INTERGOVERNMENTAL PANEL ON climate change

Task Force on National Greenhouse Gas Inventories (TFI)

IPCC Expert Meeting for Technical Assessment of IPCC Inventory Guidelines (AFOLU Sector)

São Paulo, Brazil, 13 – 16 July 2015

Co-Chairs Summary

1. In accordance with the IPCC Trust Fund programme and budget for the year 2015 (approved by the IPCC at its 40th Session), the IPCC Task Force on National Greenhouse Gas Inventories (TFI) is implementing technical assessment of IPCC Inventory Guidelines. This work is to assess where science and data availability have developed sufficiently since the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (*2006 IPCC Guidelines*) to support the refinement or development of methodological advice for specific categories and gases, with a view to identifying any specific areas or issues to be prioritized. Another aim is to conduct technical assessments on cross-sectoral issues, including improvement of user-friendliness of other inventory tools of the IPCC with a view to contributing to capacity development programmes.
2. This technical assessment is being undertaken through a combination of an on-line questionnaire survey and two expert meetings. The on-line questionnaire survey was conducted from 30 January to 27 February, and 243 experts submitted a total of 987 comments to the Technical Support Unit for the IPCC TFI (TFI TSU). Out of these 987 comments, 380 were about the Agriculture, Forestry and Other Land Use (AFOLU) Sector.
3. The São Paulo expert meeting was the second of the two expert meetings following the on-line questionnaire survey. The São Paulo meeting covered AFOLU Sector. In particular it aimed to:
    - assess the maturity of scientific advances and the availability of new data (but not an exact scientific examination of new methodology or data);
    - identify any specific areas or issues that should be prioritized in TFI's future work; and
    - consider associated cross-sectoral issues identified in the survey.
4. The meeting considered comments submitted by experts in response to the on-line questionnaire survey, particularly on the issues identified as high priorities through the prior analysis made by the TFI TSU. This was with a view to making recommendations to the Bureau of TFI (TFB) on the following:
    - Categories for which the science is sufficiently mature and data are available to recommend refinement or development of inventory guidance;
    - Where such refinement or development on the basis of this new information would lead to a noticeable improvement of the *2006 IPCC Guidelines* and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* (*Wetlands Supplement*);
    - Specific type of refinement or updating that is needed for those categories; and
    - How these refinements could be made (i.e., suggested possible way(s) to address issues).
5. The issues were considered and discussed through two break-out groups (BOGs), taking significance & prioritization criteria (see Box 1) into account. The BOGs were:
    - BOG on Agriculture covering categories 3A and 3C
      (Co-facilitators: Ms. Annette Freibauer and Ms. Hongmin Dong, Rapporteur: Mr. Adrian Leip)
    - BOG on FOLU covering categories 3B and 3D
      (Co-facilitators: Mr. Jim Penman and Mr. Nijavalli H. Ravindranath, Rapporteur: Mr. Christopher Woodall)

6. Some issues relating to soils on Cropland and Grassland (categories 3.B.2 and 3.B.3) were considered by both BOGs.

Box 1: Significance and prioritization criteria (previously agreed in the Terms of Reference for this work)

- Significance of the source/sink and the gas within the sector on a global scale. Sources significant only for a limited number of particular countries currently or in the foreseeable future may not meet this criterion. The adequacy of the existing guidance for a particular category should be considered, as should the likelihood that new information would lead to a definite improvement in the IPCC Guidelines.
- Availability of relevant new scientific results.
- Sufficient data availability and maturity of scientific advances since 2006 to provide a basis for methodological development or refinement, including:
    - Ability to develop new or updated default emission/removal factors
    - Feasibility of obtaining the necessary data to implement the methods
- Emergence of new sources or gases meeting these criteria

8. Taking account of the discussion by each BOG, the meeting participants agreed to forward the recommendations based on the elements mentioned in paragraph 4 above to the TFB as summarized in Tables 1-2 below.

9. The following issues were identified as potential elements/areas for refinements to be made by producing a Methodology Report(s).

