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Technical report on the technical analysis of the technical annex to the first biennial update report of Uganda submitted in accordance with decision 14/CP.19, paragraph 7, on 27 April 2020

Summary

This technical report covers the technical analysis of the technical annex submitted on a voluntary basis, in the context of results-based payments, by Uganda on 27 April 2020 through its first biennial update report in accordance with decision 14/CP.19. The technical annex provides data and information on the activity reducing emissions from deforestation, which is an activity included in decision 1/CP.16, paragraph 70, and covers the same national territorial forest area as the assessed forest reference emission level (FREL) proposed by Uganda in its modified FREL submission of April 2018.

Uganda reported the results of the implementation of this activity for 2015–2017, which amount to 4,035,347 tonnes of carbon dioxide (t CO_2) per year (8,070,694 t CO_2 in total) and were measured against the assessed FREL of 8,254,691 t CO_2 per year for 2000–2015.

The data and information provided in the technical annex are in overall accordance with the guidelines contained in the annex to decision 14/CP.19. The technical analysis concluded that the data and information provided by Uganda in the technical annex are largely transparent and partially consistent with the assessed FREL established in accordance with decision 1/CP.16, paragraph 71(b), and decision 12/CP.17, section II. This report contains the findings from the technical analysis and a few areas identified for capacity-building and future technical improvement in accordance with decision 14/CP.19, paragraph 14.

Abbreviations and acronyms

AD	activity data
BUR	biennial update report
CO_2	carbon dioxide
EF	emission factor
FREL	forest reference emission level
FRL	forest reference level
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
NFI	national forest inventory
NFMS	national forest monitoring system
QA/QC	quality assurance/quality control
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
SEPAL	system for earth observations, data access, processing and analysis for land monitoring
TA	technical analysis
TTE	team of technical experts
2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*

I. Introduction

A. Introduction

1. This technical report covers the TA of the technical annex provided by Uganda on 27 April 2020 in accordance with decision 14/CP.19, paragraph 7, included in its first BUR, which was submitted in accordance with decision 2/CP.17, paragraph 41(a), and annex III, paragraph 19. In the technical annex, Uganda provided the data and information used for estimating its anthropogenic forest-related emissions by sources and removals by sinks, forest carbon stocks, and forest carbon stock and forest-area changes resulting from the implementation of REDD+ activities. The submission of the technical annex is voluntary and in the context of results-based payments in accordance with decision 14/CP.19, paragraph 8. The TA was coordinated by Jenny Wong (secretariat).

2. The TA of the technical annex is part of the international consultation and analysis of BURs referred to in decision 2/CP.17, annex IV, paragraph 4, the objective of which is to increase the transparency of mitigation actions and their effects through analysis by the TTE in consultation with Uganda and through a facilitative sharing of views, resulting in a separate summary report.[1]

3. Uganda made its original FREL submission, in accordance with decision 12/CP.17, on 16 January 2017, followed by a modified submission on 30 April 2018, which was subject to a technical assessment following the guidance provided in decision 13/CP.19 and its annex. The assessed FREL was included as one of the elements of the technical annex to its first BUR in accordance with the guidelines contained in the annex to decision 14/CP.19. The findings from the technical assessment of the FREL are included in a separate report.[2]

B. Process overview

4. The TA of the first BUR of Uganda took place from 22 to 26 June 2020 as a desk analysis[3] and was undertaken by the following TTE drawn from the UNFCCC roster of experts on the basis of the criteria defined in decision 20/CP.19, annex, paragraphs 2–6: Siriluk Chiarakorn (Thailand), Ana-Maria Danila (European Union), Ryan Deosaran (Trinidad and Tobago), Madeleine Rose Diouf (Senegal), Leticia Guimarães (Brazil), Juan Luis Martin Ortega (El Salvador), Esther Mertens (Belgium), Noura Mohamed Lotfy (Egypt), Sekai Ngarize (Zimbabwe), Ioannis Sempos (Greece), Virginia Sena Cianci (Uruguay), Yusuf Serengil (Turkey), Maarten van der Eynden (Norway) and Alexander Zahar (Australia). Ms. Guimarães and Mr. van der Eynden were the LULUCF experts who undertook the TA of the technical annex in accordance with decision 14/CP.19, paragraphs 10–13.

5. The TA of the technical annex provided by Uganda was undertaken in accordance with the procedures contained in decisions 2/CP.17, 14/CP.19 and 20/CP.19. This technical report on the TA was prepared by the LULUCF experts in the TTE in accordance with decision 14/CP.19, paragraph 14.

