2 may be "0". In that unique occasion estimation of combined uncertainty with the use of Equation 3.2 makes no sense. It is proposed that the authors should discuss this case. An optional solution may be to separately consider uncertainty of each inventory category and make a combine uncertainty assessment with the use of multipication approach (Equation 3.1).	Russian Federation	Accepted with modification	Concern is considered in footnote 4. Text has been added to the footnote emphasizing the implications.
5482	1	3	734	749	Remove the Tier 2 information from this example since the uncertainty is run for the Tier 1 example.	United States of America	Accepted	Tier 2 information deleted.
826	1	3	739		“DC%” is defined but only “DC” is used in the equation. Should they be the same?	Thailand	Noted	Tier 2 information deleted.
5484	1	3	833	835	The difference here is not clear to me. Isn't the uncertainty of the trend also a confidence interval of expressed as uncertainties in relation to the trend?	United States of America	Accepted with modification	The authors recognize that the explanation is difficult to understand, and at the same time difficult to improve. An example was added to increase clarity.
9112	1	3	139	140	The uncertainty analysis doesn’t help the inventory compilers it simply provides information: Replace “it helps the inventory compilers” with “ it provides information to inventory compilers".	Canada	Accepted	Text "it helps the inventory compilers" replaced by "it provides information to inventory compilers to be used".
9114	1	3	161	162	The improvement plan is not based on the key category analysis and uncertainty assessment, but it considers the information provided by these analyses: Replace “ based on” with “considering the information provided in”.	Canada	Accepted	Done.
9116	1	3	312	313	This statement is not necessary: “It is difficult to know that the improvements produce more accurate estimates because the compilers do not have an omniscient view of the emissions (if they did, then estimation would be unnecessary)." It would suffice to say: "Accuracy is not evaluated through uncertainty analyses, but must be evaluated through validation procedures”.	Canada	Accepted with modification	The sentence has been deleted. Additional explanation is included in Section 3.1.1.
9118	1	3	494	577	This description of different sampling design is too long and is not appropriate here as it is not specific to inventories; the IPCC does not need to reproduce standard equations from statistical handbooks. Any guidance on sampling should be specific to inventories while generic text be replaced by references to common textbooks or handbooks (e.g. Sarndal et al., 1992).	Canada	Accepted with modification	The authors believe this section is relevant and should be kept but agree with the deletion of the equations.
9120	1	3	585	585	It is not clear what “It” refers to, please revise this sentence.	Canada	Accepted	Redrafted.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9122	1	3	734	739	While these calculations can be carried out for individual animal categories, since MCF and UE are not specific to individual animal categories, the uncertainties calculated for individual animal categories are not independent. Therefore when the compiler attempts to put the uncertainty of different animal categories together, using the error propagation approach then they will significantly underestimate uncertainty. This is not a good example for the error propagation equations.	Canada	Noted	The authors agree that the Tier 1 emission factors will be correlated among animal categories and this could be sorted out when applying Tier 2. However, this will not show in this example as the Tier 1 calculation is done for just one animal category. No changes have been made to the text.
9124	1	3	792	805	While the inter-correlated variables resulted in low uncertainty in this case, it is mainly due to the fact that the slurry emission factor is very high relative to the others and the fractions of AWMS are relatively equally distributed among the different manure types. In other examples from other categories, the small differences in uncertainty may not be similar and the results of the Monte Carlo could be heavily skewed and very different from the error propagation. The example is not ideal; it should be more clearly acknowledged why, in this case the results were not very different and that this may not in fact always be the case.	Canada	Accepted with modification	The authors acknowledge that the results will always depend on the particular charactheristics of the data. They still believe that the example is useful. The text has been changed as appropriate to indicate it.
9126	1	3	833	835	This sentence is unclear. The trend uncertainty is the range of the value represented by Emissions at time 1 minus Emissions at time 0. We express the trend as the percentage change from time 0. So the mean difference in emissions may equal 20 Mt +/- 25%, where emissions in time 0 were 200 Mt. Therefore the emission trend is a 10% increase. However, it could be as high 25 Mt or as low as 15 Mt. Expressed in percentage this would mean the mean change from time 0 to time 1 is 10%, but it could be as high as 12.5% or as low as 7.5%. If I understand how the trend uncertainty equation works, that means that the trend uncertainty calculated by the equation should be +/-5%. It is difficult to understand this from the sentence in lines 833 to 835, but it is really important to clarify.	Canada	Accepted with modification	The authors recognize that the explanation is difficult to understand. An example was added to increase clarity.
830	1	4	173		Chemical formula format of N2O	Thailand	Accepted	Modified.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5490	1	4	182	184	Page 4.13, Table 4.1: It seems the last row in the AFOLU section (3-Miscellaneous) attempts to cover all the other sources or sinks that can occur in AFOLU, but are not specifically mentioned in the table. It may be useful to provide a more complete listing of them in the 3-Miscellaneous description. Seems like at a minimum this would include the non-CO2 emissions from biomass burning in forestlands, cropland, grasslands and wetlands. It may also be worth mentioning the emission/removals included in the 2013 Wetlands Supplement such as the CH4 and N2O from the burning of drained organic soils, the CH4 and N2O from rewetting of organic soils and N2O from aquaculture.	United States of America	Accepted	The suggested categories added.
5492	1	4	183	183	For 1B, the 2006 GL (which had as a starting point a split between coal, oil, and natural gas) were clearer and more logical. For 1C, unclear that any disaggregation should be used. Relatively new source for most countries and disaggregating to the point that it's not key could be a problem.	United States of America	Accepted with modification	Text added to clarify when to disaggregate 1C. Suggestions accepted for 1B.
6872	1	4	183	183	In column for "Category aggregation Consideration" of table 4.1, the sentences for 2B9, 2E, and 2G, are not clear to understand. What is the meaning of significant? If this is a key, then do I have to disaggregate that category to subcategories for the key category analysis? Please provide more explanation.	Republic of Korea	Accepted with modification	This text has been clarified "If aggregated gases are key, disaggregating by gas should be considered where methods, data sources and assumptions are different to identify gases that are may be individually key."
7566	1	4	206	206	Mathematic formula in equation 4.1 should include absolute value signs, similarly as in Table 4.2	Finland	Accepted	Formula corrected.
6640	1	4	218	219	Table 4.2: To enhance the clarity of key category level assessment estimates, it is proposed to include formulas in the headings of columns E and F	Russian Federation	Accepted with modification	Column E includes Lx,t which is referred to in explanation under the table. For F it is difficult to find the correct notation.
6642	1	4	257	257	It is proposed to further elaborte the section, otherwise remove the footnote 7	Russian Federation	Accepted	Removed.
7568	1	4	264	264	Mathematic formula of eqation 4.2 is not logical, absolute value signs should be placed differentially T(x,t) = abs(E(x,t) - E(x,0)) / sum(abs(E(x,t) - E(x,0)))	Finland	Rejected	Column F compares the absolute value of the trend for the category with the absolute value of the trend of the inventory. Column G normalizes the results, naming it contribution for the trend.
