



Technical report on the technical analysis of the technical annex to the fourth biennial update report of Brazil submitted in accordance with decision 14/CP.19, paragraph 7, on 31 December 2020

Summary

This technical report covers the technical analysis of the technical annex on the Cerrado biome submitted on a voluntary basis, in the context of results-based payments, by Brazil on 31 December 2020 through its fourth 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 subnational territorial forest area of the Cerrado biome as the assessed forest reference emission level (FREL) proposed by Brazil in its modified FREL submission of May 2017.

Brazil reported the results of implementing this activity for 2018–2020, which amount to 697,486,485 tonnes of carbon dioxide equivalent and were measured against the assessed FREL of 335,540,289 tonnes of carbon dioxide equivalent per year.

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 Brazil in the technical annex are transparent and consistent with the data and information used for establishing the assessed FREL 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
C	carbon
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
EF	emission factor
FREL	forest reference emission level
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
N ₂ O	nitrous oxide
NFI	national forest inventory
NFMS	national forest monitoring system
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)
TA	technical analysis
TTE	team of technical experts

I. Introduction

A. Introduction

1. This technical report covers the TA of the technical annex provided by Brazil on 31 December 2020 on the Cerrado biome in accordance with decision 14/CP.19, paragraph 7, included in its fourth BUR, which was submitted in accordance with decision 2/CP.17, paragraph 41(a), and annex III, paragraph 19. In the technical annex, Brazil provided the data and information used for estimating its anthropogenic forest-related emissions by sources and removals by sinks, forest carbon stocks, and changes in forest carbon stock and forest area resulting from implementing 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 Dirk Nemitz (secretariat).

2. In this context, Brazil underlined that the submission of the technical annex through its fourth BUR does not modify, revise or adjust in any way the nationally appropriate mitigation actions voluntarily submitted by Brazil in accordance with document FCCC/AWGLCA/2011/INF.1, or interfere with its nationally determined contribution under the Paris Agreement.

3. The TA of the technical annex on the Cerrado biome 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 Brazil and through a facilitative sharing of views, resulting in a separate summary report.¹

4. Brazil made its FREL submission, in accordance with decision 12/CP.17, on 6 January 2017, 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 fourth 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

5. Brazil previously submitted a technical annex to its third BUR on 3 March 2019. The outcome of the TA thereof is contained in document FCCC/SBI/ICA/2019/TATR.4/BRA. Previous FREL submissions, BURs with technical annexes and associated technical assessment and analysis reports for the Party are available online.³

B. Process overview

6. The TA of the fourth BUR of Brazil took place from 28 June to 2 July 2021 as a desk analysis⁴ 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: Charles Asumana Sr. (Liberia), Irina Atamuradova (former member of the Consultative Group of Experts from Turkmenistan), Diana Barba (Colombia), Pierre Brender (United Kingdom of Great Britain and Northern Ireland), Paulo Cornejo (Chile), Patience Thelma Melfah Dampsey (former member of the Consultative Group of Experts from Ghana), Elsa Hatanaka (Japan), Benise Nissa Joseph (Saint Lucia), Brittany Meighan (Belize), Walter Oyhantcabal (Uruguay), Marieke Sandker (Netherlands), John Steller (United States of America), Hartley Walimwipi (Zambia), Jongikhaya Witi (South Africa) and Brian Zutta (Peru). Mr. Steller and Mr. Witi were the co-leads. Ms. Sandker and Mr. Zutta were the LULUCF experts who undertook the TA of the technical annex on the Cerrado biome in accordance with decision 14/CP.19, paragraphs 10–13.

¹ FCCC/SBI/ICA/2021/TASR.4/BRA.

² FCCC/TAR/2017/BRA published on 31 August 2017.

³ <https://redd.unfccc.int/submissions.html?country=bra>.

⁴ Owing to the circumstances related to the coronavirus disease 2019, the TA of the fourth BUR submitted by Brazil had to be conducted remotely.

7. The TA of the technical annex provided by Brazil on the Cerrado biome 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.

8. During the TA and subsequent exchanges, the LULUCF experts and Brazil engaged in technical discussions, and Brazil provided clarifications in response to 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.

