Review Comments by Governments on the Second Order Draft of Volume 4 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7184	4	2	general		GENERAL COMMENT: we have identified several changes to the GLs that haven't been marked, making it very difficult to track the new additions or deletions. This is very disappointing for reviewers, and reduces the trust of governments in the work done. It also can risk the final adoption of the document. We kindly request authors and IPCC secretariat to take the necessary measures to avoid this situation in the next round of draft texts.	Spain	Noted	Thank you for the comment. Every effort has been made to be transparent in the Refinement.
7298	4	2	general		We have identified several elements in this chapter that don't correspond with the colour code explained in the note of page 3.6. This makes very difficult to identify where changes have taken place. ACTION: we kindly ask IPCC secretariat and authors to make sure that changes with respect to 2006 GLs are appropriately identified in the next version of the refinement.	Spain	Accepted	Existing IPCC 2006 text is highlighted in grey where as new text is shown in white - this should make it easy to see what's new in the 2019 Refinement.
9320	4	2	general		In general, the guidance in chapter 2 is becoming highly complex and quite difficult to digest, let alone apply. Too much space is devoted to (very specific!) Tier-3 level methods, including 4 pages in section 2.2 (pp. 2.48 to 2.52) , the entire section 2.5 (over 12 pages) and some significant text sections elsewhere (e.g. lines 604-620, 1163-1180). Review the chapter in light of its intent to provide guidance on generic approaches applicable to all land categories and reduce the amount of guidance on T3 methods. Additional work is needed to avoid duplication with new guidance in vol 1, chapter 6.	Canada	Noted	It is not a requirement to gain an understanding of all methods presented in this guidance. However, the new information is useful for compilers considering the development of an inventory using a higher Tier methodology. The guidance provides examples that would illustrate these applications and some of the requirements of using or moving to higher Tiers.
9220	4	2	38	39	Section 2.3 is missing (both in the Contents and later).	Canada	Noted	This is an error in the section numbering. Whole of Section 2.2 is actually Section 2.3. The sub-section 2.1.1 is actually Section 2.2. The numbering will be corrected.
5774	4	2	147	147	Why is “Inventory Framework” included under 2.11, rather than maintaining the numbering in the 2006 Guidelines where “Inventory Framework is under 2.2? By doing this the entire numbering scheme for Chapter 2 of the AFOLU volume in the 2019 Refinement differs from Chapter 2 of the 2006 Guidelines. Changing the numbering scheme will make comparing the 2019 Refinement to the 2006 Guidelines more challenging for the inventory compiler.	United States of America	Rejected	Mapping tables are provided to facilitate understanding the refinements made and the relationship between the numbering
7186	4	2	147	226	Not relevant for this refinement. Guidelines are for National GHG emissions inventories. If and how these can be applicable to projects or subnational schemes shall not be considered here. ACTION: delete information box.	Spain	Rejected	As already noted for FOD this issue is within the outline of this Refinement
5776	4	2	151	192	Pages 2.7-2.8, Box 2.0A: Suggest removing box or placing in an annex. This guidance document is for inventory compilers of national GHG inventories. Inserting several pages of text at the beginning of the Generic Methodologies section only confuses and complicates the already challenging task of understanding how the guidance should be used for national inventories. Anyone who is planning to do MRV on AFOLU projects or other activities based on IPCC Guidance should have a very strong understanding of the guidelines and thus how they may be applied at the project level depending on the unique characteristics of their project. Attempting to provide information on how this might be done in a couple of pages is not very useful and clutters an already technically dense section of the AFOLU guidance.	United States of America	Rejected	As already noted for FOD this issue is within the outline of this Refinement
7138	4	2	164	164	We think that EF stands for Emission Factors. Emission Factors are written out most places in the report please consider to do that here as well	Norway	Accepted	
9308	4	2	180	185	It is unclear how useful it is to cite a particular government program not knowing how long this program is going to last and its website link staying open.	Canada	Noted	Authors believe citing some concrete actual examples are helpful to inventory compilers, in spite of the potential issue pointed out in this comment.
6232	4	2	183	185	Box 2.0A – suggest amendment as concept of ‘fungibility’ is more of an accounting construct. Suggest replacing 'fungible' with 'consistent'.	Australia	Accepted	

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6010	4	2	240	240	"a. Identification of the lands affected by natural disturbances" - It may help to provide guidance on how lands affected by natural disturbance can be identified (e.g. georeferenced, statistically). There have been some who interpret spatial tracking of lands as the only acceptable approach.	United States of America	Noted	Line 240 does not contain any text.
5778	4	2	257	538	These sections read more like a textbook than methodological guidance. The authors should consider reducing the length of this discussion and providing references for the inventory compiler rather than the detailed descriptions currently provided.	United States of America	Rejected	The section provides additional guidance for Tier 2 method, in relation to the potential use of allometric models in the estimation process of C stock changes; Definition and description of most commonly used allometric models are included in the section in order to supply the reader with sufficient background information to implement the Tier 2 method.
9222	4	2	258	268	Please address the following inconsistencies: -Citations: e.g., Chave et al 2005 vs Paul et al. (2016) vs Lopez-Serrano et al. 2005 vs Jucker et al, 2017 vs Calders et al., 2015 vs Chambers et al. (2001)/ -Use of “burned” vs “burnt” / -Use of “clear cut” vs “clear-cut”	Canada	Noted	Harmonized how references are included in all tables
9222	4	2	258	2835	Please address the following inconsistencies: -Citations: e.g., Chave et al 2005 vs Paul et al. (2016) vs Lopez-Serrano et al. 2005 vs Jucker et al, 2017 vs Calders et al., 2015 vs Chambers et al. (2001) -Use of “burned” vs “burnt” -Use of “clear cut” vs “clearcut”	Canada	Accepted	These changes have been made.
7188	4	2	329	338	Editorial. Delete "these conditions" in line 338, as reference to "conditions such as" is already included in line 331.	Spain	Accepted	The quoted text has been deleted.
7190	4	2	332	334	it is irreal to expect that the model will be valid for all trees, out of the sample population and even within the sampled population. What matters is that uncertainty is maintained within acceptable values. ACTION: delete last sentence of the bullet, from "individual" to "sampled population".	Spain	Accepted with Modification	The text has been modified, adding a new bullet point on model representativeness
9224	4	2	363	363	Define LiDAR the first time this abbreviation is used. It is spelled later (p. 484).	Canada	Noted	Harmonize how references are included in all tables -TSU
7192	4	2	376	376	Not 100% of the times higher tiers mean higher accuracy of methods, parameters and estimations. ACTION: add "usually" before "results in an increased accuracy"	Spain	Accepted	Text has been modified, by inserting "usually".
9310	4	2	388	2882	Errors or typos: - Line 388: “… methods can be find…” Should be “found”. - Line 402: “The replacement of generalised m”. Define m. - Line 2472: … “time series of annual emission and removals” should be “emissions” in plural. - Line 2582: a “to” seems to be lacking between 1990 and estimated. - Line 2820: “challenging to separate emissions from dead organic matter that was created” should be “were”.	Canada	Accepted	Will be addressed, at least, in the final copy-edit work.
7194	4	2	441	441	ACTION: redraft: "sensed data for ABOVEGROUND biomass estimation". This will ensure the interpretation that the application of density maps is proposed for aboveground biomass only.	Spain	Accepted	Editorial. Harmonized how references are included in all tables
9226	4	2	442	537	Re-order the entire section by starting with text relevant to the intented audience (inventory compilers): begin with lines 498-536, then lines 444-468. Inventory compilers are very unlikely to develop biomass density maps, but they should understand their advantages and limitations. Lines 483 to 497 are textbook material: it should be sufficient to provide reference to a standard text on remote sensing technologies for the interested reader.	Canada	Accepted with Modification	The subsection on remote sensing technology moved to new box to address the comment and to not distract the reader. Text is not reordered, since it is considered as important that the inventory compiler reads the considerations for the map development before considering how to used a map.
7196	4	2	480	482	We are concerned that this biomass maps can be used for estimating other than AGB pool. ACTION: redraft the paragraph: "because AG woody biomass is the ONLY variable that can be predicted from remotely sense data, additional information such as country specific data for rood-to-shoot rations IS NEEDED to estimate carbon stocks in other pools."	Spain	Accepted with Modification	The word primarily is deleted. In addition, It is not necessarily the case that BGB is estimated applying the rood to shoot ration, but for example can be predicted by allometric models.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7142	4	2	483	497	May be "Global Ecosystem Dynamics Investigation (GEDI)" is applicable in some countries. "GEDI will use three NASA-developed lasers, each coupled with a Beam Dithering Unit (BDU) to produce three sets of staggered footprints on the Earth's surface to accurately measure global biomass". It will assess the significant contribution of deforestation to CO2 concentration and effect on the global biodiversity	Norway	Accepted with Modification	A sentence is added to the second paragraph on remote sensing technologies (now a Box), indicating that “a series of targeted space-based missions will improve the capabilities for forest biomass predictions….” . Since these new missions are not yet operational and there are other missions than just GEDI, GEDI is not mentioned specifically.
7144	4	2	483	497	Application of albedo for assessing radiative forcing and NIBIO has started to undertake such evaluations. Albedo changes are increasingly included in climate change impact assessments of forestry and other land sector projects.	Norway	Rejected	The document is guidance for estimation of GHG, albedo issues are beyond the scope of these guidelines
7146	4	2	483	497	As an alternative carbon cycling, plant productivity and biomass can be assessed along a rainfall gradient	Norway	Rejected	The document is guidance for estimation of GHG, ecological studies related to the behaviour of productivity along environmental parameter gradients is out of the scope of the GLs.
5780	4	2	537	537	In Box 2.0D, insert "The" before the word "Aim" in the 2nd sentence.	United States of America	Accepted	Editorial
9228	4	2	602	602	What is the meaning of the sentence "When the gain-loss method is chosen, inventory measurements may provide estimates"?	Canada	Accepted	We have revised the text to clarify the meaning of the sentence.
9230	4	2	604	620	This text is highly technical and relevant to the development of tier-3 models; re-locate elsewhere as appropriate or delete.	Canada	Rejected	This content relates to the application of the model specified in this section not the development of Tier-3 models.
7198	4	2	621	624	We assume that this equation is also applicable for land conversions, although the chapter 2.2.2.2 doesn't reflect any update, we would like to make sure that right references to this formula are done. ACTION: ensure right reference to formula 2,19 in section 2.2.2.2.	Spain	Noted	This model at the application was not part of the 2019 Refinement so no additional text was added to specify use beyond Land Remaining in a Land Use Category. That said, it is generally agreed that this model may be used in the Land Conversion to a New Land Use Category.
7200	4	2	635	636	We disagree that the area used has to be the one at the end of the inventory period. This only work if the area has decreased. With increases in area this assumption doesn't work. In addition to this, we think that the sentence could be more precise (it is confusing saying that the area of land remaining in the same land use category will be defined at the end of the inventory period). ACTION: replace the sentence "it is good practice to use the area at the end of the inventory period (t2) to define the area of land remaining in the land use category" by something along the following lines: "it is good practice to use the smaller area , between the area in t1 and the area in t2, to define the area to be used for calculations in equation 2.19."	Spain	Rejected	We thank the reviewer for the comment, but it refers to text already agreed in the 2006 GL and changes here were beyond the scope and the mandate of the 2019 Refinement.
7202	4	2	639	719	we miss indications on how to calculate DOM out.	Spain	Rejected	We thank the reviewer for the comment, but it refers to text already agreed in the 2006 GL and changes here were beyond the scope and the mandate of the 2019 Refinement.
7204	4	2	689	690	We believe that this affirmation is true for all the factors/parameters in the AFOLU sector. Therefore, we don't see the need to highlight it only for input of DOM. ACTION: move it to the introduction of the section (2.2. generic methods) or delete it.	Spain	Rejected	We thank the reviewer for the comment, but it refers to text already agreed in the 2006 GL and changes here were beyond the scope and the mandate of the 2019 Refinement.
6926	4	2	723	724	The range of variation of default values is much higher than those of 2006 IPCC. It is necessary to reduce range of variation for improving uncertainty.	Republic of Korea	Rejected	Thank you for the comment. We included new data to cover a wider range of conditions and the min and max estimates reported reflect the range of data included in the updated table.
7206	4	2	723	724	the table refers only to DOM in forests, therefore, we don't see the need to place it here. ACTION: delete from here and move it to chapter 4, where it belongs (forest lands).	Spain	Rejected	Thank you for the comment. The placement of the table has been agreed in the original 2006 GL and changing this is beyond the mandate of this refinement.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7208	4	2	757	757	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
9232	4	2	773	773	Reference is only made to drained organic soils. Organic soils may also be excavated, impacted through compaction, changes in vegetation cover resulting from various different land use changes. Since this is general guidance, the guidelines should provide text that makes reference to how to resolve issues related to organic soil impacts that are not related to “drainage” per se.	Canada	Accepted with Mod	The text (Line 762-763) indicates that for organic soils CO2 emissions due to enhanced microbial decomposition caused by drainage and associated management activity needs to be addressed. This is handled by identifying values for L within the chapters for each land use. Also, only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope for updated in this refinement.
7210	4	2	778	778	ACTION: replace "Greater" by "Different" at the end of the line. In our view, as long as soil depth is consistent along the timeseries, it could be smaller than 30 cm. See text in chapter 4, page 4.7, lines 177 to 179. "depth for evaluating C stock changes can be different. "	Spain	Accepted with Mod	For Tier1 accounting all reference stocks and stock change factors have been developed for a 0-30cm soil layer. If the default values are to be used then the account can only operate to 30 cm. For Tier2 which will use country specific values it is recognised that a different depth could be used: either shallower or deeper than the 30 cm. However, the country will have to justify the use of the depth selected and should ensure that in selecting that depth no bias related to management practice is introduced into the estimates. For example, if soils are tilled and mixed to 25 cm, soil carbon stocks should be defined to at least this depth. If a depth shallower than 25 cm was adopted, then tilled soils may falsely appear to have a lower soil carbon stock.

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9234	4	2	790	790	IPCC guidance is not "conservative" - it should be "unbiased", that is, neither deliberately under-estimating nor over-estimating emissions and removals. Correct sentence and approach accordingly.	Canada	Accepted with mod	The word conservative was perhaps not the best choice to use in describing the methodology developed around biochar permanence in soil. Our goal was to provide a method that is valid for a Tier 1 methodology. Based on the biochar literature, there is high confidence in estimating the long-term 'permanent' component of biochar amendments that is sequestered in soils. The literature is not sufficient for estimating the shorter term dynamics of the less stable C in biochar. Moreover, estimating the dynamics of the less stable organic matter fractions in biochar requires more information than is feasible for a Tier 1 method. Therefore to be consistent with the current understanding, the authors defined Fperm as the fraction of biochar remaining after 1000 years given that the literature is sufficient for estimating this component, and the more transient components can be estimated with higher tier methods. This is consistent with other Tier 1 methods that do not always address the full impact of management, requiring higher tier methods to incorporate other components if the country has sufficient data and resources. The text has been altered to reflect the rationale for the method.
9344	4	2	824	825	Reprojection does not cause error' if done correctly. Different projections will result in different distortion and everyone should pick a projection that is appropriate to reduce distortion.	Canada	Accepted	Text has been modified "reprojection of spatial data should not cause errors if applied correctly using appropriate type of projection for a given location".
7212	4	2	837	837	After millions of years of human interaction with the environment, the expression "native vegetation" here doesn't reflect the reality of the factor. ACTION: delete reference to "under native vegetation" and replace it by something along the lines of "under the initial conditions of the land use".	Spain	Accepted with Mod	The term "under native vegetation" applies to the reference stocks of soil carbon. A definition appears at line 1066 that defines what the reference condition is. This definition needs to be moved forward to follow the first appearance of the term "reference stocks".
7214	4	2	840	841	more explanation is going to be needed to understand this note. What is Find? When is it substituted by Flu? ACTION: clarify the sentence or delete it. In addition, it would be better placed in the forest land chapter if it is only referred to forests.	Spain	Accepted with Mod	No change is required as the terms are defined. However the reference to the location where Fnd is discussed should be added to the end of the note: (see Chapter 4, Section 4.2.3 for more discussion). Also note the absence of a closed parenthesis.
5782	4	2	859	860	Page 2.27, Table 2.3: An overarching comment on this table and other data tables in this chapter is that there should be greater consistency in how the default values are presented. For example, when comparing the tables 2.2, 2.3 and 2.3A, each has a different approach for presenting the default values and uncertainty, greater consistency in table format for default values would be useful throughout the AFOLU volume. Specific to Updated Table 2.3, the uncertainty ranges do not seem realistic. For most of the values the uncertainty ranges are so large that the 95% CI would result in soils with negative carbon values, which is not possible.	United States of America	Accepted with Mod	It has been accepted that all tables provide uncertainty as a +/- value for 95% confidence intervals. Tables have been modified to present the uncertainty in this format.
6522	4	2	862	863	Figure 2.4. Typo?: "Are there changes in C stocks in mineral soils a Key category?" should read "Are the changes..."	United Kingdom (of Great Britain and Northern	Accepted	Agreed.
6524	4	2	884	884	Typo, should read: "assuming D is 20 years..."	United Kingdom (of Great Britain and Northern	Accepted	This change has been made.

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6526	4	2	888	888	Missing equation number: "Two alternative formulations are possible for Equation 2.25..."	United Kingdom (of Great Britain and Northern Ireland)	Rejected	The equation number is correct, and has been retained from the 2006 Guidelines as directed by the report's steering committee (i.e., equations retained from the 2006 guidelines must also retain the same number).
4906	4	2	913	913	We suggest to add the two following references in the parenthesis. They are excellent meta-analysis of empirical studies on SOC changes following land-use change and as such can be used to define region-specific FLU values: Poeplau, C., Don, A., 2013. Sensitivity of soil organic carbon stocks and fractions to different land-use changes across Europe. Geoderma 192, 189 – 201. doi:10.1016/j.geoderma.2012.08.003 Poeplau, C., Don, A., Vesterdal, L., Leifeld, J., van Wesemael, B., Schumacher, J., Gensior, A., 2011. Temporal dynamics of soil organic carbon after land-use change in the temperate zone – carbon response functions as a model approach. Global Change Biology 17, 2415–2427. doi:10.1111/j.1365-2486.2011.02408.x	France	Rejected	The text describes the example calculations. There is no need to add additional references.
4900	4	2	916	916	"Regardless of the data source, it is good practice that the plots being compared have similar histories and management as well as similar topographic position, soil physical properties and be located in close proximity." From experience this crucial sentence is often overlooked and/or not understood. Adding a sentence specifying that "In particular, the use of national averages per land use is usually not appropriate because different land uses seldom have a similar average topographic position and soil physical properties. Forests, for example, tend to be located on steeper and poorer soils than cropland on average at a national level."	France	Noted	Searching the Refinement to find this text showed that this comment was from line 1088. This was located within a section not identified for revision.
4902	4	2	929	929	"It is good practice to provide the results of model evaluation, citing published papers in the literature and/or placing the results in the inventory report." A welcome improvement would be to recommend that a Tier 1 or simpler Tier 2 calculation be applied in parallel, and that the possible difference with the Tier 3 results be interpreted. This is not to question the overarching principle that Tier 3 should be preferred to Tier 1, but it would greatly improve the transparency of the advanced Tier 2 or Tier 3 method and its comparability with other countries. We therefore recommend adding after the above sentence: "It is also good practice to compare the implementation of the model with a Tier 1 or simpler Tier 2 estimate and to explain what drives the possible differences between the higher and lower Tier estimates."	France	Noted	This is a broader issue for the guidance, which is not specific to soil C, and would need to be addressed in Volume I, General Guidance, and the General Tier 3 guidance in Volume IV, Chapter 2.
7216	4	2	935	935	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7118	4	2	936	1006	We fully support the inclusion of biochar in the 2019 refinement	Norway	Noted	Thank you

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7122	4	2	936	1006	The calculation in tier 1 using a simple equation with two factors (FCp and FPERMp) e.g. in table 2.3B is reasonable. However, the scientific basis for the 600-degree threshold for increased biochar stability is not very strong, and in our opinion the large difference between 0.24 and 0.38 in FPERMp is not justified. We suggest that the difference be reduced so that only the differences in biochar carbon content not captured by FCp is accounted for. The current configuration may influence market production of higher temperature biochars at a time when pyrolysis technologies are still being developed	Norway	Accepted with Mod	The values produced were data driven based on a range of studies. The derivation process and references are included in annex 2A.2. We must respect the calculations derived from the data used and cannot alter values based on opinion.
9236	4	2	943	943	IPCC guidance is not "conservative" - it should be "unbiased", that is, neither deliberately under-estimating nor over-estimating emissions and removals. Correct sentence and approach accordingly.	Canada	Accepted with mod	The word conservative was perhaps not the best to use in describing the methodology developed around biochar permanence in soil. It is important that the biochar considered to be stable in soil is only the fraction that is counted as being sequestered. The reasoning for defining Fperm as the fraction of biochar remaining after 1000 years was to be confident that the values derived from equation 2.26A provided a valid estimate of the sequestration of biochar C. The text should be altered to express this.
5784	4	2	943	947	The point about using Fpermp being used as a conservative estimate of carbon accumulation in soils is stated twice. There may be a good technical reason for stating it twice, but the authors should check.	United States of America	Accepted	Agreed.
7120	4	2	943	950	We do not understand why a 1000-year time frame was chosen over the more reasonable and traditional 100-year time frame for forestry and soil C measures used by IPCC. It is highlighted that a 1000 years timeframe gives a conservative estimate over the normal 100 year timeframe. At the same time it is said in vol 4, Ch. 8, line 3933 that the estimate is "conservatively estimated by fitting a two-pool double-exponential. This seems to give a rather conservative approach compared to other estimates in the 2019 refinement of the 2006 Guidelines. model to only those datasets that exceeded one year and allowed a two-pool model to be fitted following the rationale outlined"	Norway	Noted	Given uncertainties in biochar composition and variations in production conditions, along with the uncertainties in the initial decades, a 1000 year time frame is considered scientifically justified to ensure that there is no bias introduced into in the estimation. That is, the amount of C permanently sequestered is not over-estimated because these calculations are not tracking decomposition of more labile components of the biochar, which could addressed with a higher tier method.
6234	4	2	951	966	Box 2.2A - GHG emissions sources with biochar production can be excluded by the reporting country if feedstocks or amendments are imported.	Australia	Noted	The decisions about reporting emissions will be made in UNFCCC negotiations. This guidance is only providing the methodologies.

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9238	4	2	993	997	IPCC guidance is not "conservative" - it should be "unbiased", that is, neither deliberately under-estimating nor over-estimating emissions and removals. Correct sentence and approach accordingly.	Canada	Accepted with mod	The word conservative was perhaps not the best choice to use in describing the methodology developed around biochar permanence in soil. Our goal was to provide a method that is valid for a Tier 1 methodology. Based on the biochar literature, there is high confidence in estimating the long-term 'permanent' component of biochar amendments that is sequestered in soils. The literature is not sufficient for estimating the shorter term dynamics of the less stable C in biochar. Moreover, estimating the dynamics of the less stable organic matter fractions in biochar requires more information than is feasible for a Tier 1 method. Therefore to be consistent with the current understanding, the authors defined Fperm as the fraction of biochar remaining after 1000 years given that the literature is sufficient for estimating this component, and the more transient components can be estimated with higher tier methods. This is consistent with other Tier 1 methods that do not always address the full impact of management, requiring higher tier methods to incorporate other components if the country has sufficient data and resources. The text has been altered to reflect the rationale for the method.
9240	4	2	1000	1000	The number of significant digits on the error values (last column of table 2.3A) is misleading: how certain are authors that "errors" are 39% and not 40%? Is this statistical error or uncertainty?	Canada	Noted	This is a calculated statistical error based on the data extracted from the referenced papers. Changing these uncertainties would create an inconsistency between the published data and the resulting factors in this report, which the authors consider inappropriate.
4704	4	2	1005	1006	For the figures of Fpermp, we would like to ask some clarifications; - the time and temperature for pyrolysis and gasification used in the literature - the treatment of moisture content in the literature - the reasons of setting "1000 years"	Japan	Accepted with Mod	The details of the time and temperature of pyrolysis and gasification, as well as the treatment of water content can be found within the references provided in Annex 2A.2. All studies from which data were derived are provided in this annex. The reason for defining Fperm as the fraction of biochar remaining after 1000 years was to be confident that the values derived from equation 2.26A provided an accurate estimate of the sequestration of biochar C. The amount of biochar C sequested in the short term is considerably more uncertain, and could lead to biases in the estimates. However, compilers can use higher tier methods to address the shorter term dynamics.

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5170	4	2	1016	1020	Tier 2 should not prevent the use of country specific SOC data derived from national soil inventories performed under different purposes, that may characterize the SOC under management/climate/soil conditions at equilibrium. SOCref and the 3 factors are extremely difficult to characterize at country level, however it may be possible to find SOC databases (e.g. LUCAS) or relevant studies (e.g. Chiti et al 2017) that allow to define the SOC at the equilibrium direct. It is therefore strongly recommended to include a further option in approach 1 of tier 2 that allows the use of country data for deriving the change in SOC and can represent the final result of the combination of the SOCrefx3 Factors. As reported in the IPCC 2011, facility level data should be always encouraged. On the other side the use of facility level data at tier 2 should be allowed when the data are not sufficient enough represent annual variations of land-use and management impacts on soil C stocks, but rather as a linear shift from one equilibrium state to another.	Italy	Noted	Tier 2 does not prevent the use of country specific values - indeed country specific values are required to move to Tier 2. If a country has its own reference stocks and stock change factors derived from country data, then the compiler could move to Tier 2. The ability of a country to adopt a different reference condition and use different depths is described in the text.
4706	4	2	1049	1054	For comparability, soil categories and climate regions should be follow IPCC default classification. We suggest to delete country specific soil categories and climate regions (i.e. Instead if using the IPCC default classification)	Japan	Noted	While there would be advantages from a consistency point of view if countries were requested to do so, it is not a requirement at a Tier 2 level in which compilers develop factors that better meet national circumstances. For example a countries own soil classification system may differ from the soil types used in IPCC or the country may decide to define more climatic regions than currently in the IPCC classification with the goal of deriving more accurate emission factors given national circumstances. What is critical is that the soil carbon stock data to support both reference condition and land use change factors exists and that the compiler describes the process to derive the Tier 2 inventory.
7218	4	2	1056	1056	ACTION: delete reference to "under native vegetation". See comment for line 837	Spain	Accepted with Mod	The term "under native condition" needs to be replaced with "reference condition" and a definition for "reference condition" should be provided.
9242	4	2	1163	1180	Bottom part of box is highly technical and relevant to the use of tier-3 models; re-locate elsewhere as appropriate or delete.	Canada	Accepted	OK
7220	4	2	1181	1539	First, this section talks about three different pools under the COS pool. We think this is confusing. We should only refer as pools to those defined in "1.2.2 Carbon pool definitions and non-CO2 gases". Otherwise the text will be very confusing. Second, for us, this is a Tier 3 approach, and shouldn't be reflected as tier 2 in the Refinement. ACTION: delete the section referring to this model. We could accept its description in Tier 3 section or in an annex, but not as part of the tier 2 guidance. In any case, references to pools should be changed by sub-pools.	Spain	Accepted with Mod	Agreed. The term pool in its use here needs to be replaced with sub-pool. Information justifying the classification of the steady state modelling approach at the Tier 2 level has been added.
1810	4	2	1181	1560	Considering the complexity of “Three-Pool Steady-State C Model”, and the availability of no calculation parameter, it is not applicable as Tier 2. Instead, it is suggested to classify it as Tier 3.	China	Accepted with Mod	Information justifying the classification of the steady state modelling approach at the Tier 2 level has been added. Values are provided for all model parameters in Table 2.3C. Note that the method has been moved to Cropland Remaining Croplands based on other comments.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9244	4	2	1196	1202	It is not enough to simply say that different activity data is required. It would be helpful if there was a Table that describes the required activity data for the two methods, such that compilers could easily identify which method is more appropriate for their national circumstances.	Canada	Accepted with mod	Examples of the activity data required for two Tier 2 methods are provided in the text, and additional information has been added to better clarify the data requirements.
5786	4	2	1201	1202	It was stated earlier that the Tier 2-Approach 2 method can only be used for cropland and grassland. If that's the case the it seems that "forest land" should be removed from this sentence.	United States of America	Accepted	Agreed, and moreover the authors discussed this issue further and concluded that the method as currently presented is only appropriate for croplands because the studies underlying the Bayesian parameterisation are only from cropland sites. Consequently, the method has been moved to the cropland chapter since it is no longer considered a general method for application across multiple land uses.
5788	4	2	1221	1221	Insert after "Model" the following "(Tier 2-Approach 2)". It may even be preferable to just use the term Tier 2-Approach 2 instead of the Three-Pool Steady-State C Model as it is more consistent with how the guidance is presented across AFOLU. Depending on the authors decision on whether to implement this suggestion, it may also be good to make this change in the individual equation boxes for equation 2.26B, 2.26C, 2.26D, and 2.26E.	United States of America	Accepted with Mod	The term "Approach" has been replaced with "Method" and each method has been given a name which has been used throughout the text. Note that the method has been moved to Cropland Remaining Croplands based on other comments.
5790	4	2	1241	1241	Box 2.2C: Insert "-Approach 2" after "Tier 2"	United States of America	Accepted with Mod	All boxes have been renamed with a new naming convention.
1812	4	2	1279	1439	In lines 1279-1300, 1315-1343, 1346-1371, and 1414-1439, the dimensions of variables in the formulas are wrong.	China	Accepted	Units of the first line of the equation were not correct - the k value left a unit of y-1 in the right side of the equation, which must be balanced in order to produce units of t C/ha in the result. We added a new term D which defines the duration of the time step and is set to 1 year for the Tier 2 Steady state method. This additional term in the model cancels the y-1 units associated with the value of k.
7222	4	2	1541	1541	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9246	4	2	1633	1636	It would be useful in these boxes to provide a brief description of how each country documents their application of the models in a transparent way, applying the principals that are outlined in Volume 1 Chapter 9, section 6.11 for the application of Tier 3 models. This does not need to be elaborate, but simply describes how each country reports and what the key elements are in transparent reporting and use of Tier 3 models.	Canada	Noted	The application of the Tier 3 approach in each country is supported by papers published in international scientific journals which are identified within the box. This provides justification of the approaches used. Guidance is provided for documenting Tier 3 methods in Chapter 6 of Volume 1 and Chapter 2 of Volume 4 of the 2019 Refinement.
7224	4	2	1646	1646	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
6236	4	2	1875	1880	This paragraph notes spatial and temporal variability, but does not address this in the discussion of representative sample design. The guidance recommends that sampling be representative of the range of environmental and management conditions (i.e. sufficient strata) – however it should also state that sampling should be representative of the scale of spatial and temporal variability in stocks, in order to accurately represent the trend not local or short-term variability. For example it is difficult to accurately represent the long-term trend in soil organic carbon through sampling, due to spatial and temporal variability.	Australia	Accepted	Text edited to address concern
6528	4	2	2011	2384	why is peer-review explicitly mentioned in section 2.5.1 while only the description of QA/QC procedures is referred to in section 2.5.2. The text could be clearer to avoid the impression that some types of models need less peer-review than others.	United Kingdom (of Great Britain and Northern Ireland)	Accepted	The QA/QC text was edited to be the same in both sections to remove any impression that some models need less peer review than others..
9248	4	2	2017	2384	Tier 3 models are by nature unique and complex; in most cases a full description is rarely available. Rather, their credibility and reliability are based on the number of scientific, peer-reviewed publications demonstrating that the model indeed produced representative, credible and valid outputs. Taking this into consideration, the entire section 2.5 needs to be streamlined and made more generic. For example, group all guidance related to documentation (e.g. lines 2060 to 2069, lines 2132 to 2141) in step 9 at the end of the section. Documentation requirements seem very specific to some types of model (e.g. see lines 2060-2069 and lines 2234-2243) - and sometimes reporting requirements quite unrealistic (e.g. lines 2237-2238, 2277-2284). Simplify documentation and reporting requirements and identify the type of information that is best published in the scientific literature. Some requirements are unclear or redundant: for example in step 2 lines 2094 and 2095 ask if accuracy and uncertainty of a candidate model can be assessed, and whether the model accuracy is sufficient for the inventory: accuracy assessment overlaps with model evaluation (step 4). In addition, a more relevant question would be whether one can demonstrate a reduction in uncertainty with the T3 model. Overall, this section needs a thorough review and streamlining.	Canada	Accepted	The authors would like to thank the reviewers for this useful comment. A thorough review of Chapter 2.5 was undertaken and we believe that all the points made here have been addressed.
9250	4	2	2023	2024	This statement could be revised as it assumes that models automatically increase accuracy. They can only make that claim when they have been validated against an independent data set and the results compared to a lower Tier method that has been correctly and rigorously applied: “In all cases models used in Tier 3 methods ensure higher accuracy only when they have been effectively validated against an independent data set, are correctly applied and capable of representing the population of interest.” As is, the statement confuses precision of output with accuracy. Models can provide very detailed precise output that is completely inaccurate.	Canada	Accepted	Suggested text edit added.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9252	4	2	2053	2054	These references are missing in the list of references: Kurz & Apps, 2006, Kurz et al., 2009, Kurz et al., 2013. In addition, a ref to our NIR2018 (in relation to our land reconciliation framework) should be added. Suggest to add "Environment and Climate Change Canada 2018". Please see reference details in the next column.	Canada	Accepted	Thank you for the additional references. All have been added as requested.
9254	4	2	2053	2054	Is it correct to say that Canada integrates multiple models? Canada may reconcile the results of different models but the models are not integrated.	Canada	Accepted	Text edited as suggested
9256	4	2	2055	2075	There are inconsistencies between Volume 1 Chapter 6 and this section, in particular the emphasis on the validation of models against independent data sets is not stressed. There is a schematic in that Section, why doesn't this Section refer to that part of the Guidelines? Greater consistency in language and conceptual presentation is required.	Canada	Accepted	Checks for consistency between Vol 1, chap 6 and this text have been made. A reference to the Figure that now resides there has been included. The steps listed are consistent with this figure. Text relating to validation of models against independent data sets has been strengthened.
6530	4	2	2133	2135	could be worthwhile clarifying that for inventory purposes, the emphasis is more on reducing the bias when there is a bias-variance trade-off, or that it is "compensating errors" in specific pools/ecozones that are mentioned (as bias are defined in the new box 2.2f but not bias that translate at the aggregated level?	United Kingdom (of Great Britain and Northern Ireland)	Accepted	The text of this section has been completely revised in response to this and a number of other comments and author reviews.
6532	4	2	2211	2228	No doubt that it is good practice to keep large samples for "external validation". But considering that available data can be very scarce, it would be good to include more arguments/justify to keep half of the available data for external validation. Can't data in other geographic context be used to contribute to the external validation and thus make better use of the often scarce available information?	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Added text on the use of techniques such as bootstrapping when datasets are limited.
9258	4	2	2237	2238	The meaning of the following sentence is unclear: "the limits need to be provided in the inventory report)". What is the meaning of these "limits" and where are they provided in the NIR?	Canada	Accepted	The text in the brackets at the end of the bullet was removed.
9260	4	2	2358	2363	How was the question of spatial independence of estimates addressed when combining the results from the 20 different regions when there were no doubt parameters in the model that were not regionally specific and therefore applied to all or multiple regions? Should this be addressed in this example?	Canada	Noted	This question is not entirely clear. Table 1 in Kurz et al. 2009 describes the spatial scales at which parameter values were applied. If a parameter value was applied a the national scale, in each of the 20 projects, it was varied using the probability distribution that was applied for the 100 MC simulations for this parameter. This is explained in Metsaranta et al. 2017, but is a level of detail that need not be carried forward to this short box.
9262	4	2	2364	2367	How does the quantification of uncertainties in carbon stocks relate to inventory estimates?	Canada	Accepted	Deleted the carbon stock discussion in the text.
7226	4	2	2385	2683	This section is not mandated in the table of content as adopted by the IPCC. Nevertheless, we think it contains valuable information, but we would like to see a number of changes here. The first one, changing the name of the section, as it mainly refers to disaggregation of emissions from natural disturbances. ACTION: change the name of the section to "6.2. Guidance for the disaggregation of emissions from disturbances".	Spain	Rejected	The section is not only about "guidance for the disaggregation of emissions from disturbances"
7672	4	2	2385	2882	Several references in Chapter 2.6 to manuscripts under a review cannot be assessed in this review of SOD which is a shortcoming taking into account that this is the last review round of the 2019 Refinement.	Finland	Accepted	Reference Updated
7674	4	2	2385	2882	Please provide some guidance for taking into account the carbon storage in soil as well as in DOM pools in case of natural disturbances.	Finland	Rejected	Due to limit time and information available such guidance could not be included in the section