Category 3.A

- Improvement of parameters based on different feeding strategies for ruminants (Category 3.A.1, CH_4)
- Refinement of parameters based on new science (Category 3.A.2, CH_4)
- Development/update of guidance on how to deal with avoided methane emissions due to biogas production (Category 3.A.2, CH_4)
- Reconsideration of method of estimating nitrogen excretions (Category 3.A.2, N_2O)
- Update of emission factors for N_2O (Category 3.A.2, N_2O)

Category 3.C

- Evaluation of EF1 and options for stratification (Category 3.C.4, N_2O)
- Evaluation of EF3 as 2% of the N applied to soils, pasture, range and paddock by grazing animals (Category 3.C.4, N_2O)
- Derivation of new emissions factors[1] for indirect N_2O, both the amount of leaching/runoff and volatilization, as well as the indirect emission factor (Category 3.C.5, N_2O)
- Update of emission factor (N_2O) from rice cultivation based on country-specific publications (Category 3.C.7, N_2O)

Category 3.B

- Update of default values for litter and develop default values for deadwood (Category 3.B.1, CO_2)
- Update of values for BEF/BCEF, harvest losses and root/shoot ratio, average biomass stocks and average biomass/volume increments, emissions factors (Category 3.B.1, CO_2)

[1] This wording was used in the report from the break-out group, but it may be rephrased as “evaluation” or “update”. Though different language is being used, in all cases, the science underlying the emission factors will be reexamined.

- Update of guidance on activity data (including natural disturbances), for land representation to link land classification system with digital maps (remote sensing and/or GIS data) and also stratified by climate, soil and land use (Category 3.B, CO_2, CH_4 and N_2O)
- Update/development of guidance on mineral soils under Cropland, particularly on carbon stock change factors (Category 3.B.2, CO_2)
- Update/development of guidance on mineral soils under Grassland, particularly on carbon stock change factors (Category 3.B.3, CO_2)
- Update/development of methods to estimate emissions and removals from flooded land (Category 3.B.4, CO_2, CH_4 and N_2O)

10. It was agreed that refinements of frequently asked questions (FAQs) on the website, and of the emission factor database (EFDB) can start as soon as practicable no matter how the BOGs judged the priority is on each issue.
11. The meeting also considered and raised some cross-sectoral issues as listed below.
    - The IPCC Inventory Software needs to be updated to reflect substantial refinements, and a record of software updates should be maintained on the TFI website.
    - The usability of EFDB needs to be improved.
    - The FAO estimates of GHG emissions from AFOLU Sector are a useful source of reference data for QA/QC.
    - Modifications to the glossary should be included in the Methodology Report(s) if necessary.
12. Recommendations from this meeting are forwarded to TFB for consideration to reflect in the draft TFI's work programme for 2016 and onwards. The draft work programme should be submitted to the IPCC for consideration at its 42nd Session in October 2015.

Table 1: Recommendation on issues on categories 3A & 3C as well as 3.B.2 & 3.B.3 (from BOG on Agriculture)

Priority	Category (and Gas)	Type of refinement and explanation of issue	Suggested possible way(s) of refinement
Issues on livestock (Category 3.A)			
High	Enteric Fermentation (3.A.1)	Improve parameters based on different feeding strategies for ruminants. - CH_4 from enteric fermentation is a significant source. Feeding strategies are changing and mitigation strategies are rising in importance. - Feed intake for cattle seems to be fine in the guidelines. Particularly, as to methane conversion rates for dairy and other cattle: - Refinement for CH_4 mitigation options by feed additives and feed quality. There is a lot of new literature available, including developed countries and Africa. The approach to be taken would be to relate CH_4 conversion rates to feed components, quantitatively define what low and high quality feed means (this choice is most critical), derive a refined Tier 2 table for methane conversion rates and then check, and update if appropriate, the Tier 1 factors. The analysis has to be carefully consider the representativeness of feeding strategies for regional and global conditions. - The main concern is that different models produce different methane conversion rates so that guidance on model applications is needed. Additional guidance is also needed how to derive a time series of methane conversion rates and corresponding activity data. Check whether scaling factors or time series of the defaults are feasible. It is important to add quantitative uncertainty estimates to the default factors. As to methane conversion rates for sheep, buffalo, yaks, availability of new data is unclear.	Methodology Report
Medium	Enteric Fermentation (3.A.1)	Develop new models based on breed/geographical location. - Geographical location is covered above. - Breed is beyond a Tier 1 method and could be included in the EFDB.	About geographical location, see the previous row. About breed, EFDB
Low	Enteric Fermentation (3.A.1)	Improve parameters for non-ruminants. - Maybe an update of feed intake is needed for pigs. - The BOG had no specific expertise to assess new evidence. Comments on camelids (from responses to on-line questionnaire survey) could be included in the EFDB.	EFDB
Low	Enteric Fermentation (3.A.1)	Add new animal categories (deer). - No reference provided, only possible for higher Tiers	No action, EFDB if possible
High	Manure Management (3.A.2), CH_4	Refine parameters based on new science. - Temperature dependence of CH_4 can be updated. Tier 1 should still use annual mean temperature ranges for the MCFs. Higher tiers may use seasonal temperatures rather than annual means, and typical temperatures in manure stores.	Methodology report: re-evaluate and update where appropriate all parameters and EFs, including further stratification for countries with better