9. Following the TA of the technical annex, the LULUCF experts prepared and shared the draft technical report with Brazil for its review and comments. The LULUCF experts responded to the Party's comments and incorporated them into and finalized this technical report in consultation with Brazil.

C. Summary of results

10. 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, Brazil, on a voluntary basis, proposed a subnational 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 Brazil's Cerrado biome, which covers an area of 2,036,448 km², comprising up to 24 per cent of the national territory and 27 per cent of the country's total forest land. Around 65 per cent of the biome contains forest formations. The assessed FREL of Brazil for the Cerrado biome is 335,540,289 t CO₂ eq/year.

11. The Party's FREL is based on its annual average historical CO₂ emissions associated with the activity reducing emissions from deforestation in the Cerrado biome for the historical reference period 2000–2010.⁵ Brazil also submitted FRELs for the Amazon biome for the historical reference periods 1996–2005, 1996–2010 and 1996–2015. The LULUCF experts noted that the reference and validity periods of the subnational FRELs differ, with any attempt to harmonize the periods resulting in lower estimated emission reductions. In response, Brazil indicated its intention to submit a national FREL covering all of its biomes in the near future, with harmonized reference and validity periods. The LULUCF experts commend Brazil for this intention.

12. Brazil reported the results of implementing the activity reducing emissions from deforestation for 2018–2020, calculated against the FREL, which amount to emission reductions of 232,957,994 t CO₂ eq for 2018, 237,138,558 t CO₂ eq for 2019 and 227,389,933 t CO₂ eq for 2020, or 697,486,485 t CO₂ eq for the three years combined. The exact results period runs from October 2017 to September 2020; that is, 2018 corresponds to October 2017 to September 2018, etc. The LULUCF experts noted that the average CO₂ emissions were 221.6 t CO₂/ha over the reference period and 193.9, 191.4 and 185.6 t CO₂/ha, respectively, over the results period. Overall, 18 per cent of the decrease in emissions can be attributed to the deforestation of lower-carbon forest types, and 82 per cent to a reduction in the deforested area.

13. Brazil submitted its first FREL for the Cerrado biome for technical assessment in 2017.⁶ The assessed FREL was 335,540,289 t CO₂ eq/year for the 10-year reference period 2000–2010. Measured against this value, Brazil also submitted results amounting to 1,237,996,004 t CO₂ eq for 2011–2017 (seven years in total), which were assessed in 2019.⁷

⁵ Each AD year runs from October to September of the following year.

⁶ See document FCCC/TAR/2017/BRA.

⁷ See document FCCC/SBI/ICA/2019/TATR.4/BRA.

II. Technical analysis of the information reported in the technical annex

A. Technical annex

14. For the technical annex on the Cerrado biome to the fourth BUR submitted by Brazil, see annex I.⁸

B. Technical analysis

15. 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) The methodologies, definitions, comprehensiveness and information provided are consistent between the assessed FREL and the results of implementing 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.

16. The remainder of this chapter presents the results of the TA of the technical annex on the Cerrado biome to the Party's fourth BUR according to the scope outlined in paragraph 15 above.

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

17. In accordance with decision 14/CP.19, paragraph 3, the data and information used by a Party for estimating its anthropogenic forest-related emissions by sources and removals by sinks, forest carbon stocks, and changes in forest carbon stock and forest area resulting from implementing REDD+ activities should be transparent and consistent over time and with the data and information used for establishing its FREL in accordance with decision 1/CP.16, paragraph 71(b–c), and decision 12/CP.17, section II.

18. The LULUCF experts noted that Brazil ensured consistency between its assessed FREL and estimated results of implementing the activity reducing emissions from deforestation in 2018–2020 by:

(a) Using consistent methodologies and data to generate AD on gross deforestation, such as a minimum mapping unit of 1 ha and a visual interpretation scale of 1:75,000 from Landsat class satellite data. The AD were generated under the Brazilian Biomes Environmental Monitoring Program of the National Institute for Space Research;

(b) Using consistent methodologies and data to generate EFs, in particular using the same 23 forest types (phytophysionomies) within the same forest formations. The same polygons delimiting forest types were used in conjunction with newly detected deforestation polygons to estimate emissions;

(c) Covering the same four carbon pools: above-ground biomass, below-ground biomass, deadwood and litter;

(d) Covering the same gases: CO₂, CH₄ and N₂O, with non-CO₂ emissions only considered for fires associated with deforestation;

(e) Covering the same area: the Cerrado biome;

⁸ In accordance with decision 14/CP.19, para. 14(a).