6. During the TA and subsequent exchanges, the LULUCF experts and Uganda engaged in technical discussions, and Uganda provided clarifications in response to the questions raised by the LULUCF experts, in order to reach a common understanding on the identification of the capacity-building needs of the Party and areas for technical improvement.

7. Following the TA of the technical annex, the LULUCF experts prepared and shared the draft technical report with Uganda for its review and comments. The LULUCF experts

[1] FCCC/SBI/ICA/2020/TASR.1/UGA.

[2] FCCC/TAR/2017/UGA, published on 31 May 2018.

[3] Owing to the circumstances related to the coronavirus disease 2019, the TA of the BUR submitted by Uganda had to be conducted remotely.

responded to the Party's comments and incorporated them into and finalized this technical report in consultation with Uganda.

C. Summary of results

8. In decision 1/CP.16, paragraph 70, the Conference of the Parties encouraged developing country Parties to contribute to mitigation actions in the forest sector by undertaking a number of activities, as deemed appropriate by each Party in accordance with its respective capabilities and national circumstances. In the context of results-based payments and in line with decision 12/CP.17, the Party, on a voluntary basis, proposed a national FREL covering the activity reducing emissions from deforestation for the purpose of a technical assessment in accordance with decision 13/CP.19 and its annex. The activity is being implemented in Uganda's national territory. The assessed FREL of Uganda is 8,254,691 t CO_2/year.

9. The Party's FREL is based on its annual average historical CO_2 emissions associated with the activity reducing emissions from deforestation for the historical reference period of 2000–2015. Uganda reported the results of the implementation of the activity reducing emissions from deforestation, calculated against the assessed FREL, which amount to emission reductions of 4,035,347 t CO_2/year and a total of 8,070,694 t CO_2 for the two-year period 2015–2017.[4]

II. Technical analysis of the information reported in the technical annex to the first biennial update report

A. Technical annex

10. For the technical annex to the first BUR submitted by Uganda, see annex I.[5]

B. Technical analysis

11. The scope of the TA is outlined in decision 14/CP.19, paragraph 11, according to which the TTE shall analyse the extent to which:

(a) There is consistency in the methodologies, definitions, comprehensiveness and information provided between the assessed FREL and the results of the implementation of REDD+ activities;

(b) The data and information provided in the technical annex are transparent, consistent, complete and accurate;

(c) The data and information provided in the technical annex are consistent with the guidelines referred to in decision 14/CP.19, paragraph 9;

(d) The results are accurate, to the extent possible.

12. The remainder of this chapter presents the results of the TA of the technical annex to the BUR according to the scope outlined in paragraph 11 above.

1. Consistency in the methodologies, definitions, comprehensiveness and information provided between the assessed reference level and the results in the technical annex

13. In accordance with decision 14/CP.19, paragraph 3, the data and information used by Parties for estimating anthropogenic forest-related emissions by sources and removals by sinks, forest carbon stocks, and forest carbon stock and forest-area changes related to REDD+ activities undertaken by them should be transparent and consistent over time and with their

[4] The TA considered the results period between December 2015 and December 2017.

[5] In accordance with decision 14/CP.19, para. 14(a).

established FREL/FRL in accordance with decision 1/CP.16, paragraph 71(b–c), and decision 12/CP.17, section II.

14. The LULUCF experts noted that Uganda ensured overall consistency between the assessed FREL and its estimation of the results of the implementation of the activity reducing emissions from deforestation in 2015–2017 by:

(a) Using partially consistent methodologies, definitions and information to generate AD on gross deforestation;

(b) Using consistent methodologies and data to generate EFs, in particular the same stratification of forest types and the same weighted average EFs;

(c) Including the same two carbon pools: above-ground and below-ground biomass;

(d) Including the same gas: CO_2 only;

(e) Covering the same area: entire national territory;

(f) Assuming that all carbon from the two carbon pools is lost in the year of the deforestation event and not including any subsequent removals of CO_2 in the deforested areas;

(g) Using the same forest definition as that used in constructing its FREL.

15. With reference to paragraph 14(a) above, the LULUCF experts noted that, while Uganda used the same minimum mapping unit of 2 ha and the same statistical method to produce area estimates (bias-corrected area estimates derived from national land-use and land-cover maps and stratified random sampling), there were also some observed differences. The details of these differences are provided in paragraphs 24–25 below.

16. With reference to paragraph 14(b) above, Uganda stated that it used preliminary results from the NFI, the same as used for the FREL, to develop the EFs for estimating the results reported in the technical annex and did not apply new, more accurate data on woodland and tropical high forest carbon stocks for the EF calculation. The Party explained that this approach was adopted in order to ensure consistency between the EFs used in the technical annex and for the FREL. However, both the FREL and the results in the technical annex were recalculated to assess how the new EFs would impact the results, and this impact was found to be insignificant.