		- Storage time is an important driver to be considered in MCFs. - A good background documentation of the development of the new default MCFs is required to support countries in producing higher Tier values consistent with the defaults. - The current guidance on C and N from bedding is inconsistent. The current emission factors could, however, already include the bedding. Additional guidance for higher tiers could be included suggesting to consider carbon from bedding in the VS estimate. - The effect of natural crusts on CH_4 emissions from slurry storage may need to be re-evaluated based on new findings. - B0 for cattle and swine seems to be different in global regions (feed characteristics!) and may be further stratified.	activity data.
High	Manure Management (3.A.2)	Develop/update guidance on how to deal with avoided methane emissions due to biogas production. - New data and methodological experience is available from several world regions, including the MCF. - CH_4 from barn + farm prior to storage is missing.	Methodology report: cross-cutting issue to develop, complete and update the equation (Table 10.17 in Vol.4 of 2006 IPCC Guidelines) and parameters, that is cross-cutting between energy, waste and agriculture for biogas, including all substrates (manure, waste, biomass).
High to Medium	Manure Management (3.A.2), N_2O	Reconsider method of estimating nitrogen excretions. - Re-evaluate and update, if appropriate, the default N excretion rates for applicability in world regions. - Clarify the animal categories (e.g., rabbit values are for mother+children). Emission factors for N_2O: new data available. - Table 10.21 in Vol.4 of 2006 IPCC Guidelines contains a lot of expert judgement. EFs can be re-evaluated and updated, if appropriate, with new measured data, in particular for treatment systems. N_2O estimation from liquid manure storage based on surface area of manure storage. - Surface area is inconsistent with the available activity data in most countries and does not suit for a lower tier method.	Methodology report: 1) Verification and plausibility checks for the default N excretion rates if possible. 2) Re-evaluate and update Table 10.21 EFs if appropriate. Note: The update should not result in new methodologies and animal categories but rather improve the existing tables.
Low in terms of inventory compilation, high in terms of supporting the re-evaluation and update of the 2006 IPCC Guidelines	Manure Management (3.A.2)	Illustrate conceptual models of dairy systems, beef production systems, swine production systems, and poultry productions systems and resulting GHGs from enteric fermentation and housing and manure management systems to facilitate communication of sources of GHGs and interrelationships between sources. - This may be very useful additional illustration. The EMEP Guidebook likely contains a flow scheme. This would need to be combined with the methodological steps in the IPCC guidelines to link the N flow to the emission calculations. - The Task Force on Reactive Nitrogen Expert Panel on	Technical Bulletin