6644	1	4	281	282	Table 4.3: To enhance clarity of key category trend assessment estimates, it is proposed to include formulas in the headings of columns F and G	Russian Federation	Accepted with modification	Done for F but it would be confusing for cumulative to have this function as its relative to the position in the list.
7570	1	4	409	419	Examples of key category analysis are not updated, i.e. the renewed equation 4.2 is not used in calculation. Please update or remove Tables 4.5-4.11.	Finland	Accepted	Examples have been updated.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
6874	1	4	411	411	Since the equation 4.2 in line 262 for the trend assessment was changed, it is needed to change the example in table 4.6 (That example is for the previous equation in 2006 IPCC GL).	Republic of Korea	Accepted	Examples have been updated.
5486	1	4	71	71	Add a sentence describing what this list is. E.g. "Key categories should be subject to the following:"	United States of America	Accepted	Added "as elaborated below".
5488	1	4	73	73	Recommend revising title of this header; change "rigorous" to perhaps "category-specific", "tailored", or "focused".	United States of America	Accepted	Used "focused".
6646	1	5	227	229	The sentence in lines 227 to 229 is a repetition of the grey text in lines 271 to 273. It is proposed to remove the text in lines 227 to 229 to avoid duplication.	Russian Federation	Accepted	Text removed as proposed.
6648	1	5	366	383	Box 5.3: Calculations in Box 5.3 seem to be different from the guidance provided in the equeation 5.1. It is proposed to cross-check correspondence between the Box 5.3 and the equation 5.1.	Russian Federation	Rejected	Our view is that the equation does follow the example provided. The bracketted term is the average ratio derived from the period for which data exists for both old and new dataset and Xo is the datapoint for which data in the old time series exists but does not exist for the new dataset. Before this is achieved, there needs to be a test of variability. That is not necessarily reflected in the equation but is necessary for the use in the equation. For the sake of transparency Box 5.1B has been amended by calculation examples using equation 5.1 and equation for estimation of standard deviation with cross-reference to Vol.1, Ch.3, Box 3.0a. In addition the following text has been included: "For simplicity, the average (0.93) has been rounded to two decimal places".
5494	1	5	462	481	Linear interpolation results in 14.44 (compared to 14.49), which would seem to be reasonable, given uncertainties, and is far less complicated. Perhaps an example with more years of missing data would be clearer (e.g. if the example also calculated emissions for 2001 and 2003).	United States of America	Noted	Example has been chosen for simplicity reason.
6452	1	6	214	214	Sentence currently ends with 'checks in the energy.' - 'sector' or a synonym is missing from the end	United Kingdom (of Great Britain and Northern Ireland)	Noted	The comment refers to 2006 IPCC Guidelines text. "energy sector" is suitable edit, but it’s a 2006 IPCC Guidelines text, we can leave it intact.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
7436	1	6	339	759	We strongly suggest to rewrite the section 6.10.2 (Comparison with atmospheric measurements). In section 6.10.2 additions to the original text version of 2006 are proposed, which add some confusion. For example, on the one hand, the 2006 wording in some paragraphs (in sub-section 6.10.2.1) is maintained without change, and does not include the advancement of the inverse modelling methods. On the other hand, within the added paragraphs, successful examples of developments and first usage of inverse models for independent verification are mentioned. Nevertheless, in the same sub-section (6.10.2.1) it is virtually warned against their use as a standard tool for verification (line 364-365). The suggested procedures in section 6.10.2 should include more clearly ongoing international initiatives as the Integrated Global Greenhouse Gas Information System (IG3IS) of WMO Global Atmospheric Watch (GAW) programme, the GEO 2017-2019 Work Programme (including the GEO Carbon and GHG initiative), and the Copernicus initiative for CO2 observing systems. A lot of community calls for strengthening the cooperation between research, systematic observation and application are not appropriately reflected in this draft. It seems like the whole narrative rather discourages comparisons with independent methods, e.g., by introducing some technical barriers – steps termed 'necessary' (sub-section 6.10.2.6) might be reasonable in one case but not scientifically justified or feasible in other cases.	Germany	Accepted with modification	(1) Revised to remove confusing wording retained from 2006 IPCC Guidelines; (2) Added GEO and Copernicus references; (3) Revised 6.10.2.6 to weaken restrictions, add more explanation why S/N and added constrain matters.
7436 (cont.)					Also, the unduly tight restrictions of the criteria of applying inverse model estimates in sub-section 6.10.2.7 impede the use of independent methods. Wording in this sub-section implies the definition of only one possible method restricting other reasonable options too strongly. We urge the authors to clarify that independent verification is critical for any far-reaching and sensitive issue. Comparisons with atmospheric measurements enhance the chance to detect 'unknown unknowns', and allows for the comparison between different countries and creates credibility.			
4676	1	6	343	344	verifying national emissions' should be replaced by 'verifying national inventory estimates' to be consistent with the section 6.10.	Japan	Accepted with modification	Changed to 'verifying national emission inventory estimates'.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5498	1	6	344	346	To provide more context for this update, recommend revising the second sentence to read: "Since the 2006 Guidelines were published, the most notable advances have been achieved in the application of inverse models of atmospheric transport for estimating emission at the national scale. An increasing number of countries are considering applying such models."	United States of America	Accepted	Revised accordingly.
5500	1	6	346	346	Recommend inserting a paragraph break between the sentence ending "countries" and the sentence beginning "An ideal condition for verification."	United States of America	Accepted	Revised.
6454	1	6	365	366	Still a considerable scientific progress in this area' should be corrected to 'Still, considerable scientific progress in this area'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised (2006 IPCC Guidelines text).
5502	1	6	369	369	Recommend inserting "already" between "are" and "being" to clarify that, despite the challenges of using atmospheric measurements for verification, they are currently being used for this purpose.	United States of America	Accepted with modification	Revised to emphasise the recent progress.
6456	1	6	372	372	'magnitude of greenhouse gases' should be 'magnitude of greenhouse gas'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised accordingly.
5504	1	6	383	390	The sentences at lines 383-385 and 389-390 are somewhat contradictory and should be better reconciled. The first sentence states that "inverse modelling is not likely to be frequently applied as a verification tool of national inventories in the near future," but the second notes that "inverse modelling techniques . . . are being applied now in national inventory estimates," providing a number of examples. To help reconcile these two sentences, suggest replacing "frequently" on line 384 with "widely," and inserting "Nevertheless" before the sentence on line 389.	United States of America	Accepted with modification	Revised.
6458	1	6	389	389	inventories, at the end of the line, should be changed to inventory or inventories'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised accordingly.
6460	1	6	408	408	Should be a comma after 'N2O inventory methodologies'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised accordingly.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
6650	1	6	411	439	The application of inverse models may face challenges related to distinction between natural and human-induced emissions of greenhouse gases. It is proposed that the authors indicate of this complexity in the text.	Russian Federation	Noted	The need for distinction stated in other parts of section.