(f) Considering carbon stock from the carbon pools to be lost immediately at the time of conversion, resulting in estimates of gross emissions only for a given AD year (from October to September of the following year);

(g) Using the same forest definition, namely a minimum area of 0.5 ha, minimum height of 5 m and minimum canopy cover of 10 per cent, and applying the same minimum mapping unit of 1 ha.

19. The LULUCF experts noted slight differences in the methodologies and data used to develop AD. The FREL was based on biennial data for 2000–2010, while the assessment of the results was based on annual data for 2018–2020.

20. In view of the above, the LULUCF experts concluded that the results presented of implementing the activity reducing emissions from deforestation are consistent with the assessed FREL. The LULUCF experts commend Brazil for ensuring consistency of data and methodologies between the FREL submission for 2000–2010 and the technical annex with the results of implementing the activity reducing emissions from deforestation for 2018–2020.

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

21. As part of the TA process, Brazil provided additional information, in particular geospatial information for reconstructing the 2000–2010 and 2018–2020 AD periods, worksheets for estimates of emissions from deforestation and fires associated with deforestation, geospatial data on forest types and information on assessing the overall accuracy of deforestation data (see para. 27 below). The LULUCF experts commend Brazil for its efforts to increase the transparency and ensure the completeness⁹ of the data and information provided, thus allowing for reconstruction of the results.

22. 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 team assessing Brazil's FREL noted that the Party maintained consistency in terms of sources of AD and EFs with those used for the GHG inventory included in its third national communication.¹⁰ The LULUCF experts noted that this is also true for the estimated results of implementing the activity reducing emissions from deforestation for 2018–2020.

23. In response to a question from the LULUCF experts, Brazil clarified that, as in previous years, all data (images, annual maps and emission data) pertaining to its FREL and results will be made publicly available, which will enable stakeholders to reconstruct annual increments of forest stocks. The Party stated that it is updating its digital data repository and developing an information hub to facilitate public access to MRV and other REDD+ information. The LULUCF experts commend Brazil for providing transparent information.

24. The LULUCF experts noted that the AD used for constructing the FREL and estimating the results were consistent. The AD were calculated using the same methodology, using the Landsat platform available at the time, which is a common approach to time series analysis going back to 2000. AD for the reference period (2000–2010) were derived from images from Landsat 5, 7 and 8 and ResourceSat-2, while Landsat 8 images were used for the results period (2018–2020). The Party stated that, for both periods, images from China–Brazil Earth Resources Satellites 4 and 4A were used as a complementary source of cloud-free images. In addition, although the FREL was generated using biennial data, the LULUCF experts noted that developing annual data for the results period was reasonable and would not have contributed to significantly overestimated or underestimated emissions.

25. The LULUCF experts find the EFs used in constructing the FREL and estimating the results to be consistent. The same 23 forest types and values were used for both, with consistent geospatial distribution.

⁹ "Complete" here means including the information necessary for reconstructing the results.

¹⁰ Available at <https://unfccc.int/documents/66129>.

26. Brazil did not consider regrowth after deforestation in estimating the results or constructing its FREL. In both cases, the Party considered carbon stock from the four carbon pools of above-ground biomass, below-ground biomass, deadwood and litter to be lost immediately at the time of conversion, resulting in estimates of gross emissions from deforestation only.

27. In response to questions from the LULUCF experts regarding available uncertainty analyses for the results period, the Party provided a peer-reviewed scientific article by Parente et al. (2021), co-authored by the National Institute for Space Research, which took a sample-based approach to assessing the accuracy of deforestation data from the national deforestation monitoring system for the Cerrado biome until 2018. The assessment indicates an overall accuracy of 93.17 ± 0.89 per cent for the classification of anthropic and natural (vegetation) classes for 2018 and high user and producer accuracies for these classes with values of >90 per cent. The LULUCF experts commend Brazil for these results, but note that the user and producer accuracies for deforestation would be more informative for assessing the accuracy of the AD and thus of the results reported. The LULUCF experts also note the quantification of uncertainties related to the AD used for the FREL and the results as an area for future technical improvement.