		Nitrogen Budgets is providing relevant guidance documents for N budgets in various sectors. - Several other sources are available.	
Issues on aggregate sources and non-CO2 emissions sources on Land (Category 3.C)			
Low to Medium	Direct N_2O Emissions from Managed Soils (3.C.4)	Evaluate N_2O EF1. - There are a lot of new high-quality measurements available. Evaluate those whether the EF1 could be stratified by climate zone as an option for countries with data on fertilizer use by climate zone. - New findings are available to be considered in higher Tiers, e.g. a non-linear N_2O response to fertilizers. - There is not enough evidence yet to change the methodology for N_2O from N input by crop residues.	Methodology Report: Evaluate EF1 and include an option for stratification by climate if appropriate and the change would be significant.
Medium	Direct N_2O Emissions from Managed Soils (3.C.4)	Consider improved means for estimating crop management impacts in cropland N_2O fluxes, including tillage and account for asymbiotic fixation. - There is evidence that no-till increases N_2O emissions over some period of time, which may decline later on. It seems to be worth synthesizing the existing evidence including long-term effects of no-till and soil texture and climate, taking into account the quality criteria for measurements set out in the EFDB. - There is not enough scientific evidence for impacts of fertilizer placement. - Asymbiotic fixation cannot be separated in the N_2O measurements, so it is implicitly included in the EF. Not enough evidence for any action.	EFDB: Include review by Van Kessel et al. 2012, GCB 19: 33 of existing evidence of no-till effects in the EFDB. A Canadian data set is in the process of inclusion in the EFDB. No additional action.
Medium	Direct N_2O Emissions from Managed Soils (3.C.4)	Develop factors for nitrification inhibitors. - EFs would need to distinguish between fertilizer types because nitrification inhibitors only work with ammonium-based fertilizers. New practices would be Tier 2 or Tier 3 level. The evaluation of practices should consider the full nitrogen cycle and measurements long enough to capture delayed emissions. It seems to be worth synthesizing the existing evidence.	EFDB: One review is available and a second one in process. They should be included in the EFDB. No additional action.
High	Direct N_2O Emissions from Managed Soils (3.C.4)	Evaluate the EF3 as 2% of the N applied to soils, pasture, range and paddock by grazing animals. - The preliminary data suggest that the current EF3 is too high. It would be more logical that the EF3 is similar to the EF1, which includes organic manure application. EF3 should be re-evaluated based on clear quality criteria for the studies. Care has to be taken that the measurements cover a long enough phase to allow for decomposition of the dung. The EF3 should still relate to the sum of urine and dung.	Methodology Report/ EFDB: Encourage input of preliminary evidence to the EFDB. Methodology report to finally elaborate the new EF3.
High	Indirect N_2O Emissions from Managed Soils (3.C.5)	Derive new emissions factors for indirect N2O, both the amount of leaching/runoff and volatilization, as well as the indirect emission factor. - New evidence on N volatilization is captured in the link to EMEP guidebook, EF is OK. - Leaching/runoff: there is new scientific evidence to be considered in the guidelines. - EFs have to be seen in combination with the leaching factor, FracLEACH. There is a major methodological issue that the N leached from the root zone is currently	Methodology Report/ FAQ: The indirect N source is significant and would require some change in methodology and EF. Scientific evaluation is needed. Science on N retention in ground- and surface waters has to be stimulated and matured.

		assumed to entirely enter the ground- and surface waters. This neglects significant N loss by denitrification along the N pathway. - The methodology description is not transparent regarding the simplifications. Indirect N_2O also occurs in the waste sector (waste effluent). The approach has to be the consistent across sectors. - N_2O hotspots may also occur in riparian zones, which are not included in the methodology. - EFr: surface waters: new studies suggest higher EF for rivers with high N load, but the measurements are related to the N that finally reaches the rivers, not the N leached, which is used in the equation. - EF5g: groundwaters: OK, supported by new studies. - EF5e: estuaries; no new studies.	FAQ to better explain the concept of indirect N2O leaching/runoff pathways. Methodology Report or appendix on methodological improvements accounting for N retention in the derivation of EFs or to reconcile the measurements in rivers with N leached from agricultural systems.
Low	Rice Cultivations (3.C.7)	Update emission factor (CH4) based on country-specific publications. - CH_4 source is significant. New data and parameters are available since 2006, in particular also information on effects of management strategies that affect the scaling factors (water regime, fertilizers, organic amendments, straw burning, variety). - A first assessment suggests that the current methodology and default parameters are still valid. - New practices such as alternating wet and dry practices are becoming more widespread and could be incorporated in terms of new data and knowledge (Tier 2). A meeting in late autumn 2015 (2015 EFDB meeting) will likely bring about additional information. China has intensive monitoring programmes.	EFDB FAQ could highlight new information from the autumn 2015 meeting (2015 EFDB meeting).
High	Rice Cultivations (3.C.7)	Update emission factor (N_2O) based on country-specific publications. - The source is significant. The current EF by N input does not consider management practices. New management strategies, in particular alternating wet-dry may clearly alter (increase) N_2O emissions. - New data is available from many important rice producing countries to improve and refine and disaggregate the existing EF. - Evaluate and update the EF based on new literature. Additional guidance on activity data is needed how to allocate fertilizer fractions to the different rice management regimes, consistent with the guidance on CH4 from rice, including an aggregated EF if no further stratification by management regime is possible.	Methodology Report
Low	Residue burning (cropland)	Update emission factors for non-CO_2 greenhouse gases emission from agricultural crop residues burning. - Data concerning with non-CO_2 greenhouse gases emission from agricultural crop residues burning has been reported. - The GHG source is not significant and often residue burning is banned. There are working groups on emissions from residue burning and new data and methodologies could be included in the EFDB.	EFDB
Issues on CO2 from soils under Cropland and Grassland (Categories 3.B.2 & 3.B.3)			

