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Technical report on the technical analysis of the technical annex to the third biennial update report of Brazil submitted in accordance with decision 14/CP.19, paragraph 7, on 2 March 2019

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 Brazil on 2 March 2019 through its third 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 as the assessed forest reference emission level (FREL) for the Amazon biome proposed by Brazil in its FREL C submission of 15 January 2018.

Brazil reported the results of the implementation of this activity for 2016–2017, which amount to 769,000,872.94 tonnes of carbon dioxide and were measured against the assessed FREL of 751,780,503.37 tonnes of carbon dioxide per year for 1996–2015.

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 Brazil in the technical annex are transparent and 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.

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Contents

Abbreviations and acronyms

AD	activity data
BUR	biennial update report
CO_2	carbon dioxide
EF	emission factor
FREL	forest reference emission level
GHG	greenhouse gas
INPE	Brazilian National Institute for Space Research
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
NFMS	national forest monitoring system
PRODES	Program for Monitoring Deforestation of the Amazon by Satellite
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 2 March 2019 in accordance with decision 14/CP.19, paragraph 7, included in the third BUR of Brazil, 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 forest carbon stock and forest area changes resulting from the implementation of REDD+ activities in the Amazon biome. 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. In this context, Brazil underlined that the submission of the technical annex through its third BUR is voluntary and exclusively for the purpose of obtaining and receiving results-based payments for its REDD+ actions, pursuant to decisions 13/CP.19, paragraph 2, and 14/CP.19, paragraphs 7–8. Brazil noted that its submission does not modify, revise or adjust in any way the nationally appropriate mitigation action voluntarily submitted by the Party under the Bali Action Plan, nor does it interfere with achieving its nationally determined contribution under the Paris Agreement.

3. 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 Brazil and through a facilitative sharing of views, resulting in a separate summary report.[1]

4. Brazil made its third FREL submission (FREL C), in accordance with decision 12/CP.17, on 15 January 2018, which was subject to a technical assessment following the guidance provided in decision 13/CP.19 and its annex. As a result of the facilitative exchange with the assessment team during the technical assessment, Brazil provided a modified submission of its proposed FREL C on 28 May 2018.[2] The assessed FREL C was included as one of the elements of the technical annex to its third 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.[3]

5. Brazil previously submitted technical annexes to its first BUR (with results based on its first FREL (FREL A)) on 31 December 2014 and to its second BUR (with results based on its second FREL (FREL B)) on 3 March 2017. The outcomes of the TA thereof are contained in documents FCCC/SBI/ICA/2015/TATR.1/BRA and FCCC/SBI/ICA/2017/TATR.2/BRA (see para. 12 below). Previous submissions of the Party's FREL, BURs with technical annexes and associated technical assessment and analysis reports are available online.[4]

B. Process overview

6. The TA of the third BUR of Brazil took place from 2 to 8 September 2019 in Bonn 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: Ruleta Camacho Thomas (Antigua and Barbuda), Ana-Maria Danila (European Union), Andres B. Espejo (Spain), Mahendra Kumar (Fiji), Julius Madzore (Zimbabwe), Neranda Maurice-George (Saint Lucia), Engin Mert (Turkey), José María Michel Fuentes (Mexico), Elizabeth Philip (Malaysia), Verica Taseska Gjorgievska (North Macedonia) and Harry Vreuls (Netherlands).

[1] FCCC/SBI/ICA/2019/TASR.3/BRA. Available at https://unfccc.int/documents/230931.
[2] The original and modified submissions are available at https://redd.unfccc.int/submissions.html?country=bra.
[3] FCCC/TAR/2018/BRA, published on 12 July 2019.
[4] https://redd.unfccc.int/submissions.html?country=bra.

Ms. Philip and Mr. Vreuls are the LULUCF experts who undertook the TA of the technical annex in accordance with decision 14/CP.19, paragraphs 10–13.

7. The TA of the technical annex provided by Brazil 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 the questions raised by the LULUCF experts, in order to reach a common understanding on the identification of areas for technical improvement and capacity-building needs. As a result of the facilitative interactions with the LULUCF experts during the TA, Brazil submitted a modified version of its technical annex on 4 October 2019, which took into consideration the technical input from the experts.[5]

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. This technical report on the TA of the technical annex was prepared in the context of the modified technical annex submission. 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, paragraph 10, Brazil, on a voluntary basis, made a second submission for the Amazon biome that contained an updated subnational FREL C covering the activity reducing emissions from deforestation for the purpose of a technical assessment in accordance with decision 13/CP.19 and its annex (see para. 4 above). The activity is being implemented in the subnational territory of the Amazon biome, which covers an area of 4,197,000 km^2, comprising up to 49.29 per cent of the national territory. The assessed FREL C of Brazil is 751,780,503.37 t CO_2/year. Brazil's FREL C is based on a dynamic mean of CO_2 emissions[6] associated with gross deforestation in the Amazon biome for the historical reference period 1996–2015. The Party noted that, for this FREL C submission, it took into consideration the improvements suggested by the assessment team for the first proposed FREL in 2014, as part of the country's efforts to continuously improve the transparency and clarity of its submissions.