28. The LULUCF experts noted that the scientific article by Parente et al. (2021) assessed sample-based estimates for deforestation area and compared these with estimates from the national deforestation monitoring system. This comparison showed that, while the estimates were very similar for 2005 onward, those derived from the national deforestation monitoring system were approximately twice as large as the sample-based estimates for 2000–2004. This is explained as being likely due to the first years of the national deforestation monitoring system assessment including deforestation events that happened before 2000, resulting in the deforestation area being overestimated for 2000–2004. The LULUCF experts also noted that the deforestation area estimates derived by Parente et al. (2021) from the national deforestation monitoring system are generally higher than those included in the FREL. Brazil explained that the scientific article includes loss of natural vegetation in its estimates, while the FREL includes loss of natural forest only. The LULUCF experts further noted that, on the basis of the information shared by Brazil, it appears that deforestation area was overestimated for the FREL and, as a result, that the results for 2018–2020 assessed against the FREL were also overestimated. If the deforestation area used for the FREL is indeed twice the actual deforestation area, and in turn the associated estimated emissions for 2000–2004 in the FREL are twice the actual emissions, this would mean the REDD+ results for 2018–2020 were overestimated by approximately 40 per cent. The LULUCF experts note the improvement of the accuracy of the deforestation area estimates used for the FREL to avoid overestimating the results as an area for future technical improvement.

29. Brazil indicated that it has been implementing an NFI since 2005. The LULUCF experts asked Brazil whether the preliminary results from the inventory can be shared, while acknowledging that these results could not have been used in estimating the results so as to maintain full consistency with the FREL and the third national communication. The Party shared a report submitted by the Government of Brazil to the Food and Agriculture Organization of the United Nations (2020), which contains preliminary findings from the NFI. The LULUCF experts noted that, for 21 of the 23 forest types, the above-ground biomass values in the NFI were lower than those used in constructing the FREL and estimating the results (2.5–54.8 t C/ha in the NFI compared with 9.4–160.2 t C/ha in the FREL/REDD+ assessment). The LULUCF experts commend Brazil for its intention to use NFI data for a future national FREL submission in order to avoid overestimating emissions and emission reductions.

30. The LULUCF experts concluded that Brazil provided the information necessary for reconstructing the results of implementing the activity reducing emissions from deforestation. The data and information provided in the technical annex are considered to be transparent, consistent and complete to the extent possible. The LULUCF experts identified a few areas for technical improvement associated with the accuracy of the data and information provided (see paras. 27–28 above).

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

31. Brazil 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 CO₂ eq/year, consistent with the assessed FREL; a demonstration that the methodologies used to produce the results are consistent with those used to establish the assessed FREL (as outlined in chap. II.B.1 above); a description of forest monitoring systems and institutional roles and responsibilities in MRV of the results; the information necessary for reconstructing the results (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.

32. Brazil provided a summary table with the results of implementing the activity reducing emissions from deforestation for 2018–2020, which are consistent with the assessed FREL, thus allowing for reconstruction of the results. The emission reductions achieved are listed in table 2 of the technical annex and amount to 697,486,485 t CO₂ eq for the three years covered.

33. The LULUCF experts noted that Brazil provided a description of the NFMS and a transparent summary of the roles and responsibilities of the agencies and institutions involved in MRV of the results in the technical annex, together with weblinks for accessing further information. During the consultation process, Brazil explained that the NFMS will cover all biomes in the national territory, namely the Amazon, Atlantic Forest, Caatinga, Cerrado, Pampa and Pantanal, by 2022 as part of the Party's plan to facilitate monitoring at the national level. The LULUCF experts commend Brazil for sharing this information.