17. In view of the above, the LULUCF experts concluded that the results presented of the implementation of the activity reducing emissions from deforestation are partially consistent with the assessed FREL. The LULUCF experts commend Uganda for working to improve the consistency of the data and methodologies described in the FREL submission for 2000–2015 and in the technical annex with the results of the implementation of the activity reducing emissions from deforestation for 2015–2017.

2. Transparency, consistency, completeness and accuracy of the data and information provided in the technical annex

18. The LULUCF experts noted that, as part of the TA process, Uganda provided additional information, in particular on the QA/QC procedures for checking the data and estimates; the differences between the national and global data sets; the statistical procedure used for the calculations; the uncertainty analysis carried out; its ongoing work to improve EFs; the institutional arrangements for the NFMS; the treatment of forest plantations; and consistency with the national GHG inventory. The LULUCF experts also noted that the Party could further enhance the transparency and completeness of the data and information used for estimating results by making the information shared with the LULUCF experts publicly available on the website of its Ministry of Water and Environment. The LULUCF experts commend Uganda for its efforts during the TA to increase the transparency and ensure the completeness[6] of the data and information provided, allowing for the reconstruction of the results.

[6] "Complete" here means the provision of the information necessary for the reconstruction of the results.

19. The LULUCF experts noted that the transparency of Uganda's technical annex and the completeness of the data and information used for estimating results could be further enhanced by the Party including more detailed descriptions of the data and methodologies used. The LULUCF experts also noted that the Party could increase the transparency and accuracy of the submission by generating more data points for the historical AD. This would also give readers of future technical annexes a more comprehensive overview of the data and methodologies used, enabling them to gain the understanding required without necessarily having to consult several sources of information. The LULUCF experts note this as a potential area for future technical improvement.

20. According to decision 12/CP.17, paragraph 8, the FREL shall be established taking into account decision 4/CP.15, paragraph 7, and maintaining consistency with the anthropogenic forest-related GHG emissions by sources and removals by sinks reported in the Party's GHG inventory. The LULUCF experts noted that Uganda's technical annex does not include sufficient information for assessing consistency between the data used in the construction of the FREL and those used in the latest GHG inventory included in the Party's first BUR. The team assessing Uganda's FREL noted that the Party did not maintain consistency in terms of sources of AD and EFs with the GHG inventory included in its second national communication.[7] The LULUCF estimates contained in the national GHG inventory cover a wider scope, such as the inclusion of emission estimates from fire and soils, than the estimates for the assessed FREL. The LULUCF experts noted that this is also true for the estimated results of the implementation of the activity reducing emissions from deforestation for 2015–2017.

21. The LULUCF experts noted that the values in some of the tables summarizing information on the FREL in the technical annex were different from the values provided in the report on the technical assessment of the assessed FREL. Following a request for clarification, Uganda explained that these differences were due to rounding issues in the Excel spreadsheets used to produce the estimates and to the fact that the factor used to convert carbon estimates into CO_2 estimates was not applied consistently (a factor of 3.67 was used for the FREL, while 44/12 was used for the results). The LULUCF experts welcome this explanation and note that the Party could enhance the transparency of its submission and the accuracy of the estimates by applying a consistent factor for the conversion of carbon to CO_2 and checking for rounding issues that could lead to erroneous estimates as part of its QA/QC procedures.

22. To construct the FREL and estimate the results, Uganda used AD derived from national land-use and land-cover maps. The information from the maps was disaggregated into 13 land-use classes, 5 of which are considered as forest classes and the rest as non-forest classes. Bias-corrected estimates of AD were produced in line with procedures that used reference sampling data, in accordance with guidance from Olofsson et al. (2014) and the Food and Agriculture Organization of the United Nations (2016). Further information on the accuracy of the results can be found in chapter II.B.4 below.

23. Forests in Uganda comprise broadleaf and conifer plantations, tropical high forests that are well stocked or low stocked, and woodlands. The Party used the same data sets and methods for the EFs used to generate the results reported in the technical annex as for those used to construct the FREL. The carbon stocks from these three classes were estimated by combining data from permanent sample plots, exploratory inventories and the national biomass study (Forest Department, 2002), combined with the model from Chave et al. (2014) for estimating above-ground biomass in tropical high forests and woodlands, and forest plantation yield models from Alder, Drichi and Elungat (2003) for forest plantations. The two classes of tropical high forests (well stocked and low stocked) were combined to derive a single EF by using an area-weighted mean, applying the mapped proportions of the two classes from the 2015 land-use and land-cover map.