1794	1	6	419	607	In this section, there are many additions on atmospheric concentration and tracer measurements, and inversion models, involving a brief description of stable isotope, radioisotope and atmospheric potential oxygen (APO), which are only briefly described. It is suggested that when they are first mentioned, they should be given a science-based description and definition, including relevant formulas and sources, their application range, uncertainty or limitations. The details are: Lines 419-420: ".....complemented by observations of isotopic ratios, atmospheric potential oxygen (APO), and co-emitted tracers, such as carbon monoxide." Lines 540-546: ".....and supporting tracer measurements useful for discriminating between natural fluxes and fossil emissions, such as atmospheric potential oxygen (APO, as discussed by Minejima et al., 2012) and radiocarbon 14C in CO2 (Levin et al., 2003)." Line 607, Table 6.1: ".....Need more CO2 observations targeting anthropogenic emissions, complemented by APO and radiocarbon observations."	China	Accepted with modification	Added text.
5506	1	6	423	423	After "verification" insert "through atmospheric measurements"	United States of America	Accepted	Revised accordingly.
4678	1	6	427	431	More implementation details are presented in the IG3IS (Integrated Global Greenhouse Gas Information System, http://www.wmo.int/pages/prog/arep/gaw/ghg/IG3IS-info.html) plan prepared by the Global Atmospheric Watch program of WMO (DeCola et al., 2017), which will be an up to date guide for implementing observations and inverse modelling for inventory verification' should be replaced by 'More details are presented in the IG3IS (Integrated Global Greenhouse Gas Information System) Science Implementation Plan prepared by the Global Atmosphere Watch (GAW) program of WMO, which documents "good practice" methodological guidelines for how atmospheric measurements and analysis methods can deliver valuable information for inventory verification" to be consistent with the IG3IS Science Implementation Plan approved by the 70th session of WMO Executive Council in June 2018.	Japan	Accepted	Valid suggestion, replaced ref. to DeCola 2017 by ref. to IG3IS Plan.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5508	1	6	433	433	For clarity, recommend revising the last sentence of the paragraph to read "Another example of a verification system based on inverse modeling is also in place in Australia."	United States of America	Accepted	Revised accordingly.
5510	1	6	437	437	Regional atmospheric modeling has also been used to verify halocarbon emissions (HFC-23) from point sources, specifically by Keller et al. Recommend adding "halocarbon emissions" to the list of emission categories and Keller et al to the list of references. (See Keller citation at right.)	United States of America	Noted	Here in the text, emissions at local, facility (single emitter) scale are mentioned, while Keller 2011 HFC-23 paper deals with larger, regional scale, cited later in text.
4680	1	6	476	476	a system for verifying' should be replaced by 'a verification system for' to be consistent with the phrase "verification system" mentioned in lines 431 and 433.	Japan	Accepted	Revised a sentence to accommodate the edit.
4682	1	6	476	477	National Greenhouse Gas Inventories with Atmospheric Observations and Inverse Modelling' should be replaced by 'national greenhouse gas inventories with atmospheric observations and inverse modelling' because the initial letter of each word should be lowercase here.	Japan	Accepted	Revised accordingly.
6462	1	6	477	477	Emission estimates needs' should be 'Emission estimates need'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised accordingly.
4684	1	6	481	491	The whole texts in lines 481-491 should be formulated as follows, so that the contents can be better understood: • Surface-based and airborne observations of atmospheric GHGs are made by, usually, networks of meteorological agencies, research institutes and site operators. The observations need to meet high standards in all procedures including air sample analysis, data processing, reference gas maintenance, calibration correction against international standards, accompanied by metadata on conditions of measurement. Data quality can be better monitored by data submission to global databases such as WDCGG (World Data Centre for Greenhouse Gases). Establishing a national GHG monitoring network involves optimal network design in order to set up the observation locations that maximize the effect of the observations on reducing the uncertainty of the emission estimates (Nickless et al., 2015; Lopez-Coto et al., 2017). The guidelines for observation techniques and reference gas maintenance are provided by such programs as WMO/GAW and AGAGE (Prinn et al., 2018).	Japan	Accepted	Revised accordingly.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5512	1	6	481	497	The formatting should be corrected so that it is clear that atmospheric observations are a needed component and that surface-based, airborne, and satellite retrievals are options under this component	United States of America	Accepted	Revised accordingly.
6464	1	6	518	526	We welcome the mention of the use of inverse model in the UK as a good example of collaboration with inventory.	United Kingdom (of Great Britain and Northern Ireland)	Noted	No action needed.
6466	1	6	526	526	'and this comparison has got in a better agreement' reads clumsily - suggest 'resulting in better agreement between inverse modelling and inventory results'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised accordingly.
5514	1	6	527	596	Section 6.10.2.3 has example emission estimates by target gas and Section 6.10.2.6 has procedures and examples (lines 655 - 729), If possible would be good to combine examples. Recommend eliminating Section 6.10.2.3 and combining with examples in Section 6.10.2.6.	United States of America	Accepted with modification	There was a misunderstanding that both subsections give examples, instead section 6.10.2.3 gives overviews, and section 6.10.2.6 gives procedues backed with examples, so combining these two is not needed. The subsection titles were modified to better reflect the contents.
5516	1	6	539	539	Note here also challenges with distinguishing between anthropogenic and nonanthropogenic. Note also that satellite and aircraft observations can only collect data on CH4 during the day.	United States of America	Noted	The difficulty of distinguishing between anthropogenic and non-anthropogenic is mentioned. This paragraph intends to introduce few typical examples. Use of satellite and airborne data is not typical for the national scale.
832	1	6	546	554	Chemical formula format of CO2	Thailand	Accepted	Revised accordingly.
5518	1	6	583	595	It is difficult to evaluate the utility and reliability of the methods cited in this example (Australia's modeling of SF6 emissions based on atmospheric measurements) without seeing the underlying analysis. The only citation provided is "Australian Government, 2018)," and there is no corresponding reference in the list of references at the end of the chapter.	United States of America	Accepted with modification	Added reference to Fraser et al. 2014, corrected the reference list to add Australian NIR 2018.
6286	1	6	592	593	Request a change from "inventory leakage rates are assumed and not based on measurements" to "inventory leakage rates are based on limited measurements"	Australia	Accepted with modification	Revised accordingly.
5520	1	6	596	596	Recommend including a new section titled "Developing a Gridded Version of a National Inventory." As noted above, this is a critical step, it is one that the inventory compiler would need to play a key role in to do so correctly, and there is no guidance available on how to do so. Please see attached example text.	United States of America	Accepted with modification	Revised proposed text for gridded inventory and combined with already existing paragraph.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
6652	1	6	599	607	The challenge for application atmospheric measurements for verification of greenhouse gas emissions is the distinction between natural and human-induced emissions of greenhouse gases. Additional challenge is attribution of human-induced greenhouse gas emissions to particular countries. It is proposed that the authors describe these challenges in section 6.10.2.4.	Russian Federation	Accepted with modification	Section 6.10.2.4 is discussing the differences between tracers, and relative difficulties and advantages of the inverse modeling application to those tracers, thus it is better to discuss the mentioned challenges in other sections. Challenge of separating anthropogenic from natural is mentioned multiple times in the text (for example in section 6.10.2.1). The difficulty of making estimate for a single country separation from emissions by other countries is mentioned in new sentence in section 6.10.2.1.