Low	Cropland (3.B.2)	Update data of mineral soil reference C stocks by land-use category for land-use changes - ISRIC World Soil Information (http://www.isric.org/) has constantly updated improved data by soil region and climate link to there. - Check whether new data would substantially change the defaults of reference C stocks - Only if really substantial changes occur it would be worth considering an update. This may occur in particular for rarely sampled pedons. Updates are most relevant for tropical regions and regions where countries are using the defaults. - Alternatively, adjust transition time to the time soils need to really do the full change - Rather a research project first?	FAQ/Technical Bulletin: TSU will, in consultation with experts, ask ISRIC to check whether new data would substantially change the defaults of reference C stocks for a future scoping meeting for re-evaluation with better knowledge. Result to be published as FAQ or technical bulletin that the data is available.
High (because the current carbon stock change factors (no-till, organic input) may overestimate carbon stocks. The default should be related to a real effect (so that the right incentives are set for measures that really mitigate CC)).	Cropland (3.B.2)	Update/develop guidance on mineral soils under Cropland: Carbon stock change factors. - Main difficulty is to find necessary activity data. Maybe it is useful to show alternative methods to get necessary data (consistent with 3.D) or to use them in a refined alternative methodology (gain-loss; C input minus C losses; Russia has experience, Stephen Ogle suggests equilibrium model runs). The methodology would somehow be less data-intensive than the current methodology (simpler). But methodologies have to be consistent across land-uses and in the time series. - Tillage: a lot of new research; no-till effect does not work everywhere, so the defaults may imply an impact which does not happen everywhere. Check how much information comes from tropics and regions where the default method is commonly used. - Productivity: new data, in particular on cover crops. Highlight that residue etc. data is available from N input estimate in 3.D. Strive for internal consistency and highlight this here - Organic input: new data available, factor was very uncertain. Highlight that organic manure data is available from N input estimate in 3.D. Strive for internal consistency and highlight this here.	Methodology Report: If there is a methodology change in croplands, this has implications in all land-use categories. Assess the potential other, simpler methodology for croplands for applicability in other land-use categories.
Depends on cropland	Grassland (3.B.3)	Update/develop guidance on mineral soils under Grassland: Carbon stock change factors. - C stock change factors in 2006 IPCC Guidelines were made on a small data base; several more are available and could make a difference, which cannot be assessed by the expert group; defaults, e.g. linked to production, could be more robust. An update of the EF is probably not a big effort, since the overall information is relatively scarce. Would also help to improve burning estimates.	In line with changes in cropland. (See above.)
Low	Cropland (3.B.2) & Grassland (3.B.3)	Update data on organic soils under Cropland and Grassland: Better integration with Wetlands Supplement. - Most recent updates in Wetlands Supplement are considered sufficient and reflecting important processes. N fertilizer is estimated independent on what type of soil it is applied on. Other management effects could be included in higher Tiers. Recent	EFDB: It is upon UNFCCC to decide on the use of 2006 IPCC Guidelines versus Wetlands Supplement. Any new EFs could be

		literature would not substantially change the EFs in the Wetlands Supplement. However, the Wetlands Supplement separates and adds sources, in particular the peat burning. It has to be clarified that the EFs in the 2006 IPCC Guidelines include peat fires and oxidation, and are mainly based on Armentano and Menges and a few other studies (mainly subsidence), and do not differentiate between the various C loss pathways.	included in the EFDB.

Table 2: Recommendation on issues on categories 3B & 3D (from BOG on FOLU)