11. Brazil reported the results of implementing the REDD+ activity reducing emissions from deforestation, calculated against the assessed FREL C, which amount to emission reductions of 377,344,006.03 and 391,656,866.92 t CO_2 for 2016 and 2017, respectively, and a total of 769,000,872.94 t CO_2 (see table 2 of the modified technical annex).

12. In addition, Brazil submitted its first FREL for the Amazon biome for a technical assessment in 2014.[7] The assessed FREL A (1996–2005) and FREL B (1996–2010), as contained in its modified first submission, were 1,106,027,617 and 907,959,466 t CO_2, respectively. Thereafter, Brazil also submitted results measured against these FRELs, which amounted to emission reductions of 2,971.02 Mt CO_2 for 2006–2010 (assessed in 2015) and emission reductions of 3,154,501,728 t CO_2 for 2011–2015 (assessed in 2017) (see para. 5 above).

[5] The modified technical annex is available at https://unfccc.int/BURs.

[6] The FREL for the Amazon biome includes CO_2 emissions only; therefore, to avoid confusion, no emissions are reported herein in carbon dioxide equivalent.

[7] See document FCCC/TAR/2014/BRA.

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

A. Technical annex

13. For the technical annex to the third BUR submitted by Brazil, see annex I.[8]

B. Technical analysis

14. 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.

15. 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 14 above.

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

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

17. The LULUCF experts noted that Brazil ensured consistency between its FREL and its estimation of the results of the implementation of the activity reducing emissions from deforestation in 2016–2017 by:

(a) Using consistent methodologies and data to generate AD on gross deforestation of natural forests; in particular, using the same forest monitoring system (PRODES) to detect deforestation, and making adjustments to either remove cloud-covered areas or include deforestation in previously cloud-covered areas, and using the same minimum mapping unit (6.25 ha);

(b) Using consistent methodologies and data to generate EFs, in particular the same carbon map and the same stratification for 22 types of forest physiognomy in the Amazon biome and their corresponding EFs;

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

(d) Including the same gases: CO_2 only;

(e) Covering the same area: Amazon biome;

(f) Assuming that all carbon from the carbon pools is lost in the year of the deforestation event;

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

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

18. In view of the above, the LULUCF experts concluded that the results presented of the implementation of the activity reducing emissions from deforestation are consistent with the assessed FREL. The LULUCF experts commend Brazil for ensuring the full consistency of the data and methodologies described in the FREL submission for 1996–2015 and in the technical annex with the results of the implementation of the activity reducing emissions from deforestation for 2016–2017.

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

19. The LULUCF experts noted that, as part of the TA process, Brazil provided additional information on how areas of deforestation were estimated and how associated adjustments were made for areas under cloud cover (see para. 20 below). Brazil shared with the LULUCF experts an Excel spreadsheet of the calculations. The LULUCF experts commend Brazil for its efforts to increase the transparency and ensure the completeness[9] of the data and information provided, allowing for the reconstruction of the results.

20. During the TA Brazil provided additional information on improvements made for making adjustments for areas under cloud cover. The PRODES methodology is regularly improved to facilitate collection of cloud-free images. Since 2012, in the case of cloud cover in Landsat images, INPE has adopted a procedure for identifying deforestation using different medium-resolution images. This improved procedure has increased its success in identifying deforestation each year compared to previous years when detecting deforestation under cloud cover was more difficult. Nevertheless, the LULUCF experts noted that, for example, the adjustment of the area resulted in a change in the deforestation increment for 2015 of – 60,327.08 ha (see modified FREL C submission, table 1, p.31) and of –31,218.22 ha related to the further adjustments for 2016–2017 for the emissions in table 2 of the technical annex (see also annex III, chap. B). The LULUCF experts also noted that Brazil may wish to analyse the results of using the different medium-resolution images on the level of adjustments for 2012 onward.

21. The construction of FREL C was based on the INPE historical time series for gross deforestation in the Legal Amazonia based on Landsat-class satellite data generated on an annual, wall-to-wall basis since 1988. Similarly to the way FREL C was calculated, the AD used to generate the results are derived from PRODES, adapted to include only deforestation within the geographical boundaries of the Amazon biome. The minimum mapping area of 6.25 ha was maintained. The emissions from deforestation were estimated by combining the AD (i.e. the area of annual gross deforestation per forest type considered) with the appropriate EF. The carbon map that was used for estimating emissions from forest conversion for the second national GHG inventory and described in detail in Brazil's first FREL submission[10] was used to ensure consistency between FREL C and the results thereafter.