24. The LULUCF experts noted that, despite reducing emissions from deforestation being the only activity included in the reference level and the results periods, there is general inconsistency in the classification of AD between both periods. Uganda reported forest plantations (broadleaf and conifer species) as a forest class in both the FREL submission and

[7] Available at https://unfccc.int/documents/144886.

the technical annex. The LULUCF experts noted that, for the FREL, natural woodland areas converted to forest plantations between 2000 and 2015 were classified as forest degradation and thus this class was excluded from the estimates. In the technical annex, however, natural woodland converted to forest plantations between 2015 and 2017 was classified as deforestation and therefore included in the estimated results. During the TA, Uganda acknowledged this inconsistency but indicated that it expects the impact to be limited, since, over the reference period, the total deforestation area assessed was 752,203 ha, while the area of tropical high and woodland forest converted to forest plantations was 21,237 ha (or 2.8 per cent of the overall deforestation area). The Party explained that it made use of available data sources and satellite imagery to provide AD estimates for the FREL and the results in the technical annex, but that current methods do not permit the detailed tracking of changes of natural woodlands to forest plantations. The LULUCF experts welcome the explanation provided by the Party, and noted the development of more detailed assessment procedures of the conversion of natural forests to forest plantations and the tracking of subsequent land use for forest plantations as areas for future technical improvement.

25. In addition, the LULUCF experts noted that it is not clear whether temporarily unstocked forest plantations were classified using the same approach for both the reference period of the FREL and the results period. In response to a question from the experts on how the rotational harvesting of forest plantations was taken into account when generating AD, Uganda explained that it is challenging to separate cyclical harvesting from other forest-change categories using current data sources and methods. According to national experts, once an area becomes a forest plantation, it generally remains as such over many years with many harvesting cycles, and these temporarily unstocked areas are not accounted for as deforestation. The Party also explained that high-resolution satellite imagery, when available, is used by data interpreters to assess whether a forest plantation has been re-established after harvesting. Uganda is in the early stages of developing a forest plantation database as part of the NFMS, which will enable tracking of age-class, species, rotation age, harvesting and replanting of forest plantations in the country. The LULUCF experts welcome the explanation provided by the Party and noted the exclusion of temporarily unstocked areas as an area for future technical improvement.

26. In response to a question from the LULUCF experts on why it chose historical maps from 2000 and 2015 to establish AD for the FREL instead of the existing maps for 2005 and 2010, Uganda explained that the use of the 2000 map was a political choice, as stakeholders believed that this period best represented the REDD+ activities included in the FREL submission. The Party also explained that, even though the comparison of maps from 2000 and 2015 is not an optimal approach, it was not considered problematic as the area-change estimates are based on the reference data collected. The maps were only used for stratifying the reference data, but the final estimates of AD were based on samples from the different forest classes. The decision was also based on the time and financial resources available, given that each data point interval requires a land-use change matrix to be developed. The Party further noted that its assessments indicated that the 2005 and 2010 maps did not provide consistent measuring points in relation with those of the 2000 and 2015 maps. The LULUCF experts welcomed this clarification, and informed the Party that including more data points would facilitate a better understanding of land-use and forest-change dynamics in Uganda and facilitate an assessment of the consistency between the FREL and the results in the technical annex.

27. In response to a question from the LULUCF experts, Uganda clarified that all data (images and annual maps) are or will be made publicly available on the NFMS portal.[8] The LULUCF experts commend the Party for its efforts to further develop its NFMS and enhance the transparency of forest-related information.

28. During the TA, Uganda informed the LULUCF experts that it is in the process of finalizing an updated NFI, which is expected to provide data that will help to improve the accuracy of its estimates. The LULUCF experts commend the Party for providing transparent information and continuing to improve the accuracy of its estimates.

[8] http://154.72.199.254:8008.

29. The LULUCF experts concluded that Uganda provided most of the necessary information to allow for the reconstruction of the results of the implementation of the activity reducing emissions from deforestation. The LULUCF experts noted that the Party including the supplementary information shared during the TA in future technical annexes or making such information publicly available would increase the transparency and completeness of future submissions. In addition, they noted that the data and information provided in the technical annex, in combination with the supplementary information provided, are considered to be largely transparent, partially consistent, and complete and accurate to the extent possible.