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
5794	4	2	2385	2883	General comment: While natural disturbance events are those "beyond the material control of a Party," it must be recognized that land use policies, forest management regimes, etc have an effect on emissions from natural disturbance events. How is this addressed?	United States of America	Noted	Forest management including fire suppression, choice of tree species (where tree species are not regenerating naturally), salvage logging of dead trees that could become sources of bark beetles, and other management activities can have impacts on short term and long-term disturbance risks. This is one of the issues that makes it so difficult to completely separate anthropogenic from natural disturbance impacts. And that is why this text refers to the approach as a second order approximation. It represents an improvement over the MLP without disaggregation, but it does not represent a complete disaggregation of natural from anthropogenic impacts.
5792	4	2	2385	2883	General Comment on section 2.6 IAV: While innovative and potentially helpful to a subset of countries using the 2019 Refinement, based on the following considerations and observations we believe that the material presented in this section on IAV is better suited for an appendix rather than in the main body of Volume 4, Chapter 2, reasons include: From a review of the approved Table of Contents for the 2019 Refinement, there appears to be no mention of including new guidance on Inter-Annual Variability in Volume 4, Chapter 2. Additionally, the guidance could confuse inventory compilers that will be applying the IPCC Guidelines. The IPCC Guidelines should be very clear on what are the Tier 1, 2 and 3 methods, this IAV approach is not associated with the IPCC Tiers, it is a separate sub-analysis that allows countries to more clearly identify, separate and report fluxes from natural disturbance and is not consistent with the application of the Managed Land Proxy. Inclusion in an appendix is more consistent with recognition that this guidance is optional for countries. A "text box" in Chapter 2 could be provided briefly mentioning this IAV approach and then refer the reader to an appendix where the guidance would be provided. This would help minimize confusion among inventory compilers using the 2019 Refinement and be just as useful for those countries that chose to perform this supplementary analysis.	United States of America	Rejected	The purpose of the GHG reporting is to estimate anthropogenic emissions and removals. The described approach is a refinement of the MLP that countries can elect to implement.
9264	4	2	2385	2882	Unclear whether drought is a natural disturbance or a climate extreme. Does it matter in the context of this section? Please clarify.	Canada	Accepted with Modification	We have removed explicit references to drought being a ND (a country can still chose to define it as such). References to drought now are limited to those where it is described as a precursor to fires.
5796	4	2	2386	2391	Good to see reference to the managed land proxy as only universally applicable approach to estimating anthropogenic emissions and removals in the AFOLU sector.	United States of America	Noted	
6534	4	2	2386	2883	Would it not be closer to what the atmosphere sees to continue to present the emissions and removals for Managed Land ? The proposed approach to addressing interannual variability seems more relevant for accounting than reporting and therefore not appropriate here. The result of this proposed approach could be retained in the reporting as a memo item that could be later used for accounting purposes.	United Kingdom (of Great Britain and Northern Ireland)	Rejected	The purpose of the GHG reporting is to estimate anthropogenic emissions and removals. The described approach is a refinement of the MLP that countries can elect to implement.
5798	4	2	2390	2390	Change "reported" to "estimated".	United States of America	Accepted	
5800	4	2	2392	2392	Add "Some" to the beginning of the sentence, before "Emissions and removals".	United States of America	Accepted	
7228	4	2	2395	2399	no problems with content, but we would like to avoid references to KP supplement. ACTION: delete "as described in the IPCC KP supplement 2013, " and start the sentence with "The two largest causes of..."	Spain	Accepted	Edited text and added more references.
7230	4	2	2400	2401	We don't see the need to explain here the purpose of the refinement. ACTION: delete from the beginning ("this refinement") up to "emissions and removals" in line 2401.	Spain	Accepted	Text deleted
5802	4	2	2402	2402	Add "quantitative" between "clear" and "understanding". It seems that a qualitative comparison or cross-walk between known disturbance events and MLP-only inventory results can help to understand those results, but won't provide a quantitative understanding.	United States of America	Accepted	Text modified
9266	4	2	2403	2407	Two consecutive sentences have the same meaning: merge them.	Canada	Accepted	Deleted second sentence

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
5804	4	2	2404	2404	Change "refined estimates of" to "additional information on". Use of "refined" indicates that these estimates would necessarily be the preferred good practice results, rather than part of a broader presentation of results.	United States of America	Rejected	This approach does represent a refinement of the estimates of the anthropogenic E/R and by using refinement the text reaffirms that this is consistent with the MLP. The text also makes it clear that this is neither a good practice requirement nor that it is mandatory by stating that countries can choose to disaggregate.
5806	4	2	2423	2424	Change "wish to increase the transparency of anthropogenic GHG flux estimates on managed lands" to "wish to carry out this disaggregation of results". All countries using the IPCC GL want to maximize transparency, which is a core aspect of good practice. A country that does not wish to disaggregate natural disturbances can still be fully transparent in its inventory if it clearly documents its results according to IPCC good practice.	United States of America	Accepted	
5808	4	2	2428	2458	This section introduces useful information on how to think about interannual variability, and why a country might want to use the methods that follow to make a quantitative estimate of natural disturbances. It should however take a bit more care not to undermine or contradict the MLP guidance in Volume 4 chapter 1 but suggesting implicitly via the choice of words that a country that uses the methods below is being more transparent or has made a higher "tier" or more refined estimate than a country that doesn't use the methods below. It is certainly important and useful to provide the guidance for countries that wish to do it, but take care not to go beyond the mandate for the 2019 refinement. Also, missing in this section is a recognition that the importance of IAV to a country may be a factor of the magnitude of AFOLU as a sector as part of combined economy-wide national totals of GHG emissions and removals. Countries for which AFOLU plays an major role in overall trends may have more interest in using the methods described below than a country in which AFOLU plays a minor role.	United States of America	Accepted with Modification	Thank you for the feedback that the information is useful. The comment is broadly applicable to the section and a number of changes have been made throughout the chapter to address these recommendations. For example, the introduction to the section now states: These approaches may be of interest to countries with AFOLU sector emissions that have high IAV or trends due to natural effects. Note also that all remaining references to "transparency" are in the context of documenting the methods used, not that the methods make the results more transparent. The Canada example box, is the only exception, because that country chose the disaggregation approach with the express intent to increase transparency of reporting of the anthropogenic emissions and removals.
4708	4	2	2434	2434	Check the status of this article (Grassi et al. submitted).If a cut-off date is over, delete the sentence below. ”Describing how the various effects are reflected (…) policy communities.”	Japan	Accepted	Reference Updated
9268	4	2	2435	2436	First, the colouring of this Figure is confusing. Secondly, in the indirect-human induced effects portion there is discussion of the natural disturbance regimes, but in the Natural Effects, it is simply inter-annual variability. In reality, the interannual variability is due to the expression of natural cycles (or regimes if you like) that are not expressed on an annual basis, these include fire regimes, but also insect cycles, disease cycles and weather cycles (not climate change). Many of these cycles may not be represented effectively in inventory modelling or even stock change estimates. This Figure doesn’t really provide an effective “conceptual illustration of the complexity of this question and could be removed from the text.	Canada	Accepted with Modification	Modified the figure to reduce the confusion. Remainder of the comment is unclear.
4710	4	2	2436	2438	Check the status of this article (Grassi et al. submitted).If a cut-off date is over, delete from line 2436 to 2438 including the Figure 2.7A.	Japan	Accepted	Reference Updated
7612	4	2	2437	2440	There is growing amount and quality of "attribution studies", i.e. how much of the risk for an extreme event (or type of events) should go to anthropogenic climate change and how much should go to random climate variability. Figure 2.7A holds but authors might consider revising text to include explanation that it is sometimes possibility estimate role of climate change in extreme events affecting GHG emissions.	Finland	Accepted with Modification	The three examples provided in the text all demonstrate that at the landscape level attribution is feasible and that change in climate will change the partitioning of the E/R that are anthropogenic. However, a brief review of the literature shows that attribution analyses are still controversial, and certainly very complex and beyond the scope of a national GHG inventory. E.g. see http://www.pnas.org/content/115/33/8232.short as an example of the complexities involved. And as the reviewers stated - it is only sometimes possible.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7666	4	2	2437	2440	The theoretical framework behind the Figure 2.7A and Chapter 2.6 is a simplification. For instance, extended periods of drought can be in some cases considered to be a result of a changing climate, i.e. "natural disturbance" at least partly attributable indirectly to human activity. However, this type of disturbances and the subsequent secondary disturbances such as insect damage cannot be prevented in most cases, thus the term " natural damage" fits.	Finland	Rejected	Natural disturbance is the term used consistently in the scientific literature and the introduction of an new term "natural damage" is not supported.
9270	4	2	2447	2448	This sentence is unclear. By stating “are of relevance to annual GHG inventories” do you mean “can have an important impact on annual GHG inventories”? Please clarify.	Canada	Accepted	Text implemented
9272	4	2	2450	2452	Wording is unclear - could be read as implying that both emissions and removals occur at the same time. Also, this description lacks a reference to the fact that these impacts can affect emissions and removals over long time horizons - so not just about addressing short-term IAV. Therefore, suggest rewording to state: "Land sector GHG emissions and removals are affected by both human and natural factors, and to varying degrees. The impacts of human and natural factors can also have an impact on emissions and removals over long time horizons (e.g. complete regrowth of post-disturbance forest cover can take up to -and sometimes over - 100 years).	Canada	Accepted with Modification	Revised wording, removed simultaneously, but did not accept all suggested wording.
7668	4	2	2456	2458	Please rephrase the sentences because calculated this way, the refined estimate of emissions and removals from anthropogenic causes will still include the effect of interannual variability of weather patterns because only natural disturbances or a very small proportion of the impact of natural disturbances (see Box 2.2L for instance) are taken into account.	Finland	Accepted	We added to the sentence that effects of interannual variation may still be included.
5810	4	2	2457	2458	Delete the last sentence starting with "This second order approximation…", as it implies that only countries that use the methods below are producing good practice results, whereas others are not. The value of the exercise has already been demonstrated earlier in this section.	United States of America	Accepted	Deleted.
5174	4	2	2459	2479	No definition of natural disturbance is provided in section 2.6.1.2. It is strongly recommended to include a definition that clearly delineate what is considered as "natural disturbance", e.g. (IPCC 2013) non-anthropogenic events or non-anthropogenic circumstances that cause significant emissions in forests and are beyond the control of, and not materially influenced by a Party.	Italy	Accepted	We have moved the existing definition of natural disturbances so that it appears earlier in the section and revised the text to further improve clarity.
9274	4	2	2460	2461	“The frequency and intensity of fire events is strongly controlled by climate” should be rephrased to include the four most important variable families: “The frequency and intensity of fire events is strongly controlled by weather/climate, fuels, ignition sources, and human activities”. This will facilitate the understanding of the following text.	Canada	Accepted	Revised text accordingly
5812	4	2	2461	2461	Fire intensity is also strongly influenced by weather.	United States of America	Accepted	
6238	4	2	2462	2464	The proposition may oversimplify the cited reference and could be misleading: Frequent fires can affect ecosystem structure and carbon stocks across time: for instance, savannas are frequently affected by fire events that reduce average tree basal area across time (Lehmann et al. 2014). This sentence implies that a policy of fire exclusion from fire-adapted savanna ecosystems would lead to increased woody biomass. However, the key findings of the paper are that fire has a much smaller influence on basal area than other environmental variables, and that a single conceptual model for savannas cannot be applied across continents (see Figure 3). (See e.g. Murphy Brett P., Liedloff Adam C., Cook Garry D. (2014) Does fire limit tree biomass in Australian savannas?. International Journal of Wildland Fire 24, 1-13.). Suggest modifying this text as follows: While fires are largely controlled by climate, frequent fires can themselves affect ecosystem structure and carbon stocks across time to vary degrees in different regions and ecosystems: for instance, in savannas frequently affected by fire events average tree basal area is affected by both climate and fires (Lehmann et al. 2014).	Australia	Accepted	Accept and revised text as suggested
9276	4	2	2467	2470	As natural disturbances of all kinds can have long-term impacts on emissions (depending on the type of disturbance, area affected, and recovery rate), suggest deleting "Unlike fires" at the beginning of this sentence.	Canada	Accepted	

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6240	4	2	2474	2475	Reference to Australia's 2015 NIR – note that the 2016 NIR has been submitted. The updated table reference is Table 6.21.	Australia	Accepted	Reference has been added
5814	4	2	2477	2479	Delete "and even in all other sectors" as it is misleading. Economic fluctuations are typically larger for other sectors.	United States of America	Accepted	Deleted.
7232	4	2	2489	2490	we don't think this table (table 2.6C) is necessary, and we disagree with some of the information provided in it. ACTION: delete the table.	Spain	Rejected	We have further improved the table but did not delete it as this was the only comment against it and the reviewer provided no information about which information the disagree with - or why. Therefore no specific response is possible.
4712	4	2	2490	2490	Add the explanation of abbreviation for "Live AGB & BGB pools" and "DOM & SOM pools" in the table 2.6C.	Japan	Accepted	We spelled out all abbreviated terms.
6536	4	2	2490	2490	The subtitle of the table: "does the estimation method distinguish between the impact of the drivers" can be confusing. Rather than "distinguish", would an expression like "account for" be more appropriate. E.g. even with ancillary data, annual measurements of stock difference would not always enable to distinguish the IAV induced by the various drivers but account for all.	United Kingdom (of Great Britain and Northern Ireland)	Rejected	The term "distinguish' between drivers was carefully chosen, because it is not simply about "accounting for" all of the impacts - but to truly distinguish between and quantify the impact of each driver.
7234	4	2	2493	2494	We don't agree with the affirmation that periodic stock assessment don't provide information on drivers of interannual variability. ACTION: delete the sentence with this affirmation.	Spain	Accepted with Modification	We modified the text to state that Periodic assessments without auxiliary data cannot quantify interannual variability.
7236	4	2	2496	2501	We don't agree that only with annual measurements IAV emissions and removals can be quantified. Biennial measurements, or even more separate measurements can provide also information to quantify these emissions and removals. Uncertainty could be bigger, but quantification can be done. ACTION: delete this paragraph, or redraft to reflect the idea that quantification can be done anyway, although the uncertainties would increase.	Spain	Rejected	We modified the text to state that Periodic assessments without auxiliary data cannot quantify interannual variability. By definition, interannual refers to single years and yes variability over multi-year periods can be estimated and then assigned as average across single years - but that is no longer a measure of interannual variability.
4714	4	2	2515	2515	The sentence "It is good practice for countries to apply the Managed Land Proxy" may mean countries should apply to disaggregate emissions and subsequent removals from natural disturbances. Also, this sentence seems to be contradict with the sentence "The Managed Land Proxy (MLP) is currently recognised as the only universally applicable approach to estimating anthropogenic emissions and removals in the AFOLU sector (IPCC 2010)". To avoid this misunderstanding / confusion, we would suggest to delete this sentence here.	Japan	Rejected	The first sentence clearly reaffirms the MLP and the statements that the MLP is currently recognised as the only universally applicable approach.
5816	4	2	2515	2518	Change starting with the second sentence to "This section describes a generic methodological approach that countries who choose may apply to estimate emissions and subsequent removals from natural disturbances. The original text confuses the description of the method, which is to isolate and quantify the effects of natural disturbances, with the subsequent step of reporting a national total with these effects excluded. These are two completely different things. Revised wording is more consistent with what is described at the end of the paragraph as the aim of the methodological approach.	United States of America	Accepted with Modification	Revised the first part of the text - but there is no reference to reporting in the original wording.
5172	4	2	2530	2530	No definition of natural disturbance is provided in section 2.6.1.2. It is strongly recommended to include a definition that clearly delineate what is considered as "natural disturbance", e.g. (IPCC 2013) non-anthropogenic events or non-anthropogenic circumstances that cause significant emissions in forests and are beyond the control of, and not materially influenced by a Party.	Italy	Accepted	The definition has been revised and moved to Section 2.6.1.1
7238	4	2	2530	2530	having in mind that there is no definition of natural disturbances in 2.6.1.2., but only a description of what could be considered ND, we would like to change the wording. ACTION: change from "recalling the generic DEFINITION of NDs" to "Recalling the generic DESCRIPTION of natural disturbances".	Spain	Accepted with Modification	The definition has been provided and moved to Section 2.6.1.1
5818	4	2	2530	2530	"Recalling the generic definition of natural disturbances provided in section 2.6.1.2…" Note that the cited section does not provide a generic (or any) definition of natural disturbances.	United States of America	Accepted with Modification	The definition has been provided and moved to Section 2.6.1.1

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9278	4	2	2530	2530	Definition of natural disturbances is provided in section 2.6.1.1, not 2.6.1.2.	Canada	Accepted	
7240	4	2	2532	2533	We don't think that the methods and criteria to identify the areas affected by a disturbance are part of the national description or definition of NDs, it is part of the method to quantify E/R due to these disturbances. ACTION: delete "as well as the methods and criteria to identify the areas affected by such disturbances".	Spain	Accepted	Text deleted
7242	4	2	2540	2540	See comment to lines 2532 to 2533. ACTION: add here "a(bis)) description of methods and criteria for identifying areas under natural disturbances"	Spain	Accepted with Modification	The definition has been provided and moved to Section 2.6.1.1
9280	4	2	2545	2546	The sentence "Consequently…." is confusing. Why would emissions and removals subsequent to a human intervention in the landscape be split between anthropogenic an natural causes? This seems to be a needlessly complicated exercise and inconsistent with the entire "managed land" prescription. Post-disturbance emissions and removals should be deemed anthropogenic from the point of a post-disturbance human intervention.	Canada	Rejected	To achieve a balance between emissions and removals from ND, it is necessary to ensure that removals that are following ND are not considered anthropogenic only because of human intervention.
5820	4	2	2547	2554	This section should be re-framed so that it avoids characterizing the goal of the guidance as producing a "refined" total that is preferred to a total where these methods are not used. The goal of this section should be to provide clear guidance on how the effects of natural disturbances can be isolated and quantified. Whether or not the results are subsequently used to produce a different AFOLU total as part of a national inventory report is a decision that goes beyond the IPCC Guidelines. An example box would be a better place to show the results of the Australian inventory.	United States of America	Rejected	The text does not state that there is a revised TOTAL but that there is a revised estimate of the anthropogenic component within the total MLP. The total remains as the sum of the refined anthropogenic estimate PLUS the natural disturbance estimate. The results of the Australian inventory have been deleted here.
5822	4	2	2548	2549	This is unclear, are countries removing the natural disturbances emissions/removals from their inventory totals? This should be more explicit. If emissions and removals are occurring on managed lands, regardless of natural or anthropogenic, those emissions should be captured in national totals. This could easily lead to countries reporting more emissions from natural disturbances when in fact they were anthropogenic in nature, reducing their LULUCF emissions. Recommend this be more explicit.	United States of America	Accepted with Modification	The guidance provides methods for disaggregation of MLP E/R estimates into anthropogenic and ND components and the table provided further down in this section shows that the total MLP estimate of emissions and removals does not change - but that it is merely disaggregated into two components. How countries then report this information in their CRF tables is beyond the scope of IPCC Guidance.
6538	4	2	2548	2554	Fires on managed forest land might not be the most relevant example considering that policies to minimize their extent can reduce their scale (including Box 2.2.J is fine, but one could argue with such citation of national approaches in the main text of the guidelines, considering that they are not consensual)	United Kingdom (of Great Britain and Northern Ireland)	Rejected	In the context of an IAV discussion, fires are clearly the most relevant example. The national approaches are provided as examples only - they need not be consensual.
5824	4	2	2550	2551	Insert the word “can”. The refined MLP flux can have a lower interannual variability…. (Australia or Canada may not be representative of other countries that have lower levels of natural disturbances).	United States of America	Accepted with Modification	Used "is expected to have" instead of "can have"
7670	4	2	2550	2552	Lower interannual variability after removal of the effect of natural disturbances is not necessarily true: 1)interannual variability in demand for timber creates variability 2) interannual variability of weather and possibly a part of natural disturbances creates variability	Finland	Accepted with Modification	Used "is expected to have" instead of "can have". Yes - on the other sources of interannual variability but unless the removed IAV has the opposite variation then the other sources of IAV, removing ND IAV will reduce overall IAV.
9282	4	2	2555	2596	Is there not an interaction between forest management and the “carbon balance” concept? If in a given country, harvest is being carried out in a forest management area at a rate that is more rapid than the typical recovery times post-disturbance, how could this be captured? The forest management strategy may in fact impose a change in carbon stocks in their FMA and if reporting rules are based on carbon recovery than it is likely that the going to misrepresent what is actually occurring on the land base. While this concept is understandable from a theoretical perspective, it is inconsistent with the objective of capturing anthropogenic trends and impacts on the carbon stocks which a country would wish to achieve by attempting to removal natural disturbances from their reporting framework.	Canada	Noted	Not sure what the reviewer is trying to say here: if forest harvest rates are more rapid then the typical recovery times post disturbance, then the landscape-level carbon stocks will decline - and this will be captured correctly in the reported anthropogenic emissions. The expectation of the balance between emissions and removals applies to natural disturbances.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7244	4	2	2567	2570	we see a number of inaccuracies in this paragraph. First, it is assumed that emissions will occur as consequence of the land use change. This wouldn't be the case, for example, if a land with very little carbon (for example, some classified as "other land" are burned and converted afterwards to shrublands or grasslands, or a cropland is burned and converted to forest). Second, the paragraph refers to "deforestation" limiting the application of guidelines to a single land use change after a disturbance. ACTION: FIRST, redraft the paragraph to reflect what would happen if the land use after the natural disturbance has, or is supposed to have, higher carbon stocks in the short term. SECOND, delete "(deforestation)" in line 2569	Spain	Accepted with Modification	This reviewer comment is internally inconsistent. If the land is burned - as in this example - then clearly there are emissions - even if the carbon stocks are "very little". The emissions will just be smaller but that is no reason not to report them. However, we have edited and moved the paragraph further up in the text, because we agree with the reviewer that it contained inaccuracies - in particular the issues was not one of balance between E/R but an issue of how to deal with ND emissions if the land was subsequently subject to land-use change.
9284	4	2	2568	2568	Sentence should read, “may not be valid if land use or land management change occurs”.	Canada	Accepted with Modification	This sentence has been deleted.
9286	4	2	2568	2579	Why would a land-use change following a disturbance result in the initial disturbance emissions being deemed anthropogenic instead of natural? This is illogical. Rather, it is the human intervention (the land-use change) that alters the nature of the emissions or removals. Post-disturbance emissions and removals should be deemed anthropogenic from the point of a post-disturbance human intervention.	Canada	Rejected	Because the human activity changes the land use and therefore precludes the removal by the forest sink in the post-fire years.
5826	4	2	2569	2570	Change "are reported as" to "considered to be"	United States of America	Accepted	
7246	4	2	2571	2579	we see that this paragraph causes unnecessary burden to inventory compilers, and this guidance won't provide any useful additional information. It is useless for reporting, as emissions and removals will be the same, and has no effects on accounting, as accounting is done to the future, not to the past. ACTION: delete the paragraph.	Spain	Rejected	If the approach described here is not used then an artificial trend will arise with natural sinks (regrowth from disturbances prior to the start of the GHG time series) attributed to the anthropogenic component within the MLP.
5828	4	2	2573	2575	Delete "and to report these removals as part of the natural disturbance component"	United States of America	Accepted with	Text revised
7248	4	2	2580	2580	ACTION: replace "regrow forest" in this line by "recover C stocks". Text as it is now is assuming that NDs only occur on forests.	Spain	Accepted	Text revised
6242	4	2	2595	2596	The comment that non-CO2 emissions do not permanently accumulate in the atmosphere may not be so relevant (this is addressed by the use of agreed 100 year GWPs). Suggest that a stronger argument would be: While non-CO2 emissions are not balanced by subsequent removals, under the second-order approach described in this chapter, non-CO2 emissions from natural disturbances are not considered to be anthropogenic (although it is not possible to completely separate human impacts) and are therefore not reported. This is similar to for example methane emissions from peatlands that have not been drained or undergoing active peat extraction, which may still be influenced by indirect human activity.	Australia	Accepted with Modification	Revised text
6540	4	2	2595	2596	The sentence "However, such emissions [non-CO2] do not accumulate permanently in the atmosphere since biochemical and physical processes contribute to their degradation." is slightly misleading. Some non-CO2 gases, while not strictly considered permanent, do remain in the atmosphere for an extremely long time which could be considered almost permanent. Suggest this is reworded.	United Kingdom (of Great Britain and Northern Ireland)	Accepted with Modification	Revised text
5830	4	2	2595	2596	"However, such emissions do not accumulate permanently in the atmosphere since biochemical and physical processes contribute to their degradation." The point of this sentence is unclear. Is it suggesting that CH4 and N2O emissions from natural disturbances should not be estimated, even though they are short-lived climate forcers?	United States of America	Accepted with Modification	Revised text
7250	4	2	2608	2608	ACTION: delete the text in brackets in the title. We would like to avoid any referents to KP supplement	Spain	Accepted with Modification	We have deleted not only the text in brackets but the entire box as the definition that is now in the text makes this level of detail redundant.
7252	4	2	2609	2609	NDs can occur in any land use, description of NDs shouldn't be limited to forests. ACTION: delete "forest" and replace it by "ecosystems"	Spain	Accepted with Modification	We have deleted the box as the definition that is now in the text makes this level of detail redundant.
7678	4	2	2609	2632	Examples of natural disturbances originate from Decision 2/CMP.7, for reporting and accounting under the second commitment period of the KP, and are cited in the KP Supplement, i.e. not defined by the KP Supplement.	Finland	Accepted with Modification	See comment 7252 above
7254	4	2	2610	2610	NDs can occur in any land use, description of NDs shouldn't be limited to forests. ACTION: delete "forest" and replace it by "these"	Spain	Accepted with Modification	See comment 7252 above

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7256	4	2	2619	2620	NDs can occur in any land use, description of NDs shouldn't be limited to forests. ACTION: delete "forest" in line 2619 and "forested" in line 2620	Spain	Accepted with Modification	See comment 7252 above
7258	4	2	2628	2628	NDs can occur in any land use, description of NDs shouldn't be limited to forests. ACTION: replace "forests" by "ecosystems".	Spain	Accepted with Modification	See comment 7252 above
5832	4	2	2654	2654	Box 2.2J title - change "managing" to "estimating".	United States of America	Accepted	Deleted the box
9288	4	2	2654	2805	Description of examples is too long: limit to 1 page each - and refer to other publications as necessary.	Canada	Accepted with Modification	Boxes have been shortened but not to the extent requested by the reviewer. For the details of the explanation readers are referred to other publications.
9290	4	2	2667	2669	Description of how "outliers" are addressed is unclear. Suggest rewording to better explain how the double threshold concept (national and state) is applied, what happens with the value for the years which are determined as "outliers" and what values are ultimately reported in the inventory. **This approach is considerably different from the disaggregation approach used by Canada as it replaces the "outlier" value with an "average" value instead - so this should be made very clear.**	Canada	Accepted with Modification	The description has been shortened and for the details of the explanation readers are referred to other publications. Each of the boxes is an example of a country-specific implementation but the authors refrain from comparison across methods.
4716	4	2	2674	2674	There is no “Figure2.7B”. Remove “Figure2.7B”.	Japan	Rejected	Figure 2.7B is present
5834	4	2	2685	2685	Box 2.2K title - change "managing" to "estimating".	United States of America	Accepted	
5836	4	2	2685	2686	Pages 2.84 and 2.84, Box 2.2K: This box might be better titled "Canada's approach to reporting on interannual variability." The box reflects an inventory reporting approach, not an approach to managing interannual variability on the ground. The first sentence in the box also seems somewhat less than objective.	United States of America	Accepted with Modification	
4718	4	2	2685	2743	Four articles (Kurz et al. in review) are cited in this Box 2.2K. Please check the status of these articles. If a cut-off date is over, delate the referenced sentence.	Japan	Accepted	Published and reference added
9292	4	2	2702	2703	Grammatical: Sentence lacks a subject. The word “This” is not a subject. Also, The phrase “background level of natural disturbance” seems odd. Would it not be more accurate to refer to “normal forest mortality”.	Canada	Accepted with Modification	Revised wording but did not accept the change to "normal forest mortality" because that is not the meaning of the sentence.
9294	4	2	2710	2710	Grammatical: new paragraph beginning in the middle of a sentence.	Canada	Accepted	
9296	4	2	2711	2712	Specify the “re-entry age”.	Canada	Rejected	Information is already listed in the same paragraph.
5838	4	2	2733	2733	Box 2.2K title - change "managing" to "estimating".	United States of America	Accepted	
7260	4	2	2748	2748	as mentioned repeatedly, we would like to avoid references to KP supplement. ACTION: change the title of the box.	Spain	Accepted	
5840	4	2	2748	2805	It is unclear why "country Z" is not identified and the technical example does not have a citation, and contrasts clearly in this regard with the Australia and Canada example. It would add more credibility to the 2019 refinement if the country were identified and the information cited so that users could go to the original analysis.	United States of America	Accepted with Modification	Country Z is now+K127 identified in a footnote
7680	4	2	2749	2805	Box 2.2L: Please check if the interpretation that statistical outliers (specifically outside the 95% confidence interval of variability) are a reflection of natural disturbances beyond country's control is actually that of the KP Supplement (as stated in the title of Box 2.2L). Approach in the KP Supplement is that of background level of natural disturbances which has to be exceeded (with a margin) so that emissions from natural disturbances can be taken into account in accounting of emissions and removals whereas Box 2.2L uses the definition of outliers to be a definition of what cases of disturbances can be called natural disturbances and beyond country's control.	Finland	Noted	KP reference has been removed. The current description is the interpretation contained in the EU legislation for reporting on natural disturbances in forest. Checked the interpretation and found to be correct.
7676	4	2	2761	2764	Definition of natural disturbances originates from Decision 2/CMP.7, for reporting and accounting under the second commitment period of the KP, and is cited in the KP Supplement, i.e. not defined by the KP Supplement.	Finland	Accepted	reference removed
7614	4	2	2768	2773	The described procedure is simplistic. For example, an extreme event like large scale forest fire may cause a peak in GHG emissions caused by changes in forest management. If due to changed forest management practises more biomass is left in the forest (e.g. residue), increased GHG emissions is due to management change, but in the case of forest fire it would be calculated as due to "natural disturbance".	Finland	Rejected	The use of a marging addresses the variability of management activities across time. Where this occurs and emissions are less than the threshold, the emissions are deemed anthropogenic.
5842	4	2	2773	2773	The wording of footnote 20 is cryptic and unclear. What does the following text mean? "while the KP addresses it in the accounting"	United States of America	Accepted	Text revised