6468	1	6	638	638	alarmingly' is a needlessly dramatic word (unless this is quoting the authors directly) - 'significantly' will suffice	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Editorial.
4686	1	6	641	641	The literature "Matsunaga and Maksyutov (2018)" is referred in the Chapter text, but not listed in the "References" section. Please include ”A Guidebook on the Use of Satellite Greenhouse Gases Observation Data to Evaluate and Improve Greenhouse Gas Emission Inventories, Satellite Observation Center, National Institute for Environmental Studies, Japan, 129 pp.” https://www.nies.go.jp/soc/en/documents/index.html	Japan	Accepted	Added to references list.
4688	1	6	652	654	"It would be more user friendly to provide the source for information such as type of observed GHGs and data available period of each satellite mission for ensuring continuous availability of satellite observation data. For example; CEOS Missions, Instruments and Measurements database online <http://database.eohandbook.com/>	Japan	Accepted	Revised. References to literature dealing with this added to section 6.10.2.4.
834	1	6	657		Typo “PROGAM”	Thailand	Accepted	Revised accordingly.
6470	1	6	660	660	'implementing such system' should read 'implementing such a system' or 'implementing such systems'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised.
5522	1	6	664	664	Change to "from a surface-based or airborne network, or satellite"	United States of America	Accepted	Revised.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5524	1	6	667	668	In addition to being spatially disaggregated, should consideration be given to temporally disaggregating the prior emissions data to provide a better comparison to when the atmospheric measurements are made. There is potentially significant temporal variability in emissions for example from sources such as methane from manure management, enteric/livestock and reservoirs. CO2 flux from lands would also be different during different times of the year as vegetation grows or dies	United States of America	Accepted with modification	Revised.
5526	1	6	668	668	Edit to "up-to-date national inventory data, adjusted to include the same time period of the measurement (e.g. same season, same years) if possible"	United States of America	Accepted with modification	Notice of a need for temporal disaggregation added.
5528	1	6	673	673	Consider adding: "In many cases, steps 1, 3, and 4 are conducted by research institutions not connected to the GHG Inventory compilation, and steps 2, and 5 are conducted by the GHG Inventory compiler."	United States of America	Accepted	Revised.
6472	1	6	676	676	Example 1, Step 1 - ' totally 4 cites'. Presume this should be 'total 4 sites'	United Kingdom (of Great Britain and Northern Ireland)	Accepted with modification	Revised.
5530	1	6	677	677	The examples in the table above all show good agreement. The guidance does not include steps an inventory compiler should take if there is not good agreement. For this guidance to be useful in improving inventories, this is critical. Some suggested language is attached.	United States of America	Accepted with modification	The supporting material text submitted with comment was edited and inserted in the chapter.
6474	1	6	697	697	'on route' should be 'en route'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised.
6476	1	6	710	710	CBW and DECC haven't been defined at this point	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised. Final checks carried out in the final revision for editing.
6478	1	6	712	712	MHD+CBW should be in brackets	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
6480	1	6	732	732	Utility of inverse model estimates for quality checks, improving the inventory' should read 'The utility of inverse model estimates for quality checks and improving the inventory'	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Revised.
6482	1	6	750	750	In reference to the flow diagram step that says 'Expand observation network (and add satellites)' - should this refer to the diminishing returns of adding more measurement sites? Are there other steps that could be tried before adding more stations, what about engaging with other countries with verification experience?	United Kingdom (of Great Britain and Northern Ireland)	Accepted with modification	Diminishing return is mentioned in network design studies, reflected in section 6.10.2.2 text instead.
5532	1	6	758	758	Unclear that this is the best approach to do this comparison (developing a national total from the gridded observation and then comparing it to the national GHG Inventory total). It's great if they match, but if they don't, then what? This is why it's important to have a gridded version of the national GHG Inventory, so that any differences can be investigated (e.g. the compiler can identify which emission sources are occurring in the area with the mismatch and review relevant AD and EF).	United States of America	Accepted	Added table entry on action when mismatch is found.
7664	1	6	760	1040	Chapter 6.11 is written with a point of view of models typical to natural sciences, such as process models used in the AFOLU sector. Thus, not all guidance, including documentation and reporting requirements, are appropriate for other kinds of models, such as some transportation models. Please modify the text and lists of requirements to reflect the variety of complex models used in the inventories.	Finland	Noted	The guidance provided in section 6.12 is not prescriptive to any form of model or modelling conditions. It is meant to provide guidance on the overall use of models. Therefore any model use for inventory compilation should follow guidance provided in section 6.12 to report on the use of any model.
4690	1	6	764	764	National Greenhouse Gas Inventories' should be replaced by 'national greenhouse gas inventories' because the initial letter of each word should be lowercase here.	Japan	Accepted	Change effected as suggested.
836	1	6	786		What is “E.” in “E. Emission = (Emission factor) x (Activity data).”	Thailand	Accepted	Change effected as suggested.
5534	1	6	793	813	Additional bullet points in this list could include: 1.) Models can account for more of the environmental and management influences on emissions/removals than simpler IPCC Tier 1 or Tier 2 methods. 2.)Models can allow for estimation of multiple emission sources (e.g., direct N2O emissions and soil C stock changes from mineral cropland soils) in a single analysis. Coupling the two source categories in a single inventory analysis can help ensure consistency of activity data and treatment of the processes and interactions (e.g., C and N cycling in soils).	United States of America	Accepted with modification	Additional bullet points added to account for how models deal with representation of processes covered by the models.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
4692	1	6	821	821	National Greenhouse Gas Inventories' should be replaced by 'national greenhouse gas inventories' because the initial letter of each word should be lowercase here.	Japan	Accepted	Change effected as suggested. Proposed change implemented.
838	1	6	889		Unclear text "…with Tier 1/2 results."	Thailand	Accepted	Change effected as suggested.
5496	1	6	90	93	Another potential outcome of QA/QC to potentially include: identification and resolutions of errors (e.g., transcription errors, omissions, etc.) during the inventory compilation process. This is a given as part of QC but it is an important outcome.	United States of America	Noted	The suggestion reflects an output and at most a process. The outcome of such an identification of errors would lead to an improvement in the estimates or removals which is an outcome. This is already covered in the first bullet point. Hence, the text has been kept the same.
7662	1	6	952	1040	Please modify the title "Checklist for ensuring good practice…" by omitting "good practice" in order to avoid additional good practice guidance for evaluating, documenting and reporting (on models) on top of good practice and "should" guidance already presented in the chapter. The list of "good practice guidance" in the new chapter on models is already very extensive and on brink of being beyond means of a ghg inventory. The checklist includes many new pieces of advice on what countries "may" want to evaluate and report, thus please omit "good practice" from the checklist title.	Finland	Accepted with modification	A new sentence has been added to ensure duplication is avoided.