3. Consistency with the guidelines on elements to be included in the technical annex

30. Uganda provided data and information on all the required elements in accordance with the guidelines contained in the annex to decision 14/CP.19, namely summary information from the final report containing the assessed FREL; results in t CO_2/year that are partially consistent with the assessed FREL; a demonstration that the methodologies used to produce the results are partially consistent with those used to establish the assessed FREL (as outlined in paras. 14(a) and 15 above); a description of forest monitoring systems and the institutional roles and responsibilities in the MRV of the results; the information necessary for the reconstruction of the results (taking into account the supplementary information provided, as outlined in chap. II.B.2 above); and a description of how the elements contained in decision 4/CP.15, paragraph 1(c–d), have been taken into account.

31. In its submission, Uganda provided a summary table with the results of the implementation of the activity reducing emissions from deforestation for 2015–2017. The FREL value reported in this table is not consistent with the assessed FREL (see para. 21 above). However, the LULUCF experts noted that they were able to reconstruct the results in the technical annex using the supplementary information provided by the Party and the details from the FREL submission. The emission reductions achieved are listed in table 8 of the technical annex and amount to 4,035,347 t CO_2/year for the two years covered.

32. The LULUCF experts noted that Uganda provided a description of its NFMS and a summary of the institutional roles and responsibilities for the MRV of the results in the technical annex. The forest monitoring system used is a national system covering the national area of Uganda. The system uses a combination of remote sensing, ground-based forest inventory approaches and statistical methods for estimating gross emissions from deforestation. During the TA, Uganda also provided a weblink for accessing further information (see annex III). The roles and responsibilities of the agencies and institutions involved in MRV were transparently explained. The LULUCF experts commend the Party for sharing this information, and for its efforts to develop the NFMS further.

33. According to decision 11/CP.19, paragraph 4(b), the NFMS should enable the assessment of different types of forest in the country, including natural forest. During the TA, Uganda explained that the NFMS distinguishes between several natural forest classes (tropical high forests and woodlands) and plantation forest. The Party stated that it is undertaking ongoing work to enable it to assess forest degradation in different forest classes in the future. Uganda is working with several international partners to continuously improve the transparency, consistency, completeness and accuracy of the estimates produced by the NFMS, and the LULUCF experts commend the Party for its efforts in this regard.

34. As the NFMS in Uganda is national in scope, displacement of emissions is not considered an issue.

35. The Party provided a description of how IPCC guidance and guidelines were taken into account in accordance with decision 4/CP.15, paragraph 1(c). For the estimation of emission reductions in its national territory, Uganda used the methodology provided in the 2006 IPCC Guidelines for estimating carbon stocks in forest land converted to other land uses. Accordingly, the emissions from deforestation were estimated for 2015–2017 by combining AD (i.e. areas of annual deforestation) with the appropriate EF (i.e. emissions associated with the corresponding forest type).

36. Uganda included in its FREL and estimation of results the most significant pools and GHGs (i.e. CO_2 only). Overall, the exclusion of the soil organic carbon pool and non-CO_2

gases was adequately justified. The inclusion of additional carbon pools and non-CO_2 gases in future submissions remains an area for technical improvement. The LULUCF experts commend the Party for expressing its intention to obtain better information on soil organic carbon and non-CO_2 gases with the aim of including them in future FREL submissions and estimates of results as part of the stepwise approach.

4. Accuracy of the results proposed in the technical annex

37. The LULUCF experts noted that the Party's estimation of the results of the implementation of the activity reducing emissions from deforestation in the national area of Uganda was undertaken using a largely transparent and partially consistent approach. The LULUCF experts commend the Party for its significant long-term efforts to build up a robust NFMS that is capable of providing transparent and accurate estimates of emissions from deforestation that are consistent over time in accordance with decision 11/CP.19.

38. Both the established FREL and the results obtained in 2015–2017 from the implementation of the activity reducing emissions from deforestation are based on the assumption that all forest carbon is emitted immediately in the year of the deforestation event, and that the carbon densities are identical across the country for the different forest classes. Variations in carbon stocks within various forest classes (i.e. degradation and/or enhancement of forest carbon stocks in standing forest) are not considered owing to a lack of reliable data sources. The inclusion of additional REDD+ activities in the future is an area for potential future technical improvement.

39. As mentioned in paragraph 18 above, Uganda provided some information related to the QA/QC procedures established for checking the quality of the data and estimates. The LULUCF experts welcome this information and noted the correction of spelling mistakes and rounding errors in future submissions as a potential topic to be addressed in QA/QC procedures in the future (see para. 21 above).