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9298	4	2	2783	2798	How this approach is applied to identify "outliers" is clear; however, what is unclear is what values ultimately are reported in the National GHG inventory as the anthropogenic impacts on forests. Suggest adding further explanation to clearly address what values Parties should report.	Canada	Accepted with Modification	EU Box Discussion - when this box is revised the text will be modified.
5844	4	2	2806	2882	This section appears to suggest that separating emissions and removals from natural disturbances in national GHG inventory reporting is the only possible approach to increasing transparency on anthropogenic emissions and removals in forest land. This is not the case. Similar (or arguably more) transparency could be achieved by following the guidance in ACCOUNTING FOR any national GHG target or commitment. This provides full transparency on what a country itself considers to be beyond its control (itself an anthropogenic policy construct to a degree), without interfering with the holistic estimates provided by the national GHG inventory.	United States of America	Accepted with Modification	The references in the text that indicate that this method increases transparency have been removed. However, the suggestion to refer to accounting methods has been rejected as beyond the scope of this refinement. IPCC Guidance does not address accounting issues.
5846	4	2	2808	2812	Delete the first paragraph as it is value-laden and goes beyond the MLP approach outlined in the 2006 GL. Transparency is related to how clearly a country "shows its work", and whether or not an independent observer can understand how the results were generated. Transparency is not related to whether or not a country chooses to implement a method to separate/isolate the effects of natural disturbances. A country that quantifies natural disturbances is not necessarily more transparent than a country that does not. The reporting of the results of quantifying IAV should be presented below objectively as a means of showing how the results were generated by countries that have decided to use these methods.	United States of America	Accepted with Modification	text revised to respond to comment
7262	4	2	2811	2811	the reference "IPCC 2010 and papers therein" is quite vague. ACTION: include the right reference or delete the paragraph.	Spain	Accepted with Modification	Accept and included only IPCC 2010 reference
7264	4	2	2828	2829	we disagree with the view that providing estimates associated with NDs reduces the interannual variability, we only see that transparency is increased. ACTION: replace "greatly reduces interannual variability" by "increases transparency of national GHG reports"	Spain	Accepted with Modification	We revised the test but because of other reviewers' opposing comments did not use "transparency".
7682	4	2	2828	2831	Please rephrase to "…can greatly reduce the interannual variability of anthropogenic emissions and removals" as it may not in countries with smaller interannual variability of natural disturbances but greater variability in harvesting for instance.	Finland	Accepted with Modification	
5848	4	2	2828	2831	Change "Providing" to "Developing", as it more accurately reflects the guidance in this section. Change "greatly reduces" to "identifies and describes the impact of". IAV is what it is and doesn't change by virtue of a country estimating it.	United States of America	Accepted with Modification	We revised the text to address several comments on this section - but did not use the wording suggested by this reviewer.
7266	4	2	2835	2836	We suggest to delete the table. We would like to see a table for all emissions and removals and a separate table for NDs. Then it would be easy to make calculations of what is the remaining managed areas and what are the emissions not caused by these disturbances. This table duplicates work and can be confusing. ACTION: example of the table, or modify it to reflect only NDs emissions/removals.	Spain	Accepted with Modification	We did not delete the table but modified its structure to address the reviewers comments.
9300	4	2	2835	2836	Box 2.2M, footnote 28: "past emissions" should be made more specific by adding "since the occurrence of the natural disturbances" at the end of the footnote.	Canada	Accepted	
5850	4	2	2838	2840	Change to "For those countries that choose to identify, quantify and disaggregate natural disturbance emissions, it is good practice to provide information that describe the approaches and methods that are used."	United States of America	Accepted	
5852	4	2	2841	2841	Change to "For those countries that choose to disaggregate natural carbon fluxes using these methods, it is also good practice to…"	United States of America	Accepted with Modification	see previous comment
7268	4	2	2841	2842	we see the need to add a new bullet between these two lines. ACTION: add a new bullet "define natural disturbances nationally" or "include national definition of natural disturbances"	Spain	Accepted	

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9302	4	2	2841	2883	Over-prescribed documentation requirements on disturbances: from this text, it would appear that countries would be expected to maintain documentation within their inventory system of the all fire management efforts and information about individual fire events demonstrating their cause and even weather conditions. If this were an inventory documentation requirement, it would not be practicable. Documentation requirements should be balanced and realistic - keeping in mind that disturbance data might be but one input in a GHG inventory. Keep lines 2841 to 2847, delete lines 2848 to 2871 and move the remainder in box 2.2i with the KP material.	Canada	Accepted with Modification	We greatly reduced the detailed documentation requirements
7270	4	2	2850	2850	As commented above, we think that NDs can happen in all land uses. ACTION: replace "forest type" by "ecosystem type".	Spain	Accepted with Modification	The reference to forest type has been deleted (but no reference to ecosystem type has been added).
9304	4	2	2862	2862	Grammatical: Administrative, not administrational.	Canada	Accepted	
7272	4	2	2874	2874	it is not clear at all how a method can be consistent with an expectation. ACTION: redraft. "how the method addresses the condition that the CO2 emissions from..."	Spain	Rejected	The term expectation has been used throughout the chapter and should not be changed on the last page.
7274	4	2	2880	2882	it is not clear from the current text what emissions and subsequent removals associated with human activities mean. ACTION: please, clarify further.	Spain	Accepted	Revised the text.
4720	4	2	3935	3936	The meaning of "The Fperm estimate was also adjusted for CH4 and N2O emissions " is unclear. If it means some compensating rate is adopted for the Fperm estimate, please indicate the numbers.	Japan	Accepted with Mod	The inclusion of this sentence was a mistake. The calculation of Fpermp did not include any adjustment for CH4 or N2O emission. This needs to be corrected in the text and equations added to estimate the CH4 and N20 emissions associated with pyrolysis.
6542	4	2	4163	4163	typo? size n= 1,000,000 (and not 1,000,00) assuming the rest of the sentence is correct.	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Value should be 1,000,000
9306	4	2	1577	1644	This section provides model-based approaches that can capture the influence of land use and management on processes controlling carbon input and soil microbial decomposition along with four examples from Australia, Finland, Japan, and United States of America. What it lacks in this section is to outline basic requirements for model-based methods to assure that Tier 3 methods indeed provide more accurate estimates than Tier 1 and Tier 2 methods; more specifically more guidance on minimal model validation and transparent documentation is required.	Canada	Accepted with mod	We agree with your points. Guidance on model evaluation and documentation has been further developed in Chapter 6 of Volume 1 and Chapter 2 of Volume 4 of the 2019 Refinement. These sections provide the guidance on these topics, and the authors decided to not duplicate the guidance with further elaboration here.
9312	4	2	730	731	The organic matter content of “Organic Soils” seems too low.	Canada	Accepted	Note that the text was out of scope for the review. However, the value provided does indeed seem low when used to express organic matter content. It should be expressed in terms of organic carbon content. This was confirmed by checking the 2006 Guidelines.
9314	4	2	794	795	Organic soils are generally acidic, suggesting to delete “or organic soils”.	Canada	Rejected	For terrestrial systems where organic soils develop on acidic sediments/rocks the reviewer's comment may be appropriate. However for organic soils developed over limestone or in coastal systems (e.g. mangroves and tidal marshes) significant quantities of inorganic carbon may be present within organic soils.
9316	4	2	2397	2397	“ wind throw” should be referred to as “windthrow”.	Canada	Accepted	

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9318	4	2	Box 2.2		This could use some additional instruction on how to address areas that are affected by multiple disturbances - i.e. the total area may not increase from year to year, but the same area may be affected by multiple natural disturbances (e.g. pest infestation followed by wildfire). Should clarify whether this kind of table would be required for each disturbance type - or if it would aggregate all natural disturbance-affected areas.	Canada	Noted	The box presents the calculations required to implement the Tier 1 method where land use change has occurred. It does not deal with disturbances. Guidance on how to deal with disturbances can be found in Volume 4, Chapter 2, Section 2.6 of the 2019 Refinement.
9542	4	3	125	308	Lines 125, 308, 381, 426 mention RS data here but haven't defined the acronym yet. Define RS acronym at first appearance in text (line 125?).	Canada	Accepted with Modification	RS was removed as acronym. All RS converted to "Remote Sensing"
9544	4	3	164	168	Edit this section to reflect the guidance of the IPCC Wetlands Supplement which expanded the wetlands category (included other wetlands categories) and guidance in Chapter 7 of this Refinement for Flooded Land (Reservoirs and other constructed waterbodies).	Canada	Accepted with Modification	Reference to Wetlands Supplement added.
7276	4	3	181	182	we believe that it is more accurate to refer to years instead of reporting period. ACTION: replace "reporting period" by "year" at the end of the sentence.	Spain	Accepted	This sentence has been deleted as part of the revision.
7278	4	3	188	188	we believe that it would be more precise to refer to current land use management instead of land cover management. ACTION: replace "land cover" by "land use"	Spain	Accepted	This section has been revised thoroughly to address this and other comments related to this section.
5854	4	3	198	200	This sentence needs to be edited, it’s not clear as currently written.	United States of America	Accepted	This sentence has been edited to the following: 'To ensure consistency, it is good practice that the total reported land area (the sum of all managed and unmanaged lands) remain constant through the time-series.'
7280	4	3	199	199	when the text refers to "areas of land-use" we would like to see "areas under the different land uses". ACTION: replace the text as proposed.	Spain	Accepted with Modification	In response to other comments the text has been modified so the reference to 'areas of land-use' has been removed.
6244	4	3	207	208	Excluding lands that exit country reporting due to changes in political boundaries risks global incompleteness unless paired with the inclusion in the full series of lands that enter country reporting.	Australia	Noted	Re-drafted to improve expression and clarify the intent.
7282	4	3	263	263	after "concession boundaries" we would like to see "subsidies for land use changes or land management" as an example of auxiliary information. ACTION: add the text as proposed.	Spain	Accepted	the paragraph has been edited to include reference to "subsidies for land use changes or land management".
9546	4	3	296	297	Include reference to the IPCC Wetlands Supplement, especially when considering different wetland categories.	Canada	Rejected	This table just illustrates a few example. It is not the best place to insert Wetlands Supplement Reference. However, this reference is included elsewhere in this chapter.
7284	4	3	296	297	difficult to provide comments without numbers for lines. ACTION: delete thresholds in the definition of forests, these are KP thresholds that shouldn't be included in the refinement	Spain	Accepted	We have deleted the threshold ranges (i.e. 10-30% cover etc) as the reviewer is correct that these are KP. We have left the examples of structural measures that could be used to help define forest though as these are consistent with the national definition of Forest Land. We are assuming the reviewer only meant the values rather than the example measures.
7286	4	3	296	297	difficult to provide comments without numbers for lines. ACTION: add "or natural disturbances" after forest harvesting in the cell referring to forest cover lost.	Spain	Accepted with Modification	We agree with this comment. We have reviewed the text to better address issues of natural disturbance.
7288	4	3	296	297	difficult to provide comments without numbers for lines. ACTION: in the cell starting with "countries often" add "in some countries, land use is assumed to continue, even if destocked, unless change is proved by land use maps or any other information source"	Spain	Accepted with Modification	This table is now included as a box (3.1a) and has been thoroughly revised considering all other comments.
7290	4	3	296	297	difficult to provide comments without numbers for lines. ACTION: In the cell starting with "where the forest does not..." we would like to replace the first sentence by "Where the land cover does not recover after a number of years, land would be moved to a conversion category unless its permanence in the original category is duely justified".	Spain	Accepted with Modification	We have modified the table to account for these issues and believe we have addressed this in the reviewed text.
7292	4	3	296	297	difficult to provide comments without numbers for lines. ACTION: delete the line starting with "consider how the threshold...". First, nothing forces countries to define their forests with thresholds, second, classification of land in some countries does not depend on forest cover, but on land use. This line creates confusion.	Spain	Accepted with Modification	Text rewritten both for clarity but also to remove the reference to a specific threshold. Rather it simply notes that countries need to consider the definition of FL and how it may affect CL.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7294	4	3	296	297	difficult to provide comments without numbers for lines. ACTION: in line for grassland, in the second cell, we would like to change "definition for forest used" by "definitions for forest and croplands used". We think both definitions can have impact in the classification of GL.	Spain	Accepted	Agree with this comment and have made this change
7296	4	3	296	297	difficult to provide comments without numbers for lines. ACTION: in line for wetlands, instead of "use of existing definitions" write "use of national definitions", as definitions will be developed nationally (in line with GLs).	Spain	Accepted	Agreed, text revised
6544	4	3	296	297	Table 3.1A. Forest Land rows. Change "How to identify systems with a vegetation structure that currently fall below, but in situ" to "How to identify systems with a vegetation structure that currently fall below, but in future" and "potential to reach a minimum height in situ (2-5 m)" to "potential to reach a minimum height in future (2-5 m)"	United Kingdom (of Great Britain and Northern Ireland)	Accepted with Modification	Made changes but with reference to forest land rather than a threshold definition
6546	4	3	296	297	Table 3.1A. Forest Land rows. Blank row should be removed.	United Kingdom (of Great Britain and Northern	Accepted	Deleted.
6548	4	3	296	297	Table 3.1A. Forest Land rows. Clarify "(consistent with the need for structural thresholds...", should this be "(needs to be consistent with structural thresholds..."?	United Kingdom (of Great Britain and Northern	Accepted with Modification	We have changed this text given the issues with structural definitions raised by other reviewers
6550	4	3	296	297	Table 3.1A. Forest Land rows. "e.g. land undergoing a process of conversion to forest land" should be in brackets.	United Kingdom (of Great Britain and Northern	Accepted	Closed brackets
6552	4	3	296	297	Table 3.1A. Forest Land rows. "minimum width (meters)." Should an example width be included, such as "minimum width (100 meters)"?	United Kingdom (of Great Britain and Northern	Rejected	We have removed reference to meters here but not included example as it is not applicable
5856	4	3	359	373	While the guidance presented here is relatively clear, a quick example of how this works in practice would be useful i.e., a side box with example.	United States of America	Accepted with Modification	This comment refers to existing IPCC 2006 text. Consistent use of land area has been discussed elsewhere in this chapter.
7300	4	3	360	361	the affirmation in this sentence is not true. For example, for croplands, where they are all assumed to be managed lands (at least in most countries), and this area is yearly reduced due to abandonment of lands or reforestation (for example). ACTION: we suggest to redraft the section taking this into account.	Spain	Rejected	Firstly, this is existing IPCC 2006 text. Secondly, the example provided by the reviewer is not an example of managed land becoming unmanaged. In the case of croplands being abandoned or reforested the land remains managed, but moved between land use categories. As such the existing text is correct.
5858	4	3	421	421	Change "Parties" to "countries", and change "reporting" to "estimating".	United States of America	Accepted with	Sentence has been updated as suggested.
5860	4	3	423	423	Insert "statistical" before "products". Or change to "datasets".	United States of America	Accepted	Replaced: "products" with "datasets"
9322	4	3	426	427	The word "map" is used in two different ways, which is confusing. Reword to use "map" in the sense of "cartographic representation" only, not as a verb meaning "cross-walk" as in "map to new RS products".	Canada	Accepted	Text has been updated and now reads as "Even where the definitions are the same, existing forest type maps generally cannot compare to new RS products due to differences in spectral and geometrical resolutions and the methods applied for land-use classification."
7302	4	3	443	444	there is the need to evaluate the accuracy and consistency of land cover and land use classification, but also to report about it. ACTION: replace "evaluate" by "report"	Spain	Accepted with Modification	Deleted bullet point as reporting accuracy of land use change is covered elsewhere.
6554	4	3	476	482	To give an idea of the underreporting of the changes when using only information on net changes rather than on gross changes, a reference to the work of Tomlinson (2018) could have been made. This would be useful to gives examples that can guide "expert judgement" to try to estimate gross changes from information on net changes only (in context fairly similar to the UK).	United Kingdom (of Great Britain and Northern Ireland)	Rejected	The paper is out of the cut-off date for literature review: June 2018.
9324	4	3	622	623	Explain why and when approach 1 (no data on conversion between land uses) could result in inconsistent maps; and why would approach 2 (total land use area, including change between categories) not track through time series?	Canada	Accepted with Modification	The reviewer has misread the purpose of the table: the point is that inconsistent maps with no data on LUC means the maps will lead to Approach 1 methods. Approach 2 will not track multiple changes in land use, but where these do not occur it is the same as approach 3. These are further described in the text and the table is an example only. We have redrafted parts of this table based on other comments and hope this will resolve these issues.
7304	4	3	651	651	ACTION: replace "IPCC cover type" by "IPCC category".	Spain	Accepted with Modification	Figure 3.2 has been revised and new text has been added to explain the decision tree. Terminology adjusted consistently.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6556	4	3	657	658	Figure 3.2. "Classify as the initial use type." Should this be "Classify as land remaining land of the initial use type."?	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Figure 3.2 has been revised and new text has been added to explain the decision tree. Terminology adjusted consistently.
6558	4	3	657	658	Figure 3.2. "Classify as land remaining land." It would be clearer to say "Classify as land remaining land of the new cover type."	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Figure 3.2 has been revised and new text has been added to explain the decision tree. Terminology adjusted consistently.
6560	4	3	657	658	Figure 3.2. It seems that "cover type" and "land use" are used interchangeably, it would be less confusing if only one term were used. (e.g. in "Do the cover types for the present and next step..." and in "Did the cover type change back to a previous land use...")	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Figure 3.2 has been revised and new text has been added to explain the decision tree. Terminology adjusted consistently.
6562	4	3	657	658	Figure 3.2. "Classify as cropland." Should this be "Classify as cropland remaining cropland."?	United Kingdom (of Great Britain and Northern Ireland)	Accepted	Figure 3.2 has been revised and new text has been added to explain the decision tree. Terminology adjusted consistently.
7306	4	3	672	672	ACTION: replace "land cover and land cover change" by "land use and land use change". In most cases, land cover change doesn't imply a land use change. For example, a forest with crown cover of 90% that changes to 85%. Some times these changes are not even identifiable in cartography or other information sources.	Spain	Accepted	Updated text as suggested. Additionally a full check and update to ensure consistent use of terms was triggered by this comment.
7308	4	3	673	673	ACTION: replace "land cover" by "land use". See comment to line 672,	Spain	Accepted	Change made as suggested
9326	4	3	686	690	For clarity, suggest to reword as "when doing so it is good practice to demonstrate that the changes tracked through time are consistent and to report possible bias and known uncertainties of the change analysis"	Canada	Accepted	This section has been revised thoroughly to address this and other related comments.
9328	4	3	707	708	Challenge of inferring land use from land cover has been mentioned already. Suggest to remove.	Canada	Accepted	Bullet removed.
7310	4	3	711	712	We disagree with the idea that it is unlikely that land uses will be specially consistent through time in maps developing using different data. We believe that it is difficult or challenging but not unlikely. ACTION: replace "unlikely" by "challenging".	Spain	Accepted with Modification	Text was edited to remove 'unlikely' and add 'challenging' which also required further editing of the text for grammar. the text now reads as follows "It is challenging to maintain a spatially consistent time series where maps have been developed using different data (e.g., different sensors) or methods (different algorithms or operators in visual interpretation). In such cases it may not be possible to use this data in an Approach 3 context, however such data may be used in to stratify samples used in the application of Approach 2 (GFOI 2016)."
9330	4	3	711	715	This section is unclear. Explain why, if two highly accurate land use maps for different points in time are produced from different method/data, the land-use change may not be accurate or consistent.	Canada	Accepted	While the land cover maps may be accurate to represent changes between two time periods, the text here is referring to consistency across the entire time series used between the two dates, so not just consistency between two dates. The new text reads as "Where different land cover maps have been developed using different data (e.g. , different sensors) or methods (different algorithms or operators in visual interpretation) it is unlikely that the land-uses will be spatially consistent through time in the time series..."
9332	4	3	716	716	Again (see comment on lines 426-427) the word "map" seems to mean different things, in this particular case "data" (as in the images used in creating the land use maps) but it is unclear. Only use the word map when talking about a "cartographic representation". Differentiate between land cover data (= the result of a land cover classification) and imagery data (pixel values).	Canada	Accepted	Text updated, now reads as"' describe the differences between the land cover data in the time series;"
9334	4	3	717	717	Unclear why this can't be done using Approach 3?	Canada	Accepted with	Text updated, deleted "Approach 2"
5862	4	3	724	724	Should "National Forest Inventory" be capitalized? It is meant generically here, not specifically.	United States of America	Accepted	Replaced: "National Forest Inventory" by "national forest inventory"
7312	4	3	725	725	Some countries combine their inventory sampling methods on remote sensing images. ACTION: add "or a combination of both" after "lidar)"	Spain	Accepted	Added: "or a combination of both"

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9336	4	3	731	732	The third option - using whatever data are available - may also involve inconsistent methods; clarify.	Canada	Accepted	Revised this dot point to clarify that by simply removing the notes on consistency, thus leaving it open to both consistent and inconsistent methods, the main point being they are for different locations
7610	4	3	740	741	It is also possible to use temporary sample plots for Approach 2 and 3 methods. This was stated earlier in 2006 IPCC guidelines, V4 Ch3, page 3.33. Besides of auxiliary data, while carrying out field inventory of sample plots, land use changes can also be assessed in the field, e.g., by observing the surroundings of the plot, existing vegetation, decay rates of tree stumps etc. I suggest to modify the text: ...Where temporary sample plots are used, it is not possible to apply Approach 2 or 3 methods -> CORRECTION:... unless a time dimension can be introduced into the sample. This can be done by drawing on auxiliary data, for example maps, remote sensing or administrative records about the state of land in the past or assessing in the field. See also 2006 IPCC Guidelines, V4ch3, page 3.33 about temporary plots and time dimension	Finland	Accepted with Modification	See comment 5188.
5864	4	3	743	743	Does the sampling network really need to be applied to the whole country to be usable? It should be applied to a whole land category or sub-category.	United States of America	Accepted	Sentences redrafted: "... the sampling method should be applied to the whole area of interest …."
7314	4	3	748	748	We believe that not always additional information from other sources is needed to convert samples to land uses. ACTION: add "if needed" after "used with other information".	Spain	Accepted	Added: "if needed" after "used with other information".
9338	4	3	752	753	Bullet point unclear: if in the past measurements were collected every 10 years, but now they can be collected every year, will this improve the detection rate?	Canada	Accepted	The detection rate indeed may improve with a higher sampling frequency, but the resulting rate of change is not consistent across time series. This means that where frequency of sampling changes (10 years to annual), this needs to be accounted for in the inventory to ensure consistency across time series. Changed the text and is now "'samples are collected with sufficient temporal consistency that detection rates of change do not alter due to differences in sampling frequency.'"
6564	4	3	783	884	Reference to Levy (2018) and adjustment of the text to take into account such approaches would have been useful.	United Kingdom (of Great Britain and Northern Ireland)	Accepted	The authors appreciate this recommendation. However, it is not useful to add this reference without providing additional guidance on how to use such methods. This is beyond the scope of the current revision. Authors believe revised text does not preclude use of such advanced methods even though it is not referenced here.
9340	4	3	804	804	Current GIS systems do not require to have all data in same map projection as GIS systems can project on the fly in doing most types of analysis. What is important is knowing the projection that was used in doing the area calculation. Equal area projections should be used, but still result in some distortion. Provide more guidance. Perhaps suggest an equal area project that everyone should use (e.g. a global projection vs local?).	Canada	Accepted with Modification	Authors agree with the comment in the case of GIS visualization. However, for undertaking spatial analysis and area calculations it is necessary to consider appropriate coordinate systems specific to a country. This information was clarified in the text.
7316	4	3	804	805	We think that is totally impossible to ensure that all data is in the same map projection. ACTION: delete bullet.	Spain	Accepted with Modification	Spatial data can be in any format and projection. However, when combining data from different sources it is preferable to have the data in same map projection to facilitate spatial data analysis. Text has been edited to clarify that spatial datasets to conform to national mapping standards to ensure accurate area estimates.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7318	4	3	809	810	We disagree with this bullet. Each land use change can have different conversion periods. As long as the total national area is maintained, and there is avoidance of double allocation of lands to different land uses, there is no need to ensure that conversion period is the same. One simple example is deforestation, where most of the AGB will be released in one single year, and no conversion period is needed. Using a conversion period of, for example, 20 years, would be reducing the accuracy of the inventory. ACTION: replace the bullet with "ensure that the use of conversion periods doesn't result in gaps or overlaps between land uses/categories/subcategories." We would also prefer to see this lines in a different section (for example, land-use conversions, page 3.8.), we don't think this sentence belongs here.	Spain	Accepted with Modification	Agree that land use changes can have different conversion periods, if supported by data. For each land-use category the conversion period should be consistent across time. Authors agreed that this bullet will remain in this place as this concept applies for all land-use categories.
6566	4	3	811	812	As applied in Levy (2018), Bayesian approaches that take into account various data sources and weight them depending on their uncertainties rather than just use the information conveyed by the higher quality data-stream. It would be worth adding a reference to that work	United Kingdom (of Great Britain and Northern Ireland)	Accepted	The authors appreciate this recommendation. However, it is not useful to add this reference without providing additional guidance on how to use such methods. This is beyond the scope of the current revision. Authors believe revised text does not preclude use of such advanced methods even though it is not referenced here.
9342	4	3	815	815	What does "ensure the accuracy" mean? Is the intended meaning "report the accuracy"?	Canada	Accepted	Text replaced: "ensure" to "report".
7320	4	3	820	829	Most of these good practices, if not all, are impossible to achieve, it is not realistic for most of the countries. Therefore, this creates problems for countries that land t use spatially explicit information, making very difficult for them to elaborate national inventories. ACTION: delete these bullets.	Spain	Rejected	Justification: While it is true that not all countries can apply spatially explicit methods, this does not prescribe the guidance. Even if it is not achievable, IPCC should provide guidance on the best way possible to have a consistent representation of lands.
9346	4	3	827	827	Should it be "the data aligns" or "the pixels align? (e.g. see next bullet).	Canada	Accepted	Text modified to clarify that alignment of pixels with the same ground coordinates (whatever projection or datum is used).
9348	4	3	828	829	Unclear what the word "alignment" is referring to in the context of this sentence; alignment with what?	Canada	Accepted	Deleted the word alignment.
7322	4	3	946	948	ACTION: move definition of stratification to glossary	Spain	Accepted with	Definition added to the Glossary
9350	4	3	1270	1273	Clarify what ground data is: land-use? carbon stocks? Sentence below says that canopy cover is more easily assessed with RS data than ground data- but canopy cover is usually derived from a model of RS-ground data relationships, and therefore this sentence doesn't make sense.	Canada	Accepted	Ground truth data can be any variable measured in the field. Deleted reference to canopy cover. In this context, the text refers to use of ground data to validate RS outputs. We agree with the comment that canopy cover can be mapped in the field or using very high resolution imagery to train the classification algorithm.
9352	4	3	1274	1276	This paragraph is unclear: RS data does not directly measure things like canopy cover and carbon stocks. To obtain these parameter it requires some sort of model production and validation (e.g. ground data to be collected). So re-word to "all countries should use a combination of RS and ground data".	Canada	Accepted	Text modified that use of high resolution remote sensing data can be cost effective to validate RS outputs. Most countries use a combination of ground sampling and remote sensing.
9354	4	3	1279	1279	Does reference data mean data used to validate? Please clarify and/or reword.	Canada	Accepted with Modification	Reference data is clarified in line 1267 of the SOD. No further action required.
9356	4	3	1280	1281	Clarify whether this means to use additional remotely sensed data to validate products that were derived from remote sensing at lower resolution?	Canada	Accepted	Deleted reference to remote sensing in line 1280, which was confusing. Dot points under line 1278 of SOD have been redrafted to provide better explanation of what constitutes good practice in this context.
9358	4	3	1283	1283	Selection of plot size and sample size must also consider variability in the physical feature of interest, not only the pixel resolution of the image? This is highly variable in the literature. Clarify, remove or reword.	Canada	Accepted with Modification	Lines 1278 to 1298 of SOD have been revised and simplified to clarify what constitutes good practice when validating remote sensing maps without being prescriptive.
9360	4	3	1284	1284	Clarify: positional accuracy does not hinder one from "locating" a sample on a land use map. Is the desired accuracy here in relation to the need to "identify" a specific feature in a land use map?	Canada	Accepted	Lines 1278 to 1298 of SOD have been revised and simplified to clarify what constitutes good practice when validating remote sensing maps without being prescriptive.
9362	4	3	1285	1285	This seems highly specific. Why the focus on canopy cover? What other physical parameters might be measured? Reword to "where ground data are used for estimates of biophysical parameters..."	Canada	Accepted	Lines 1278 to 1298 of SOD have been revised and simplified to clarify what constitutes good practice when validating remote sensing maps without being prescriptive.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6568	4	3	1347	1347	Much of the initial information used is cited, but it is not the case of MERIS and Landsat. Including this information could be useful for the reader.	United Kingdom (of Great Britain and Northern Ireland)	Rejected	This table shows a few examples of global land cover datasets. Landsat global datasets are already included in this table. The intent here is not to list all sensors instead the focus here is to provide a list of existing global land cover products that can help countries if they don't have national datasets.
6570	4	3	1347	1347	Examples are limited to optical products. It would have been interesting to include examples of use of LiDAR and RADAR products	United Kingdom (of Great Britain and Northern Ireland)	Accepted with Modification	Radar based global land cover datasets are included in this table. There are no lidar based global land cover datasets which we can be included here. The intent here is not to list all products as mentioned above.
9364	4	3	1462	1465	While well written, this section contains a lot of basic information about remote sensing (textbook-like). Suggest to replace with references to textbooks	Canada	Rejected	We assume this comment applies to the entire section (not just lines 1462-1465 as noted here). While this is basic info, in this section, we have highlighted information relevant to compilers of national inventories which the authors believe is useful in selecting suitable remote sensing products for carbon accounting. This text was modified in response to earlier comments and suggestions for improvements from the First Order Draft (FOD) review.
9366	4	3	1548	1548	Millions of points in what area? Generally we state points per square meter (i.e. 2 pts per square meter will result in a 1 m spatial resolution grid). Lidar data points should be represented as points per area, not as a total.	Canada	Accepted	Replaced "millions" with "stream".
9368	4	3	1577	1577	GCP's are important for all data. what do GCP's have to do with time series data specifically? Clarify how to keep GCPs " consistent through time" as well as how to "improve them over time".	Canada	Accepted	New text added to clarify the point - "For example, when using Landsat data from the USGS, it is important to use data from the same collection and tier for the entire time series."
9370	4	3	1587	1591	different sensors will use slightly different wavelengths as well. e.g. see the difference between the wavelengths in Landsat7 and Landsat 8 even for the same "name" band. L7 red = 0.63-0.69 nm; L8 red = 0.636 - 0.673 nm. Add something about this issue as it will affect time series analysis.	Canada	Accepted	Updated text: Overlap techniques can be used when a new higher resolution sensor data becomes available in recent years but such data are not available in the past. In such cases, data from old and new sensors can be compared for at least one year (preferably more) to establish a consistent relationship between the two products which could take care of spectral bandwidth differences and calibration variations. This technique can be used, for example, to construct a consistent time-series using historic Landsat sensors and the more recent Sentinel-2 sensors (Zhang et al, 2018).
9372	4	3	1631	1631	Nowadays most classification is not always done in an "image processing package". Most people are using home-grown techniques (e.g. process the imagery in a software package and then to image classification in R, matlab, or using TensorFlow). This is because the world of "classification" is exploding for all sectors, not just image classification. Delete "most image processing packages include several algorithms for image classification".	Canada	Accepted	Deleted sentence as suggested.
6930	4	3	1794	1794	We need sharper and higher resolution figure (Figure 3.A.5.1).	Republic of Korea	Accepted	Figure 3.A.5.1 has been replaced with a higher resolution image reproduced at 600 dpi. Also added new text to explain how this figure is derived.
7150	4	4	72	79	Species composition can have an effect on the productivity, biomass and soil organic matter and carbon stocks, especially in tropical forest on poor soils	Norway	Noted	We address the possible influence of tree species composition on forest management effect in the new guidance for Tier 2 stock change factors in Box 4.3.A. We do not have the similar degree of detail in this introductory section that remains as it was in the 2006 guidelines except one correction.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7160	4	4	76	77	It is written that "... soil organic matter tends to concentrate in the upper soil horizons, with roughly half of SOC in the upper 30 cm". However, to same extent, the existence of soil carbon can prolong to a depth of 1-2m (Kirschbaum 2000). Limiting to ploughing depth (3o cm) may be applicable for cropland and grassland, but it might underestimate the amount of soil carbon in forest land.	Norway	Accepted	We modified the text accordingly.
7154	4	4	101	102	Besides, forest land classes can be stratified according to level of disturbance. For example, intermediate level of disturbance hypothesis assumes that species diversity is high at the intermediate level of disturbance. Moreover, some studies show a unimodal relationships.	Norway	Accepted with Modification	We added "for Tier 1" to the original sentence and added a sentence "Further stratification may be useful for development of Tier 2 or 3 methodology for a country".
7152	4	4	102	102	Soil can be classified based on national and international systems of classification. For consistency, standard ways of classification system might be applicable, ex. FAO system of classification.	Norway	Noted	Guidance aims to allow inventory compilers to select the classification that produces the most accurate results although existing systems of classification are a good resource and essential for data compilation from several countries.
7324	4	4	163	164	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7148	4	4	165	199	Both mineral and organic soils can be influenced by aspect and position of landscape that can have a direct effect on rates of soil erosion and accumulation. These are most likely related to status of soil fertility and productivity. Moreover, the response of landscapes position to CO2 emission is different.	Norway	Noted	More guidance on soil erosion and deposition can be found in Box 2.2D Chapter 2. Factors mentioned in the comment in total can be addressed best with Tier 3 methods for which more detailed guidance is given in Chapter 2.
7326	4	4	202	203	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
9374	4	4	205	250	The entire box is an in-depth literature review; while this review may be of interest to a very small subset of specialized scientists, it is not required in this guidance. Re-write a simpler, condensed version with clear and concrete conclusions.	Canada	Rejected	Scientific findings do not allow for clear and concrete conclusions on the effect of forest management on soil carbon stock change. Considerable effort was made to provide at least some quantification for forest management impacts but results of analyses were in part contradictory as described in Box 4.3A and treatment of controls challenging for developing default stock change factors or providing clear conclusions. The box is supplementary information and not required 'reading' for a compiler to conduct inventory. Yet, it does provide information and references to be used as a starting point for developing Tier 2 factors as well as to point out some challenges one would need to be aware. Therefore, the authors have decided to leave this supplementary information for compilers who decide to develop higher tier methods.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7164	4	4	206	239	Besides, techniques of harvesting (traditional vs heavy vehicles), size of harvested forest and age of harvested stands can be used as evaluating parameters. Harvesting machineries can affect soil bio-physio-chemical properties, for example., structural disturbance due to compaction and this leads to increase runoff and erosion. The effect is most likely site dependent. Moreover, a study by Yuan in 2014 showed that rate of carbon sequestration by invasive species in the 1 meter soil profile was by far higher than in the native plant marshes. Thus, carbon sinks should be associated with properties of the dominated plant species. Some invasive species have an allelopathy effect which can have effect on species diversity composition and productivity. Productivity and soil carbon stocks are most likely positively related.	Norway	Noted	Countries may develop their own Tier 2 or Tier 3 methodology to take into account the effect of different harvesting regimes, including the effect of different machinery, but at the moment there is no meta-analyses or reviews to quantify the effect of machinery on change in soil carbon stocks and we could not accommodate this level of detail in this one-page box. Effect of species in relation to the effect of forest management regimes or practices is briefly discussed in Box 4.3A in question but it is also stressed that the apparent effect of tree species is often confounded by other variables - which makes it difficult to add something definite and detailed on this topic.
7328	4	4	287	288	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
9376	4	4	334	334	“Metsäranta et al. 2017” should be “Metsaranta”.	Canada	Accepted	Corrected.
7162	4	4	353	354	Forest land conversions can also modify or reduce carbon storage of mineral soils. These might increase the rate of mineralization because of exposure different atmospheric conditions, temp., rainfall, etc. Since change rate of SOC increase with temperature and rainfall. Moreover, the amount of soil loss per unit area, example estimated by the Universal Soil Loss Equation (USLE) model, can be changed because of change in vegetation cover (C) and management factor (P).	Norway	Noted	This kind of level of detail can be addressed best with Tier 3 methods for which more detailed guidance is given in Chapter 2.
7158	4	4	358	358	"Conversion from cropland will tend to decrease emission". Does this assumption consider rice farming as well, paddy field? This is related to drainage status. Besides, it depends on frequency of farming, fallowing period/ no-till farming, rainfall, etc.	Norway	Noted	This kind of level of detail can be addressed best with Tier 3 methods for which more detailed guidance is given in Chapter 2.
7330	4	4	414	415	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7332	4	4	492	493	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7334	4	4	533	534	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
9378	4	4	552	593	This guidance is likely only applicable to Tier 3 models: simplify and make it more generic for all types of interpolation.	Canada	Noted	Generic guidance is provided in Chapter 5, Volume 1 as explained in this section, therefore it is not necessary to include generic guidance here. However, this section will be further refined.
9380	4	4	615		Box 4.3B: First paragraph: they refer to Volume 4, Chapter 2.3 for a case in which the stock difference method is applied to construct a consistent time series between 1990 and 2015, but section 2.3 does not exist. Second paragraph: an additional explanation should be added to understand how historical GHG emissions can be extrapolated through “functional relationships”.	Canada	Noted	In Chapter 2, there is an error in the section numbering. Section 2.3 exists, but it is errorneously numbered as Section 2.2. The numbering in Chapter 2 will be corrected, so the cross-reference here can remain unchanged.
4910	4	4	618	619	When updating table 4.4, beware that the current version contains two problematic points: 1) The values from Mokany et al (2006) for tropical moist forest are not specific to "deciduous" forests so the term "deciduous" should be deleted. 2) The values from Mokany cover 3 continents, are more recent and based on a larger dataset than the older Fittkau and Klinge (1973). The Fittkau and Klinge (1973) reference should be dropped and the Mokany et al (2006) values should be preferred for all tropical rainforests.	France	Rejected	The original data from the Mokany et al. paper was used to reclassify estimates according to the new Table 4.4.
6928	4	4	641	642	Country-specific emission factor for LULUCF	Republic of Korea	Noted	Thank you for the comment. The authors will review the table to ensure the estimates are consistent with the available data. If additional data is available, since last compilation, it will be incorporated into the estimates.
4722	4	4	662	664	A "References" part of UPDATED1-TABLE 4.7 ABOVE-GROUND BIOMASS IN NATURAL FORESTS [TONNES D.M. HA-1] is missing.	Japan	Accepted	Rodel will add references to the bottom of the Table.
4724	4	4	1143	1143	The description should be as: Sato, T. (2010) Stocks of coarse woody debris in old-growth lucidophyllous forests in southwestern Japan. J For Res 15, 404-410 https://doi.org/10.1007/s10310-010-0198-5	Japan	Accepted	Thank you for the comment. The complete reference has been added.
5866	4	5	152	152	The explanation on how to calculate harvest area is not clear. Are the units for rotation length in days? It would be useful to clarify.	United States of America	Accepted	Clarification on units has been made.
6572	4	5	226	226	Some of the suggested default values seem surprising (e.g. the maturity cycle of only 20 years for Olive trees). Besides, the reference from which it comes from, Canaveira et al., 2018, is missing in the bibliography.	United Kingdom (of Great Britain and Northern Ireland)	Accepted with Modification	Table were compiled by experts from peer-reviewed studies that are publicly available. All citations and references have been checked and revised where necessary. The estimates for Olive groves in the Mediterranean Basin, where harvest of olives starts after 10 yr. and at 20 years trees are in full production. correspond to the report Canaveira, P., Manso, S., Pellis, G., Perugini, L., De Angelis, P., Neves, R., Papale, D., Paulino, J., Pereira, T., Pina, A., Pita, G., Santos, E., Scarascia-Mugnozza, G., Domingos, T., and Chiti, T. (2018). Biomass Data on Cropland and Grassland in the Mediterranean Region. Final Report for Action A4 of Project MediNet. http://www.lifemedinet.com/.