9136	1	6	552	552	Current wording is slightly misleading (implying the study only related to the United States). Suggest changing "The study focused on a sub-region of the United States…." to the "The study focused, *in part,* on a sub-region of the United States…."	Canada	Accepted	Revised accordingly.
9138	1	6	562	568	The text mentions uncertainty related to inverse modelling results for nitrous oxide and halogenated gases, but no uncertainty figures are given. It would be very helpful if examples of specific uncertainty ranges were given for models in particular situations.	Canada	Noted	
9140	1	6	607	608	The first column of Table 6.1 gives examples of successes using atmospheric measurements for verification of GHG emissions. Although of interest, the clarity of these examples could be improved if a little more information was provided. Descriptions of use state "National reporting" or "National emission estimates". What is the difference? Are measurements used for verification in both instances? (A referral is made to the country studies described in section 6.10.2.3, but it does not seem to provide clarification.)	Canada	Accepted	Table revised. More explanation is provided in footnotes.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9142	1	6	737	739	It is indicated that one of the criteria to be satisfied when applying inverse model estimates for comparison with national inventories is: “Sufficient number of observation sites, and measurement frequency for specific gas.” With respect to the number of sites, examples are given where anywhere from one to four sites have been used for particular regions or countries. Although stated earlier in the chapter that this will vary with the geography and situation, it would be useful if basic guidance could be provided on the keys to making a good choice or at least directing readers to an appropriate reference.	Canada	Accepted	Added references to papers discussing required number of observing stations.
9144	1	6	742	742	It is indicated that a criterion to be satisfied when applying inverse model estimates for comparison with national inventories is that: “Uncertainties in the inverse model estimates are comparable to or lower than those of the GHG inventory.” No examples of the ranges of uncertainties associated with inverse modelling are given. Generally, inventory experts and compilers are quite familiar with typical uncertainty ranges associated with inventory estimates, but not those for inverse modelling. It would be very useful if examples of such ranges could be provided.	Canada	Noted	
9146	1	6	750	751	(Decision tree for checking the necessary criteria for using inverse model estimates in the National Inventory verification.) Decision point: "Expand the observation network (and add satellites)" should be reworded to "Expand the observation network (and *possibly ,* add satellites)". "Adding satellites" is a rather casually-made option, given the scope of this type of undertaking.	Canada	Accepted	Revised accordingly.
9128	1	6	339	339	Revise heading of section 6.10.2: atmospheric measurements are not compared with inventory estimates, rather, emission estimates derived from atmospheric measurements are compared to inventory estimates.	Canada	Rejected	Section titles of 2019 Refinement follow relevant titles in 2006 IPCC Guidelines. It is out of scope of 2019 Refinement to revise section titles.
9130	1	6	431	433	Clarify the coverage of operational verification systems in the UK or Switzerland: are all sources and gases included?	Canada	Accepted	Addressed in FD.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9132	1	6	506	517	Lines 122-123 define verification as methods that apply independent data, while lines 343-344 state that atmospheric measurements can be used to verify national emissions. However, this paragraph warns that prior inventory estimates strongly influence the result of inverse modeling. Therefore the comparison of inventory estimates with estimates derived from atmospheric measurements does not provide an independent verification. Please clarify.	Canada	Noted	
9134	1	6	538	538	Other articles have noted the challenges of reconciling top-down and bottom-up emissions that are not only from Northern Europe. Suggest revising the text to expand on challenges posed by natural emission sources.	Canada	Rejected	It was not an authors' intention to list all the available studies but just to provide an example for Northern Europe.
9148	1	6	760	761	The guidance given in Section 6.11 is presumably meant to apply only to models used to develop emission estimates, as opposed to verifying them, but this is not clearly indicated, which could lead to some confusion. It is suggested that one short statement be added just below the title, making this explicit.	Canada	Rejected	Lines 763-765 of SOD provide relevant information.
9150	1	6	769	769	Is it necessary to have a section on “Why use more complex methods”? Could this not simply be integrated into the section on models?	Canada	Noted	
9152	1	6	774	777	Stonger wording is needed here to: 1. caution that complex models are not necessary improvements over simple ones and 2. point out the inherent limitations of models when underlying data are missing.	Canada	Accepted	Addressed in FD.
9154	1	6	793	888	The list of adverse effects is incomplete and as such this section is unbalanced. Examples of situations with adverse effects include: when models are used to replace missing data; models often lack transparency and are rarely fully documented; depending on the intended use, model development may not be cost-effective. Text is clearly biased in favour of "models".	Canada	Accepted	Addressed in FD.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9156	1	6	796	797	The meaning of this statement (describing one of the benefits of complex models) is unclear: "~~generally~~, models may *reduce* (~~increase the accuracy of results and usually improve~~) uncertainty assessment by providing a system with an improved structure and more systematic treatment of data". A suggested substitute is: "generally, models may ~~reduce~~ increase the accuracy of results and usually ~~improve~~ reduce uncertainty ~~assessment~~ by providing ~~words removed: a system with~~ an improved *analytic* structure and more systematic treatment of data".	Canada	Accepted with modification	Bullet revised to read: "generally, models may increase the accuracy of results by an improved representation of the processes covered by the model and more systematic treatment of data".
9158	1	6	798	798	Statement unclear. Suggest changing "models can provide an opportunity to test our understanding of cause-and-effect relationships, hence to assess the impacts of mitigation efforts" to: "models can provide an opportunity to test our understanding of cause-and-effect relationships, hence *potentially* assess the impacts of mitigation efforts".	Canada	Accepted	Addressed in FD.
9160	1	6	904	905	In our view, it is not necessary to conduct all of the uncertainty and sensitivity analyses shown, for every model. Therefore, "It is good practice to report:" is suggested to be changed to "It is good practice to report *some or all of the following:"*	Canada	Accepted with modification	Text revised to read: "When the model is created or materially modified, it is good practice to document (preferably in peer reviewed publications which can be referenced by an inventory report to avoid duplication):"
9162	1	6	948	948	It is indicated that good practice is to report all items on the given list. However, QA is not necessarily conducted on all models. Therefore, it is suggested that the item to be reported, "Findings of QA by experts not involved in model development" should be changed to "Findings of QA by experts not involved in model development, *when available"*.	Canada	Noted	
6654	1	7	181	214	It is proposed that the authors provide default fraction of precursors that completely oxidise to carbon dioxide for each category (activity) where the emissions of precursors are estimated. These default fractions should be included in Table A.7.2.	Russian Federation	Noted	Table A7.2 provides the default carbon contents whilst table A7.1 stipulates that complete oxidation is assumed for all fuel combustion activities.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
4694	1	7	286	286	There is a description which is "the carbon in NMVOC emissions from fueling stations would typically be captured in fossil fuel consumption activity data and therefore in emissions from 1.A." in the column of explanation in this table, but the carbon in NMVOC emissions from fueling stations may not necessarily be captured by the emissions from 1.A. because it depends on the statistical survey method. If the amount of fuel actually refueled to cars is surveyed, the carbon in NMVOC from fueling stations is not captured by the fossil fuel consumption data used for 1.A.	Japan	Noted	The authors considered this issue and concluded that most fuel surveys focus on fuel delivered as opposed to amount of fuel actually refueled to cars and decided to keep the text as is.