34. The current forest monitoring system is a subnational system covering the Amazon and Cerrado biomes. Annual deforestation data from satellite imagery are assessed, using systematic visual interpretation for the Cerrado biome and a similar methodology for the Amazon biome, under the direction of the Brazilian Biomes Environmental Monitoring Program. Notably, there is a minimum mapping unit of 1 ha for the Cerrado biome compared with 6.25 ha for the Amazon biome. An assessment of the system's deforestation data for 2018 points to high overall mapping accuracy but shows that the deforestation area was overestimated by the national deforestation monitoring system PRODES for 2000–2004 (see para. 28 above).

35. 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 consultation process, Brazil explained that its subnational forest monitoring system will be scaled up to an NFMS by 2022 to cover all forest in the country.

36. According to decision 1/CP.16, paragraph 71(c), footnote 7, subnational monitoring and reporting should include monitoring and reporting emission displacement at the national level, if appropriate, and reporting on how the displacement of emissions is being addressed and on the means of integrating subnational monitoring systems into a national monitoring system. The Party stated that efforts are being made to expand its forest monitoring system, as the current available data may not be sufficient to monitor potential displacement to other biomes (i.e. Atlantic Forest, Caatinga, Pampa and Pantanal). In addition, it explained that, on the basis of its current understanding and acknowledgement of deforestation pressure on the biomes, it has launched the national Plan for the Control of Illegal Deforestation and Recovery of Native Vegetation and developed an environmental service incentive programme for conservation and recovery of native vegetation called Floresta+. Constructing a national FREL, which would support the development of a reliable time series for all biomes, would help the Party to obtain findings on the displacement of emissions, considering that this is a complex issue and dependent on many factors. The Party noted that the Green Climate Fund REDD+ pilot programme, a results-based payment project, will further support its MRV process and enhancing its NFMS.

37. The LULUCF experts assessing the reported results for the Cerrado biome for 2011–2017 suggested that the main risk of displacement of emissions in Brazil is from the Amazon to the Cerrado as a result of the soy moratorium in 2006 and the zero-deforestation cattle agreements in 2009 (see document FCCC/SBI/ICA/2019/TATR.4/BRA, para. 30). On the

basis of the available information, the LULUCF experts assessing the reported results for 2018–2020 noted that, so far, there is no evidence of displacement of emissions.

38. Brazil provided a description of how IPCC guidance and guidelines were taken into account in accordance with decision 4/CP.15, paragraph 1(c). For estimating emission reductions in the Cerrado biome, Brazil used the methodology provided in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* for estimating carbon stocks in forest land converted to other land uses. Accordingly, the emissions from deforestation were estimated for 2018–2020 by combining AD (i.e. areas of annual deforestation) with the appropriate EF (i.e. emissions associated with the corresponding forest type).

39. In constructing its FREL and estimating the results, Brazil covered the most significant pools and non-CO₂ GHGs from burning on deforested land. The exclusion of the soil organic carbon pool was adequately justified and has been identified as an area for future technical improvement of the FREL.

40. The Party included in its FREL and estimation of results the activity reducing emissions from deforestation. In response to a question on information and data available on forest degradation, Brazil indicated that no data were available owing to the challenging nature of assessing forest degradation in the Cerrado biome given its biophysical characteristics (sparse vegetation and open forests). Brazil indicated in its FREL submission (see document FCCC/TAR/2017/BRA, para. 21) that forest fires occur frequently in the Cerrado biome. The LULUCF experts note the inclusion of emissions from forest degradation as an area for future technical improvement.

4. Accuracy of the results proposed in the technical annex

41. The LULUCF experts noted that the Party estimated the results of implementing the activity reducing emissions from deforestation in the Cerrado biome using a transparent and consistent approach. They commend Brazil for its significant long-term efforts to build up a robust NFMS that is capable of providing transparent estimates of emissions from deforestation.

42. The LULUCF experts noted, on the basis of recent information made available by Brazil (Parente et al., 2021; and preliminary results from the NFI), that the AD and EFs used for the FREL and the results may have resulted in emissions and emission reductions being overestimated (see paras. 28–29 above).

43. Both the established FREL and the results obtained for 2018–2020 from implementing the activity are based on the assumption that all carbon stock from all carbon pools included in the analysis is lost immediately at the time of conversion to another land use (see para. 26 above), resulting in estimates of gross emissions, and not removals, for the year of the deforestation event. The LULUCF experts note the estimation of emissions from net deforestation as an area for future technical improvement.