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5868	4	5	342	342	In chapter 2 this alternative Tier 2 approach is also called “Tier 2-Approach 2”. By clearly stating that this is an alternative Tier 2 approach as is done by stating that this is a “Tier 2-Approach 2 “, I believe it will be clearer to inventory compilers and make it distinct from the single Tier 2 approach in the 2006 Guidelines. Across Volume IV, the terminology used in Chapter 2 to describe the Three-Pool State-State C Model should be harmonized and consistent with the associated text in the cropland and grassland chapters.	United States of America	Accepted	We have changed to defining as steady-state method. Note that the method has been moved to Cropland Remaining Cropland based on other comments.
4726	4	5	350	350	References are old	Japan	Accepted with Modification	This general reference added to Ch.2 section 2.2.3.1 under Tier 3
7350	4	5	365	367	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
5870	4	5	394	394	Page 5.19, Table 5.5: For the table title it would be useful to mention that these are “Carbon” stock change factors.	United States of America	Accepted	
9382	4	5	394	395	Table 5.5. It is surprising that the tillage factor was larger for the moist cool temperate climate zone than the dry cool temperate climate zone. It is the experience of some researchers that tillage strongly interacts with other soil and management factors in the cool moist temperate regions and that zero till does not necessarily have a positive impact on carbon stocks. Could there be other factors that are driving these results, particularly type of tillage, soil texture, depth of analysis or presence of drainage that have resulted in these strong differences between wet and dry climates.	Canada	Noted	The new factors are based on many more studies and so can be considered more representative of the impacts.
5872	4	5	399	400	For the most part, I think the revised factors properly represent the accumulated evidence published since the 2006 guidelines were derived. However, the factor for tropical dry under annual cropping (1.02) does not appear to make sense as this implies that conversion from the native condition is likely to result in a small amount of C storage. For dry systems converted to cropping, are there any assumptions regarding irrigation? If it is assumed that these systems are irrigated, then some C storage would make sense because inputs would be higher. But increased inputs due to irrigation and other factors are included separately. My only other concern is that some of the factors for reduced tillage are lower than for full tillage implying that conversion to reduced tillage is likely to result in a small loss of C. This seems counter-intuitive, and justification should be mentioned in the text.	United States of America	Noted	Good points that value would be expected to be <1. This is the case after additional quality control that uncovered an error in the initial model fit, which did not include a model intercept. This had created an error in the model that led to a high value for tropical dry systems. The data were reanalysed and determined that 0.92 was representative of the loss of C with long term cultivation in tropical dry climates.
7352	4	5	431	433	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7372	4	5	525	533	as mentioned in comments to chapter 2, we don't think three-pool steady state C model is a tier 2 model. ACTION: delete method from tier 2. Move it to tier 3 guidance or to an annex.	Spain	Rejected	We provided a box providing rationale for it inclusion as Tier 2.
5874	4	5	527	527	Should the reference to “Equation 5.1” be “Equation 5.0A” which is the number of the equation starting on line 529	United States of America	Accepted	changed to reference equation 5.0A

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
8326	4	5	561	564	Tillage management data are complex and not available in many developing countries, therefor, there is a need for a specific instruction and format for data collection and provision	Iran	Noted	Agree that there are challenges to compiling activity data on tillage. However, the mechanisms for collecting such data will differ among countries so it is not feasible to provide guidance for providing this specific activity data. Vol 1 of Guidelines provides guidance on data collection that can provide guidance for tillage data collection.
7354	4	5	575	577	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7374	4	5	656	658	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7356	4	5	919	923	as mentioned in comments to chapter 2, we don't think three-pool steady state C model is a tier 2 model. ACTION: delete method from tier 2. Move it to tier 3 guidance or to an annex.	Spain	Accepted with Modification	Note that the method has been moved to Cropland Remaining Cropland based on other comments, and more information is provided about the rationale for including this option in Tier 2.
7358	4	5	936	938	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7360	4	5	1011	1013	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7362	4	5	1071	1073	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7364	4	5	1151	1153	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
1814	4	5	1176	1181	The CH4 emission from rice cultivation should include that the rice growing and non-growing seasons. It is not clear whether CH4 emissions from the rice paddy during the non-growing season (e.g. CH4 emission from winter rice paddy during a fallow period) are included in the calculation. It is suggested to reformulate "……Nouchi et al., 1990）…… before and during cultivation period,……)" as "……Nouchi et al., 1990) and ebullition (Sch ütz et al., 1989; Wassmann et al., 1996). The annual amount of CH4 emission from rice cultivation includes the CH4 emissions during the period of rice growing and the flooded fallow period preparing for rice planting. The amount of CH4 emitted from a given area of rice is a function of duration of crops grown, water regimes before and during cultivation period,……".	China	Noted	Noted, but this comment is out of scope of this refinement work mandated by the IPCC.
1816	4	5	1232	1247	Equation 5.2 shows the way to scale the default emission factor EFc with the scaling factors of SFw , SFp , SFo and SFs,r, which stands for the impacts of water regime (during and before the rice cultivation, SFw and SFp), organic matter application (SFo) and soil text and rice cultivar (SFs,r), respectively. The EFc is, herein, defined as the methane emission from a field with no pre-season flooding for less than 180 days prior to rice cultivation (SFp=1) and continuously flooded fields (SFw=1) without organic amendments (SFo=1). It is not clear with what soil texture and/or rice cultivar the EFc will be 1. In this situation, the SFs,r is impossible to evaluate even if we had sufficient data of the impacts of soil texture and rice cultivar on methane emissions. Recommended revision): Option 1：Remove SFs,r from Equation 5.2. Option 2：Make SFs,r into two scaling factors: SFs for soil texture and SFr for rice cultivar, as already stated afterwards (Line 1353-1357) in the GUIDE. SFs = 0.325+0.0225×Sand, where Sand(%) is the percentage content of sand component in the paddy soil. When Sand=30(%), SFs=1. According to a comparison study (Huang et al., 1997), SFr had the value of 1 for the majority of rice cultivars while some might have higher values up to 1.5.	China	Accepted with Modification	Option 2 is a better option since it has been known that soil type and rice cultivar influence methane emission. We have subdivided the SFs,r term into two separate scaling factors as suggested. However, since there is still limited data addressing these impacts for the 2019 Refinement, the Authors decided to not provide default values. Large variations still exist in the limited amount of data for the effect soil and rice cultivar on methane emission. However, compilers have the option to develop country-specific scaling factors if they have the emission data for different soil types and rice cultivars that can be used to derive SFs and SFr, respectively (as in the case of Huang et al., 1997; Huang et al. 1998). Providing both terms in the equation will make it more transparent that compilers can derive factors for both scaling factors as a Tier 2 method.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
1818	4	5	1298	1298	Ammonium nitrogen, which is derived directly from the composition of the fertilizer or from the hydrolysis of urea applied to the rice paddy, reduces CH4 emission by promoting the oxidation of newly produced methane in the flooded rice paddy soils. This is an important finding about CH4 emission from the rice paddy in recent years, which should be included in the methodology report. Therefore, it is suggested to add “In particular, recent studies also find that widespread application of urea or ammonium nitrogen fertilizer to rice cultivation also alters CH4 emission from the rice paddy.” (Bodelier et al., 2000; Dong et al., 2011; Xie et al., 2010; Yao et al., 2012) before “Inventory agencies …”.	China	Rejected	The effects of N application on methane emissions are complex and not yet conclusive as reviewed by Xie et al. (2010); Cai et al. (2010; and Corton et al. (2000).
4728	4	5	1391	1396	Brackets are misplaced or mistaken in directions.	Japan	Accepted	Corrected
1820	4	5	1457	1457	Considering the latest progress in uncertainty assessment, it is suggested to modify this section appropriately. For example: Zhang et al.(2014, 2017)	China	Accepted	In Section 5.5.5, the following sentence was added in the first paragraph "Reducing the total uncertainty in the national methane inventory depends on a better understanding of both the complexity of the mechanisms that lead to methanogenesis and also the spatial correlation of the factors that influence methane emissions from rice paddies (Zhang et al. 2017).
6574	4	5	1662	1663	Reference seems not to be cited anywhere?	United Kingdom (of Great Britain and Northern	Noted	Will be checked and deleted if necessary.
4730	4	5	1744	1852	Directions of the brackets are wrong.	Japan	Accepted	
4732	4	5	3210	3215	The mixed model is the statistical model that has both random and fixed effects, but not clear which were random or fixed. Equation 5A.2.1 is inconsistent in units and confusing. The general linear model should take form of Y=XB + Error, where X is the matrix of the variables, B is that for coefficients of each variable. Please rewrite. Or if this is not the model for prediction, consider to delete the equation to avoid confusion.	Japan	Accepted	Authors identified and explained parameters that are fixed and random.
4734	4	5	3219	3219	CONSTANT in Equation 5A.2.1 looks like a y-intercept and "A" is a coefficient for covariate LN(SOC).	Japan	Accepted	Authors have now defined clearly the variables in Equation 5.A.2.1 of the Annex 5A.2 (e.g. separating parameter SOC with constant A, etc.).
4736	4	5	3232	3234	It is not clear why pH should be treated as a categorical variable even though it is a continuous variable.	Japan	Noted	pH is indeed a continuous variable but the effect is not linear. Optimum soil pH (5.0-5.5) was observed for CH4 emission, and leads to a critical threshold for estimating emissions in the model. To capture this, pH has been used in this model as a categorical variable.
4738	4	5	3254	3254	Not clear about the unit consistency of Equation 5A.2.2. Please present units for all variables for the equation.	Japan	Accepted	Units and equations were corrected (Eq. 5A.2.1 and 5A.2.2) to be consistent with the rest of the text.
9548	4	5	Table 5-5		Errors associated with the IPCC default factors for land use (FLU), tillage (FMG), and input (FI), are provided in Table 5.5. Through references are provided, it’s unclear how errors are calculated; most of these errors are so small (from ±3% to ±7% for Tillage, and from ±10% to ±13% for Input – all regions but tropical montane). These errors are so optimistic, and if so how low would errors be when countries use Tier 2 or Tier 3 C factors?	Canada	Noted	These errors are provided in the 2006 Guidelines, and this Table 5.5 in the 2019 Refinement is its updated version derived in a consistent manner with the 2006 Guidelines. In the final draft a list of sources of data will be included for more transparency.
7366	4	6	91	96	as mentioned in comments to chapter 2, we don't think three-pool steady state C model is a tier 2 model. ACTION: delete method from tier 2. Move it to tier 3 guidance or to an annex.	Spain	Accepted with Modification	Information justifying the classification of the steady state modelling approach at the Tier 2 level has been added. Values are provided for all model parameters in Table 2.3C. Note that the method has been moved to Cropland Remaining Croplands based on other comments.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7368	4	6	113	116	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7370	4	6	151	151	it is mentioned that reference C stocks should be consistent across the land uses. Not clear at all what this means. Consistency in sampling for its estimation? Consistency in laboratory protocols? Consistent in depth of the sample? ACTION: please, clarify further or delete.	Spain	Accepted	Good point. We removed sentences 151-153 regarding reference C stock. Note similar sentences deleted to Ch 5
7380	4	6	153	153	there will be cases where the land use has more impact on reference C stocks than climate zone or soil type. Why should the reference stock should be the same independently of the land use? This deserves an explanation, or a deletion of the affirmation in the text. ACTION: delete "therefore, the same reference... regardless of the land use."	Spain	Accepted with Modification	The impact of land use is estimated based n the land use factor, and not the reference C stock. However, we do accept that the sentence is confusing and not necessary in this chapter since the concept is covered in Ch2. Note the change to the same sentences in Ch.5
7382	4	6	177	179	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7384	4	6	290	292	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7386	4	6	375	377	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7388	4	6	480	483	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7390	4	6	558	561	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
7392	4	6	629	632	We can't accept references to 2013 WL supplement, as they are text that we are not having the opportunity to review. If no refinement is done in 2006GLs text, we would like to keep the text as it is in the 2006 GLs, or, if text from 2013 WL supplement is going to be the reference, we would like to have the chance to comment on in, and make comments as appropriate. ACTION: delete any references to 2013 WL supplement.	Spain	Rejected	Only the section on organic carbon in mineral soils was identified for revision based on the approved Table of Contents by the IPCC panel. Organic soils were out of scope and the 2013 Wetlands Supplement provides the latest guidance associated with organic soils, which has been reviewed and approved by the IPCC plenary.
6300	4	7	18	18	Please correct capitalisation of A in land: "Land"	Australia	Accepted	
6302	4	7	59	59	Unmanaged land converted to flooded land, previously "Land converted to flooded land" in FOD. Would it be better to replace "unmanaged land" with "Other Land", which is a defined land-use category in the 2006 IPCC Guidelines?	Australia	Accepted with Mod	Heading of Figure will be updated and new figure moved to the "Introduction of Factoring out" in section 7.3 Flooded Land
6304	4	7	73	73	Table 7.9 CH4 Emissions for reservoirs > 20 years old … Do you mean "Emission Factors for reservoirs" or "EF values for reservoirs"? Please correct spelling of "reservoirs".	Australia	Accepted	
6306	4	7	94	94	FOD provided a refinement to the Introduction that included reference to the expanded methodologies presented for flooded lands. This was removed in the SOD and leaves a contextual and informational gap. Please provide an appropriate expansion of the introduction to address inclusion of the expanded advice on flooded land in this refinement.	Australia	Accepted	The expanded methodology will be introduced/explained under Chapter 7.3 Flooded Land
6308	4	7	97	97	Should this be "additional guidance" rather than just "guidance", with relevant chap/section references? The main guidance on peatlands, for example, is provided in Sect 7.2 of this chapter rather than the 2013 Wetlands Supplement (see remarks for line 196, below)	Australia	Rejected	The original guidance in the 2006 GL is still relevant
9550	4	7	102	210	A lot of cross-referencing with Annex 7.1 was required to understand the guidance in the main chapter (e.g. to understand why and how downstream emissions were included). Therefore, suggest including more background information in the introduction section of this chapter.	Canada	Noted	Will be taken into account together with other comments in revising the draft.
5876	4	7	105	106	A footnote to explain how altering sedimentation rates could result in altering the natural flux of GHGs would be useful.	United States of America	Accepted	A text was added in the Annex.
5878	4	7	108	109	Page 7.7, Table 7.7: When describing the emissions from reservoirs it would be useful to state that CO2 from reservoirs is only estimated for land converted to flooded land. One way to do this would be to split the final column in two with one column for flooded land remaining flooded land and the other column for land converted to flooded land and then indicate for each flooded land type what emissions are estimated.	United States of America	Rejected	There is a chapter describing CO2 emissions from Flooded Land Remaining Flooded Land, although they are set to zero based on the managed land proxy, there are removals that would occur on these lands if they remained unmanaged. Therefore there are calculations for this category when applying the factoring-out methods.
9552	4	7	113	121	To improve clarity, add text in this section to indicate in the beginning of the chapter that Land converted to Flooded Land is for the first 20 years and Flooded Land remaining Flooded Land is after 20 years.	Canada	Noted	Will be taken into account together with other comments in revising the draft.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
4740	4	7	114	117	The explanations of lines 114-117 and 302-308 are almost the same. The followings are suggestion of the possible modification of this part. - In lines 114-117, giving an explanation that CO2 emissions are considered separately under Flooded land remaining Flooded land and Land converted to Flooded land first. Then continuing explanations about remaining land and converted land. Also suggesting that only brief introduction of no guidance of CO2 for remaining land with the explanation of the further guidance is provided in the other part here in lines 114 and 117. Then inserting the text that "see section 7.3.1.1 for further details.	Japan	Accepted	Text revised according to suggestion.
5880	4	7	116	119	You only mention forest land and cropland, but it would also include grassland and settlements. Rather than mentioning the specific sections where CO2 soil emissions are estimated for each land use, it may be preferable and shorter to say "…accounted for elsewhere (i.e., Volume IV Forest Lands, Croplands, Grasslands and Settlements)…"	United States of America	Accepted	Text modified accordingly
4742	4	7	117	117	The word of "accounted"(or accounting) in the context of LULUCF has special meaning historically. It is better to use "estimated" here.	Japan	Accepted	changed to "estimated" all over
5882	4	7	120	120	After "CO2 emissions" suggest inserting "resulting from biomass, dead organic matter and/or soil carbon that was present in the pre-flooded area". Also should the decomposition of organic matter from internal biomass production also be included here. It's important for the inventory compiler to know what should and shouldn't be covered so additional explanation is useful.	United States of America	Accepted	Text modified accordingly
9554	4	7	123	138	Add text in this section to indicate in the beginning that guidance is provided to estimates CH4 emissions from both Land converted to Flooded Land is for the first 20 years and Flooded Land remaining Flooded Land is after 20 years.	Canada	Noted	Will be taken into account together with other comments in revising the draft.
4744	4	7	124	138	Drainage of a small pond/lake is undertaken as a part of management practice in order to improve water quality. It is really welcome including some text that what effect is considered in terms of GHG emissions due to this practice.	Japan	Accepted	We have included that drainage of ponds "Emissions of CH4 from aquaculture ponds may be reduced as part of aquaculture management, including mixing or aeration, periodic drainage or when water is saline (Vasanth et al., 2016, Yang et al., 2017, Robb et al., 2017). "
5884	4	7	133	133	Very relevant citation for the effects of agriculture on GHGs: Tangen BA, Finocchiaro RG, Gleason RA (2015) Effects of land use on greenhouse gas fluxes and soil properties of wetland catchments in the Prairie Pothole Region of North America. Science of the Total Environment 533:391-409	United States of America	Accepted	We have added this reference
5886	4	7	143	143	Change sentence to "This guidance on Flooded Lands does not consider these emissions …"	United States of America	Accepted	
5888	4	7	148	148	A subtitle to introduce the types of flooded lands included in this guidance would be useful. Currently it goes from explaining the various gases covered directly into reservoirs, which is a little confusing.	United States of America	Noted	A new decision tree will be added
6784	4	7	161	165	Some researches show that in boreal and moderate temperate conditions zone the GHG emissions from newly established water bodies returns to the natural levels that are typical for the respective climatic zone within 2-4 years after establishment (Tremblay A., Varfalvy L., Roehm C. and Garneau M. (eds.). Greenhouse Gas Emissions: Fluxes and Processes, Hydroelectric Reservoirs and Natural Environments. Environmental Science Series, Springer, New York, 2005,732 p.). However, the method given in the SOD proposes higher GHG emissions up to 20 years. It should be clearly stated in the text that there are such studies and results that show much shorter period when the discharges from the reservoirs of the boreal and temperate zones go into a natural state.	Russian Federation	Noted	While some boreal reservoirs have exhibited rapid recovery, the temporal evolution used here is the result of the modelling of reservoirs with a worldwide distribution. It is important to note that the emission factors provided in Table 7.9 and 7.14 represent the integrated emissions expressed as a 20 year average (see Annex 1 for details) appropriate for each climate zone.
4746	4	7	162	162	Based on the 2006GL, land conversion category is explained as remaining conversion category for 20 years. Thus, "less than 20 years ago" is considered necessary to be clearer sentence that 20 years is included in conversion category.	Japan	Accepted	Added text "less than and equal to"

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6310	4	7	167	167	Can you please provide some comment in this section on how to differentiate between "Reservoirs" and "Other flooded land: constructed ponds etc"? For example, large agricultural dams constructed for on-farm irrigation can fit into either definition. However the applicable EF values will be different depending on which land-use category is chosen.	Australia	Accepted	A decision tree has been added (Fig 7.2) to provide this guidance
5890	4	7	171	171	Change “exhibit” to “emit”	United States of America	Accepted	
5892	4	7	174	174	After “…same for all age classes of other flooded lands” insert “(i.e., there is no distinction between Land Converted to Flooded Land and Flooded Land Remaining Flooded Land) …” However, since that is unusual in comparison to other IPCC Guidance in the AFOLU sector it also seems like you should state here which of these two categories these other flooded lands should be reported in.	United States of America	Accepted with Mod	Inserted the suggested text as requested. We did not prescribe in which category emissions should be reported as this is dependent on activity data.
6312	4	7	179	179	The guidance provided in the 2013 Wetland Supplement is currently voluntary under current Annex 1 Party reporting requirements. Can you please clarify the status of any reference to or text from the 2013 Wetlands Supplement that is included in the refinement text? Such a clarification might be provided as a statement in the introduction.	Australia	Rejected	This is a UNFCCC process and should not be discussed here.
5894	4	7	181	196	In the prairie potholes, small wetlands are drained and consolidated into larger wetlands. Is there any accounting for the increase in size for consolidated wetlands?	United States of America	Noted	An expansion of flooded lands would increase the emissions in proportion to the area change
4748	4	7	196	196	It is considered the reference of "2013 wetlands supplement, chapter 2" is missing in the row of "Canals and drainage channels, ditches" in Table 7.8. CH4 emissions from ditches in organic soil area is covered in the chapter 2 of the 2013 WLSL.	Japan	Accepted	Added reference to Table 7.8
6314	4	7	196	196	Table 7.8 lists Ramsar classes of human-made wetlands and proposes IPCC equivalents and associated methodology. In Annex B: Ramsar classification system for wetland type (Ramsar, 2009), peatlands are classified as either non-forested or forested peatlands under Inland wetlands. Human-made wetlands are classified separately within Annex B and include those created through excavation, e.g. gravel/brick/clay pits; borrow pits, mining pools, but does not include peatlands managed for peat extraction. It therefore appears that there is a misalignment between the Ramsar wetland class and corresponding IPCC land-use category recorded in this table. Also, the main guidance on peatlands "managed for peat extraction" is provided in Chap 7, Vol 4, 2006 IPCC Guidelines, in the first instance. Chap 2, 2013 Wetland Supplement (Drained Inorganic Soils), provides a new EF for CO2 for boreal and temperate peatland managed for extraction (Table 2.1) for on-site CO2 emissions from drained peat deposits and refers to Vol 4, Chap 7 Wetlands for all other guidance and EF values regarding managed peatlands.	Australia	Accepted	Text was modified considering that there is no equivalent in Ramsar classification
6316	4	7	199	199	Use of a decision tree is recommended in 2006 IPCC Guidelines, Vol1 Chap 4 "Methodological Choice and Identification of Key Categories". Could you please provide an appropriate decision tree (was present in FOD) in this section. Figure 7.2 may be a branch of the decision tree for the activities covered in this chapter.	Australia	Accepted	Decision trees for flooded land classification and methodological guidance is now present.
5896	4	7	200	200	Change “We provide guidance” to “ Guidance is provided”	United States of America	Accepted	done
5898	4	7	204	204	Delete “scientific evidence” and replace with “emission factors”. Delete “always” and replace with “generally” because in some cases low-quality/biased country-specific data/factors can be less accurate than the defaults	United States of America	Accepted	done
4750	4	7	204	205	The sentence of "Country-specific scientific evidence and data are always preferable to Tier.1 default data" is confusing. Does this mean countries should provide country-specific evidence even when using Tier.1 default? If so, the requirement is considered demanding in terms of general Tier.1 procedure. Could you rephrase the sentence? For example; "country-specific scientific evidence and data are preferable than Tier. 1 default data" or "it is good practice to examine country-specific scientific evidence and data to consider the appropriateness of Tier. 1 default data ".	Japan	Accepted	