40. Following a request for additional information on the accuracy assessment and bias-corrected area estimates, Uganda provided a document describing in detail the statistical procedure for estimating the AD for 2015–2017. The LULUCF experts noted that this procedure differed from the procedure used to generate AD for the FREL. The map of forest-area change for 2000–2015 excluded water bodies, while the map of forest-area change for 2015–2017 included water bodies, leading to an inconsistency in the generation of AD. For the estimates for 2017 in the technical annex, new methods and software were used to generate the land-use and land-cover maps (e.g. introduction of the SEPAL[9] system). In addition, the LULUCF experts noted that the total national area of Uganda is reported as 20,414,369 ha in the FREL estimates and as 24,155,307 ha in the AD for 2017 in the technical annex. Following a question from the LULUCF experts, the Party explained that the difference was most likely due to water bodies being included in the estimates for 2017 in the technical annex and not in the AD estimates for the FREL. The LULUCF experts noted that this could result in the AD estimates being inaccurate or inconsistent between the FREL and the results reported in the technical annex. Uganda responded that the different treatment of water bodies was not likely to affect the estimates of AD. While this may have impacted the maps, they were used for stratification only, and therefore this approach is expected to have only a limited impact on the sample-based estimates. However, the Party noted that it has not specifically investigated this possibility. The Party stated that it will generate future estimates of AD without including water bodies. The LULUCF experts note this as an area for future technical improvement.

41. The LULUCF experts asked whether areas that were deforested in the past, then regenerated, and later deforested again could be double counted as deforestation. Uganda explained that the NFMS currently does not enable the annual tracking of changes, but that the NFMS is continuously being developed, meaning that this could be possible in the future. The LULUCF experts commend the Party for its ongoing efforts to develop its NFMS and note this as an area for future technical improvement.

[9] SEPAL is a project of the Forestry Department of the Food and Agriculture Organization of the United Nations; see https://sepal.io/.

42. In its FREL submission, Uganda discussed differences and similarities between AD estimates produced from the NFMS and global forest-change[10] data sets, most notably on the basis of information from Hansen et al. (2013). Uganda explained that, for the reference period 2000–2015, the global data sets generally reported less forest change than the national data sets. For the results period (2015–2017), this trend seems to be reversed, with the global data sets showing an increasing trend in forest change in Uganda and the national data sets indicating a decreasing trend. Following a question from the LULUCF experts, the Party provided several possible explanations for these differences in trends. Firstly, the global data sets are likely to report cyclical harvesting in forest plantations as a forest change. Secondly, small-scale degradation and fire in woodlands are also likely to be picked up by the global data sets, despite not meeting the national definition of deforestation. Lastly, there are also differences in the spatial assessment units used for the global data sets compared with those used for national reporting.

43. In order to better understand why the estimates of tree-cover loss from the global forest-change data sets are higher than the country's deforestation estimates, Uganda evaluated its sampling points that had been identified as stable forests in more detail to determine whether some had been classified as tree-cover loss in the global forest-change data sets. Of 1,574 stable forest sample points in the AD, 49 were classified as tree loss in the global data sets. These samples were validated using Google Earth to better understand the possible cause of these differences. Of these 49 samples, 29 were classified as plantation forest and were related to temporary loss of cover through harvesting. Furthermore, the Party noted that a large number of commercial plantations were established 20 years ago, meaning that more harvesting is expected in those areas in 2015–2017 compared with preceding years. Of the remaining 20 sampling points, some showed degradation in woodland and tropical high forests due to logging and fires. According to the forest definition used by Uganda, these points still qualify as forest and are therefore classified as stable forests in the AD. The LULUCF experts noted that, while these explanations helped them to understand the differences between the data sets, it was still unclear why the observed trends varied to such an extent between the data sets and between the FREL reference period and the results period. Uganda stated that it will continue to explore the differences between national and other global data sets in the future. The LULUCF experts welcomed the additional information and encouraged the Party to continue to investigate the differences between data and trends derived from the NFMS and those derived from other data sources and include explanations in future submissions.

44. During the TA, Uganda informed the LULUCF experts that new data from the ongoing NFI are being finalized and will be used for updating the EFs, which will enable it to incorporate updated and improved EFs into future submissions of FRELs and REDD+ results. The LULUCF experts commend the Party for its efforts to improve the accuracy of EFs.

45. Uganda provided additional information related to the statistical procedure used for the accuracy assessment and the estimation of AD. The LULUCF experts commend the Party for providing this additional information and noted potential areas for future technical improvement related to this topic (see para. 40 above).

46. In addition, the Party explained that it is in the early stages of compiling more detailed information relating to forest plantations in the country with the aim of enhancing the accuracy of assessment of land-use change related to forest plantations for future REDD+ reporting (see para. 24 above).