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 assessment team assessing Brazil's FREL noted that the Party maintained consistency in terms of sources of AD and EFs with the GHG inventory included in its second national communication.[11] Brazil indicated on page 53 of the technical annex to its third BUR that the application of the carbon map developed for its third national GHG inventory resulted in an insignificant difference of 0.22 per cent in emission estimates relative to the carbon map used for the second national GHG inventory, while maintaining the same carbon pools (living biomass and litter). The LULUCF experts noted that this is

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

[10] Available at https://redd.unfccc.int/files/20140606_submission_frel_brazil.pdf.

[11] Available at https://unfccc.int/documents/69067.

also true for the estimated results of the implementation of the activity reducing emissions from deforestation for 2016–2017.

23. Brazil has made its data (i.e. images, annual maps and spreadsheets) publicly available, enabling stakeholders to reconstruct the annual increments of forest stocks.[12] The Party is currently developing a national forest inventory, which is expected to provide data that will help to improve the accuracy of the forest carbon estimates. The LULUCF experts commend Brazil for providing transparent information and continuing to improve the accuracy of its estimates.

24. The LULUCF experts concluded that Brazil provided the necessary information to allow for the reconstruction of the results of the implementation of the activity reducing emissions from deforestation. The data and information provided in the technical annex, in combination with the information provided during the TA, are considered to be transparent, consistent, complete and accurate to the extent possible.

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

25. 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 CO_2 per 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 the institutional roles and responsibilities in the MRV of the results; the information necessary for the reconstruction of 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.

26. In its submission, Brazil provided a summary table with the results of the implementation of the activity reducing emissions from deforestation for 2016–2017, consistent with the assessed FREL and allowing for the reconstruction of the results. The emission reductions achieved are listed in table 2 of the technical annex and amount to 769,000,872.94 t CO_2 for the two years covered.

27. The LULUCF experts noted that Brazil provided a description of the NFMS and a summary of the institutional roles and responsibilities for the MRV of the results in the technical annex, together with weblinks for accessing further information. The roles and responsibilities of the agencies and institutions involved in MRV were transparently explained. The LULUCF experts commend Brazil for sharing this information.

28. The forest monitoring system used is a subnational system covering the Amazon biome. This system is part of the NFMS, which contributes to the implementation and monitoring of nationally appropriate mitigation actions for LULUCF, as well as to the MRV of REDD+ results. The Ministry of the Environment established the Brazilian Biomes Environmental Monitoring Programme for monitoring deforestation, land cover and land use, selective logging, forest fires and recovery of native vegetation. INPE developed PRODES to monitor gross deforestation in areas of natural forest in the Legal Amazonia through use of satellite imagery. PRODES is part of a larger programme, the Amazonia Program, and is key in the context of expanding land-cover monitoring to the other Brazilian biomes.

29. 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. Brazil reported in its technical annex that it used a carbon map for the Amazon biome with 22 types of forest physiognomy (which is the same as that used for its second GHG inventory), making it consistent with the approach used for constructing FREL C, and reported that only natural forest is included.

30. According to decision 1/CP.16, paragraph 71(c), footnote 7, subnational monitoring and reporting should include monitoring and reporting of emission displacement at the national level, if appropriate, and reporting on how the displacement of emissions is being

[12] Available at http://redd.mma.gov.br/pt (in Portuguese) and http://redd.mma.gov.br/en/infohub (in English).

addressed and on the means to integrate subnational monitoring systems into a national monitoring system. During the TA process Brazil clarified that there is a downward trend in deforestation for the Cerrado biome, suggesting a positive development in relation to the issue of possible displacement of emissions from the Amazon biome. Brazil also clarified its plan to expand systematic forest monitoring to other Brazilian biomes and stated that establishing a longer time series will facilitate better and more robust assessment of emission displacement at the national level, and such information will be included in its summary of safeguards.[13]

31. 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 the estimation of emission reductions in the Amazon biome, Brazil used the methodology provided in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* for estimating changes in carbon stocks resulting from deforestation. Accordingly, the emissions from deforestation were estimated for 1996–2017 by combining AD (i.e. areas of annual deforestation) with the appropriate EF (i.e. emissions associated with the corresponding forest type).

32. Brazil included in its FREL and estimation of results three carbon pools: above-ground biomass, below-ground biomass and litter. Overall, the exclusion of non-CO_2 gases was adequately justified. The LULUCF experts commend Brazil for expressing its intention to obtain better information on 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

33. The LULUCF experts noted that the Party's estimation of the results of the implementation of the activity reducing emissions from deforestation in the subnational territory of the Amazon biome was undertaken using a transparent and consistent approach. The LULUCF experts commend Brazil 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.