6656	1	7	286	287	It is proposed that the authors provide default values of emission factors for estimation precursor emissions. The default emission factors should be included in Table A.7.1, otherwise separate table should be developed to include default emission factors referred to in this section.	Russian Federation	Noted	The table provides default carbon contents. If complete oxidation is used, it should be easy for inventory compilers to estimate emission factors by converting from carbon to carbon dioxide using the ratio of molar masses.
5536	1	7	47	55	The current introductory paragraph discussing radiative forcing & metrics seems misplaced as the first of the chapter. The paragraph starting on line 56 is more appropriately placed as the introductory paragraph.	United States of America	Accepted	Revised accordingly.
5538	1	7	63	63	Add as a final sentence of the paragraph: "All of these compounds can have chemical interactions that may perturb the lifetime and behavior of other atmospheric species, with the potential for additional radiative effects."	United States of America	Noted	No action can be taken because comment is out of scope of 2019 Refinement.
9164	1	7	46	55	IPCC Guidelines are focused on emissions by sources. This is unclear in the Introduction. The first paragraph therefore should: 1) state that national GHG inventory totals need only account for direct CO2 emissions and that determining CO2 from the atmospheric oxidation of precursors is an optional calculation, 2) explain that 'indirect CO2' occurs due to the oxidation of precursors in the atmosphere and will vary depending on regional atmospheric conditions, and 3) state that there are currently no IPCC GWPs for CO and NMVOC.	Canada	Noted	1) The IPCC GL is not to be prescriptive on accounting rules for what is included, but is to provide method methodologies for how to estimate emissions. 2) It is explained in the text already that this CO_2 is from the oxidation of CH_4, CO, and NMVOCs. The method for calculation of CO_2 from atmospheric oxidation is based on national scale data that aggregates across local variation, and the method has been revised to include an oxidation factor to enable countries to apply regional factors. 3) The IPCC Inventory GLs are intended to be non-prescriptive regarding selection of metrics for aggregating GWPs. This chapter only states that countries should recognize what their selection of metric includes and excludes with respect to atmospheric oxidation effects. Section 7.2.1.5 addresses the issues of metrics with respect to CH_4. Given that explanation the text has not been changed.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9166	1	7	52	54	This text suggests that the “chapter is based on the underlying assumptions used in the derivation of the GWP and GTP metrics…” However, the connection is not explained and nowhere else in the chapter are these metrics or their derivation mentioned. It is therefore suggested that the text of this sentence (and possibly, the next) be removed.	Canada	Accepted with modification	Further explantion of the implications of different metrics is included in section 7.2.1.5 with respect to methane where further explantion is included. Reference to this section was added. Some text has been removed that has raised concerns.
9168	1	7	127	128	Indirect CO2 is not really an ‘input to the atmosphere’. The use of that term can be misleading to compilers, since it is formed in the atmosphere and not a direct input/release. More exact phrasing should be used, for example, "CO2 formation resulting from the atmospheric oxidation of CH4, CO and NMVOCs". Here, suggest changing “This section provides guidance on calculating CO2 inputs to the atmosphere from emissions of carbon-containing compounds that are not included under other emission categories” to “This section provides guidance on calculating *atmospheric CO2 formation from of precursor gases* that are not included under other emission categories’.	Canada	Rejected	The proposed alternative language is a process "formation" versus the product (CO_2 added to the stock in the atmosphere). Further, the opening paragraph of section 7.2.1.5 refers to "CO_2 inputs to the atmosphere from emissions of carbon containing compounds", which distinguishes it from direct emissions. And the next paragraph describes the oxidation mechanism. It does not seem to be productive to dwell on the terminology already used in the 2006 GL for these calculations since we are clear that they are distinct from direct emissions from sources.
9170	1	7	153	153	Use of "CO2 inputs to the atmosphere" should be replaced with "formation of atmospheric CO2 from the oxidation of precursors" to avoid confusion between direct and indirect CO2.	Canada	Rejected	See above with response to line 127.
9172	1	7	155	155	Add context to clarify the use of "indirect CO2" as compared to"‘direct CO2 input to the atmosphere".	Canada	Rejected	See above with response to line 127. The term "indirect appeared in text twice, which were removed.
9174	1	7	162	162	Replace: ‘CO2 resulting from emissions of…’ with ‘atmospheric CO2 formation resulting from the oxidation of ….’ to be more specific and clear.	Canada	Rejected	See above with response to line 127
9176	1	7	164	164	Replace ‘account’ with ‘calculate’ or ‘estimate’, since molar ratios are used to estimate precursor gas oxidation. It would also be useful to add some text to assist compilers in recognizing that a) some precursor gases remain un-oxidized and b) that the molar ratio approach does not take into consideration the actual time for oxidation to occur especially for NMVOCs that have very complex hydrocarbon molecules.	Canada	Accepted with modification	Revised text to replace "accounted" with "estimated" or "included" or "addressed". A) method now includes oxidation factor, and existing text on uncertainty at the end of section 7.2.1.5 addresses complex NMVOC oxidation processes.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9178	1	7	170	182	Replace ‘input of CO2’ and ‘Input CO2’ with ‘atmospheric CO2’. The term ‘input’ is misleading since these are not CO2 input/emitted into the atmosphere instead they are formed in the atmosphere.	Canada	Rejected	See above with response to line 127.
9180	1	7	185	185	Need references and justification to support the default values of 0.6 and 0.83 for NMVOC; it will vary based on speciation profiles and local atmospheric conditions.	Canada	Accepted	Included citation for entire paragraph for both default values.
9182	1	7	190	190	Replace “accounting” with “*list of precursors that contributes to the formation of CO2”*. (The method is not an accounting, but an estimation based on approximation.)	Canada	Accepted with modification	Replaced the word "accounting" with the term "estimation".
9184	1	7	204	207	Some justification (or details from a supporting reference) should be provided for the applicability of the default percentages of mass carbon content presented (i.e., 60%, 85%), considering it can range from 51% to 100% for CH4 (as an example).	Canada	Accepted with modification	Text has been revised by adding to parenthetial where defaults are introduced a reference to supporting data in Table A.7.3
9186	1	7	209	210	This text indicates: “Boucher et al. (2009) assumes 95% of emitted CO2 is oxidized with a range of 51 to 100 percent.” Without more information, the significance of this statement is unknown. Further, clarity should be provided here: over what time period? Why was the 95% figure selected when the range was so wide?	Canada	Noted	The study is cited and users can refer to it for more information, as is done with other references in the IPCC GL. The 95% **mean** value is taken from Boucher (2009). The values closer to 50% are quite rare.
9188	1	7	211	214	Supporting documentation for the duration from ‘minutes to months’ for NMVOCs to oxidize, since it is possible that some species may take years while others don’t get oxidized.	Canada	Accepted with modification	Added the word "primarily" to eliminate absolute nature of sentence. The vast majority of NMVOCs by mass will have short atmospheric lifetimes.