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6318	4	7	209	209	There is a statement on the managed land proxy and how it applies to wetlands in the introduction to the 2013 IPCC Wetland Supplement. Can you please also cite that statement here?	Australia	Accepted with Mod	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
7686	4	7	211	290	Box 7.1 is not consistent with the managed land proxy; guidance on factoring out of natural emissions is allowed/required for other land-use changes, PLEASE provide justification why it is important for land converted to flooded land.	Finland	Accepted with Mod	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
7124	4	7	211	291	Please make sure that valuable information from Figure 7.2 in the FOD is covered by the much simpler Figure 7.2. in the SOD. It is, important that information is not lost in the new Figure 7.2.	Norway	Accepted with Mod	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
9384	4	7	211	290	Although the IPCC prescribed authors to provide guidance on estimating "net" emissions, guidance to factor out pre-flooding emissions and removals should not be provided as an example applicable to national inventories. Re-write sentence starting on line 220 as "However, this box provides an overview of an approach that could be used to factor out these emissions and removals..."	Canada	Accepted with Modification	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
9556	4	7	211	290	This box is presented as additional information, but situated within the guidelines it could be perceived as IPCC guidance. Factoring-out is an accounting approach rather than an inventory approach. Many of the statements in the text are not backed up by scientific evidence. For example, there are no citations to support the claims that net CO2 emissions and removals from most land categories should be near zero or that it’s only necessary to factor out CH4 emissions from wetlands. The text is biased towards factoring out CH4 emissions from unmanaged wetland pre-flooding but not accounting for the loss of carbon sequestration in the pre-flooded landscape. Therefore, recommend deleting this box to not make a precedent for including accounting approaches in IPCC methodological guidelines for GHG inventories and jeopardize the legitimacy of the guidance contained in the rest of this chapter. In particular, delete the decision tree, as it greatly resembles IPCC guidance. Instead this material could be contained in an external document that is referenced for those who are interested in considering factoring out in their accounting approaches.	Canada	Noted	See the authors' note above.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7684	4	7	214	216	The text that "if this land area is already managed land, these emissions will be included in the inventory, and changes in the emissions will be captured by this guidance" is wrong. When managed land is converted to flooded land, all emissions from this land area will be reported based on guidance to land converted to flooded land.	Finland	Noted	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
6320	4	7	222	222	Should be Box 7.3.; Box 7.2 presents a discussion on "Additional information on sedimentation and carbon burial in reservoirs".	Australia	Accepted	
6322	4	7	226	226	Appendix 7.2 does not exist. Possibly Appendix 7.1.2?	Australia	Accepted	
9386	4	7	228	231	That part of a reservoir should remain "unmanaged land" forever because it was already a water body prior to flooding is unrealistic and even absurd: once the area is flooded, the entire reservoir is involved in the new nutrient dynamics triggered by the flooding and therefore becomes managed. In addition, as pointed out further in the chapter, emission factors post-20 year would largely reflect the fate of a sustained carbon input either from the watershed or from large flooded C stocks (such as organic soils). In the 1st case emissions are not related to the land status pre-flooding and in the 2nd one the emission factors only represent the C input from the organic soils that were actually flooded: scaling those emissions down by some area factor would actually under-estimate emissions caused by flooding. Finally, even if pre-flooding emissions or removals from lakes were a consideration, they should be dealt with when considering land converted to flooded land, not flooded land remaining flooded land (especially the SOCj,k in equation 7.13): it makes no sense to continue "discounting" such pre-flooding emissions or removals every year of the time series for ever. Delete sentence.	Canada	Accepted with Modification	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
9388	4	7	232	253	Authors rightly point out that an assessment of the carbon balance of natural ecosystems is highly linked to both temporal and spatial scales; however, there is no widely applicable evidence of the spatial and temporal scales at which "unmanaged land" has a balanced C budget: such scales (if they exist) are likely to be very specific to combinations of time intervals, ecosystems, landscapes and climates. Further, and unless authors provide evidence to the contrary, there is no scientific basis for treating "unmanaged wetlands" differently in this regard. It is strongly recommended to merge paragraph 2 and 3 of the box into a single one; clarify that a T1 methodology should assume a balanced C budget for all unmanaged land (consistent with the "managed land proxy") and that only T2 or T3 methods could credibly estimate pre-flooding C balance of an area of unmanaged land over appropriate temporal and spatial scales.	Canada	Accepted with Modification	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
9390	4	7	297	309	Since emissions are now being discounted from flooded lands, would it not make sense to consider the loss of wetland and the associated carbon sink as an emission in Flooded Land remaining Flooded Land? It could be assumed that other upland ecosystems that were flooded were net 0 emission sources, but if wetlands were flooded, this represents a permanent loss of a sink, which should automatically be included according to the approach that is used throughout this chapter.	Canada	Accepted	See '7.3.1.1CO2 EMISSIONS FROM FLOODED LAND REMAINING FLOODED LAND'
9392	4	7	299	308	Include citations to the scientific literature that were used to justify the assumption that all CO2 emissions from Flooded Land remaining Flooded Land are not attributable to the flooding and are included in the estimation methodologies of other land categories.	Canada	Accepted	Reference to Prairie et al 2017 inserted
4752	4	7	304	304	The word of "accounted"(or accounting) in the context of LULUCF has special meaning historically. It is better to use "estimated" here.	Japan	Accepted	Changed to "estimated" all over

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6324	4	7	318	319	Several reviews on wetland carbon kinetics conclude that established freshwater wetlands are likely net carbon sinks (small), or neutral, due to primary productivity and sedimentation leading to burial of organic carbon under anaerobic conditions (see Kayranli et al., 2010, Mitsch, et al., 2013, Brix et al., 2001). Inundation of pre-impoundment wetlands will destroy the primary productivity component and, although burial of allochthonous carbon through sedimentation is still possible, may convert the impacted wetland area to a source. Inundation also removes any wetting/drying cycles that have been demonstrated to significantly reduce CH4 emissions compared to permanently inundated lands (Altor and Mitsch, 2004). Therefore permanent inundation of a wetland can modify its physical, hydrological and biogeochemical profile that results in a changed carbon emission/removal profile. Any such transition, which is the result of direct anthropogenic action, should record the entire area impacted in the activity data over a transition period (default for Tier 1 is 20 years). After the transition period the area of former wetland is likely to have stabilised its biophysical properties so that the emission factor values for that reservoir now apply to it. This is the case for reservoirs classified as Flooded Land Remaining Flooded Land as they are more than 20 years old. Can you please provide details of the explicit circumstances under which an adjustment to the total flooded area of a reservoir (>20 years old) can be made? This impacts equation 7.10. It is suggested that a note be attached to Aflooded , j,I stating the explicit circumstances under which it used in preference to Atotal , j,I, and under what circumstances Atotal , j,I should replace Aflooded , j,I .	Australia	Accepted with Mod	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
7688	4	7	318	319	Factoring out is not consistent with the managed land proxy. If text kept, please change to read "can be adjusted for the area of unmanaged land prior to reservoir construction" - otherwise emissions from managed land prior to the construction of the reservoir would be subtracted twice"	Finland	Accepted with Mod	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
9394	4	7	318	320	Remove text in the main guidance on how countries can factor out emissions, as that is only relevant for accounting and not inventory estimation guidance. Information related to factoring out some pre-flooding emissions is already provided in box 7.1.	Canada	Rejected	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
4754	4	7	323	323	"less than 20 years old" should be modified to "less than and equal to 20 years old" (or other description that makes clear 20 years old is included in Land converted to Flooded Lands category) in order to be consistent with the general definition of land conversion category.	Japan	Accepted	
7690	4	7	328	335	Unclear why newly flooded areas are included in the estimation of emissions from reservoirs more than 20 years old -please explain or correct.	Finland	Accepted	This term has been replaced.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6326	4	7	330	334	May need to adjust equation 7.10 and associated explanatory notation. See discussion 318-319	Australia	Noted	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
9396	4	7	334	334	Delete "that is newly" and replace with "area flooded for more than 20 years".	Canada	Accepted with Modification	New text incorporated taking care of the comment. "Newly flooded" is no longer in use
4756	4	7	340	340	"reservoir of this age class" is a little unclear. Does this mean "reservoir > 20 years old" like the other terms of this equation? If so, it is better to use the same text here as well.	Japan	Accepted	Done.
6328	4	7	346	347	Depending on circumstances, damming a natural water course may change its hydrological character through substantial changes to water levels and/or water transition times, and alter its emissive profile. It is therefore likely that individual assessments may need to on whether to include the natural water course area taken into the account. See discussion 318-319.	Australia	Noted	Tier 2 factoring out approach allows for the use country specific emission factors for natural waterbodies.
7692	4	7	355	361	Is this a pragmatic and implementable Tier 2 method?	Finland	Noted	Scaling by trophic status is a practical and achievable approach at the Tier 2 level and is based on the science.
6330	4	7	362	362	The statement on factoring out may need to be qualified based on outcomes from the discussion on box 7.1 and Annex 7.1	Australia	Accepted with Mod	The methodology has been revised to improve transparency by first providing guidance on estimating total emissions from flooded land (consistent with the MLP) and then how to factor out emissions from pre flooding sources, as requested in the mandate provided by the IPCC Plenary (to “develop consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area”).
9398	4	7	362	363	Why would factoring out be acceptable for reservoirs but with no guidance for other land categories and sectors? The text indicating that countries can factor out emissions and removals should be deleted as it’s misleading guidance suggesting it’s ok to factor out emissions and removals in inventories. This is not consistent with the inventory approach as it’s introducing accounting constructs.	Canada	Rejected	The mandate from IPCC plenary is to "Update CO2 emission factors for land converted to flooded land (Wetlands) and to develop, on the basis of comprehensive review of available literature, consistent methodologies that take into account factoring out of emissions and removals that would otherwise occur in the absence of the flooded area for estimating CO2 and CH4 emissions from flooded lands (both land converted to flooded land and flooded land remaining flooded land)." The new guidance is following this principle.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
8446	4	7	364	386	It is declared in box 7.2 SOD, that sediments of reservoirs can depose carbon and lead to carbon sink activity of reservoir. But the presence of set of factors does not establish exact origin of carbon and to produce quantitative estimations of the process. In Russia the big amount of data are collects for sedimentation, concentration and origin carbon in sediments. The sedimentation and carbon accumulation is continued in reservoirs with age 70 years and more. The rate of carbon accumulation with sedimentation is 0.10-0.60 т C/ha/year (Butorin et al, 1975; Bikbulatova, 1993, Zakonov, 1994 and others). It is recommended to change the text of box, to refer the quantitative estimations o carbon removals due to sedimentation with possible presenting of table for different climate types (data in example of table is preliminary). Table. Carbon removal with sedimentation win reservoirs of temperate climate. Trophic ClassCarbon removal, t C/ha/year Oligotrophic0.018 Mesotrophic0.075 Eutrophic 0.3 Literature Butorin N.V., Zimina N.A., Kurdin V.P. Sediments of reservoirs of Upper Volga. Leningrad, Nauka, 1975. 159 P. (In Russian) Bikbulatova E.M. Assessment of rates of sedimentation of organic matter of phytoplankton in Rybinskoe reservoir. In: Organic matter of sediments of Volga reservoirs. Materials of I.D. Papanin's Institute of biology of inland water. Issue 66, Sanct-Petersburg, Gidrometeoizdat, 1993. P. 16-23. Zakonov V.C. Accumulation of biogenic elements in sediments of Volga reservoirs In: Organic matter of sediments of Volga reservoirs. Materials of I.D. Papanin's Institute of biology of inland water. Issue 66, Sanct-Petersburg, Gidrometeoizdat, 1993. P. 3-15. (In	Russian Federation	Noted	It is possible to implement such methods at Tier 3.
9400	4	7	377	377	The word 'sluicing' may be a typo. Please define otherwise.	Canada	Rejected	"Sluicing" is commonly used for this practice, sluicing sediments through gates
6332	4	7	397	397	Reference "UNESCO/IHA 2010", not in bibliography, assumed to be "GHG Measurement Guidelines for Freshwater Reservoirs". It would be useful to have a summary of the guidance provided in UNESCO/IHA 2010.	Australia	Accepted	Reference added
6334	4	7	443	443	Table 7.9 It is stated that the emission factor values are prepared by empirical modelling (line 421). If so then the references, which provide the raw data, should be removed from the table footnotes and replaced with a single reference that fully describes the work to develop the EF values. Also, is the "average value" an arithmetic mean or geometric mean, given that the data summary (Figure A3) consists of log transformed data?	Australia	Accepted	Reference to Annex 7.1.2.1 inserted and all the references deleted. The table shows arithmetic means of model outputs.
6336	4	7	443	443	Please review apparent inconsistencies between derived EF values recorded in Table 7.9. In the draft table, the CH4 EF values for reservoirs in dry zones have greater CH4 emissive potential relative to wet zone reservoirs in both tropical and warm temperate climate regions. This is inconsistent with the trend in CH4 EF values previously recorded in the 2006 IPCC guidance; specifically Vol 4, Table 3A.2. It also runs counter to the observed soil organic carbon content, which is generally greater in moist/wet zones compared to dry zones in any climate region (e.g. see Table 5.2 in the 2013 Wetlands Supplement). A similar trend reversal also occurs with respect to temperature in this table, wherein the warm temperate/dry EF has a greater value than that of the tropical moist/wet EF. This is also counter to the trend recorded in the 2006 IPCC guidance, Vol 4, Table 3A.2.	Australia	Rejected	It is true that the EF's in Table 7.9 are different from 2006 Guidelines. There has been a lot more observations and data available since the 2006 Guidelines was written. This has now been taken into account, hence EF's are different

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6338	4	7	443	443	The calculations and assumptions underpinning the empirical modelling approach (using the G-Res tool) are not provided in any detail in the G-Res technical document, so that the validity of the modelled EF values cannot be tested statistically against the field measurements.Are the data sets used in establishing the models and deriving the EF values available for study or use? Is there further documentation, beyond the G-Res tool technical documentation, that explicitly explains all aspects of the modelling processes used to develop the G-Res tool and the derived EF values? Some of the modelled EF values in Table 7.9 are inconsistent with those reported previously in the 2006 IPCC guidance and 2013 wetlands supplement, both in absolute terms and in relative terms regarding climate zones. Figure A3 is therefore briefly reviewed here as it is assumed to summarise both the model outputs directly relevant to Table 7.9, and the field measurements on which the modelling is based. Figure A3 comprises box plots of log transformed data for both model outputs and field measurements. The extended lower whisker, non-central position of the median within each box, and non-equivalence of the median with the arithmetic mean reported in Table 7.9, indicate skewed distributions for each data set. It is therefore probably not correct to classify all of the "filled circles" as outliers. Seven to eight percent of regular data may be expected to exceed the upper bound of a box distribution when data is skewed. Were any/all of the "outliers" excluded from estimates of the EF values? The distribution of modelled EF values is significantly constrained relative to that of the measured data for each of the climate zones. In almost all cases the modelled median value exceeds that of the field measurement values, except for the Boreal (almost equal) and tropical wet (less than field measurement for that climate zone as well as the tropical dry climate zone). This last reversal in the tropics accounts for the lower EF value recorded for tropical wet vs tropical dry. There is no record for warm temperate dry field measurements in Figure A3 (it is noted as unavailable), so a similar conclusion cannot be drawn regarding the warm temperate dry and warm temperate moist climate zone EF values.	Australia	Noted	The G-res Technical document does provide a comprehensive compendium of the calculations and assumptions used in the G-res. More generally, Prairie et al. (2017a) describes the scientific basis of the overall approach. Figure A3 is provided for transparency but it should be noted that the model output and direct measurements are not strictly comparable. These differences and the rationale for using EF derived from model outputs are described in detail in Section A7.1.2.1 . The overall validation of the approach is best illustrated in Figure A4 where GHG emissions estimated from the tabulated climate-specific EFs (Table 7.9 and 7.14) are compared with field measurements. No outliers were removed in the estimation of the climate-specific EFs.
6340	4	7	443	443	Do the EF values incorporate shallow (< 3m) and deep water emission data, or are they based on shallow water emission data only? Sturm et al., 2014 demonstrate that, although total CH4 emissions (diffusive + ebullitive) from deep waters in a stratified reservoir are less than those from shallow waters, they are still substantial. Development of scaling factors (based on climate zones and edaphic factors, both of which are considered in development of the G-Res model) to distinguish shallow and deep water emissions might be considered at this time, with additional guidance provided on compiling areas for "shallow" and "deep" part of the reservoir. Sturm's work also suggests that employing Aflooded , j,l in equation 7.10 will lead to an under-estimation of CH4 emissions from the reservoir surface.	Australia	Noted	EF incorporate emissions both from shallow and deep waters
6366	4	7	443	443	Please review apparent inconsistencies between derived EF values recorded in Table 7.9. If the available data do not comply with the principles established in the terms of reference, this table should be deleted.	Australia	Rejected	Unclear what this comment means, but it's probably expressed in comment 6336. Please see answer to this comment
6376	4	7	443	443	Please remove the differentiations of factors by climate zone presented in Table 7.9 (and Table 7.14). The evidence provided in Figure A3 would seem to indicate that the average rate of emissions from 'cool temperate'; 'tropical dry'; 'tropical wet'; and 'warm temperate moist' are not significantly different from each other. Are you able to conduct such a statistical test to prove the contrary? If not, a single factor for all reservoirs should be applied regardless of climatic zone.	Australia	Accepted with Mod	The apparent and real overlap in the model outputs and field measurements (Figure A3) does not preclude the fact that that the mean climate-specific EFs are significantly different from one another. In fact, such test formed the basis of the aggregation of several climate zones (see Section 7.1.2.1, point 5). However, we agree that the confidence intervals on the individual predictions reported in Table 7.9 and 7.14 were misleading. We have now modified the tables to report the mean EF and the CIs on the mean (not the individual observations).

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
5900	4	7	443	444	Very odd that 'warm temperate/dry' has double emission than 'warm temperate/moist'. This is counter-intuitive and may be due to insufficient data to characterize these ecosystems	United States of America	Noted	While this may be counter-intuitive, the values are the average of hundreds of systems to which the models were applied to. The resulting EF estimates are therefore more robust than a few measurements of various temporal coverage.
6780	4	7	443	444	The proposed default emission factor for the boreal zone is too high. The much lower estimates are published in the literature.	Russian Federation	Rejected	There must be a unit mistake. The public literature suggested by the reviewer and the proposed default emission factor are at the same order of magnitude
6782	4	7	443	444	Within the one boreal zone there are big differences among countries and regions on the ice period and period without ice during the year. We believe that it is important to take it into account in the 7.10. It should be more correct to give the coefficients not in kg CH4 per year, but in mg CH4 per day in order to allow each country to implement their national data.	Russian Federation	Rejected	The Emission Factors are derived from models predicting annualized values that have taken the reduced emissions in the ice covered reservoirs .
8440	4	7	443	444	When the table 7.9 SOD was developed, the change of climate classification from Koeppen to standard IPCC 2006 climate was performed. This change is relevant to make calculations more consistent with other chapters. But values, presented for some climatic zones, arise a questions. It is evident from table 7.3 FOD, that for boreal subzones (Snow Fully Humid Warm Summer, Snow Fully Humid Dry Summer) typical values of CH4 emission are 3.7-5.0 kg/ha/year, but in table 7.9 SOD value for boreal climatic zone is 13.6 kg/ha/year, this is overestimated value. Likely, the procedures to recalculate values from Koeppen climate to standard IPCC was not completely adequate, it could not take into account the areas of subzones, which were combined to generalized “boreal” zone. It is necessary to make revision of this value, which likely could be in limits 3.7-5.0 kg/ha/year. Also the value 54 kg/ha/year for “cool temperate climate” is strange, because in table7.3 FOD this value is 21.3 kg/ha/year.	Russian Federation	Rejected	The values 3.7-5 from the FOD were medians, and not means, of measurements on a few reservoirs (total of 12). Individual reservoirs varied between 0 and 76. Our value of 13.6 seems appropriate.
6342	4	7	447	447	Reservoirs are established across a diverse range of habitats and may be subject to significant shifts in regional/continental weather patterns that may last for a season, or up to a decade or more. The default EF values represent a baseline that may not properly reflect methane emissions as environmental/climate conditions change. Scaling factors that apply to specific environmental factors rather than regions provide an alternative approach to significant resources required to develop regionally-specific EF values. Available data (GRanD and empirical model databases) should be sufficient to develop appropriate scaling factor values for T1 and T2 models. Could an approach using scaling factors to adjust for changes in conditions be considered here? Also see the previous discussion, line 174.	Australia	Noted	The provided EFs (table 7.9 and 7.14) are climate specific. They are derived from the application of G-res to several thousand reservoirs each with their own specific characteristics (see Annex 1 for details) and aggregated per climate zone. Countries wishing to develop Tier2 country specific EFs could use a similar approach.
9402	4	7	464	465	It doesn’t make sense why it is good practice to factor out CH4 emission from wastewater treatment and discharge, when methods to factor out emissions and removals are not generally included in IPCC guidance for inventories. Suggest deleting or providing a rational explanation.	Canada	Noted	Emissions from wastewater treatment are estimated in other chapters in line with the Managed Land Proxy
9404	4	7	471	487	Why wouldn't the eutrophication modifier to the EF, including default values, not be applicable at the T2 level? It is suggested to use the same approach as in equation 7.14 (T1 estimation of CH4 emissions from land converted to flooded land) and have α = 1 at T1.	Canada	Accepted	Agreed, editorial mistake not to put this in Tier 2
9406	4	7	483	487	Many of the components of Table 7.11 are not explained in the main text or glossary (e.g. Secchi depth). Provide explanations of what these values are.	Canada	Accepted	Glossary have been updated
5902	4	7	486	487	The 'state adjustment factor' is based on relatively little data, but can have a huge impact on emissions estimates. I recommend using lowest values of the range to be conservative	United States of America	Rejected	These coefficients are based on the best available data. As such As such arbitrarily chosen low-end estimates would be biased.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
8442	4	7	486	487	Including of this table is very useful act because there is a lot of different classifications of trophic classes. The recommendation is to add column “Nitrates”, because this is most often measured hydrochemical parameter (in Russia the registration of nitrates is performed in 100% point of hydrochemical monitoring, otherwise “total phosphorus” is measured only in 5% points. The value can be next (follow classification of Kitaev, 1984). Trophic Class Nitrates, mg/L Oligotrophic 0-0.12 Mesotrophic 0.12-0.24 Eutrophic 0.24-0.95 Hypereutrophic ≥0.95	Russian Federation	Accepted with Mod	We looked for but could not find the Kitaev (1984) reference given by the reviewer. Instead, we have added a TN-based trophic status criterion to table 7.11.
5904	4	7	492	498	This only describes how to obtain the total area of reservoirs. Given the equation also asks for the “area of land that is newly flooded as a result of reservoir construction,” it seems like some guidance should be provided on how to obtain/estimate that data. This is key because it responds directly to the mandate in the approved TOC regarding factoring out emissions and removals that would otherwise occur in absence of the flooded area.	United States of America	Accepted with Mod	Guidance now included in FD
5906	4	7	510	517	The Tier 3 description does not seem to deal with the activity data required to estimate reservoir flooded land area, rather it provides further explanation of Tier 3 approaches, which is discussion that relates to Choice of Method and should be included in the section on page 7.15 Lines 393-415. The text that goes into Page 7.18, lines 510-517 should provide some explanation of the activity data required for measurement of modelling approaches. Possibly a generic statement such as “Tier 3 approaches will likely require more detailed activity data on for example climate and reservoir management, but the exact requirements will depend upon the model or measurement design.” (Please note this is just example text that the authors should adapt to Tier 3 reservoir methods.)	United States of America	Accepted	Added suggested text
7694	4	7	510	517	Even for Tier 3 activity data on the areas are needed.	Finland	Accepted	The sentence was added
7706	4	7	511	512	UNESCO reference is not included in the list of references, IHA 2010 is.	Finland	Accepted	Same reference, ref.name will be corrected
9408	4	7	519	528	Is it possible for the authors to provide clear definitions of what constitutes an emitting drainage ditch or canal, or even pond? Without clear guidance of what these “constructed waterbodies” are it will be very difficult for compilers to quantify the total areas of the bodies in their countries and apply to appropriate emission factors. What about ditches that only have water periodically? Clear descriptions are needed.	Canada	Accepted with Mod	Updated definitions of water bodies and corresponding decision tree are included. Methods to identify areas of water bodies are included in methods for Activity data
6344	4	7	522	522	Is this chap 2, drained inland organic soils, specifically Section 2.2.2 and Annex 2A.2 Table 2A.1.?	Australia	Accepted	reference to correct section in the wetlands supplement is provided. Section 2.2.2.1; Table 2.4
5908	4	7	523	525	Could this method also apply to ponds in settlement areas where they are quite common? If so, then it would be useful to mention that specifically so inventory compilers will know to include them in their estimates.	United States of America	Accepted	Yes. This includes ponds within settlements, however, note that CH4 emissions associated with wastewater are considered elsewhere (Volume 5, Chapter 6, 2019 Refinement).
5910	4	7	525	528	This sentence could confuse inventory compilers about the proper reporting of emissions from drainage ditches used to drain organic soils in the forest land, cropland, grassland and settlements land use categories which should be included with “Organic Soils” in the appropriate land use category. While the methods may be similar to what is being used here for other constructed water bodies, it would be inappropriate to include the emissions from drained organic soils in the flooded lands category since the draining of the organic soils converts them from wetlands to another other land use. In addition, the method proposed here does not include the CO2-C emissions from drained organic soils, which are included in the method described in the Wetlands Supplement.	United States of America	Accepted	Clarified the reporting of emissions from drainage ditches on organic soils "For Managed Land categories on organic soils Inventory inventory compilers may also choose to ‘embed’ emissions from small channels such as drainage ditches within their reporting of other Managed Land categories (applying the methodology described here, together with using Equation 2.6 of the 2013 Wetlands Supplement for drained organic soils). The same emissions should however not be included in Flooded Lands both if they are included other Managed Land categories. "

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7696	4	7	525	527	Do both methods produce the same emissions - alternative methods should be reasoned, why is the new method introduced?	Finland	Accepted	We anticipate similar emissions. We have clarified that equation 2.6 was for organic soils. "For Managed Land categories on organic soils Inventory inventory compilers may also choose to 'embed' emissions from small channels such as drainage ditches within their reporting of other Managed Land categories (applying the methodology described here, together with using Equation 2.6 of the 2013 Wetlands Supplement for drained organic soils). The same emissions should however not be included in Flooded Lands both if they are included other Managed Land categories. "
6346	4	7	530	530	There are currently insufficient data to derive EF values specific to various combinations of climate zones, environmental factors and management practices experienced by "other constructed water bodies" for Tier 1 modelling. In addition, seasonal and inter-annual variation in weather patterns (e.g. drought years vs flood years) may change the emissive potential of water bodies between annual accounts. Could you please discuss the applicability and development of scaling factors that adjust either the base-line EF values provided in Table 7.12, or Equation 7.12 outputs, to account for conditions encountered in that reporting year? Precedence is already established in this refinement in Section 7.3.2.1: CO2 emissions from land converted to flooded land. Table 7.13 provides scaling factors to account for CO2 emissions or removals from newly flooded land in various climate zones. Could you develop for this document one or more sets of scaling factors to account for climate zones, soil type, and/or wetting/drying cycles for methane emissions from "other constructed water bodies"? To illustrate the potential improvement this would bring, in Australia many small farm dams undergo periods of drying due to low rainfall and/or usage patterns. Work by Altor and Mitsch (2004) demonstrated that "intermittently flooded wetland zones, when inundated, emitted significantly less methane than permanently inundated areas, (which) indicates a difference in soil conditions or microbial community structure and dynamics between these areas." Therefore, an unmodified equation for methane emissions (Equation 7.12), quantified by a generic methane EF value for ponds (Table 7.12) will not provide a reliable estimate of methane emissions from that proportion of ponds that experienced one or more dry spells during the reporting period.	Australia	Accepted with Mod	We have added guidance to say modifications due to inter-annual (and other variations) in inundation could be accommodated at Tier 2 and Tier 3 level. Inter-annual variation in rainfall is likely to alter the area of the water in farm dams and thus variation would be accommodated in the "A" term in Equation 7.12
9410	4	7	542	548	From the explanation of variables it seems the equation is just for the total flux of methane from "ponds and channels", but the section is for all other constructed waterbodies. Clarify if the equation is just for ponds and channels (and if so why) or the whole category.	Canada	Accepted	Changed to "other constructed water bodies"
6348	4	7	549	549	Some practical considerations that impact the quality and therefore the materiality of the flooded land inventory item could be explored here. These include advise on how to (1) establish database of annual stocks of relevant categories of water bodies from 1987 onwards (establish a time series) (2) over the time series, estimate the period of time during each year in which there is water in each water body, (3) the average area of water during this period (unlikely to be 100% of the water body area), and (4) monitoring farm dams are less than a Landsat pixel in size (816 m2) in size, so how to monitor if remote sensing (Landsat) not reliable? Can you please discuss alternative strategies to establishing a time series for areas of "Other constructed water bodies" where documentation and/or remote imagery are insufficient?	Australia	Accepted	We have added guidance to address many of these concerns. Line 549 was the definition of term A in the equation. We have provided discussion around the area of waterbodies in Choice of Activity Data section. "The Ramsar Convention provides guidance on mapping of wetlands (Annex III) which can be used to determine the area of other Other constructive constructed water bodies. The minimum recommended scale of mapping is 1:5000 (50m x 50m or 0.25 ha) which could be used if appropriate data are available, for example from Landsat remotely sensed imagery (Pekel et al., 2016) or other higher resolution satellite imagery. "

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6350	4	7	558	558	Can you please comment on the possibility of development and use scaling factors for adjusting the total annual flux equation to take account of variations due to local geography (soil type), weather patterns (drought and floods), usage/management practices, all of which can contribute to variation in wetting/drying cycles of small constructed water bodies?	Australia	Accepted	This is possible at Tier 2 and 3. We have clarified the text to make this more obvious. "In addition, it may be possible to incorporate additional modifiers such as soil type (e.g. mineral versus organic); water flow rate; inter-annual and seasonal variation in water levels; salinity; presence of emergent vegetation (which may increase emissions) and species (for aquaculture); or take account of site management activities that may increase or decrease overall CH4 emissions (e.g., controlling organic matter loadings or aeration, including pond drainage)."
9412	4	7	565	566	Clarify if the Tier 3 guidance is just for “constructed ponds and channels used for agricultural purposes” (and if so why) or the whole other constructed waterbodies category.	Canada	Accepted	Removed reference to agricultural ponds. "A Tier 3 approach for constructed ponds and channels may take account of soils and land-use within the catchment area of each waterbody as controls on organic matter and nutrient inputs."
5912	4	7	581	582	This sentence should be deleted. Ditches used to drain organic soils are addressed in the Wetlands Supplement and are not part of the flooded lands category, the exception may be for peatlands.	United States of America	Rejected	Ditches are included in flooded lands. Ditches in organic soils have already been considered in the Wetland Supplement, but ditches in other Land cover categories have not been considered elsewhere.
6352	4	7	589	589	Table 7.12 - saline ponds: Previous advice in the 2013 wetlands supplement (Table 4.14) assumes that the Tier 1 default CH4 emissions are zero for water with salinity greater than 18ppt. Has this advice changed or are there other factors that need to be considered?	Australia	Noted	This advice has not changed. Saline aquaculture ponds have high levels of organic matter inputs that support low levels of methane emissions (compared to freshwater ponds). A statement has been added to clarify. "However, although because seawater suppresses production of CH4, emissions from saline aquaculture ponds are lower under saline compared to freshwater ponds"
6368	4	7	589	589	Please ensure consistency with other parts of the GLs. Other constructed water bodies are subject to significant shifts in regional/continental weather patterns that may last for a season, or up to a decade or more with significant impacts on methane emissions profile. This is recognised in other parts of the GLs. Please ensure consistency with the treatment, for example, of rice paddies which provides for a 'drought-prone' scaling factor of 0.16 (Vol4, chapter 5 Table 5.12)	Australia	Accepted	We have provided Guidance for inclusion of modifying factors at Tier 2 and 3.
6370	4	7	589	589	Please ensure consistency with other parts of the GLs. Other constructed water bodies are subject to significant differences in depth with significant impacts on methane emissions profile. This is recognised in other parts of the GLs. Please ensure consistency with the treatment, for example, of rice paddies which provides for a 'deep water' scaling factor of 0.06 (Vol4, chapter 5 Table 5.12)	Australia	Accepted	We have provided Guidance for inclusion of modifying factors at Tier 2 and 3.
7708	4	7	589	590	Please add a note that EF's for drainage ditches in organic soils can be found in Table 2.4 in the Wetland Supplement.	Finland	Accepted	Added at note c to the Table 7.8
7698	4	7	603	611	Where would countries get the activity data - is it collected presently, by whom, if not what would be the method to collect the data - please provide guidance on this.	Finland	Accepted	We provide descriptions of where data may be available in the Tier level descriptions. These have been improved. Sentences added include: "The Ramsar Convention provides guidance on mapping of wetlands (Annex III) which can be used to determine the area of other Other constructive constructed water bodies. The minimum recommended scale of mapping is 1:5000 (50m x 50m or 0.25 ha) which could be used if appropriate data are available, for example from Landsat remotely sensed imagery (Pekel et al., 2016). "

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6354	4	7	604	604	The level error in methane emission estimation, due to a differences between default EF and actual CH4 flux values, can be treated statistically if the observed water bodies are co-located and all experience similar environmental and management profiles. However, when the water bodies are spread across diverse landscape and climate types, and experience a variety of management strategies, then a common Tier 1 approach is likely to present significant error that cannot be treated statistically. Available emission factors values are unable to be disaggregated according to climate zone, yet temperature is an important factor and there is no advice provided for the wet/dry cycles that small dams may experience between seasons or during periods of drought or flood. A national inventory, therefore, will accumulate significant error that cannot be treated statistically, and which will adversely affect the accuracy and confidence in the account.	Australia	Noted	We provide guidance that changing water levels and stratification over climatic and environmental factors could be handled at Tier 2 and 3
6372	4	7	604	604	Please provide for the possibility for compilers to apply a minimum size threshold, consistent with the treatment of some other land use types, given materiality concerns.	Australia	Accepted	We provide guidance in the Activity data section and also in the Uncertainty Assessment section: "The Ramsar Convention provides guidance on mapping of wetlands (Annex III) which can be used to determine the area of other Other constructive constructed water bodies. The minimum recommended scale of mapping is 1:5000 (50m x 50m or 0.25 ha) which could be used if appropriate data are available, for example from Landsat remotely sensed imagery (Pekel et al., 2016). " and "Uncertainties in estimating emissions and removals from other constructed water bodies (ditches, canals, farm ponds and aquaculture ponds) are to a large extent derived from assumptions and uncertainties in the area to which the EFs are applied."
6374	4	7	604	604	Please provide for the possibility for compilers to apply a minimum size threshold given detection limits of readily available monitoring systems and the appropriate application of scarce inventory resources.	Australia	Accepted	We have provided guidance on this matter. "The Ramsar Convention provides guidance on mapping of wetlands (Annex III) which can be used to determine the area of other Other constructive constructed water
5914	4	7	604	606	Delete these first two sentences, they do not relate to choice of activity data. Perhaps this information could be included a the beginning of the Other Constructed Waterbodies sections on page 7.18.	United States of America	Accepted	ponds- These two lines have been deleted as they do not relate to the 'Activity' section
5916	4	7	608	608	After "…over time," insert "countries should consider this in developing their time series of activity data". The later part of the sentence "countries should use updated and recent data" should be rewritten to ensure inventory compilers also refer to older data sources as well to better understand when new non-reservoir waterbodies were constructed.	United States of America	Accepted	Change implemented
5918	4	7	619	619	The use of the term Fracditch here is confusing as it is not a term used in equation 7.12 on page 7.19. It seems you are using the methods in the Wetlands Supplement as an example of how to obtain some of the activity data for your method. If so, then you should make this clearer, or preferably just adapt that text and include it in this section so it is easier for inventory compilers to use this guidance.	United States of America	Accepted	Reference is made to the Wetlands Supplement which is the source of the Fracditch parameter and describes its calculation.
7700	4	7	623	623	the FAO database does not provide areas for aquacultures as stated in the text - please correct; if area data cannot be found in any statistics is it realistic that countries can use the guidance?	Finland	Accepted	We have removed the link (which was to yield estimates) and incorporated alternative text and reference. "For area of aquaculture ponds, estimates of area may be available from remote sensing imagery (Ottinger et al., 2017) or national databases."
7702	4	7	634	635	It is unclear from the text how these articles could be used in developing a Tier 3 method. Please expand - especially as the article Yang et al 2015 is available only when purchased, and Gusmawate et al. 2017 talks mainly about management not how it is linked to emission estimation.	Finland	Accepted	We have clarified these statements. "National level information capturing the differing pond management (e.g. whether ponds are intensively managed or abandoned (Gusmawati et al., 2017), particularly where the effects of pond management (e.g. drainage, Yang et al., 2015) or activity (Gusmawati et al., 2017) influences CH4 emissions (e.g. drainage, Yang et al., 2015) may also be appropriate to incorporate within a Tier 3 method."