Priority	Category (and Gas)	Type of refinement and explanation of issue	Suggested possible way(s) of refinement
Issues for Methodology Report and/or Expert Meetings			
High	Forest Land (3.B.1), CO_2	Update values for litter and develop default values for deadwood; update values for BEF/BCEF, harvest losses and root/shoot ratio, average biomass stocks and average biomass/volume increments, emissions factors that have been provided in the 2013 Wetlands Supplement, and other parameters.	Expert meeting/Methodology Report: updating issues and adding new default values. There is a cross cutting issue on time series because defaults over time. Update EFDB as well.
High	Forest Land (3.B.1), CO_2	Reconsider or improve methods to estimate emissions and removals from forests.	1) Merge consideration of BEF/BCEFs with the issue in the previous row. 2) FAQ followed by Methodology Report which clarifies guidance associated with forest management practices in forests (includes collateral damage issue) and guidance on emissions from soils related to management practices. 3) Merge treatment of disturbances with the issue in the next row.
High	Land (3B), CO_2, CH_4 and N_2O	Update guidance on activity data (including natural disturbances). - Guidance on land representation should be updated to link land classification system and digital maps (remote sensing data or GIS data) and should allow for aggregation of relevant classes into the main six IPCC Land Categories defined in the IPCC Good Practice Guidelines. Also stratified by climate, soil and land use type.	Methodology Report: Update references in Chapter 3 in Vol.4 of 2006 IPCC Guidelines (including list of RS datasets). Update guidance, (including on data organization, use of reference data, and integrating frameworks) referring to material elsewhere (FAO emissions database, GFOI, GOFC-GOLD, FFPRI REDD+ Cookbook).
Low to Medium (Soil issue)	Land (3B)	Update default values for soil organic carbon, examples of international land cover dataset can be extended. (This issue was considered with BOG on Agriculture.)	Expert Meeting (or Consultation with experts): TSU in consultation with experts consult with ISRIC to determine extent to which new pedons in ISRIC database and other new sources make a significant difference to defaults.
Low and High (See the column on suggested possible way(s) of refinement)	Cropland (3.B.2), CO_2 and N_2O	Add guidance on conversion of croplands to either rice wetlands or to permanent wetlands. Refine emission factor to reflect relationship between N fertilizer and N_2O, refine stock change factors for soil carbon for soil tillage.	Methodology Report (only on 3 below): 1) No action in respect to conversion of croplands. 2) Low priority: review science on link between N and carbon factors 3) High priority: revise carbon stock change factors and consider possibility of gain loss method (part of Methodology Report) – see the relevant row in Table 1 above. May be considered in conjunction with the Expert Meeting on issues in the first and second rows in this table.

High in terms of development of FAQs Low in terms of remainder: (recognizing that this issue will be discussed at UNFCCC during SBSTA46.)	Harvested Wood Products (3.D.1), CO_2	Improve usability of HWP guidance considering 2013 KP Supplement.	Expert Meeting and FAQ: - Short term: Expert meeting leading to FAQ and consideration of ways forward to improve usability and access to information with respect to reporting requirements and methodological issues. Retain all approaches in 2006 IPCC Guidelines. - Decisions on way forward taking account of SBSTA46 (in 2017). - Confer with HWP experts.
See the previous row on HWP.	Land (3B), CO_2	Update guidance in Appendix 1 in Vol.4 of 2006 IPCC Guidelines: CO_2 Removals in Residual Combustion Products (charcoal): Basis for Future Methodological Development.	Consider as part of the issue on HWP in the previous row. Consider linkage to energy sector.
High	Wetlands (3.B.4): Flooded Land, CO_2 N_2O and CH_4	Revise emission factor taking into consideration issues such as the following: - quantity and type of carbon pool flooded; - management activities prior to flooding and during reservoir management; - inflow/outflow rates and drawdown area; - upstream watershed and erosional estuarine exchange; - other new scientific literature.	Expert Meeting/Methodology Report: Expert Meeting with a view to providing advice to the scoping meeting on the development of a Methodology Report to update and complete methods in the 2006 IPCC Guidelines to estimate emissions and removals from flooded lands.
Low	Wetlands (3.B.4): Flooded Land, CH_4	Develop a methodology for constructed wetlands, particularly those that occur in regions of salinity >15ppt where methane flux is minimal, carbon sequestration using surface elevation tables and eddy covariance.	Expert Meeting: Convene an expert meeting to consider whether science sufficient 2-7 years from now.
Low	Land (3B), CO_2	Develop a methodology for biochar C immobilization via soil improvement.	Expert Meeting: Convene an expert meeting on sequestration of C by biochar. Consider linkage to IPPU/energy sector in some cases.
Issues for FAQs			
High	REDD+	Add or improve methods (equations) – degradation/REDD+.	FAQ: FAQ on the relationship between 2006 guidelines and REDD+, degradation.
High	REDD+	Reconsider or improve methods to estimate emissions and removals from forests	FAQ (associated with the issue in the second row in this table): FAQ which clarifies guidance associated with forest management practices in forests (includes collateral damage issue) and guidance on emissions from soils related to management practices.
High	Land (3B), CO_2, CH_4 and N_2O	Update guidance on activity data (including natural disturbances). See the issue in the third row in this table.	FAQ: Identify sources of training materials (with disclaimer). FAQ or Technical Bulletin: Integration of various data sources.