44. The deforestation event year is from October to September of the following year. Once an area has been deforested, it is marked and not quantified as a deforestation area again, preventing it from being accounted for again. Brazil explained that any loss of natural forest is included in the deforestation estimate, including temporary tree cover loss for land that remains under a forest land use. The minimum area for defining forest is 0.5 ha while the minimum mapping unit for assessing deforestation is 1 ha. All deforested land is assumed to be burned for estimating non-CO₂ emissions. The LULUCF experts note the full alignment of the assessment with the forest definition, that is using the same minimum area threshold and excluding tree cover loss from the assessment where the land use remains forest land, as an area for future technical improvement.

45. As mentioned in paragraphs 27–28 above, Brazil provided some information related to the analysis of uncertainty of AD for the Cerrado biome for 2018, and sample-based area estimates of deforestation for 2000–2018 as well as previous years outside the scope of the submitted FREL. The LULUCF experts noted that the current submission does not contain an uncertainty analysis for the AD and EFs used for constructing GHG estimates or for the results period 2018–2020. Therefore, the cumulative effects of the uncertainty on the

accuracy of the results of implementing the activity reducing emissions from deforestation could not be assessed. The LULUCF experts note this as an area for future technical improvement.

C. Areas identified for technical improvement

46. The LULUCF experts concluded that the following areas for technical improvement identified in the report on the technical assessment of Brazil's FREL also apply to the provision of information on the results of implementing the activity reducing emissions from deforestation:

- (a) Quantifying uncertainties for the AD, EFs and emission estimates used for the FREL and the results (see paras. 27 and 45 above);
- (b) Exploring the possibility of including the soil organic carbon pool (see para. 39 above);
- (c) Including emissions from forest degradation caused by forest fires (see para. 40 above);
- (d) Estimating emissions from net deforestation (see para. 43 above).

47. Furthermore, the LULUCF experts concluded that the following areas for technical improvement identified in the report on the technical assessment of Brazil's results for 2011–2017 also apply to the technical annex being analysed:

- (a) Providing more information on the data integration process (see document FCCC/SBI/ICA/2019/TATR.4/BRA, para. 19);
- (b) Using the carbon fraction of 0.37 t C/t dry matter or country-specific data for litter, as provided in the 2006 IPCC Guidelines (vol. 4, chap. 2) (see document FCCC/SBI/ICA/2019/TATR.4/BRA, para. 31).

48. In addition, the LULUCF experts would like to note the following areas for technical improvement:

- (a) Improving the accuracy of the AD and EFs used for estimating emissions for the FREL and the results (see paras. 28–29 above);
- (b) Aligning the assessment with the forest definition, that is using the same minimum area threshold and excluding tree cover loss from the assessment where the land use remains forest land (see para. 44 above).

49. The LULUCF experts acknowledge and welcome Brazil's intention to:

- (a) Submit a national FREL to cover its entire forest area, allowing for better assessment of eventual emission displacement and consolidation of results across biomes (see para. 11 above);
- (b) Improve the EFs used when data from the NFI become available and are incorporated into the national GHG inventory (see para. 29 above).

D. Comments and responses of the Party

50. During the consultation process, Brazil noted a number of areas of capacity-building needs. Addressing those needs could enable Brazil to improve its data and methodologies, move from subnational to national coverage and include additional activities and gases in future FREL submissions. After exchanges with the LULUCF experts, Brazil identified the need to ensure adequate training of the national LULUCF experts on MRV under the UNFCCC.

III. Conclusions

51. The LULUCF experts conclude that Brazil reported the results of implementing the activity reducing emissions from gross deforestation by following a subnational approach covering the Cerrado biome, which represents about 24 per cent of the national territory. The results include estimates of emissions of CO₂, CH₄ and N₂O from four carbon pools (i.e. above-ground biomass, below-ground biomass, litter and deadwood) from deforestation of a minimum mapping unit of 1 ha for 2018–2020. The results of the activity were estimated and reported using methodologies, definitions, assumptions and information that are consistent with those used for constructing the assessed FREL.