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5920	4	7	641	641	Replace “impounded” with “flooded”	United States of America	Accepted	
5922	4	7	655	661	Are there differences between CO2 and CH4 as it relates to this discussion on the surge of emissions following flooding. Also, the word “return” on line 657, does not seem appropriate since the previous emissions pattern was that of unflooded land and it’s not returning to that emissions profile.	United States of America	Accepted with Mod	Text modified to reflect differences among gases.
5924	4	7	661	662	This is not an issue of recalculating the times series, but rather of adding a new category and ensuring time series consistency. Perhaps direct reference to Section 5.2.2 in Volume 1, Chapter 5 on “Adding new categories” would be a better way to describe this than a recalculation, which is when modifications are made to existing estimates that require recalculating the time series.	United States of America	Accepted	Changed as suggested
9414	4	7	668	671	This text is not necessary as it’s understood that unmanaged land categories can be converted to many of the LULUCF managed land categories. Therefore recommend deleting as it does not add relevant guidance to the text.	Canada	Accepted	Deleted in FD
9416	4	7	674	678	It’s not clear from reading the text here and in Annex 7.1 if the EF for the first 20 years represents estimates of average emissions during this period or if it is estimating emissions over 100 years but then calculated in the 20 year reporting period. Also it’s not clear if the EFs represent the total emissions or emissions after natural emissions levels have been subtracted. Text should be edited to clarify what the emission estimates using the EFs in the table represent.	Canada	Accepted	The principle of calculating the CO2 emissions from land converted to flooded land has been edited for better clarification.
7704	4	7	686	687	Is the reference to HWP chapter 12 the correct one for slash and stumps?	Finland	Noted	Reference is correct
5926	4	7	691	692	This sentence would seem to indicate that the method requires separating the amount of carbon in the drawdown zone from the carbon not in the drawdown zone, but the method in equation 7.13 does not seem to make that distinction. Is clarification needed here?	United States of America	Accepted	Sentence deleted
8444	4	7	700	705	The title of equation suggests, that the equation suitable for calculation of C-CO2 “emissions/removals”. Only C-CO2 emissions can be calculated by this equation, so it is expedient to remove the word “removal”.	Russian Federation	Accepted	Changed as suggested
4758	4	7	709	709	"less than 20 years ago" should be modified to "less than and equal to 20 years old" to make it clear that 20 years old is included in Land converted to Flooded Lands category.	Japan	Accepted	Corrected as suggested
9418	4	7	712	714	Variable SOCj,k of equation 7.13 should be clearly related to generic methods in chapter 2 for estimating SOC. In particular, should the Mj scaling factor depend on the distribution of SOC stocks among the active, slow and passive pools (see new box 2.3c and equations 2.26b to 2.26h)?	Canada	Noted	The scaling factor is based on the ratio between SOC stock proxy from the FAO harmonised soil map and empirical flux rates. The impact of different OC fractions are thus embedded in the scaling factor.
5928	4	7	713	713	Table 2.3 in the 2006 IPCC Guidelines has been updated as part of the 2019 Refinement, therefore this should direct them to the updated Table 2.3 in the 2019 Refinement.	United States of America	Accepted	
5930	4	7	723	723	The reference to Table 2.3 in the 2006 IPCC Guidelines has been updated as part of the 2019 Refinement, therefore this should direct them to the updated Table 2.3 in the 2019 Refinement. Also, note that the updated Table 2.3 has added a Polar climate, not sure that matters.	United States of America	Accepted	
5932	4	7	727	728	Is this really necessary to mention here? Mangroves and tidal marsh are already wetlands and they remain wetlands if used for aquaculture i.e., there is no additional flooding of land.	United States of America	Accepted	Sentence deleted
9420	4	7	730	731	Explain what “nb reservoir” represents. Is it the number of reservoirs sampled?	Canada	Accepted	Nb changed to "Number of" in text
9422	4	7	740	742	Since the emission factors for Tier 1 were developed externally with the G-res model, it’s difficult to understand from the new guidance how Tier 2 EFs could be developed to be consistent with guidance in this chapter. Many of the variables in equations A1-A3 require parameters directly from the G-res model that would be difficult to obtain (e.g. solar irradiance, dimensionless temperature factor derived from air temperature). Recommend providing more detailed guidance on how Tier 2 estimates could be produced from national GHG measurements.	Canada	Accepted	Added reference to G-res supporting documentation where more detailed information about G-res formulation and development of supporting parameters can be found.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9424	4	7	743	748	The removal of the level of the natural annual background release of CO2 isn't consistent with other LULUCF guidance. For example this is not done when wetlands are converted during land-use change to other categories (e.g. drainage in the IPCC Wetlands Supplement). Recommend editing text so that guidance is consistent with the rest of LULUCF guidance for other land-use change categories.	Canada	Rejected	Flooded land is a special case, not covered by the previous IPCC methodology. Flooding of previously water-saturated organic matter continues to preserve a large proportion of the C stock. For non-water saturated OM the decomposition rate may decrease, differently than after drainage of water saturated OM such as peat. The CH4 emissions are continued, modified, or newly established for earlier non-CH4 emitting organic carbon stocks. The process of CO2 surge after flooding is covered by the empirically based CO2 emission factors and the conversion of organic matter to CH4 is covered by the empirically based CH4 emission factors, respectively. Therefore the MLP methods for other land use changes do not accurately describe the changes in fluxes in flooded lands
5934	4	7	748	748	Delete "until"	United States of America	Accepted	Deleted
5936	4	7	750	756	This paragraph should be integrated in the Choice of Emission Factor section on page 7.24 line 766-773	United States of America	Accepted	Implemented
5938	4	7	789	789	Not sure the first sentence is relevant for guidance on developing Tier 2 and 3 activity data.	United States of America	Accepted with Mod	Text has been corrected.
5940	4	7	802	803	It's not clear why there is a mention of aquaculture on coastal wetlands, mangroves, tidal marsh and seagrass meadows are already wetlands and they remain wetlands if used for aquaculture i.e., there is no additional flooding of land.	United States of America	Rejected	Conversion of coastal wetlands to aquaculture results in conversion to flooded land and therefore a change in emissions
5942	4	7	810	810	Insert after "flooding" suggest to insert the following or other explanation for the high levels of CH4 in the 20 years following flooding: "as a result of anaerobic decomposition of C in biomass, dead organic matter and soil carbon on the land prior to flooding"	United States of America	Accepted	Text modified as suggested
5944	4	7	825	826	There does not appear to be any guidance on how to estimate the area of land that is newly flooded. It seems like some guidance should be provided on how to obtain/estimate that data. This is key because it responds directly to the mandate in the approved TOC regarding factoring out emissions and removals that would otherwise occur in absence of the flooded area.	United States of America	Accepted	Guidance now included in FD
5946	4	7	865	865	After "information to" insert "develop an alternative methodology or"	United States of America	Accepted	
5948	4	7	876	883	An additional clarification that could be discussed here is the uncertainty in estimating the area of land that is newly flooded—distinct from total area of flooded surface area. This is an additional data requirement as a result of the need to factor out the emissions and removals that would otherwise occur in the absence of the flooded area.	United States of America	Accepted	New text better describing how to estimate additional area of land flooded is included, as well as new text about uncertainty
5950	4	7	886	887	It's not clear why there is a mention of aquaculture on coastal wetlands, mangroves, tidal marsh and seagrass meadows are already wetlands and they remain wetlands if used for aquaculture i.e., there is no additional flooding of land.	United States of America	Rejected	Conversion of coastal wetlands to aquaculture results in conversion to flooded land and therefore a change in emissions
9426	4	7	892	895	Suggest moving this description of downstream emissions up to section 7.3.1.2 to better explain to inventory compilers what emission estimates are included in the main guidance. For example it wasn't clear at first that the Rd constant in equation 7.10 would result in including downstream emissions in flooded lands estimates.	Canada	Rejected	In the SOD, downstream emissions aren't defined until after equation 7.10 is presented. We agree this is not optimal. The definition is now presented in the "CH4 Emissions", which appears very early in the guidance. The text on lines 892-895 are relevant to uncertainty and will remain in the 'Uncertainty Assessment' section.
5952	4	7	908	908	Delete "for EF"	United States of America	Accepted	
9428	4	7	951	985	This text and figure are specific to reservoirs so put in a reservoir section. It would be helpful to include this section in the main chapter before the calculations. This would help with understanding the calculation steps for Tier 1, 2 and 3.	Canada	Rejected	Thank you for the comment. This is a quite technical description that fits best in the Annex for those who seek better understanding

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6356	4	7	1195	1195	Can you please clarify some aspects of the empirical models used to derive the methane EF values provided in this document? The G-Res tool technical document (Prairie, et al., 2017, pp 8 and 10) provides a list of studies used in establishing a GHG emissions database from which the mathematical equations underpinning the empirical models were derived. The empirical models were then applied to the larger GRanD database of values to calculate a set of Reservoir EF values (Tables 7.9 and 7.14). Could you please comment on the method used to validate the empirical models as described in Annex 7.1 (1195 onwards)? The method does not appear to comply with common practice in validating empirically derived models; i.e. to use half the data in the database to prepare the models and then validate against the other half. Rather model estimations were regressed against direct measurements that were also used to estimate EF values used by the models themselves. That is, the test data is not independent of the simulated values.	Australia	Noted	The overall validation of our approach is not amenable to the procedure referred by the reviewer. The empirical data was used strictly to develop the empirical models. The models were then applied to the >6000 reservoirs contained in the GranD database and the model outputs were then aggregated by climate zones to produce Emissions Factors. The validation of our approach is best illustrated in Figure A4 where GHG emissions estimated strictly from the tabulated climate-specific EFs (Table 7.9 and 7.14) are compared with GHG emissions from reservoirs in which field measurements were made.
6358	4	7	1195	1195	Does the G-Res tool factor out pre-impoundment emissions prior to calculating the EF values? The current level of G-Res technical documentation is not entirely clear on this point. It appears it does so for CO2 emissions but not necessarily CH4 emissions. Also, in applying the G-Res tool at Tier 3, CH4 emission/removal estimations will under-estimate emissions and could potentially turn a source into a sink. It is unclear at this time whether the G-Res tool cumulatively: (1) utilises an EF value already adjusted to factor out pre-impoundment emission, (2) subtracts pre-impoundment emissions from the estimate, and (3) reduces the activity data to "newly flooded land" (see Prairie et al., 2017, p38), for land that has finished its transition to Flooded land remaining flooded land. Can you please clarify the modelling approach used, and provide an explanation if pre-impoundment emissions are adjusted for in multiple ways.	Australia	Noted	For CH4, the Emissions Factors (Table 7.9 and 7.14) represent our best estimates of CH4 emissions for each climate zone. These EFs do not factor out any pre-impoundment emissions. However, the guidance (Equations 7.10 and 7.13) does provide a methodology to factor out CH4 emissions from unmanaged lands such as wetlands or lakes that existed prior to the flooding. For CO2, as detailed in section A7.1.2.2 and in G-res technical document section 3.1.2), our approach aims at providing EFs that factor out CO2 emissions that would have occurred regardless of the presence of the reservoir. These calculations depend in part on the time evolution of CO2 emissions after flooding and the amount of soil carbon that was flooded. This approach is also discussed more generally in Prairie et al. 2017. Greenhouse Gas Emissions from Freshwater Reservoirs: What Does the Atmosphere See? Ecosystems 19:1–14. The methodology provided here regarding the factoring out due the presence of a former lake or wetland in the reservoir area is independent.
9430	4	7	1202	1208	Outlier patterns suggest highly skewed data distributions. In addition, in all climate zones except the Cool Temperate one, "outliers" of the box plots for modelled estimates lie about one order of magnitude higher than the median, while the lower whiskers of the plot extend over 2 orders of magnitude below the median. It is difficult to understand how such "outliers" have been defined for measured and modelled estimates. Something needs to be explained about the distribution of the modelled estimates.	Canada	Noted	Once the empirical models were developed, they were applied to several thousand reservoirs and because of their individual configurations and environmental conditions, they produce a wide range of estimates for each climate zone. While the range of prediction is wide, the average value is well constrained (see new table with standard errors.
6378	4	7	1210	1217	Is the claim that 'the model estimates capture both the variability and central tendency in CH4 emission rates' a claim that has been reported and tested in peer reviewed scientific literature? If not, the basis for the emission factors differentiated by climatic zone would be highly questionable.	Australia	Rejected	Figure A4 demonstrates that the model estimates capture both the variability and central tendency in CH4 emission rates. No bias can be observed with respect to measured vs estimated values.
5954	4	7	1253	1253	Please make it clear that the 2019 Refinement provides updated values for Table 2.3 that is in the 2006 IPCC Guidelines	United States of America	Noted	
6360	4	7	1289	1289	A4 should be A5 (figure below at line 1312)	Australia	Accepted	
9432	4	7	1289	1290	Provide more clarity on why the emissions over the 100 year period are reported in the 20 year period. It's not clear in the main chapter what emission estimates produced from the equations represent.	Canada	Noted	While most of the CO2 emissions attributable to the reservoir do occur within the first two decades, the return to new equilibrium conditions was assumed to be equal to the expected lifetime of reservoirs (100 years). As explained in Figure A4, those values were reported as a 20 years average for consistency and simplicity..

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6362	4	7	1312	1312	Figure A4 should be Figure A5 (Figure A4 is above at line 1227 and refers to CH4 flux)	Australia	Accepted	
5956	4	7	1339	1340	Page 7.41, Table A3: If the * in the cool temperate moist and dry cell relates to the Note at the bottom of the table there should also be an * at the bottom of the table in front of the note.	United States of America	Accepted	the asterisk was removed from the table
6364	4	7	1339	1339	Sturm et al., 2014. Gold Creek (Brisbane), IPCC climate zones places Brisbane in "warm temperate moist" climate zone	Australia	Rejected	According to the map of IPCC climate zone, the location of Gold Creek Reservoir is in the "tropical dry and montane"
9434	4	7	1371	1371	Provide examples of silvicultural practices that involve creation of waterbodies.	Canada	Noted	The text describes that silviculture sometimes requires the construction of ponds for irrigation, canals to provide water etc
5958	4	7	1371	1380	Could this method also apply to ponds in settlement areas where they are quite common? If so, then it would be useful to mention that specifically so inventory compilers will know to include them in their estimates	United States of America	Accepted	Yes. Comment has been added "In Settlements ponds may be created for recreation, aesthetic or stormwater management."
9436	4	8	82	82	Editorial comments: settlements instead of Settlements (ex. Line 167, 168, 212, 221, 222, 227, 228, 234 etc.) Inconsistency in the document: C vs carbon (ex. Line 111, 131, 144, 151, 169, 321, 348, 378, etc.) 5.0t (line 101) vs 4.0 t (line 102) , missing before etc. line 107 Inconsistency in the document: settlements remaining settlements in lower case vs upper case (ex. Line 231, 235, 243, 291, etc.) Inconsistency in the document: country-specific vs country specific (ex. Line 172, 174, 242, etc.) -Inconsistency in the document: t vs tonne (ex. Line 259, etc.) Inconsistency in the document: Land-use vs land use at line 227 (ex. Line 241, 294, 304, 305, 313, 318, 319, 320, 326, 327, etc) Inconsistency in the document: DOM vs dead organic matter / DOC dead organic carbon (DOM: abbreviation explain at line 2148…)	Canada	Accepted	Editorial - TSU. Note that for Settlements vs settlement the land-use category name was capitalized. C vs carbon: should be consistent with the 2006GL Country-Specific (with hyphen) is the correct way. t vs tonnes: basically use "t C" land use vs land-use: general meaning of land use is without hyphen. category name or LUC context is with hyphen. DOM vs dead organic matter: use dead organic matter here.
9438	4	8	83	89	Not clear how to take into account urban conditions, such as local air quality, to assess tree growth. Maybe add a reference for guidance and ensure consistency on how to account for those effects.	Canada	Noted	The current guidance includes several references related to impact of e.g. air quality on tree growth and mortality in settlements area. In case of higher Tiers application additional information would be applied for country specific modelling.
9440	4	8	84	84	CO2 vs CO2 Misplace abbreviation (CRW)?	Canada	Accepted with Modification	Sub index typo corrected in the grey text. No CRW abbreviation in the sentence found.
9442	4	8	94	94	If there is so much discrepancy, please add a definition.	Canada	Accepted with Modification	Additional text was included to clarify that the large variation is due to the national definition of the land-use category Settlement.
4760	4	8	110	111	The removal factors of urban parks in Japan (Tonosaki, 2018) are shown as values per park area rather than as values per crown cover. The sentence ", and the averaged removal factor of urban parks in Japan can be represented as 2.50 tonnes C (ha crown cover)-1 yr. -1 (Tonosaki 2018) " should be removed.	Japan	Accepted	Suggested text has been deleted.
7394	4	8	121	163	we feel that the discussion in these paragraphs belongs to tier 1 section. ACTION: move these paragraphs after line 119 and before line 120	Spain	Rejected	For settlement estimation of biomass carbon stock changes the application of Tier 1 method implies the assumption of an equilibrium between the changes in biomass carbon stocks due to growth in biomass and the decreases in carbon stocks due to removals. Therefore, the methods and values presented in this section refer to country-specific estimates which is why they are considered Tier 2.
9444	4	8	125	127	It is a US factor, not a global factor. Add examples from outside the US.	Canada	Accepted with Modification	Text has been revised deleting "global default value" and referring to updated studies.
9446	4	8	139	140	The 0.26 ratio comes from Cairns et al. (1997), not Nowak et al. 2002. The ratio could be more region specific and based on a more recent publication (ex. Poorter et al. 2012).	Canada	Accepted with Modification	Reference was corrected as the reviewer suggested. The suggested publication (Poorter et al. 2012) was examined but it was decided that no additional shoot-root ratios, to be potentially referred to in the guidance, are included in the abovementioned paper.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9448	4	8	150	151	Is it supposed to be included? If yes, there is an issue about double counting the emissions from the peat drained for horticulture. For the Wetland category, we assume that peat dedicated to horticulture is immediately converted to emissions in the inventory year.	Canada	Accepted with Modification	Text has been revised to clarify that the paragraph related to perennial crops included in Settlement land-use category. The reference to horticulture has been removed since it is not mentioned in chapter 5.
9450	4	8	174	174	"Rationale" instead of "rational".	Canada	Noted	The term rationale is used in the sentence.
5960	4	8	197	198	Conversion of wetlands to settlements should also be mentioned here and discussed further under the carbon pool sections similar to what is provided for forest land, cropland and grassland	United States of America	Accepted with Modification	Text has been revised to include the reference to wetlands.
9452	4	8	243	244	What is the definition of urban green space? Does it includes soccer field (no trees) as well as golf courses (scattered trees) and Parks (variable tree density)?	Canada	Accepted with Modification	Text has been revised and "crown cover area" is used instead of "urban green space" to be consistent with default factor.
9454	4	8	263	263	"cropland" instead of "Cropland". "grassland" instead of "Grassland".	Canada	Accepted with Modification	Cropland and Grassland in this table as land-use category name were capitalized.
9456	4	8	322	322	Remaining should be lower case. Same at line 325.	Canada	Rejected	To be consistent with Chp. 8 of the 2006GL, Remaining as part of the category name is capitalized.
9458	4	8	383	383	within in italic	Canada	Accepted	Editorial - TSU
9460	4	8	494	494	"Gu¨neralp" instead of "Güneralp".	Canada	Accepted	Editorial; done.
4762	4	8	496	496	The description should be as: Tonosaki, K. (2018). Carbon Accumulation Rate by Trees in Urban Parks in Japan, Urban Green Tech, 106,18-21	Japan	Accepted	Done, page numbers were inserted.
7634	4	10	174	175	Table 10A.2-8 in Annex : Please check if EF for reindeer is correct when using parameters mentioned in the table (VS, Bo, MCF)	Finland	Accepted	
7616	4	10	436	444	Please emphasize that slaughtering weights can be utilized in live weight estimations if slaughtering ages and growth curves are also available.	Finland	Rejected	There is already a description of the use of slaughter weights in the text.
7618	4	10	451	456	Please add a sentence emphasizing that mature weights of bulls are 1.5 times higher as cows in the same genotype. A reference for this: Table 9, p.1443, in Doren, P.E., Baker, J.F., Long, C.R. and Cartwright, T.C. 1989. Estimating parameters of growth curves of bulls. Journal of Animal Science. 67: 1432–1445.	Finland	Accepted	
7620	4	10	471	473	Johnson (1986) is missing in the references.	Finland	Accepted	Should be added t the reference list
7622	4	10	471	473	Please specify the temperature range intended, i.e. starting from what temperature the relationship described in Equation 10.2. is applicable? How could one access the reference behind this relationship? Via IPCC archives? How about countries with cool summers? Or should this be used when animals have an outdoor shelter as well?	Finland	Rejected	Countries should apply that temperature equation in a consistent manner than has been explained in the NRC 2018. It is applied in during periods where cattle are outdoors and temperatures are transitioning from warm to cool until the animals become acclimatized. The Johnson reference has been added to the reference list.
7624	4	10	637	649	Does the Equation 10.6. mean that different mature weight values will be used for females, castrates and bulls - in addition to the difference created by the coefficient differing from 1 for these cattle subgroups? This is an important issue because of the great difference in mature weights between sexes.	Finland	Rejected	The answer would be yes, but this is out of the scope of the 2019 Refinement.
7626	4	10	637	649	Calculation examples for a bull and a heifer would be useful.	Finland	Rejected	No action can be taken because comment is out of scope of 2019 Refinement.
9464	4	10	826	827	Suggested re-wording: “It is also possible to predict dry matter intake for mature and growing cattle based on the body weight of the animal, using either the dietary net energy concentration of the feed NEmf (MJ kg-1 DM) (National 827 Academies of Sciences & Medicine 2016) or DC, and if lactating dairy cow, fat corrected milk production.”	Canada	Noted	Will be taken into account together with other comments in revising the draft.
4898	4	10	931	931	Ym has not yet been defined. We suggest to add "This variation is captured by Ym, defined as the percentage of gross energy intake converted to CH4." after the sentence "The extent to which feed energy is converted to CH4 depends on several interacting feed and animal factors.". Or at least refer to equation 10.24 coming two pages later where Ym is defined.	France	Rejected	Out of scope, proposed edit occurs in greyed text. No action can be taken because comment is out of scope of 2019 Refinement.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
1822	4	10	1039	1039	For Table 10.10, it is suggested that “developed countries” and “developing countries” be used in place of “High Productivity Systems” and “Low Productivity Systems” in the Table by following the classification given in the 2006 IPCC Inventory Guidelines.	China	Noted	The shift from reporting of EFs for developed/developing countries to low- and high productivity systems was made. As this approach permits to track changes in GHG emissions occurred from transition from low- to high-productivity systems within developing countries, in particular.
7420	4	10	1298	1938	Many references to tables or equations are misleading (including references to non-existing tables or equations). Therefore, we were unable to follow the instructions. Please revise.	Germany	Accepted	The references to the tables and equations were verified and changed as appropriate.
6576	4	10	1301	1301	Add the words "Volatile Solid" following the use of VS. (first time use of that abbreviation in the document)	United Kingdom (of Great Britain and Northern	Accepted	
7422	4	10	1329	1607	To us the new Tier 1A and Tier 1B methodology for methane emissions from manure management is too complicated. It covers more than 20 pages of tables and equations (not to speak of additional tables in the annex) and is, at least, a Tier 2 methodology. Due to the length of the description, this methodology lacks transparency. Please revise.	Germany	Accepted with Modification	As noted in comment 1176, the Tier 1 method for manure methane has been modified to maintain consistency with the Tier 1 method for nitrous oxide. This is to assure that there is consistency between manure N2O and manure CH4, whereas in the 2006 guidelines, this was not the case. Therefore there are changes to the Tier 1 method for manure methane. However, the reviewer's comment is noted and the choice of emission factors for the Tier 1 method has been reduced significantly, furthermore, the application of the method using the Tier 1A and Tier 1B method has been simplified and better explained such that there is only one additional equation from the 2006 Guidelines, that required to calculate volatile solids
6578	4	10	1376	1379	‘change ‘day. then’ into ‘day. Then’.	United Kingdom (of Great Britain and Northern	Accepted	
4764	4	10	1437	1607	Emission factors by productivity and climate zone are provided, but the definitions of productivity and climate zone are not provided. In the section of enteric fermentation, the level of livestock weight are showed with productivity (ex.Table10.10), and the definitions of climate zone are showed in Annexes of Ch.10. The definitions of those should be provided in the section of manure management as well.	Japan	Rejected	It is preferred to avoid repetition in the livestock Chapter. The definitions of climate zones have already been repeated from Chapter 3 of Volume 4 and we have compiled all animal weights in Annex Tables. We feel that compilers have all the information that they require without repeating the information in each section.
4774	4	10	1527	1527	Concerning Aerobic treatment of TABLE 10.14B AVERAGE REGIONAL METHANE EMISSION FACTORS OF CATTLE. Judgement of IPCC Expert Group are underestimate of Methane emission. Methane emission surely occur during storage in actual (Average 0.91% (kgCH4 / kg volatile solids –1) 0.1%–3.0%, kg CH4/volatile solids–1), and thus emission factor of 0.0 is inappropriate. According to the IPCC 2006 guidelines, under aerobic treatment conditions, the CH4 emission should be negative from wastewater treatment (0%; kgCH4/kg volatile solids–1). The CH4 emission from the individual aeration tanks (aerobic reactor of activated sludge process) was certainly negligible in our previous lab scale studies. However, methane is generated from organic degradation under anaerobic conditions by microorganisms in manure or wastewater. It is possible that the IPCC2006 calculation of the CH4 emission factor may not account for the full reactors of the wastewater purification treatment facility. Such CH4 emissions were reported at sewer treatment plants. See Supporting document	Japan	Rejected	The emission factor for forced aerated systems is only applicable for 'biological treatment of municipal and industrial wastewaters with negligible N2O emissions', as noted in Table 10.21. For all other systems using aeration the emission factor for natural aeration systems has to be used. Countries are always welcomed to use country-specific emission factors.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
5962	4	10	1527	1528	Page 10.58-10.59, Table 10.14B: The values for Dairy Cattle, both High and Low Productivity, with Liquid/Slurry, and Pit storage below animal confinements > 1 month in Tropical climate are shown as 0.9, this is also the case for Deep bedding > 1 month which are shown as 0.5. These values seem much lower than they should be when comparing to other values in the table. There is also a similar issue in Tables 10.14C, 10.14D and 10.14E	United States of America	Accepted	These values were verified and modifications were made where appropriate
4772	4	10	1540	1540	Concerning Aerobic treatment of TABLE 10.14C AVERAGE REGIONAL METHANE EMISSION FACTORS OF SWINE. Methane emission surely occur during this storage in actual (Average 0.91% (kgCH4 / kg volatile solids–1) 0.1%–3.0%, kg CH4/kgvolatile solids–1), so emission factor of 0.0 is inappropriate. See Supporting document. According to the IPCC 2006 guidelines, under aerobic treatment conditions, the CH4 emission should be negative from wastewater treatment (0%; kgCH4/kg volatile solids–1). The CH4 emission from the individual aeration tanks (aerobic reactor of activated sludge process) was certainly negligible in our previous lab scale studies. However, methane is generated from organic degradation under anaerobic conditions by microorganisms in manure or wastewater. It is possible that the IPCC2006 calculation of the CH4 emission factor may not account for the full reactors of the wastewater purification treatment facility. Such CH4 emissions were reported at sewer treatment plants. See Supporting document	Japan	Rejected	See comment 4774
5964	4	10	1606	1607	Page 10.75, Table 10.16A: There are footnote notations for Deer, Reindeer and Rabbits, but the footnotes seem to be missing.	United States of America	Accepted	
7632	4	10	1636	1636	Please check Equation 10.23, formula does not give kgCH4/VS - not grams and not per VS	Finland	Accepted	Equation was corrected
9462	4	10	1694	1694	Reference should be made to section 10.20 and not section 10.2.	Canada	Rejected	Reference to Section 10.2 is correct. Probably, this comment refers to "page 10.20".
4776	4	10	1755	1755	Concerning Aerobic treatment of TABLE 10.17 METHANE CONVERSION FACTORS FOR MANURE MANAGEMENT SYSTEMS. Judgement of IPCC Expert Group are underestimate of Methane emission. Methane emission surely occur during treatment of this treatment system in actual(Average 0.91% (kgCH4 / kg volatile solids–1) 0.1%–3.0%, kg CH4/kgvolatile solids–1). According to the IPCC 2006 guidelines, under aerobic treatment conditions, the CH4 emission should be negative from wastewater treatment (0%; kgCH4/kg volatile solids–1). The CH4 emission from the individual aeration tanks (aerobic reactor of activated sludge process) was certainly negligible in our previous lab scale studies. However, methane is generated from organic degradation under anaerobic conditions by microorganisms in manure or wastewater. It is possible that the IPCC2006 calculation of the CH4 emission factor may not account for the full reactors of the wastewater purification treatment facility. Such CH4 emissions were reported at sewer treatment plants. See Supporting document	Japan	Rejected	see previous version of this comment