High	Land (3B)	Develop or elaborate guidance to avoid incorrect implementation of the stock difference method during land use area changes which may result in significant mistakes in estimation of emissions (creates artefacts especially for soils). - 2006 IPCC Guidelines remain unclear. - A whole section dedicated to this issue has been included in the 2013 KP Supplement (section 2.3.3).	FAQ: FAQ taking into account section 2.3.3 of KP Supplement.
High	Land (3B)	Clarify use of 20 year defaults in the presence of longer time constants.	FAQ
High	Land (3B)	Develop or elaborate guidance on treatment on land areas with slope in the calculation of carbon stocks (different for soils versus biomass).	FAQ (linked to the issue in the third row in this table.)
High	Harvested Wood Products (3.D.1), CO_2	See the issue on HWP in the sixth row in this table.	See the issue on HWP in the sixth row in this table.
Medium	Land converted to Cropland (3.B.2.b.i), CO_2, CH_4 and N_2O	Improve user-friendliness of guidance in relation to emissions from deforestation.	FAQ
Medium	Land (3B), CO_2, CH_4 and N_2O	Develop or elaborate guidance on land conversion due to mining and development of non-renewable energy resources to extract minerals and fossil fuels occurs in many countries.	FAQ + inclusion in EFDB: Consider potential linkage to the issue in the fifth row (the issue relating to carbon stock change factors) in this table.
Low	Wetlands (3.B.4): Flooded Land, CO_2 N_2O and CH_4	Clarify how both the guidance from the 2006 IPCC Guidelines and the Wetlands Supplement should be applied together to develop estimates for wetlands.	FAQ: FAQ on joint use of Wetlands Supplement and 2006 IPCC Guidelines for creation of national GHG inventories. Clarify guidance on reporting tables.
Issues for EFDB			
Medium	Forest Land (3.B.1), CO_2 and N_2O	Update EF with new research on fire, both wildfire and prescribed burning, on emissions of CO2, CH4, and N2O and changes in those terrestrial pools, including burning during land use conversions (Tables 2.4 and 2.5, page 2.45 - 2.47 in Chapter 2 in Vol. 4 of 2006 IPCC Guidelines). - Also add data on how to reduce uncertainty when updating/adding new emission factors for wild fires and prescribed burning. - Clarification needed on activity data – link to the issue on guidance on activity data in the third row in this table.	EFDB: TSU in consultation with experts to consider and literature and update or add emission factors in the EFDB. Collect and include relevant data into EFDB. If it is appropriate and necessary for them to be recognized as updated or additional default data, include them in a new Methodology Report
Medium	Cropland (3.B.2), CO_2	Update values for C stock for perennial woody crops. - Default C stock for perennial woody crops of 63 ton C/ha	EFDB: TSU in consultation with experts to explore literature with a view to differentiation where necessary by species by ecological

		(Table 5.1, page 5.9, Chapter 5 in Vol.4 of 2006 IPCC Guidelines) is too high, consider revising.	zone. Collect and include relevant data into EFDB. If it is appropriate and necessary for them to be recognized as updated or additional default data, include them in a new Methodology Report.
Medium	Cropland (3.B.2), CO_2	Update values of biomass in annual crops. - Defaults on biomass in annual crops not necessarily representative.	EFDB: Collect and include relevant data into EFDB by crop. If it is appropriate and necessary for them to be recognized as updated or additional default data, include them in a new Methodology Report.
Low	Peat Extraction Remaining Peat Extraction (3.B.4.a.i)	Update values of EFs for off-site emissions associated with peat extraction for temperate and boreal zone. - The default emission factor for off-site emissions associated with peat extraction for temperate and boreal zone is not necessarily suitable for boreal conditions (Table 7.4 page 7.13 in Chapter 7 in Vol.4 of 2006 IPCC Guidelines). - Further investigation is required to include separate EFs for temperate and boreal zones. Consider describing existing emission factor more in terms of depth (e.g., BD and C content).	EFDB: Collect and include relevant data into EFDB. If it is appropriate and necessary for them to be recognized as updated or additional default data, include them in a new Methodology Report.