C. Areas identified for technical improvement

47. The LULUCF experts concluded that the following areas for technical improvement identified in the report on the technical assessment of Uganda's FREL[11] also apply to the

[10] Available at http://earthenginepartners.appspot.com/science-2013-global-forest.

[11] FCCC/TAR/2017/UGA, para. 41.

provision of information on the results of the implementation of the activity reducing emissions from deforestation:

(a) Developing criteria for distinguishing between temporary loss of tree cover and deforestation;

(b) Harmonizing the minimum mapping unit at 1 ha with a view to increasing accuracy and helping to build confidence in the emission estimates;

(c) Providing additional information on how the Africover[12] data set corresponds to the 13 land-use classes in the national biomass study;

(d) Continuing to develop the necessary disaggregated AD for final land uses resulting from deforestation, and ensuring that any subsequent removals and/or emissions resulting from regeneration and/or planting in deforested areas are taken into consideration in future submissions;

(e) Disaggregating the land-use and land-use change matrix by main forest type;

(f) Updating and improving the accuracy of the AD and EFs for woodlands;

(g) Applying different root–shoot ratios to each forest type and/or forest substratum to improve the accuracy of the estimates;

(h) Further explaining the differences between information provided in the FREL submission and results reporting and information reported to other international organizations;

(i) Continuing to update and improve the accuracy of AD to further reduce uncertainties;

(j) Including emissions from deadwood;

(k) Including emissions from soils with the aim of maintaining consistency with the GHG inventory;

(l) Including emissions from forest fires in order to enhance consistency between the FREL submission and the GHG inventory, ensuring that emissions are not overestimated or underestimated;

(m) Including additional REDD+ activities in future FRELs when new, adequate data and better information become available, as part of the stepwise approach.

48. Furthermore, the LULUCF experts noted that Uganda could consider:

(a) Including more detailed descriptions of the data and methodologies used for estimating the results (see para. 19 above);

(b) Introducing additional QA/QC procedures to address spelling mistakes and rounding errors in future submissions (see para. 21 above);

(c) Producing bias-corrected area estimates for more data points in the reference period (see para. 26 above);

(d) Developing more detailed assessment procedures on the conversion of natural woodlands to forest plantations and a more detailed registry of forest plantations to ensure complete consistency between the FREL and the technical annex (see paras. 15 and 24–25 above);

(e) Improving the NFMS and the mapping methods to enable a more detailed stratification, especially for assessing and identifying forest degradation and enhancements (see para. 33 above);

(f) Including additional carbon pools and activities, such as reducing emissions from forest degradation and enhancement of forest carbon stock, in future submissions (see paras. 33 and 36 above);

[12] Details of the Africover project are available at http://www.fao.org/geospatial/projects/detail/en/c/1035404/.

(g) Further streamlining the statistical procedure, including relevant input data, that is to be applied in the generation of maps as inputs for estimating AD, and ensuring that the statistical procedure and the relevant input data are applied consistently over time (see para. 40 above);

(h) Generating AD estimates either with or without including water bodies in the forest-area change maps for both the reference and the results periods (see para. 40 above);

(i) Developing the NFMS to provide annual assessments of forest change (see para. 41 above);

(j) Continuing to investigate the differences in trends between national data and other available data sources (see para. 43 above).

D. Comments and responses of the Party

49. During the TA, Uganda noted a number of areas of capacity-building needs. Addressing those needs could potentially enable Uganda to improve its data and methodologies and include additional activities and gases in future FREL submissions. After technical exchanges with the LULUCF experts, the Party identified the following capacity-building needs:

(a) Making use of higher-resolution satellite imagery for generating AD;

(b) Remeasuring the permanent sample plots and using the data to update EFs in the future;

(c) Developing accurate methods for estimating emissions from forest degradation.

III. Conclusions

50. The LULUCF experts conclude that Uganda reported the results of the implementation of the activity reducing emissions from deforestation, which is defined as the gross emissions resulting from the transition of forest areas (tropical high forests, woodlands and plantation forests) to non-forest areas in the entire national territory of Uganda. The results include estimates of emissions of CO_2 from two carbon pools: above-ground and below-ground biomass. The results of the activity were reported using partially consistent methodologies, definitions, assumptions and information with those used for the assessed FREL.

51. The LULUCF experts consider the data and information provided in the technical annex, together with the supplementary information, to be largely transparent, partially consistent, and complete and accurate to the extent possible, and encourage the Party to include more supplementary information in future technical annexes to enhance transparency and completeness.

52. The LULUCF experts found that the data and information provided in the technical annex and the supplementary information shared with them are partially consistent with the guidelines referred to in decision 14/CP.19, paragraph 9.