9190	1	7	47	47	Meaning of sentence somewhat unclear. To clarify, suggest adding the word ‘direct’ to line 47 as follows, “Global warming potential-weighted greenhouse gas emission totals are based upon *direct* greenhouse gas emissions…” Also, include or list direct greenhouse gases. I.e. Direct greenhouse gases with accepted GWPs are CO2, CH4, N2O, HFCs, SF6, PFCs, NF3’.	Canada	Rejected	The term "direct" is not a term used in the IPCC GL, and there is no definition available in the Glossary for it. So this chapter should avoid introducing a new undefined term. However, the core is the reference to chapters 2-5, where methods for emission calculation are provided. Only this section deals with the atmospheric transformation of carbon containing substances.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9192	1	7	50	52	This text brings up the subject of radiative forcing metrics, but it appears to contradict standard IPCC inventory guidance. How does 'the use of any radiative forcing metric…' from other…'assessment reports of the IPCC' ensure comparability and consistency? This is not in line with IPCC's guiding principles for consistent and comparable inventories. The intention of current text is not clear, but it is suggested that new text be substituted, which clearly explains reasons for utilizing the method outlined in this chapter, which is based on the calculation of indirect CO2 from molar ratios.	Canada	Accepted with modification	The orginal statement has been modified by deleting one sentence. This remaining statement on metrics is included to indicate that choice of metric is relevant to the methods addressed in this chpater, but that these GLs should not be prescriptive to the current or future choice of metrics used to address radiative forcing. Countries that may choose not to apply metrics at all still have one option for estimating these inputs.
840	1	8			General concerns: -Objective of Chapter 8 is to provide the guidance on how to report national inventory but the chapter outline is not as clear as it intends. For example, section 8.2 should not start with miscellaneous points about what sources should or should not include in the national inventory (lines 54-85). The content may start with a prefer coverage in the national inventory report by sector or source category (energy, IPPU, AFOLU, Waste, other). Then, other miscellaneous points can be added or provide a prefer outline of the report.	Thailand	Rejected	What the reviewer is asking for is already addressed in Chapters 1 and 4 of Volume 1 including in each introductory chapter of the sectoral Volumes. Also, it is important for the reader to have context of reporting principles such as those covered in section 8.2 (Gases, coverage, time frame, sectors and categories) before getting to section 8.5 dealing with definitions and classificatons.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
7106	1	8	110	118	The Norwegian Environment Agency has recently performed a screening study on the potential occurrence of emerging substances to the Arctic environment. Many of the compounds have been selected for the study as they have been identified as chemicals of emerging concern in a recent report from the Arctic Monitoring and Assessment Programme (AMAP Assessment 2016: Chemicals of Emerging Arctic Concern, 2017). As one of the main findings of the study, five volatile fluoroorganic and related compounds (as listed under) were detected in Arctic air for the first time. Several of these compounds, which are by instance used as liquids in chemical industry and medical applications, have not been found in environmental samples before. The detection of these compounds in Arctic air samples is a potential indication of long-range transport and persistency. In addition, these compounds have no sink in the lower atmosphere and they have a strong IR-absorbance, which together make it very likely that they can act as long?lived greenhouse gases. Please take those information into account and consider to include those compounds in the assessment. A report summarizing the findings of the study will be published in a couple of weeks. The substances in question are: PFPHP - Perfluoroperhydrophenanthrene (Vitreon, Flutec PP 11) - CAS 306-91-2, PFTBA - Tris(perfluorobutyl)-amine (FC-43) - CAS 311-89-7, TCHFB - 1,2,3,4?Tetrachlorohexafluorobutane - CAS 375-45-1, DCTFP - 3,5-Dichloro-2,4,6-trifluoropyridine - CAS 1737-93-5, DCTCB - 1,2-Dichloro-3-(trichloromethyl)benzene - CAS 84613-97-8	Norway	Accepted	The authors thank the reviewer for highlighting these new F-gas observations. The electronics authors recognize PFTBA as a popular heat transfer fluid used in electronics manufacturing. Although the compound's GWP and atmospheric lifetime have not been published in the peer-reviewed scientific literature, research by the manufacturer, as well as the compound's perfluorinated structure, indicate that it has a very long atmospheric lifetime and a 100-year GWP near 10,000. Guidance on estimating emissions of this and other fluorinated liquids is provided in Chapter 6 of the Refinement. Research into the other compounds indicates that they are used in a variety of applications, some of which are addressed in the 2006 IPCC Guidelines. For example, PFPHP is used in cosmetics and medical applications, whose emissions of perfluorinated compounds are addressed in Volume 3, Section 8.3 of the 2006 IPCC Guidelines (Use of SF6 and PFCs in Other Products). The authors will note the other substances as potentially of interest for future IPCC research.
5548	1	8	175	178	Recommend adding a sentence or two also indicating that it is good practice to perform recalculations of the time-series as necessary	United States of America	Accepted with modification	Suggestion implemented by including a sentence on recalculation linking to Chapter 5 (section 5.2) of Volume 1 of the 2019 Refinement (guidance on recalculations).

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
5550	1	8	254	258	Pages 8.30 and 8.33, Table 8.2: The category "3B2—Cropland" indicates that emissions and removals from rice fields including CH4 should be reported in this category, but the category "Rice Cultivation—3C7" also indicates that CH4 emissions from rice cultivation should reported in that category. Is it optional on where to report rice CH4, or is the table wrong? I would also note that in Volume 4, Chapter 1, Table 1.2 of the 2006 IPCC Guidelines, CH4 emissions from rice is only included under the Cropland Remaining Cropland category. However, in Volume 4, Chapter 1, Figure 1.4 of the 2006 IPCC Guidelines it only shows rice CH4 under a separate category 3C "Aggregate sources and non-CO2 emissions sources on land." Seems like some clarification should be provided in Table 8.2 of the 2019 refinement to consistently show the structure of AFOLU. Depending on how this issue of rice reporting is resolved, it may be necessary to update Figure 1.4 and Table 1.2 of Chapter 1, Volume 4 of the 2006 IPCC Guidelines as part of the 2019 refinement work.	United States of America	Accepted with modification	Thank you for picking this up. Text added to 3B2 to highlight that 3B2 does not include CH4 emissions from rice cultivation and that it is included in 3C7. The methodology for estimation of methane emissions from rice is provided in section 5.5 of Vol.4, Ch.5 (3B2 Cropland). However, according to Vol.1, Ch8, table 8.2 and also Figure 1.4, Vol.4, Ch.1 methane emissions from rice cultivation should be reported under 3C.7.
5552	1	8	254	258	Page 8.31, Table 8.2: For the category "Wetlands" should the subcategory of coastal wetlands (from the 2013 Wetlands Supplement) be included in the table? Also, a subcategory for lands converted to coastal wetlands?	United States of America	Accepted with modification	A sentence titled "Emissions estimated for the categories in the Wetlands Supplement are included in the land use categories forestland, cropland, grassland as well as wastewater treatment and discharge. The 2013 Supplement to the 2006 IPCC Guidelines for national Greenhouse Gas inventories: Wetlands provides guidance on reporting these categories and the sub-categories contained in the supplement" has been added in section 8.2.1 to clarify the guidance already provided in the supplement to avoid duplication in guidance.