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7628	4	10	1755	1756	Table 10.17: How is crust cover considered in practice? When is there a thick, dry crust? What about open storages in a country where there are big changes in weather during the year and between years? Can a thick, dry crust to be expected only when there is a solid roof above the storage. MCFs by climate zone is missing for deep litter for other than cattle/swine.	Finland	Noted	see response to comment 636 and 638.
7630	4	10	1755	1756	Table 10.17: MCFs by climate zone is missing deep litter for other than cattle/swine.	Finland	Accepted	
5160	4	10	1829	1829	Replace equation 10.26 with equation 10.24B	Italy	Accepted	
4766	4	10	1829	1829	The word "equation 10.26" should be revised by "equation 10.24B".	Japan	Accepted	
5162	4	10	1855	1855	Replace equation 10.30A with equation 10.24G	Italy	Accepted	
4768	4	10	1855	1855	The word "equation 10.30A" should be revised by "equation 10.24G".	Japan	Accepted	
5166	4	10	1873	1873	Replace equation 10.30B with equation 10.24H	Italy	Accepted	
4770	4	10	1873	1873	The word "equation 10.30B" should be revised by "equation 10.24H".	Japan	Accepted	
5168	4	10	1894	1894	The reference "was recommended in. T able 10A-4 to T able 10A-9 of 2006 IPCC guideline" is wrong.	Italy	Accepted	Editorial error. The 10% of MCF for biogas digesters was replaced by 10% of MCF for biogas digesters。
7638	4	10	1925	2534	Chapter 10.4.3 (row 1925) says The borderline between dry and liquid can be drawn at 15% dry matter content and Table 10.21 says the borderline is 20%	Finland	Accepted	We changed the footnote value to 15%
6932	4	10			Canada submitted the comment about the calculation method of CH4 emissions related to monthly volatile solid excretion per animal. Because there are four seasons in the Republic of Korea like Canada and it is very cold in winter season, if you accept the comment of Canada, it is expected that CH4 emissions from stored liquid swine manure may be decreased.	Republic of Korea	Noted	Korea would apply the method according to the Guidelines as defined in this refinement.
7430	4	10	1985	1988	Co-digestion of energy crops and animal manures in the context of direct N2O emissions from manure management: The text more or less suggests that N from energy crops must be treated as if it were part of the N pool constituted by animal manures. However, CRF table 3B(b) is designed for animal husbandry data only (animal numbers, animal excretions) and cannot account for such an atypical N source like energy crops. In addition, the draft of the revised guidelines does not mention co-digestion of energy crops in the context of CH4 from manure management. This implies an inconsistent guidance on how to deal with anaerobic digestion of energy crops (co-digestion of energy crops considered for N2O but not for CH4). In order to enable proper accounting of emissions due to animal husbandry on the one hand and emissions due to anaerobic digestion of energy-crops on the other hand, we suggest to make separate emission calculations for animal manures and energy crops (as it is done in the German inventory, cf. NIR 2018, Chapter 5.1.4.1, see supporting document). Depending on the solution to these problems, the inventory compiler must be made aware of possible double-counting with the waste sector (5B2).	Germany	Accepted	The proposed reporting tables that consistent with CRF reporting tables 3.B(a)s1, 3.B(a)s2, and 3.B(b) have been updated to allow the estimation of VS input and Bo for co-digestates, and N available in co-digesters, respectively. The new sub-category '5. Co-digestates' have been introduced with sub-categories '5.1. Crop residues', '5.2 Food Waste' and '5.3 Other'. The sub-categories 'Crop residues' and 'Food waste' are important for ensuring consistency with the N2O emissions from soils and the Waste sector, respectively. Energy crops are to be reported under '5.3. Other'. CH4 emissions from anaerobic digestion are to be estimated with a Tier 2 method. The text has been updated. *** Do we need default VS and B0 values???***or/and do values come from the waste sector?***Anyhow, this needs to be resolved in the text (Hong Min)
5966	4	10	2086	2101	In the list of variables for Equation 10.26A, there should be a note that FracGasMS can be found in Table 10.22. It is stated above the equation that the value can be found in Table 10.24, which is a mistake (line 2086-- should be changed to Table 10.22).	United States of America	Accepted	Reference to Table updated
5968	4	10	2103	2155	It should be more clear what the Party should do with the N losses calculated from leaching using Tier 1. If there is no emissions estimate available, should the Party mark this as NA, NE, or NO in their CRF tables? There should be explicit instructions in this section what to do, and that the N-leach (and N-vol) should be subtracted from N available for cropland.	United States of America	Rejected	Default values for FracLEACHMS are given in Table 10.22
7636	4	10	2205	2206	Default EF5 (lines 2205-2206) in chapter 'Indirect N2O emissions from Manure Management' is 0.0075 kg N2O-N (kg N leaching/runoff)-1 but in Updated table 11.3 it is 0.011	Finland	Accepted	No numeric values of EF5 are given, just the reference to Table 11.3
9558	4	10	2437	2438	List of considerations for estimating the N excretion by growing pigs appears to be missing from the text	Canada	Accepted	This sentence has been deleted.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
5154	4	10	2354	2354	Section 10.2.2. The reference to the equation or table or text of the paper from NRC 1996 (as reported in line 2354, section 10.5.2, EQUATION 10.33A N RETAINED RATES FOR CATTLE) could be inserted.	Italy	Rejected	No action can be taken because comment is out of scope of 2019 Refinement.
5164	4	10	2533	2533	In Table 10.21 "EF3 [kg N2O" the rest of the unit of measurement is not seen.	Italy	Accepted	Table header adjusted
4778	4	10	2533	2534	Concerning Aerobic treatment of TABLE 10.21 DEFAULT EMISSION FACTORS FOR DIRECT N2O EMISSIONS FROM MANURE MANAGEMENT Judgement of IPCC Expert Group are underestimate of Nitrous oxide emission. N2O emission factor of "Aerobic treatment Forced Aeration system" in actual are more high (Average 2.87% (kg N2O-N$ kg totalN–1), 0.3%–9.1%, kg N2O-N$g total N–1).. See Supporting document. Same range of emission factor were reported other similar organic wastewater treatment systems.	Japan	Noted	The emission factor for forced aerated systems is only applicable for 'biological treatment of municipal and industrial wastewaters with negligible N2O emissions', as noted in Table 10.21. For all other systems using aeration the emission factor for natural aeration systems has to be used. Countries are always welcomed to use country-specific emission factors.
4780	4	10	2533	2534	Judgement of IPCC Expert Group are underestimate of Nitrous oxide emission in this category. N2O emission factor of "Solid storage" (bacical data:0.005) and "Composting – passive windrow" (bacical data:0.005) in actual are more high. See Table 2 in Paldo et al.2015 of source of this judgement. N2O emission factor from this report, we should be use Average emission factor not Median from Table 2 and Table 3. ("Solid storage" Median 0.005 Mean 0.17 / "Composting – passive windrow" Median 0.005 Mean 0.12), This expert judgement is high risk of environment in future. Because so many nitrogen are excrete from Livestock's. See Supporting document, some of then were introduced in Paldo etal. 2015	Japan	Rejected	The median is generally used to return the central tendency for skewed number distributions as it is the case here
5970	4	10	2618	2621	FracGasMS and FracLeach MS can both be found in Table 10.22, not table 10.24. Typo.	United States of America	Accepted	Reference to Table 10.22 corrected
5972	4	10	2620	2621	FracLeachMS may also be a country-specific value, if the Party used a Tier 2 methodology. This should be noted in the list of variables for Eq. 10.34B.	United States of America	Rejected	There is no reference to the Tier level
5974	4	11	136	138	While this section is on N2O from managed soils, it may be worth mentioning (possibly in a footnote) that the method for drained organic soils in the 2013 Wetlands Supplement also provides a method for estimating CO2 and CH4.	United States of America	Noted	The compiler is directed to the 2013 Wetlands Supplement for additional guidance on drained organic soils, and will find the methods for CO2 and CH4 when reviewing the supplement. It is not necessary to mention the methods here.
4782	4	11	160	183	If mitigation options such as application of nitrification inhibitors are implemented, too small emission factors compared with the actual emissions may be used. A description such as "conservative or reasonable emission factors with clear scientific rationale should be used if country-specific emission factors considering the effects of mitigation options are used" should be added in order to avoid the underestimation.	Japan	Noted	This is true for any emission factor, i.e., EF values need to be accurate regardless of the actions that they represent.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7406	4	11	162	181	If a non-linear relationship concerning the response of N2O emissions to N applications is allowed, a guidance on data aggregation is required. Studies that found an exponential relationship always used data from measurements on individual fields. Typically, activity data is not available at the field level. Unfortunately, for a nonlinear model f the relationship sum(f(x)) = f(sum(x)) does not hold, which should be addressed explicitly here. Please revise. In addition, footnote 6 on page 11.8 refers to "individual soils". We suggest to change this to "individual fields" to avoid confusion with stratification by soil classes.	Germany	Accepted	Thank you for the suggestions. The reference to 'individual soils' has been changed to 'individual fields'. The text stating that "This method will require activity data on specific fertiliser application rates to soils in order to apply the rate specific emission factors that capture the exponential response." was replaced by "This method will require activity data on specific fertiliser application rates to individual fields in order to apply rate-specific emission factors that capture the exponential response. "
5976	4	11	187	188	Before “managed soils “insert “animal manure applied to”. The way the sentence currently reads it seems to imply that direct N2O emissions from managed soils are calculated only from animal manure applied to soils.	United States of America	Accepted with Modification	The text has been changed to "According to Equation 11.1, direct emissions of N2O from managed soils are calculated in the Tier 1 approach on the basis of total N applied to soils as synthetic and organic fertilisers and/or soil N mineralisation."
5978	4	11	196	197	This sentence does not provide sufficient guidance for an inventory compiler to adopt an “N-flow principle” approach as mentioned in the paragraph.	United States of America	Accepted with Modification	It is up to individual countries to define the method used in the inventory with higher tier methods. A reference illustrating the N flow principle has been added. The impacts can be addressed with a Tier 3 method where the compiler uses a more complex method that tracks N flows rather than the simple EF approach based on total N input. The corresponding text was therefore moved to the Tier 3 section.
5980	4	11	219	219	Consider changing “form” to “type” as is done on line 220	United States of America	Accepted	
5982	4	11	222	222	The use of the term “confounded” is unclear, please consider rewording for improved clarity.	United States of America	Accepted	The text was changed to "for both organic and synthetic N."
5984	4	11	231	232	Before “values” insert “updated”. After “Table 2.5” insert “and replace the values in the 2006 IPCC Guidelines”	United States of America	Noted	The sentence relating to the Wetlands supplements has been deleted, following advice from another reviewer comment.
7432	4	11	237	238	Updating the important and fundamental emission factor EF1 should be based on a peer-reviewed publication. To us, the description in 11A.2 is insufficient regarding transparency and reproducibility. After the data was made available, we reanalysed the data and came to the conclusion that the data does not support the proposed disaggregation sufficiently. Thus, we recommend that the disaggregation should be retracted until more (and better) data is available. See supporting document for more details.	Germany	Accepted with Modification	Thank you for analysing the dataset. Annex 11A.2 was further elaborated to improve understanding, transparency and reproducibility. Furthermore, the final order draft has an updated analysis for the EF1 after inclusion of additional data to the database, as requested by other reviewers.
5986	4	11	237	238	I think the revised factors properly represent the accumulated evidence published since the 2006 guidelines were derived. In particular, the disaggregated factors make sense and are defensible based on results from field studies. The revised uncertainty ranges are also reasonable and consistent with observations. My only minor concern is the lower bound of the range being 0 in some cases. This seems counter-intuitive but does appear to be based on observational evidence so perhaps is still justified.	United States of America	Noted	Thank you for the comment. The null lower bound of the range for EF1FR was based on observational data, while null lower bound of the range for EF1 was slightly negative based on original analysis. However, the analysis for EF1 was rerun after inclusion of additional data (as requested by some reviewers) and uncertainty ranges were recomputed.
5988	4	11	237	238	Page 11.10, Table 11.1: It would be useful to insert a footnote in this table indicating that the values for EF2 are provided in Table 2.5 of the 2013 Wetlands Supplement. Inventory compilers could refer back to the 2006 Guidelines for EF2 if they don’t read the guidance in the 2019 Refinement carefully.	United States of America	Accepted	Thanks for the suggestion, a footnote was added to refer the compiler to the 2013 Wetlands Supplement.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
8318	4	11	237	238	In Table 11.1 A, an absolute value is determined for N content of residues and dry matter fractions of harvested in different product, while these values can change based on the crop cultivar or cropping system (ex. for irrigated or rainfed lands). A results of the research in Iran shows that there is significant difference between 1000-grain weight, grain yield and harvest index of two different wheat cultivars. The type of cultivar can affect the crop residues and crop residues can affect soil organic carbon (Sadeghi and Bahrani, 2009). Halvorson et al. (1999) showed that increased crop residue rates returned to soil in semiarid dry land region of Central Great Plains, USA, accompanied by increased N rate resulted in increased soil organic carbon levels which contribute to improved soil quality and productivity, and increased efficiency of carbon sequestration into the soil (Halvorson et al., 1999). In crop models, the input parameters can be a source of uncertainty (Wang et al., 2005), they should be considered in min and max range. Therefore, it is suggested that an uncertainty range is considered for crop parameters and indexes based on different cultivars and cropping system (ex. for irrigated or rainfed lands).	Iran	Accepted	Expert-based judgment uncertainty (75%) was added for N content of above-ground residues and N content of below-ground residues.
7408	4	11	237	238	Many countries already experience effects of climate change. It should be clarified, whether Figure 3.A.5.1 in Vol. 4 Ch. 3 should be used to stratify wet/dry or, if not, over which time period precipitation and potential evapotranspiration should be averaged. Or should this be updated annually? Vol. 4 Ch. 3 apparently suggests a 30 year average from 1985 to 2015. However, in Figure 3.A.5.1 Germany is depicted as entirely moist, whereas data from the German weather service designates some regions (mainly in east Germany) as dry. (cf. supporting document: Here, the difference instead of the quotient is depicted). Please revise.	Germany	Noted	The compilers can use their own data to classify the climate zones. The global dataset presented in Figure 3.A.5.1, Vol. 4, Ch. 3 may be too coarse in resolution to reflect some of the variation discussed by the reviewer. Country-specific classifications can be updated over time, but it is not recommended to change the climate annually due to droughts and other weather events that deviate from long-term averages.
5990	4	11	274	278	This section is referring the inventory compiler to the 2006 Guidelines, however, there have been updates to the manure management text and even equation 10.34 (in addition to a new equation 10.34B that estimates FRACloss) in the current version of the 2019 refinement, therefore the authors should review the manure chapter in the 2019 Refinement and ensure the guidance is referring to the most updated text/equations.	United States of America	Noted	The text and equation numbers were correct for the refinement. No edit is needed in the refinement.
5992	4	11	344	344	There are updates to Table 2.6 in the 2019 Refinement relative to crop burning, you should specify that they should refer to the Table 2.6 in Chapter 2 of the 2019 Refinement.	United States of America	Accepted	Thank you, we have corrected the cross-referencing.
5994	4	11	399	400	New Table 11.1A: This looks more like an updated Table 11.2 rather than a new Table 11.1	United States of America	Rejected	Table 11.1A is a new Table created from Table 11.2 in the 2006 guidelines. Its numbering is "11.1" since the numbering is not specific to the updated table, but rather to the table that is provided before it in the chapter.
7410	4	11	399	400	In table 11.1A a few values are missing. How should they be handled? E.g., should for (R:S(T)) of rye the value of generic grains be applied? Please specify.	Germany	Accepted	Clarification was added in a footnote as follows ,"No estimate is available. The most appropriate generic value can be used based on expert judgment, in absence of more specific information available to develop a country-specific value."
7412	4	11	399	400	Footnote f: Please specify the definition of root turnover used here. Gill and Jackson (2000, see supporting document) report a turnover of 53 % for grasses (Root turnover = annual belowground production / maximum belowground standing crop) and also a strong dependence on annual temperature (Q10 = 1.6).	Germany	Rejected	Footnote f explains how the proposed 0.8 +/- 50% was derived based on root turnover in the range 30 to 50%. The 53% and associated uncertainty found by Gill and Jackson (2000) falls within the uncertainty range of the value in the table. Temperature dependence of root turnover can be addressed in higher tier methods, but is to complicated for Tier 1.
4784	4	11	590	592	Please add a description such as "conservative or reasonable emission factors with clear scientific rationale should be used if country-specific emission factors are used".	Japan	Noted	This is true for any emission factor, i.e., EF values need to be accurate regardless of the actions that they represent. This is discussed in the general guidance, Volume I.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
4786	4	11	590	592	We would like to add the application of nitrification inhibitor to mitigation option to develop country specific emission factor.	Japan	Rejected	Nitrification inhibitor could slow down emissions of NOx associated with nitrification and denitrification but is not a mitigation option for NH3 emission. Given that the fraction of N applied that volatilises is a major component of FracGASM, nitrification inhibitor is expected to have a relatively small influence on FracGASM.
7414	4	11	602	604	We suggest to add a remark that emission factors must take into account the losses, i.e., in contrast to the Tier-1 emission factors they need to be defined and determined as EF = Emission / (input - losses).	Germany	Accepted with Modification	A reference was provided in Section 11.2.1.1 that reflects N flow through the manure management 'continuum' including practices that affect direct and indirect N emissions from soils. The impacts can be addressed with a Tier 3 method where the compiler uses a more complex method that tracks N flows rather than the simple EF approach based on total N input. The corresponding text was therefore moved to the Tier 3 section.
7424	4	11	602	606	In order to ensure in a simple manner that techniques reducing NH3 emissions from spreading have adequate impact on N2O emissions from soil, EF1 should refer to the N remaining in the soil (considering N losses due to NH3-N and NO-N emissions) and not to the amount of N applied to the soil. Referring to the amount of N applied to the soil was the basis of the N-flow based approach already used in the IPCC 1996 Guidelines. However, as the current EF1 is not consistent with this approach, we suggest to modify EF1 accordingly (e.g. by an IPCC expert judgment, in the case there is no or not enough data for a new definition of EF1).	Germany	Rejected	The authors of the 1996 guidelines who worked on the 2006 guidelines changed this approach because the data underlying Tier 1 EF1 did not subtract the N emitted from volatilization. That is to say, the EF was based on the total N input, and subtracting this N led to a bias in the calculation. It is not simple to derive an EF based on the flow and reducing the available N as losses occur due to volatilization, leaching, plant and microbial uptake because most experiments are not conducting a full accounting of all N flows. Most measurements of emissions relate those losses to the N inputs, and therefore we are constrained to developing EF values based on the N inputs. However, such impacts can be addressed at higher tier methods if there are adequate data or models for this purpose.
5996	4	11	605	606	This sentence does not provide sufficient guidance for an inventory compiler to adopt an “N-flow principle” approach as mentioned in the paragraph.	United States of America	Rejected	It is up to individual countries to develop higher Tier methodology, including alternative EF and Frac values, to account for the N flow effect. A reference was provided in Section 11.2.1.1 that reflects N flow through the manure management 'continuum' including practices that affect direct and indirect N emissions from soils. The impacts can be addressed with a Tier 3 method where the compiler uses a more complex method that tracks N flows rather than the simple EF approach based on total N input. The corresponding text was therefore moved to the Tier 3 section.
7416	4	11	621	621	The value of 0.32 mentioned here is different to the value of 0.236 as stated in Table 11.3. Please revise.	Germany	Accepted	Revised as suggested.
5158	4	11	621	623	Section 11.2.2.2. The default FracLEACH-(H) is wrong. Replace 0.32 with 0.236 as reported in Table 11.3.	Italy	Accepted	Revised as suggested.
7640	4	11	621	651	FracLeach is mentioned to be 0.32 (line 621) but in table 11.3 it is 0.236.	Finland	Accepted	Revised as suggested.
7426	4	11	651	652	In case of water-holding capacity (FracLEACH-(H)) it is misleading to use terms like „rainy season“. This implies that emissions are calculated for periods shorter than a year. If this is really intended, the guidance on how to do this in practice is completely missing. Please revise.	Germany	Accepted	FracLEACH-(H) was calculated mainly from annual data. Thus both note and table were revised.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7428	4	11	651	652	FracGASF and FracGASM: The new defaults (0.112 instead of 0.1 and 0.110 instead of 0.2) are questionable due to the fact that many (mid-European) countries report totally different country-specific values with FracGASF < FracGASM. In the case a country is reporting NH3 and NOX emissions (CLRTAP), we suggest to mention that the fractions FracGASF and FracGASM should NOT be used to calculate indirect N2O emissions from atmospheric deposition.	Germany	Accepted with Modification	FracGASM was revised as suggested, while the CLRTAP reporting can be used for Tier 2 or 3 if a compiler is developing a higher Tier method.
5998	4	11	651	652	I think the revised factors properly represent the accumulated evidence published since the 2006 guidelines were derived. In particular, the disaggregated factors make sense and are defensible based on results from field studies. The revised uncertainty ranges are also reasonable and consistent with observations.	United States of America	Noted	Thank you for the comment.
7418	4	11	651	652	Many countries already experience effects of climate change. It should be clarified, whether Figure 3.A.5.1 in Vol. 4 Ch. 3 should be used to stratify wet/dry or, if not, over which time period precipitation and potential evapotranspiration should be averaged. Or should this be updated annually? Vol. 4 Ch. 3 apparently suggests a 30 year average from 1985 to 2015. However, in Figure 3.A.5.1 Germany is depicted as entirely moist, whereas data from the German weather service designates some regions (mainly in east Germany) as dry. (cf. supporting document: Here, the difference instead of the quotient is depicted). Please revise.	Germany	Accepted with Modification	The compilers can use their own data to classify the climate zones. The global dataset presented in Figure 3.A.5.1, Vol. 4, Ch. 3 may be too coarse in resolution to reflect some of the variation discussed by the reviewer. Country-specific classifications can be updated over time, but it is not recommended to change the climate annually due to droughts and other weather events that deviate from long-term averages. 'Long-term mean of annual data should be used' has been added to the text.
6000	4	11	726	727	Page 11.27, Table A2-1: There appears to be information on what the letters “A” and “B” are in terms of significance, but what is the “C” for in the “120 < days ≤ 180” row	United States of America	Accepted	Annex 11A.2 was updated, and the text was clarified.
7404	4	11	1151	1278	Several references, which are cited in the text, are missing in the library.	Germany	Accepted	References were checked.
4908	4	11	139	139	"The essence of the publications by Bouwman, later mentioned (l. 227-228) as the rationale for updating EF1 default values is that the N2O emissions from N inputs are a quadratic or exponential - rather than linear - function of N inputs. Accordingly, in this equation, (FSN + ... + FSOM) * EF1 should be changed to (FSN + ... + FSOM) * EF1a + (FSN + ... + FSOM)^2 * EF1b or exp(EF1a + (FSN + ... + FSOM) * EF1b). Default values for EF1a and EF1b can be derived from the already quoted Bouwman publications or from more recent existing publications/calculators updating them such as: Gerber, J.S., Carlson, K.M., Makowski, D., Mueller, N.D., Garcia de Cortazar-Atauri, I., Havlík, P., Herrero, M., Launay, M., O’Connell, C.S., Smith, P., West, P.C., 2016. Spatially explicit estimates of N2O emissions from croplands suggest climate mitigation opportunities from improved fertilizer management. Global Change Biology 22, 3383–3394. https://doi.org/10.1111/gcb.13341 Hillier, J., Walter, C., Malin, D., Garcia-Suarez, T., Mila-i-Canals, L., Smith, P., 2011. A farm-focused calculator for emissions from crop and livestock production. Environmental Modelling & Software 26, 1070–1078. https://doi.org/10.1016/j.envsoft.2011.03.014"	France	Accepted with Modification	Countries using Tier 1 have aggregated N input data which are not appropriate for the suggested method. An exponential method can be addressed at higher tiers by countries wishing to do so. We added the reference to Gerber et al. 2016 into text, after the sentence "Countries can also consider an exponential response of N2O emissions to N application by developing country-specific emission factors"
5156	4	11			Section 11.2.1.3. Paragraph "Crop residue N, including N-fixing crops and forage/ pasture renewal, returned to soils, (FCR)". The following text could be inserted: as regards Crop residue N a cross check with the amount of NbeddingMS of the Equation 10.34 "Managed manure N available for application to managed soils, feed, fuel or construction uses" and the categories "Field Burning of Agricultural Residues" (3F CRF category - volume 4 chapter 5 section 5.2.4 Non-CO2 greenhouse gas emissions from biomass burning), relative to the amount of agricultural residues that is returned to soils other than the amount of agricultural residues that is removed for other purposes (e.g. bedding) or burnt should be done. This is important to eliminate the possibility of double counting.	Italy	Accepted	Revised as suggested.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7346	4	12	general		We have identified some inconsistencies in the chapter. In some sections seems that HWP could apply to wood extracted from different land uses, while in other parts of the chapter it refers only to HWPs from forest land. ACTION: we would appreciate consistency across the chapter, preferably providing ways to estimate emissions and removals from HWP for all land uses (for example, some countries have plantations classified as croplands, and wood is coming out from them, they might need methods and approaches to estimate associated emissions and removals).	Spain	Accepted	The chapter has been reviewed to ensure the wording "forests and other wood producing land categories" is used consistently through the chapter.
9466	4	12	86	106	Since there is no text copied from the 2006 GLs in this chapter, the reader is left to wonder whether the chapter entirely supersedes chapter 12 of vol 4 in the 2006 GLs. Clarify in the introduction how this chapter is to be used.	Canada	Accepted	Text has been amended for clarity.
9468	4	12	86	183	The term "CO2 removals " has a special meaning in the context of the HWP pool and should be clarified at the beginning of the Chapter. Suggest to move the clarification provided for this term in lines 178-183 as a new term/definition under Section 12.2 (Comment from Ana Blondel: This might need to be discussed).	Canada	Accepted	The text has been moved to definitions to give it more prominence.
9470	4	12	125	126	The distinction between Approaches and Methods is very useful. However the sentence needs to be corrected to be consistent with text in lines 170-174. Re-write sentence: "It follows that different methods could be applied to implement a particular approach and that the same method can be used in different approaches." - or replace with lines 170-174. The fact that the same method can be applied to different approaches is illustrated by the use of equations 12.2 and 12.3 in both the stock-change and atmospheric flow approaches.	Canada	Rejected	The proposed amendment does not improve the existing text which is consistent with lines 170-174.
9472	4	12	127	128	Suggest: "…it is possible to apply methods that are 'inventory-based', 'flux data-based' or mixtures of both".	Canada	Accepted	The text has been revised accordingly.
9474	4	12	127	138	The distinction between "inventory-based" and "flux-based" methods is not practical. The only real application of an "inventory-based" method is considered in section 12.4.4.2 and is a T3 method, applicable only to HWP pools that are actually located in the reporting country. In all other cases, some modelling of decay (through half-lives) is necessary to establish stocks and stock-changes. Delete these lines.	Canada	Accepted with Modification	This is an established distinction between types of methods already covered in previous IPCC guidance. The comments also contradicts other comments requesting further clarification. However, as an attempt at clarification, we have amended some terminology where relevant.
7336	4	12	143	143	Remove references to accounting as they are not relevant to the reporting methodology: “"At the time of writing this text, the approach for reporting on HWP is under consideration by the UNFCCC. Accordingly, this guidance does not prejudge whether one particular approach should be preferred.” This sentence would better fit in a footnote.	Spain	Accepted with Modification	The text has been amended in the light of comments.
9476	4	12	143	144	the sentence "The approach... by the UNFCCC" is prejudging what will the discussions be about in the climate negotiations. ACTION: delete the sentence, and delete also "Accordingly" in the following sentence.	Canada	Accepted	The text has been revised accordingly.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9478	4	12	149	155	It's understood that the guidance must not change HWP approaches or note any preference but provide guidance for all approaches in the in the 2006 IPCC guidelines. The simple-decay approach is included in the 2006 IPCC guidelines, but there is a lack of guidance for this approach in the 2019 refinement. Therefore, edit the text to state that there are 4 main approaches that differ in terms of their conceptual framework and system boundaries, by adding the 'simple-decay' approach to the main list. The 'simple decay' approach shares the same system boundaries with the 'production' approach but if differs in that it focuses on estimating CO2 emissions from the HWP pool, similar in this respect to the 'atmospheric-flow' approach.	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. The 2006 IPCC GL included some discussion of how to combine variables under the 'simple decay' concept, but no explicit guidance was provided on calculation methods. In some places, guidance relevant to the 'simple decay' concept in the 2006 IPCC GL is identical to that given for the 'production' approach. It remains the case that there is no basis for providing exclusive methodological guidance for calculations relevant for the 'simple decay' concept. However, in the discussion of Tier 3 methods we have amended the text so that it mentions the possibility of applying a country-specific method reflecting the 'simple-decay' concept.
7338	4	12	162	162	ACTION: replace "HWP pools" by "HWP pool". There is only one HWP pool.	Spain	Accepted	We revised the text in the light of the comment.
9480	4	12	167	169	The simple-decay approach also focuses on estimating CO2 fluxes from HWP. Therefore change the text to state: (strikethrough is deleted text, red font is new text) "The 'stock-change' and 'production' approaches are based on the first conceptual framework and the 'atmospheric flow' and 'simple decay' approaches is are based on the second conceptual framework."	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. We have inserted text towards the start of the section to clarify that discussion of 'production' approach also applies to the 'simple decay' concept.
9482	4	12	170	174	Very true. Move these lines to replace lines 137-138.	Canada	Rejected	The two statements are made in different contexts and it is not appropriate to replace the first statement with the second one.
9484	4	12	175	178	This sentence is extremely confusing because it equates a pool with a stand-alone reporting category. As pointed out in lines 178-183, C stock changes in a pool that involve transferring the carbon to or from other pools are not emissions or removals, because they are not C exchanges with the atmosphere. Reporting C stock changes in such a pool in a stand-alone reporting category incorrectly represents such C stock changes as emissions or removals. This is what results in the corrections described in lines 558-568, i.e. correcting for exported wood carbon being wrongly reported as emissions from a wood producing land. The IPCC, as a scientific body, should recognize that the HWP pools cannot materially sequester carbon from the atmosphere and recommend that C stock changes in HWP pools be explicitly reported within the land producing wood category and not reported as a stand-alone category. Delete lines 175 to 178.	Canada	Rejected	The implication of the proposed deletion is out of scope. It is not within the mandate of the authors to remove (or recommend the removal of HWP as a separate element of reporting. Furthermore, we make no explicit presumption about HWP being represented as a category separate from certain other land use categories. However, we have tried to further clarify the reasons for referring to CO2 removals in the context of HWP (see Definitions section 12.2).

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9486	4	12	175	183	While this approach (assuming that carbon stocks in HWP pool are considered as "removals") may be the most common approach among countries when estimating the emissions associated with HWPs for inventories, there are other approaches that are equally valid - i.e. assuming that the removals are associated with the ecosystem changes on the forest land and that any harvested material is then transferred to the HWP pool where it is considered as a pool of emissions. This is the approach that Canada uses and, for all intents and purposes, it provides the same results as the approach described. Would suggest, therefore, the addition of a footnote that indicates: "An alternative approach is to focus on actual emissions and removals on forest land and in the HWP pool as they occur. Under this approach, the transfer of carbon from the forest to the HWP pool is not treated as an emission (as it is not released to the atmosphere). Rather, the transfer creates a pool of HWPs from which emissions are then estimated as they occur.	Canada	Rejected	The comment addresses issues with the presentation of results for emissions and removals, but the proposed changes cannot be addressed in the context of this guidance.
6258	4	12	184	219	The text implies that countries reliant upon FAO data for HWP may assume that there is no net change in carbon stocks stored in 'other industrial roundwood', due to the unreliability of activity data in this respect. However, it should also be described as good practice for countries to include within the scope of HWP all roundwood removals from the forest where reliable data is available. For example, in Australia national statistics offer more comprehensive information on industrial roundwood and fuelwood, and these pools are included in HWP reporting. This good practice requirement would facilitate a wood products classification that is consistent with reporting of carbon in forest lands and other land uses, as described in lines 203-207. This good practice requirement should also be clarified in the diagrams in Appendix 12A. Currently there is a lack of clarity regarding the link between carbon removals from the forest, and the later production of the three semi-finished product pools. Based on the discussion in lines 1026-1038, the guidelines suggest an inconsistent approach – excluding products which are not part of the three defined pools semi-finished product pools (i.e. other industrial roundwood, and fuelwood, if not reported in Equation 2.11). The best way to achieve the principles of avoidance of omissions or double-counting, and compatibility with other stock change reporting as described in lines 203-207, is to ensure conservation of carbon mass between forest and wood products reporting. All carbon transfers from the forest, that are not emitted and not reported in Forest lands, should be included as part of HWP reporting. For example, using the Gain-loss method in Chapter 2.3.1.1, reporting of carbon stocks in forest land accounts for all roundwood removals, plus fuelwood (See equations 2.11, and 2.20). Harvested wood products reporting should therefore include all other wood products (i.e. based on Figure 12.2 this includes all industrial roundwood).	Australia	Accepted with Modification	The proposed use of country-specific data is a Tier 2 or Tier 3 method which is supported in the guidance. Furthermore, the request to modify the approaches would mean that the existing approaches would not be maintained which is out of scope. Hence, we have included an elaborated explanation that other industrial roundwood is treated in Tier 1 and Tier 2 methods on the basis of the assumption of a steady-state HWP pool and we have explained why this HWP commodity class is treated in this way. We have also clarified that improved treatment of other industrial roundwood is possible as part of a Tier 3 method. See revised text in Section 12.4.1.1 and in particular the discussion of other industrial roundwood in the sub-section, “Definitions for semi-finished wood product commodities”.
9488	4	12	185	188	Change to state the 4 approaches, which includes the ‘simple-decay’ approach.	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. We have inserted text towards the start of the section to clarify that discussion of 'production' approach also applies to the 'simple decay' concept.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9490	4	12	202	203	Add a paragraph to provide an overview of the ‘simple decay approach’. Suggest including text in the red font below: The ‘simple decay’ approach estimates fluxes of CO2 to the atmosphere from the HWP pool from wood harvested in the reporting country. Therefore the “producing country” reports CO2 emissions and removals from HWP. To clarify how CO2 emission and removal estimates are presented in combination with the Forest land and other wood producing land categories suggest adding the following text in red font: There is an important link between forests and other wood producing land categories and the HWP pool. Thus the approach chosen to estimate emissions and removals from HWP impacts estimation for the land categories. For example, with the ‘production’ and ‘stock-change’ approaches carbon stock changes in forests and other wood producing land categories and the HWP category are estimated separately. Conversely, with the ‘atmospheric flow’ and ‘simple-decay’ approaches HWP is treated as a pool from forests and other wood producing land categories with emissions occurring as HWP is produced and consumed.	Canada	Accepted with Modification	The proposed text is based on a misinterpretation of the system boundary of the 'simple decay' concept/approach. We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. We have inserted text towards the start of the section to clarify that discussion of 'production' approach also applies to the 'simple decay' concept.
9492	4	12	203	207	Suggest adding text to this paragraph to highlight the important link between GHG estimates from HWP and those from forests and other wooded land and the need to insure consistency and transparency.	Canada	Accepted with Modification	The text has been amended in the light of the comment as part of guidance for the 'production' approach.
9494	4	12	207	208	Change both sentence to state the 4 approaches.	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. We have inserted text towards the start of the section to clarify that discussion of 'production' approach also applies to the 'simple decay' concept.
7340	4	12	208	212	We think that this paragraph goes beyond what is needed for GHG national inventories. It is out of the scope of the refinement. ACTION: delete paragraph.	Spain	Rejected	The statement in the paragraph is not out of scope. It merely explains a technical fact related to the application of the approaches. Furthermore, a very similar statement was included in the IPCC 2006 GL (please see page 12.5: "*The approaches that have been identified are mutually exclusive in the sense that a global or regional estimate of annual HWP Contribution would only be correct if all the different countries provided estimates using the same approach*").