53. The results are accurate to the extent possible, based on the assumptions used.

54. In conclusion, the LULUCF experts commend Uganda for showing a strong commitment to the continuous improvement of the data and information used for estimating the results, in line with the stepwise approach. Some areas for future technical improvement and capacity-building needs identified by the Party have been identified in this report. At the same time, the LULUCF experts acknowledge that such improvements are subject to national capabilities and circumstances, and note the importance of adequate and predictable support.[13] The LULUCF experts also acknowledge that the TA process was an opportunity for a facilitative and constructive technical exchange of views and information with Uganda.[14]

[13] In accordance with decision 2/CP.17, para. 57.

[14] In accordance with decision 14/CP.19, paras. 12–13.

Annex I

Technical annex to the biennial update report

Owing to the complexity and length of the submitted technical annex to the BUR, and in order to maintain the original formatting, the technical annex is not reproduced here. It is available on the UNFCCC website at https://unfccc.int/BURs.

Annex II

Summary of the main features of the proposed results of the implementation of the activities referred to in decision 1/CP.16, paragraph 70, based on information provided by Uganda

Key elements		*Remarks*
Results reported	4 035 347 t CO_2/year	Uganda submitted its technical annex in April 2020 (see para. 9 of this document)
Results period	2015–2017	See paragraph 9 of this document
Assessed FREL	8 254 691 t CO_2/year	Uganda submitted its proposed FREL in January 2017, followed by a modified version of its proposed FREL, based on technical inputs from the TA, on 30 April 2018 (available at https://redd.unfccc.int/submissions.html?country=uga) (see para. 8 of this document)
Reference period	2000–2015	See paragraph 9 of this document
National/subnational	National	See paragraph 8 of this document
Activity included	Reducing emissions from deforestation	The FREL and results reported only include gross emissions from deforestation resulting from the conversion of forests to other land uses and exclude any subsequent emissions and removals from the deforested areas (see para. 38 of this document)
Pools included	Above-ground biomass Below-ground biomass	There is a lack of accurate data on the omitted pools; plans are in place to provide data on deadwood and soils in the future (see para. 36 of this document)
Gas included	CO_2	Although non-CO_2 emissions were estimated for the latest national GHG inventory, they were not included in the FREL or results reporting, as they were deemed to be not significant and the available data were not sufficiently accurate (see paras. 20 and 36 of this document)
Consistency between assessed FREL and the results	Methods, definitions and information used for the assessed FREL are partially consistent with those used for the results	Uganda used partially consistent methods for generating AD and EFs for the FREL and the results reporting. Some questions regarding the consistent application of these methods were raised during the technical assessment (see paras. 15–17 of this document)
Description of NFMS and institutional roles	Included	See paragraphs 32–34 of this document
Identification of future technical improvements	Included	Several areas for future technical improvement were identified (see paras. 47–48 of this document)

Annex III

Documents and information used during the technical analysis

A. Reference documents

Alder D, Drichi P and Elungat D. 2003. *Yields of Eucalyptus and Caribbean Pine in Uganda.* Kampala: Uganda Forest Resources Management and Conservation Programme.

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"Guidelines for elements to be included in the technical annex referred to in decision 14/CP.19, paragraph 7". Annex to decision 14/CP.19. Available at https://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf.

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Hansen M, Potapov P, Moore R, et al. 2013. High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science*. 342(6160): pp.850–853.

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Forest Department of the Ministry of Water, Lands and Environment of Uganda. 2002. *National Biomass Study – Technical Report*. (unpublished report).

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Original and modified FREL submissions of Uganda. Available at https://redd.unfccc.int/submissions.html?country=uga.

Report on the TA of the proposed FREL of Uganda submitted in 2017. FCCC/TAR/2017/UGA. Available at https://unfccc.int/sites/default/files/resource/uga.pdf.

B. Other documents

The following references have been reproduced as received:

Ministry of Water and Environment, Uganda and the United Nations Food and Agriculture Organization. 2018 (update). *Field Manual: National Forest Inventories for FRELs/FRLs Uganda REDD+ Programme.* Information on QA/QC procedures. (unpublished report).

National Forestry Authority, Ministry of Water and Environment, Uganda. 2019. *Reference Data Collection Protocol for Land Use/Land Cover 2015–2017 Using High-resolution Imagery*. (unpublished report).

National Forestry Authority, Ministry of Water and Environment, Uganda. 2019. *Accuracy Assessment and Area Estimation of Forest Change 2015–2017*. (unpublished report).
Uganda's National Forest Monitoring System Portal. Available at http://154.72.199.254:8008.