5540	1	8	32	42	Should there be mention of the 2013 Wetlands Supplement in this introductory section? Even a footnote to remind users that the 2013 Wetlands Supplement exists and is available for use in conjunction with the 2016 IPCC Guidelines and this latest 2019 refinement would be useful.	United States of America	Accepted with modification	The Wetlands Supplement is mentioned in section 8.2.1 to highlight the relationship between the reporting guidance provided in the refinement and that provided in the supplement with respect to categories and subcategories related to wetlands.
5542	1	8	56	56	Recommend revising this text to be more clear about exactly where these emissions should be attributed (which country) based on the end-user. Perhaps providing an example.	United States of America	Accepted with modification	The sentence has been revised to be more clear in terms of which category it is referring to and the other gases affected.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
4696	1	8	77	79	The allocation of CO2 emissions captured for use should be more flexible because it could be better to report CO2 emissions not under the category where CO2 were captured but the category where CO2 were used from the viewpoint of reduction measures. Therefore, "unless it is shown that the CO2 captured is reported in other sectors properly" should add to the end of this paragraph.	Japan	Accepted with modification	Captured emissions should be reported where they occur so that the net emissions (emissions - capture) are easy to verify. However, if CO2 emissions occur during their use in another category, the emissions associated with use should be reported where CO2 is used (see Ch.8, section 8.2.1).
5544	1	8	80	81	It might help to clarify that the non-CO2 emissions from combustion of biomass for energy are reported as part of the Energy sector. Also, it would be useful to clearly state that while the CO2 emissions from combustion of biomass are reported in AFOLU, they are not explicitly identified as emissions from combustion in reporting. This is implied by saying they are part of the “net changes in carbon stocks” but this is an important point that many people have been confused about over the years so additional clarification would be helpful.	United States of America	Accepted with modification	This issue is now addressed in Chapter 1 of Volume 1 under section 1.1 titled "Concepts".
5546	1	8	84	85	Isn’t this also true for N2O resulting from leaching and runoff? These N2O emissions can also occur outside of the country where the N runoff or leaching occurred.	United States of America	Accepted	Text amended.
842	1	Annex 8A.2			Annex 8A.2 has some table and line crossover to the next page without proper break.	Thailand	Accepted	Editing revised. Tables corrected.
7140	1	Cover page			Please consider to add EF to the list of abbreviation in Annex 8A.1	Norway	Noted	EF addressed in the Glossary.
5306	1	1	365	373	Should be noted up front or as part of re-inserted/updated compilations steps in the 2006 GL and cross-referenced from roles/responsibilities.	United States of America	Accepted with modification	Added cross reference in Table 1.3 to section on QA/QC management.
5308	1	1	370	370	Not just QA and verification, but QC activities too. Recommend adding.	United States of America	Accepted	Added QC to bullet.
9078	1	1	373	373	Change” illustrated below” to “illustrated in Table 1.8 below”.	Canada	Accepted	Added cross reference to Table 1.8.
5310	1	1	374	381	I would reorder the table to have the IPCC categories listed first. Clarify what an owning stakeholder is. Is it the source lead responsible for implementing the improvement?	United States of America	Accepted	Column reordered and stakeholder term replaced in table footnote with more specific language.
9080	1	1	385	385	Should be in bullet form.	Canada	Accepted	Bullet corrected.
9082	1	1	386	404	Section 1.5.4.4 (Education, Awareness Raising and Public access to the Information) is beyond the scope of IPCC Guidance and should be deleted.	Canada	Accepted with modification	Text in this section has been refined and reduced to focus more narrowly on role of education in engaging stakeholders as users of GHG inventory outputs.
5312	1	1	401	404	Line 401-404 should highlight the policy-neutral, technical role of the inventory to inform these other uses. The inventory’s role is to present findings resulting directly from the data.	United States of America	Accepted with modification	Last bullet in list has been deleted.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
9084	1	1	236	248	"Illustrative work plan" for the preparation of GHG inventory is overly prescriptive; clearly label this text as a possible example ONLY.	Canada	Accepted	Cross-reference added noting table as example.
9086	1	1	105 Table 1.1	129 Table 1.2	This section suggests that information on commitments supported by the GHG inventory be provided. The stated purpose of Table 1.1 is to provide useful detail on why the GHG inventory is needed and to define and prioritize the data and expert needs, which exceeds the requirements of the 2019 refinement terms of reference and the purpose of the guidance document. This type of information may be relevant when considering improvements, however given that this information does not enhance the emission estimates being produced, this requirement should simply be removed. This section provides an example table to be used (Table 1.2), which is overly prescriptive.	Canada	Noted	No requirement is specified in section. Text has been modified to remove mention of commitments. Table is illustrative and an example, and chapter introduction states that guidance is not intended to be prescriptive.
9088	1	1	138 Table 1.3	162 Table 1.4	“Managing the interests, contributions and involvement of stakeholders” is beyond the scope of this IPCC document and therefore any guidance on this should be removed. This sections provides a table on stakeholder roles and responsibilities (Table 1.3), however the listed "stakeholders" are not actual stakeholders, but rather members of the organization structure. Stakeholders are people or groups impacted by the GHG estimates and not the people creating the estimates. The provision of a table that defines the role of each stakeholder/member is overly prescriptive and this section should be deleted or revamped to provide guidance. Chapter 6 already provides guidance on roles and responsibilities with respect to planning, preparation and management of inventory activities. It is unclear what value is being added through this duplication.	Canada	Accepted with modification	Language modified to refer to both stakeholders and actors. Sentence on interests changed to state that interests should be "understood" not managed.
9090	1	1	213	248	The 2019 refinements for datasets and dataflows are overly prescriptive; clearly label this text as possible examples ONLY.	Canada	Noted	Box cross reference already indicated to be example.
9092	1	1	Table 1.7	354	The table column name is “National Nomenclature” and the note on line 354 has a mix of “Native nomenclature” and “nomenclature used nationally”. Suggest to only use “national” and be consistent throughout the text.	Canada	Accepted	Text corrected to refer to National.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Authors' note
4904	4	2	1795	1795	A common flaw in the use of complex model is that the user - and even sometimes the designer - are not able to track back the key drivers of their results. This is why an interpretation of the differences with simpler - Tier 1 or Tier 2 - approach seems to be good practice as well. It would garantee that the key engines with the "black box" have been identified and are consistent with the current state of knowledge. Accordingly, We recommend adding a fourth bullet point to this list of good practices pertaining to model evaluation: "It is also good practice to compare the model simulation with simpler Tier 1 or Tier 2 estimates, and to be able to identify the key drivers of the possible differences between the higher and lower Tier estimates."	France	Noted	Copied from Volume 4 (Chapter and Line numbers are not appropriate).