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9496	4	12	210	211	Use of the same approach for estimating HWP emissions is ONE way to avoid double or zero-counting, but it is not the "only" way - as is suggested here. Rather, countries can still avoid double and zero-counting through a number of specific combinations of approaches - e.g. production and simply decay; stock-change and atmospheric flow. Suggest that this be added to the explanation.	Canada	Rejected	It is not possible to accommodate this request. First of all, as explained in responses to other comments here, **in terms of approaches,** the production approach and the simple-decay approach are effectively the same approach. We have clarified that the simple-decay concept is a combination of the production approach in conjunction with a specific calculation method. We believe it is crucial to avoid confusing approaches with methods. Hence, it is unsurprising that the production approach applied by one country in combination with what is effectively the production approach applied in another country does not lead to double-counting or non-counting of emissions. In the case of the other example cited by the reviewer (the stock-change approach applied by one country in combination with the atmospheric flow approach applied by another country) we cannot agree that this would avoid double-counting or non-counting of emissions. For example, if a producer country applied the stock-change approach and exported a significant quantity of wood feedstock used for energy purposes in a consuming country that applied the atmospheric flow approach, this would lead to double-counting of emissions.
6280	4	12	213	219	Instantaneous oxidation is a Kyoto Protocol accounting construct. This concept deals with the allocation of emissions to different activities or land uses, and between countries, for policy purposes (E.g. preferring completeness over the risk of double-counting). The concept of 'instantaneous oxidation' is not relevant to the accuracy or estimation of emissions – clearly this assumption is inaccurate in almost all cases of forest harvesting (compared to, for example, deforestation). However, as the IPCC has rightly noted in lines 405-410, accounting by instantaneous oxidation is consistent with previous IPCC guidance regarding no net change in carbon stock. The concept of steady state pool is an assumption related to the estimation of emissions – like all T1 assumptions, this may not be accurate in all cases but can be improved upon using higher tier methods. The guidelines should avoid prescribing accounting approaches and should focus on the appropriateness and accuracy of estimation methodologies.	Australia	Accepted with Modification	The discussion in this section has been amended in the light of the comment
9498	4	12	213	219	This text explains that where the assumption of 'instantaneous oxidation' is applied that CO2 emissions associated with harvested biomass are included implicitly as part of the CO2 emissions and removals from above-ground biomass carbon pools. However, this is also true when the stock-change' and 'production' approaches are applied. Therefore edit text to clarify this issue.	Canada	Accepted with Modification	The discussion in this section has been amended in the light of the comment
9500	4	12	223	227	Long complex sentence. Perhaps simplify e.g. 223: "…and the data used to estimate…"; 227: delete 'and relates'. Typo "national borders".	Canada	Accepted	Editorial
9502	4	12	236	236	To enhance clarity, finish the sentence " …countries might need to decide not to distinctly report on HWP, implicitly reporting their HWP emissions as part of land management emissions and removals."	Canada	Accepted with Modification	Cross-reference to the relevant section has been added.
6274	4	12	267	269	Figure 12.1 - Guidance on the use of different tier methods should be consistent with Volume 1, or deferred to UNFCCC for negotiation as part of reporting guidelines (e.g. para 37 of Annex I reporting guidelines in Decision 24/CP.19). Does this 'default' assumption represent a T1 assumption (comparable to soil carbon under forest land remaining forest land) or a different (lower) tier? How would an ERT be expected to interpret this guidance? For example, under the 'instantaneous oxidation' assumption – are emissions and removals in the HWP pool to be considered "not estimated", "not occurring" or "not applicable"?	Australia	Accepted with Modification	The text has been modified in the light of the comment.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
7342	4	12	298	310	ACTION: move definitions to glossary.	Spain	Rejected	It is important that definitions of specific relevance in the context of HWP are included directly in this chapter. Sometimes this is necessary to clarify a specific meaning in the context of HWP, which may not apply more generally.
6248	4	12	345	351	The guidelines should also note that implementing the production approach requires additional information on how exported products are used by other countries to which domestic wood products are exported. For example, are exported woodchips being used in paper production, in wood panel production, or as an energy feedstock? This will influence the choice of half-life and other applicable decay parameters for different streams of exported products.	Australia	Rejected	The requested guidance is already included in the relevant sections.
7344	4	12	353	400	ACTION: move definitions to glossary.	Spain	Rejected	It is important that definitions of specific relevance in the context of HWP are included directly in this chapter. Sometimes this is necessary to clarify a specific meaning in the context of HWP, which may not apply more generally.
6282	4	12	401	402	Instantaneous oxidation is a Kyoto Protocol accounting construct. This concept deals with the allocation of emissions to different activities or land uses, and between countries, for policy purposes (E.g. preferring completeness over the risk of double-counting). The concept of 'instantaneous oxidation' is not relevant to the accuracy or estimation of emissions – clearly this assumption is inaccurate in almost all cases of forest harvesting (compared to, for example, deforestation). However, as the IPCC has rightly noted in lines 405-410, accounting by instantaneous oxidation is consistent with previous IPCC guidance regarding no net change in carbon stock. The concept of steady state pool is an assumption related to the estimation of emissions – like all T1 assumptions, this may not be accurate in all cases but can be improved upon using higher tier methods. The guidelines should avoid prescribing accounting approaches and should focus on the appropriateness and accuracy of estimation methodologies.	Australia	Accepted with Modification	The section has been amended in the light of the comment. See latest text in Sections 12.4.1 and 12.4.1.2 and to some extent Section 12.4.1.1.
6418	4	12	403	425	The IPCC 2013 KP Supplement guidance on when to report HWP separately should not be referred to in this context. In relation to the assumption of 'instantaneous oxidation,' the KP supplement does not represent scientific data, but simply implements the requirements of Decision 2/CMP.7 and Decision 2/CMP.8 (see for example Figure 2.8.1 in IPCC (2014)). For example Decision 2/CMP.7 requires that HWP from deforestation events and HWP used for energy purposes must always be accounted using instantaneous oxidation – which is inconsistent with the guidance in this refinement. The accounting approaches should be left to negotiations and are not relevant for the IPCC Guidance, and the reference to the KP supplement should be removed from this section.	Australia	Accepted with Modification	The section has been amended in the light of the comment. See latest text in Sections 12.4.1 and 12.4.1.2 and to some extent Section 12.4.1.1.
6272	4	12	403	425	The text on line 403 commences "This section provides guidance on when it is in line with good practice to not report CO2 emissions and removals from HWP separately". It is possible to interpret the sub-section as saying that instantaneous oxidation is the default assumption (although this is questionable, as it is highly unlikely in practice), and should be assumed if harvested wood biomass is used for energy purposes, if no activity data are available, or if the magnitude of the relevant emissions and removal is small (its application in these three cases is sensible). Presumably, other than those specific situations, the 'Stock-change', 'Production" or "Atmospheric flow' approaches should be taken, but this is not made clear. Given this, the reference to IPCC 2006 GL, Section 12.2.1, and IPCC 2014, Section 2.8.2, for further guidance is not helpful.	Australia	Accepted with Modification	The section has been amended in the light of the comment.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
6278	4	12	403	425	The text on line 403 commences “This section provides guidance on when it is in line with good practice to not report CO2 emissions and removals from HWP separately”. However, the guidance presented is hard to interpret, and it is not clear how much of the guidance is new to these draft 2019 guidelines. I interpret the sub-section as saying that instantaneous oxidation is the default assumption (although this is questionable, as it is highly unlikely in practice), and should be assumed if harvested wood biomass is used for energy purposes, if no activity data are available, or if the magnitude of the relevant emissions and removal is small (its application in these three cases is sensible). Presumably, other than those specific situations, the ‘Stock-change’, ‘Production” or “Atmospheric flow’ approaches should be taken, but this is not made clear. Given this, the reference to IPCC 2006 GL, Section 12.2.1, and IPCC 2014, Section 2.8.2, for further guidance is not helpful.	Australia	Accepted with Modification	The section has been amended in the light of the comment. See latest text in Sections 12.4.1 and 12.4.1.2 and to some extent Section 12.4.1.1.
6276	4	12	416	423	Guidance on the use of different tier methods should be consistent with Volume 1, or deferred to UNFCCC for negotiation as part of reporting guidelines (e.g. para 37 of Annex I reporting guidelines in Decision 24/CP.19). Does this ‘default’ assumption represent a T1 assumption (comparable to soil carbon under forest land remaining forest land) or a different (lower) tier? How would an ERT be expected to interpret this guidance? For example, under the ‘instantaneous oxidation’ assumption – are emissions and removals in the HWP pool to be considered “not estimated”, “not occurring” or “not applicable”?	Australia	Accepted with Modification	The text has been amended in the light of the comment. See latest text in Sections 12.4.1 and 12.4.1.2 and to some extent Section 12.4.1.1.
6284	4	12	418	418	It seems you should be more explicit about availability of data for Tier 1. Suggest you say (i.e. If no activity data are available from FAOSTAT or other sources as needed for Tier 1 estimates.).	Australia	Accepted with Modification	The text has been amended in the light of the comment. See latest text in Sections 12.4.1 and 12.4.1.2 and to some extent Section 12.4.1.1.
9504	4	12	432	436	Recalling the very useful clarification of lines 178-183, a similar caveat should be made in relation to equation 12.1: when C stock changes from the HWP pool are reported in a stand-alone category, they are equated to net emissions or removals. The outcome is that removals are wrongly attributed to the HWP "category", AND the emissions are wrongly attributed to the wood producing land category.	Canada	Rejected	The comment addresses issues with the presentation of results for emissions and removals, but the proposed changes cannot be addressed in the context of this guidance.
9506	4	12	492	493	Replace "CO2 emissions and removals from HWP" with "C stock changes in HWP".	Canada	Accepted with	The text has been revised in the light of the comment.
6002	4	12	505	507	I raised this as an issue in the comments to the FOD - this sentence is incomprehensible and needs rewriting for clarity. If I understand it correctly, the issue raised is that as data quality on HWP production improves, calculations on C stock changes that rely on those historical datasets of varying quality may result in biased estimates.	United States of America	Accepted	The paragraph has been revised in the light of the comment.
9508	4	12	505	507	This sentence should be clarified, it’s unclear as written.	Canada	Accepted	The paragraph has been revised in the light of the comment.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9510	4	12	545	593	The ‘simple-decay’ and ‘atmospheric-flow’ approaches both estimate CO2 fluxes. Therefore, remove the specific identification of the ‘Atmospheric flow’ approach from the title and change the title of this section to: ESTIMATING CO2 -FLUXES ASSOCIATED WITH HARVESTED WOOD PRODUCTS. This section could then provide clearer distinction from the approaches based on carbon stock change estimates. Edit text to not only summarize the ‘atmospheric flow’ approach but also explain overall construct for flux based approaches (‘simple decay’ and ‘atmospheric flow) that estimate net removals from Forest Land and CO2 release from the HWP pool.	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. The 2006 IPCC GL included some discussion of how to combine variables under the 'simple decay' concept, but no explicit guidance was provided on calculation methods. In some places, guidance relevant to the 'simple decay' concept in the 2006 IPCC GL is identical to that given for the 'production' approach. It remains the case that there is no basis for providing exclusive methodological guidance for calculations relevant for the 'simple decay' concept. The discussion being referred to in this comment is concerned with methods, not approaches. However, in the discussion of Tier 3 methods we have amended the text so that it mentions the possibility of applying a country-specific method reflecting the 'simple-decay' concept.
9512	4	12	551	568	What is the issue that this text is intended to clarify ? I have read it several times. What possible misunderstanding about the atmospheric flow approach are you trying to correct. Why does the analyst need this explanation to prepare an estimate? Is the text for someone trying to decide if the AF approach fits their policy interests? Please clarify your intent for this text.	Canada	Accepted	We have clarified that our intent is to explain how Equation 12.5 works.
9514	4	12	558	568	This entire paragraph and equation 12.5 aim to correct for wrongly reporting C stock changes as emissions and removals - but will not achieve the objective of reporting emissions and removals where and when they actually occur because the correction ought to be made also to the land category, not only the HWP pool. A more transparent approach (although not quite reflecting yet where and when emissions occur) would be to define a parameter InflowCl in equation 12.3 and provide guidance to calculate inflow from the sum of wood harvested in the country minus exports plus imports. This will be simpler and much more transparent then the complicated corrections in equation 12.5.	Canada	Rejected	The intention of the comment is unclear, but would appear to misunderstand the purpose of the existing paragraph, which is to implement the calculations for the atmospheric flow approach.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9516	4	12	594	745	Include a section on compilation of activity data required for the ‘simple decay’ approach.	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. The 2006 IPCC GL included some discussion of how to combine variables under the 'simple decay' concept, but no explicit guidance was provided on calculation methods. In some places, guidance relevant to the 'simple decay' concept in the 2006 IPCC GL is identical to that given for the 'production' approach. It remains the case that there is no basis for providing exclusive methodological guidance for calculations relevant for the 'simple decay' concept. However, in the discussion of Tier 3 methods we have amended the text so that it mentions the possibility of applying a country-specific method reflecting the 'simple-decay' concept.
6580	4	12	602	602	footnote 8 seems not consistent if it should be understood as the source for the density	United Kingdom (of Great Britain and Northern	Noted	We have checked and the numbers are consistent.
6786	4	12	690	699	Can you please give an explanation why in the equation uses imported HWP,when in the approach "production" the HWP pool consists of all products made from wood that is harvested domestically, i.e. those products that are consumed domestically and also those products that are exported and used in other countries.	Russian Federation	Accepted	We have clarified that imports are included in the equation, because this needed to exclude imports from the result.
6246	4	12	720	721	The Reference to Australia should read "(Commonwealth of Australia, 2018)". The report is published by Australia's Department of Environment and Energy.	Australia	Noted	Editorial. It seems to be a mistake on the allocation to the chapter. TSU to check.
6270	4	12	757	758	Table 12.3, lines 757-8, presents default half-lives of the various HWP categories, derived from IPCC 2014. Later text in Section 12.6.1, lines 1102-5, then says “Losses of HWP in use are assumed to result in CO2 emissions to the atmosphere, with no explicit representation of the subsequent retention of disposed wood in SWDS and eventual CO2 emissions from this pool. Therefore, CO2 emissions from wood in SWDS are included implicitly in the CO2 emissions due to losses of carbon from the HWP pool in use as reported in the AFOLU sector.” This could be taken to imply that the long decay half-life of the portion of HWP that is transferred to solid waste disposal sites (SWDS) is somehow incorporated into the default half-lives of the various HWP categories listed on Table 12.3. However, it is not made clear that this is the case, and the later section therefore does not provide the clarification that the title implies. The text needs to be expanded to explain explicitly how the decay half-life of those HWP that are in SWDS is incorporated in the emissions calculations; if that has not occurred, the text needs to explain why not.	Australia	Accepted	The statement that is being referred to in the comment is incorrect and has been deleted from the text.
7642	4	12	777	777	Please consider adding: It is also possible to use country-specific data before 1961 in order to estimate the total existing HWP pool, if the data is considered to give a more precise estimate of the HWP pool. It is considered that the products entering the pool prior to 1900 would be insignificant (IPCC 2006)	Finland	Rejected	This is not the section of the guidance to address this subject. However, we have elaborated the discussion of the use of historical data in the relevant Section 12.4.2.

Comment ID	Volume	Chapter	From line	To line	Comment	Country	Response	Author's Note
9518	4	12	804	804	In the text "It is a modification of RSL by seven factors" it is not clear which "seven factors" this text is referring to until going into the ref "ISO 15686-8:2008" and looking later on to the example given in Box 12.2, where these seven factors are explicitly listed. In order to facilitate the use of this guidance and make the text more straightforward, suggest to: 1) add some additional text in this line referring more clearly to the seven factors A to G provided in ref "ISO 15686-8:2008" and/or 2) suggest the reader to look into Box 12.2 for a theoretical example using these seven factors.	Canada	Accepted	The text has been revised accordingly.
4788	4	12	909	909	There is no “Section 12.5.1.1”. Remove “Section 12.5.1.1”.	Japan	Accepted	Editorial
6250	4	12	939	939	Change title to “Carbon Stock Change’ methods to improve clarity as it’s confusing to call these “inventory methods”.	Australia	Accepted with Modification	We have revised the text in the light of the comment.
9520	4	12	939	974	This draft passage sound confused. HWP Stock Inventory methods are synonymous with the consumption-based approaches of stock-change and atmospheric flow. It would be beneficial to make this point directly.	Canada	Accepted	The wording has been amended for clarity.
9522	4	12	941	941	Clarify "…relevant only for HWP that are actually located in the reporting country and could be used…"	Canada	Accepted with Modification	We have revised the text in the light of the comment.
4790	4	12	942	942	There is no “Figure 12.3”. Remove “Figure 12.3”.	Japan	Accepted with	The wording has been amended for clarity.
4792	4	12	948	949	Request to add Japan as the example of stock inventory methods. The sentence should be changed to “Examples of such inventories are reported in Gjesdal et al. (1996) for Norway, in Pingoud et al., (2001) and Statistics Finland (2010) for Finland and Japan’s 2018 National Inventory Report.”	Japan	Accepted with Modification	Japan's method is classified as a combined HWP stock inventory and flux data method. Text has been amended in the light of the comment.
4794	4	12	959	959	"inventories themselves" or "inventory itself"?	Japan	Accepted	Editorial
7348	4	12	975	1068	Authors are to be commended for this new section that provides much needed clarity on a subject matter of growing relevance. However, and in keeping with the principle of transparency and comparability, the IPCC should go one step further and recommend as good practice to report emissions from bioenergy explicitly and separately in all HWP approaches.	Spain	Rejected	The proposed amendment is out of scope. We, the authors, have no mandate to prescribe what countries should or should not report, and in what way. This is a matter for negotiations amongst countries. We have gone as far as our mandate allows, i.e. to clarify where CO2 emissions from the burning of wood for energy purposes are reported, according to the available approaches and methods. Please also see three paragraphs included at end of Section 12.3.2. Note that these statements are consistent with a similar statement included in the 2006 GL.
9524	4	12	975	1086	we don't think this section belongs to AFOLU chapter. In addition, we don't think it has a relevant effect in total emissions and removals, and it is only a difference in the time emissions/removals are accounted for. We believe that this section creates excessive burden for inventory compilers, data are not available in most countries and it will increase uncertainties in inventories. ACTION: delete section 12,5	Canada	Rejected	The section simply describes factually where the contributions are included in estimates and points to the relevant sections of guidance.
6004	4	12	980	981	In my comments on the FOD, I said I thought the draft needed more information on treatment of bioenergy emissions. I see that the SOD now contains a section dedicated to this topic, a welcome development. However, there are still some aspects that are not very clear.	United States of America	Noted	

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6006	4	12	988	991	This paragraph is critically important. It could benefit by including a statement that clearly indicates that the implicit inclusion of bioenergy CO2 in the AFOLU sector rather than Energy does not imply any particular conclusions about the GHG implications of bioenergy (e.g., the "carbon neutrality" of bioenergy).	United States of America	Rejected	The purpose of the guidance is to explain how to calculate CO2 emissions and removals associated with HWP, including wood biomass feedstocks used for energy purposes, where these are included explicitly in an "approach", or implicitly elsewhere. The guidance does not take a pre-judged view on the magnitude of emissions or removals associated with any type of activity in *any* sector, including the LULUCF sector, and including harvested biomass used for products, including for energy purposes. The requested inclusion of this sentence may appear to be simply stressing this point. However, apart from stating something that should be self-evident and therefore not needed, the very inclusion of this apparently "neutral" sentence in itself draws attention to the question (argument) as to whether GHG emissions from bioenergy are significant, or whether bioenergy can be considered "carbon neutral". In this respect, we believe that the inclusion of this sentence would be unhelpful and inappropriate. It could even lead some readers to infer that the guidance *is* expressing some sort of view on this issue.
6008	4	12	993	993	Recommend revise sentence to read as: "This is to avoid the possibility of double counting these emissions in two or more inventory sectors because they are already included in the AFOLU chapter".	United States of America	Accepted	Editorial
6260	4	12	994	1038	The guidelines suggest that “Harvested wood biomass used directly as energy feedstock” in Table 12.5 should not sit within the system boundary of harvested wood products. However, how are these such feedstocks to be distinguished from other fuelwood reporting? Fuelwood removals from forest and other land uses should be reported as part of Equation 2.11 under the Gain-loss method. For example in Australia, energy use of wood products is distinguished from fuelwood in Equation 2.11 based on residential or industrial uses - with industrial wood product use included in the Harvested Wood Products category. Explicit reporting of energy use of wood products (e.g. as part of Equation 2.11) would improve transparency and accuracy of reporting, and avoid double-counting or omissions.	Australia	Rejected	The table makes no judgements about where harvested wood biomass used directly as energy feedstock should be reported. It simply clarifies where quantities are estimated, depending on the chosen approach. We note the request at the end of the comment, but it is not possible to address this as part of the current update. Specifically, we as authors, have no mandate to prescribe what countries should or should not report, and in what way. This is a matter for negotiations amongst countries. We have gone as far as our mandate specified, i.e. to clarify where CO2 emissions from the burning of wood for energy purposes are reported, according to the available approaches and methods. Please also see three paragraphs included at end of Section 12.3.2. Note that these statements are consistent with a similar statement included in the 2006 GL.

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6254	4	12	1021	1025	Table 12.5 is helpful, but the explanation could go into even more detail. The table does not confront the core problem – that countries using different approaches may double-count or fail to count emissions at all. Would it be possible to make a *new* table that has every possible pairing of approaches, to show how biomass used as energy, and biomass used as feedstock for semi-finished HWP, would be counted, or not counted?	Australia	Rejected	Out of scope of the 2019 Refinement, because the guidance is about how to estimate, not about the implications of choosing different approaches. The purpose of this guidance is to provide advice on how to calculate emissions and removals, given the approaches that have been specified. It is important that we remain neutral with regard to the merits or drawbacks of any given approach. Choices and decisions about the selection of approaches are a matter for individual countries and negotiations between them. It is inappropriate for us to influence countries by expressing value judgements about these choices and decisions. We have gone as far as we can, by highlighting that choices made by different countries could lead to non-counting or double-counting of emissions - please see three paragraphs included at the end of Section 12.3.2. The statement made is consistent with a similar one included in the 2006 GL.
9526	4	12	1021	1024	This table is very informative. Please include a column for the ‘simple decay’ approach.	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. We have inserted text in section 12.3 to clarify that discussion of 'production' approach also applies to the 'simple decay' concept.
9528	4	12	1028	1028	Text "(i.e. as part of losses from above ground standing biomass)" should differentiate the case of residues burnt on site. Suggest to replace by: "(i.e. as part of losses from above ground standing biomass, and as part of biomass burning emissions if the CO2 emissions from residues burnt on site are not included in the biomass losses)".	Canada	Accepted with Modification	We have revised the text in the light of the comment.
9530	4	12	1035	1037	Text "(i.e. as part of losses from above ground standing biomass)" should consider the case of some countries reporting these emissions from the HWP pool. Suggest to replace by: "(i.e. as part of losses from above ground standing biomass or as part of losses from the HWP pool within the same year of harvest for those countries using AD/methods that allow this differentiation".	Canada	Rejected	The proposed amendment does not reflect the intention of the Table and following text (i.e. not to provide methods, but to clarify the implications of applying different approaches).
9532	4	12	1071	1078	This section (12.5.2) would benefit from further explanation as to why CO2 emissions are reported in the AFOLU sector, whereas non-CO2 emissions are reported in the Energy Sector, as the reason for this is not clear from the existing text.	Canada	Accepted with Modification	It is the convention that non-CO2 emissions are estimated in the Energy sector and that CO2 emissions are estimated in the AFOLU sector (See Volume 1, Chapter 8).

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6420	4	12	1102	1105	Table 12.3, lines 757-8, presents default half-lives of the various HWP categories, derived from IPCC 2014. Later text in Section 12.6.1, lines 1102-5, then says “Losses of HWP in use are assumed to result in CO2 emissions to the atmosphere, with no explicit representation of the subsequent retention of disposed wood in SWDS and eventual CO2 emissions from this pool. Therefore, CO2 emissions from wood in SWDS are included implicitly in the CO2 emissions due to losses of carbon from the HWP pool in use as reported in the AFOLU sector.” This implies that the long decay half-life of the portion of HWP that is transferred to solid waste disposal sites (SWDS) is somehow incorporated into the default half-lives of the various HWP categories listed on Table 12.3. However, it is not clear that this is the case, and the later section therefore does not provide the clarification that the title implies. The text needs to be expanded to explain explicitly how the decay half-life of those HWP that are in SWDS is incorporated in the emissions calculations; if that has not occurred, the text needs to explain why not.	Australia	Accepted with Modification	The text revised according to the comment. Reference to “information” item has been deleted.
6252	4	12	1102	1120	The description of SWDS as an “information item” is inappropriate. It is a matter for the Conference of the Parties which items are included in CRF reporting. The assumptions around end of service life products being ‘instantaneously oxidised’ is a Kyoto Protocol accounting construct. The inclusion of HWP in SWDS is of increasing relevance to reflect recycling of paper products and increasing use of waste-to-energy etc.	Australia	Accepted with Modification	The text revised according to the comment. Reference to “information” item has been deleted.
6788	4	12	1105	1105	Please give a link to AFOLU sector where it is reported	Russian Federation	Accepted with Modification	Reference to AFOLU deleted since it refer to the current report and is not needed
6256	4	12	1115	1125	An additional step on calculating the outflow is to subtract the quantum of carbon estimated to be emitted from anaerobic wood decay as methane from the waste sector, so as to avoid double-counting of waste sector emissions. This does not include any methane captured and combusted at the landfill site, which should continue to be considered an emission from HWP in SWDS.	Australia	Accepted with Modification	The text has been amended in the light of the comment.
9534	4	12	1269	1271	Change from three to four approaches, and include the ‘simple-decay’ approach in the list.	Canada	Accepted with Modification	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. We have inserted text in section 12.3 to clarify that discussion of 'production' approach also applies to the 'simple decay' concept.
9536	4	12	1271	1278	Edit text to clarify that the ‘production’ and ‘stock-change’ approaches focused on estimating changes in carbon stocks of HWP pools while the ‘atmospheric-flow’ and ‘simple-decay’ approaches focus on estimating emissions/fluxes from HWP pools.	Canada	Accepted with Modification	The requested clarification has been included more prominently in Section 12.3.

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9538	4	12	1275	1278	Describing it as a “so-called” ‘simple-decay’ approach is misleading. The 2006 IPCC guidelines included guidance for generating inventory estimates using the ‘simple-decay’ approach. Therefore, this refinement should build upon this guidance.	Canada	Accepted with Modification	We have deleted the phrase "so-called". We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. The 2006 IPCC GL included some discussion of how to combine variables under the 'simple decay' concept, but no explicit guidance was provided on calculation methods. In some places, guidance relevant to the 'simple decay' concept in the 2006 IPCC GL is identical to that given for the 'production' approach. It remains the case that there is no basis for providing exclusive methodological guidance for calculations relevant for the 'simple decay' concept. However, in the discussion of Tier 3 methods we have amended the text so that it mentions the possibility of applying a country-specific method reflecting the 'simple-decay' concept.
6262	4	12	1296	1310	It should be noted that this is the system boundary that most closely aligns with economic data produced under the System of National Accounts, e.g. GDP reporting. This boundary facilitates availability of activity data and reflects the scope of economic and climate change mitigation policies.	Australia	Rejected	The proposed amendment is out of scope
6264	4	12	1313	1314	The diagram shows domestic wood products sequestering carbon from the atmosphere, where this is not possible. The flow from the forest is the relevant one.	Australia	Accepted with Modification	The text has been modified and an additional figure has been included to explain what this means in the context of HWP.
6266	4	12	1333	1334	The diagram shows domestic wood products sequestering carbon from the atmosphere, where this is not possible. The flow from the forest is the relevant one.	Australia	Accepted with Modification	The text has been modified and an additional figure has been included to explain what this means in the context of HWP.
9540	4	12	1341	1362	Change title of Section 12.A.2 to Estimating CO2 emissions and removals from HWP on the basis of carbon fluxes” as a contrast to section 12.A.1. Then include text on the ‘simple-decay approach’ with the ‘atmospheric-flow’ approach.	Canada	Rejected	We believe that a significant improvement in this updated guidance has been to make a clear distinction between approaches and methods. In terms of approach, the 'simple decay' concept is identical to the production approach. Hence, we are maintaining the 'simple decay' concept as an approach by providing guidance for the production approach. The distinction is only in terms of methods. The 2006 IPCC GL included some discussion of how to combine variables under the 'simple decay' concept, but no explicit guidance was provided on calculation methods. In some places, guidance relevant to the 'simple decay' concept in the 2006 IPCC GL is identical to that given for the 'production' approach. It remains the case that there is no basis for providing exclusive methodological guidance for calculations relevant for the 'simple decay' concept.
6268	4	12	1353	1356	The diagram shows domestic wood products sequestering carbon from the atmosphere, where this is not possible. The flow from the forest is the relevant one.	Australia	Accepted with Modification	The text has been modified and an additional figure has been included to explain what this means in the context of HWP.

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6290	4	Annexes	92	100	Authors may like to consider data in Bray et al 2015 in the derivation of tier 1 default values (liveweight and liveweight gain) for Oceania in Tables 10A.1-1, 10A.1-3, 10A.2-1A, 10A.2-1B, 10A.2-1C	Australia	Accepted with Modification	The information has been reviewed and considered for applicability in the Tables suggested.
7376	4				general comment on three-pool steady-state carbon model: we don't think this is a tier 2 approach. ACTION: delete from tier 2 sections across chapters. We could accept having it in tier 3 sections or in an annex.	Spain	Accepted with Modification	Information justifying the classification of the steady state modelling approach at the Tier 2 level has been added. Values are provided for all model parameters in Table 2.3C. Note that the method has been moved to Cropland Remaining Croplands based on other comments.
7378	4				General comment on references to 2013 WL supplement: we don't agree with any of these references. Our main aim is that UNFCCC can accept this refinement as guidelines for future GHG inventories. The COP never agreed to use 2013 WL for national inventories, and we believe that including here references to this document will make it difficult to have this refinement as basis for future inventories. ACTION: we suggest to delete all references to the 2013 WL supplement or include the text referred to allow governments to comment on it and make them an integral part of this refinement, so it can be seen as an independent document from the WLs supplement.	Spain	Rejected	The 2013 Wetlands Supplement is an IPCC Methorolodgy Report officially adopted/accepted by the IPCC. Decision IPCC/XLIV-5 which defines the scope of 2019 Refinement refers to the 2013 Wetlands Supplement.
7396	4				General comment: it has been very difficult to keep track of the changes. In some chapters they are marked in grey, in other chapters they are white, and unchanged text is in grey, and we have identified several paragraphs that changed and weren't identified. We kindly ask IPCC secretariat and authors to ensure that, for the next round of comments, the changes compared to 2006 GLs are clearly marked. An untransparent process can difficult the adoption of this document as future guidance for inventories.	Spain	Noted	Every effort will be made for improvement.