52. The LULUCF experts consider the data and information provided in the technical annex to be transparent, consistent and complete. A few areas for future technical improvement were identified in relation to the accuracy of the data and information provided.

53. The LULUCF experts find the data and information provided in the technical annex to be consistent with the guidelines referred to in decision 14/CP.19, paragraph 9.

54. The LULUCF experts note that Brazil has initiated a number of programmes for assessing and preventing possible displacement of emissions while taking steps to launch a NFMS by 2022 to cover all forests in the national territory and support national reporting.

55. In conclusion, the LULUCF experts commend Brazil for showing strong commitment to continuously improving the data and information used for calculating the results, in line with the stepwise approach, which are consistent with those used for constructing its assessed FREL. Some areas for future technical improvement and capacity-building needs identified by Brazil 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.¹¹ The LULUCF experts also acknowledge that the TA process was an opportunity for a facilitative and constructive technical exchange of views and information with Brazil.¹²

¹¹ As per decision 2/CP.17, para. 57.

¹² As per 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 has not been reproduced here. It is available on the UNFCCC website at <https://unfccc.int/BURs>.

Annex II

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

	<i>Key elements</i>	<i>Remarks</i>
Results reported	232 957 994 t CO ₂ eq for 2018 237 138 558 t CO ₂ eq for 2019 227 389 933 t CO ₂ eq for 2020	The results were assessed on an annual basis, while the FREL assessment was based on biennial data (see para. 19 of this document)
Results period	2018–2020	The exact results period runs from October 2017 to September 2020 (see para. 12 of this document)
Assessed FREL	335 540 289 t CO ₂ eq/year	See paragraph 10 of this document
Reference period	2000–2010	–
National/subnational	Subnational	The results cover the Cerrado biome, which is about 2 036 448 km ² , around 65 per cent of which contains forest formations and is taken into account in the FREL
Activity included	Reducing emissions from deforestation	Considering gross deforestation only and using a minimum mapping unit of 1 ha. Once an area has been deforested, it is marked and not taken into account in subsequent deforestation estimates. Temporary tree cover loss is included in the deforestation estimate (see para. 44 of this document)
Pools included	Above-ground biomass Below-ground biomass Deadwood Litter	See paragraphs 26 and 43 of this document
Gases included	CO ₂ , CH ₄ , N ₂ O	Non-CO ₂ emissions are considered for fires associated with deforestation. All deforested land is assumed to be burned. Non-CO ₂ emissions from forest fires that result in forest degradation are not included
Consistency with assessed FREL	Methods, definitions and information used for the assessed FREL are consistent with those used for the results	See paragraphs 18, 20, 23, 24, 25, 26, 41 and 48 of this document
Description of NFMS and institutional roles	Included	See paragraphs 33 and 51 of this document
Identification of future technical improvements	Included	Several areas for future technical improvement have been identified (see para. 46 of this document)

Annex III

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpگلulucf/gpگلulucf.html>.

B. UNFCCC documents

First and modified FREL submissions of Brazil. Available at <https://redd.unfccc.int/submissions.html?country=bra>.

“Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels”. Annex to decision 13/CP.19. Available at <https://unfccc.int/sites/default/files/resource/docs/2013/cop19/eng/10a01.pdf#page=36>.

“Guidelines for submissions of information on reference levels”. Annex to decision 12/CP.17. Available at <https://unfccc.int/sites/default/files/resource/docs/2011/cop17/eng/09a02.pdf#page=19>.

Report on the technical assessment of the proposed FREL of Brazil submitted in 2017. FCCC/TAR/2017/BRA. Available at <https://unfccc.int/sites/default/files/resource/bra.pdf>.

C. Other documents

The following references have been reproduced as received:

Parente L, Nogueira S, Baumann L, Almeida C, Maurano L, Gomes Affonso A, Ferreira L. Quality assessment of the PRODES Cerrado deforestation data. *Remote Sensing Applications: Society and Environment* 21 (2021) 100444.

FAO 2020. Brazil report submitted to the Global Forest Resources Assessment 2020. Food and Agriculture Organization of the United Nations, Rome <http://www.fao.org/3/ca9976en/ca9976en.pdf>.