34. Both the established FREL and the results obtained in 2016–2017 from the implementation of the activity reducing emissions from deforestation are based on the assumption that deforestation takes place in areas of intact natural forest with carbon content, as determined in the carbon density map. The LULUCF experts noted that Brazil used a consistent methodology for estimating emissions for the calculation of the FREL and the results for 2016–2017. They also noted that, in annex III to the modified FREL C submission, Brazil reported on available historical data and forest monitoring systems related to degradation in the Amazon biome. Degraded areas that are subsequently deforested were not reported in the Party's FREL and results submission.

35. Brazil reported in the modified submission of its FREL C (pp.54–57) that the accuracy of the AD estimated by expert judgment is approximately 5 per cent and that this was confirmed in a study by Adami et al. (2017). In addition, Brazil reported on ongoing work to estimate uncertainties for the EFs. The LULUCF experts noted that no additional information on uncertainties was reported in the technical annex and thus the effect of the uncertainties on the accuracy of the results of the implementation of the activity reducing emissions from deforestation could not be assessed. Despite this, and given the assumptions used, the LULUCF experts concluded that the results are accurate to the extent possible.

C. Areas identified for technical improvement

36. The LULUCF experts concluded that the following areas for future technical improvement identified in the report on the technical assessment of Brazil's FREL C[14] also apply to the provision of information on the results of the implementation of the activity reducing emissions from deforestation:

[13] In accordance with decision 9/CP.19, para. 11(c).

[14] See document FCCC/TAR/2018/BRA.

(a) Improving the consistency and accuracy of the time series used for constructing future FRELs, revising the calibration period for the future national FREL and excluding less accurate AD;

(b) Providing information on the extent of deforested areas that are detected at the 1 ha threshold but not detected later by the PRODES project, which uses a 6.25 ha threshold, with the aim of showing that no significant deforestation is excluded from the FREL;

(c) Providing information on how the EFs were derived for the five remaining vegetation types (covering less than 3 per cent of the vegetation present in the Amazon biome).

37. Furthermore, the LULUCF experts noted that Brazil could consider:

(a) Improving the documentation of the adjustments related to cloud cover in future submissions (e.g. see related information in annex III, chap. B) and reporting the results obtained from the procedure for identifying deforestation using different medium-resolution images as an alternative to using cases of cloud cover in Landsat images, since this has helped in identifying deforestation since 2012 (see para. 20 above);

(b) Continuing the assessment of forest degradation resulting from anthropogenic actions and the related emissions in the case of degraded areas being subsequently deforested (see para. 34 above);

(c) Providing information on improvements related to uncertainties within the monitoring system managed by INPE (e.g. PRODES); for example, providing information on the use of Landsat 8 images, which have lower associated uncertainties than Landsat 5 images (see para. 35 above).

38. The LULUCF experts acknowledge that Brazil developed a carbon map for its third national GHG inventory and that the inventory contains information on the deadwood pool as well as estimates of non-CO_2 gases. The LULUCF experts noted that this information was used for calculating the FREL for the Cerrado biome, but not for the FREL for the Amazon biome, to ensure consistency with the previously proposed FREL A and FREL B. The LULUCF experts also noted that Brazil reported that estimation of emissions from fires resulting from deforestation is expected to be improved in the next national inventories, and that, if possible, non-CO_2 emissions from fires will be included in the national FREL, assuming that the consistency of the time series can be assured and if deemed relevant (see the modified technical annex submission, box 2). Brazil noted that it might consider improving the accuracy of a future FREL by using the data on deadwood and non-CO_2 gases.

39. The LULUCF experts commend Brazil for extending the FREL to the Cerrado biome[15] as part of efforts to move towards a national FREL (see para. 30 above). The experts noted that some of the EFs used for both biomes are the same and therefore any improvement in these EFs would improve the accuracy of the estimates for both biomes.

D. Comments and responses of the Party

40. During the consultation process, Brazil did not note any areas of capacity-building needs in addition to the areas for future technical improvement identified in paragraph 41 of document FCCC/TAR/2018/BRA.

III. Conclusions

41. The LULUCF experts conclude that Brazil reported the results of the implementation of the activity reducing emissions from deforestation in the Amazon biome for 2016–2017 on the basis of the assessed FREL C for the same biome as for 1996–2015. The results achieved represent the reduction in emissions associated with gross deforestation in the natural forests in the Amazon biome. The results include estimates of emissions of CO_2 from

[15] The Party's FREL submission for the Cerrado biome (2017) is available at https://redd.unfccc.int/submissions.html?country=bra.

the carbon stock changes in three pools, namely above-ground biomass, below-ground biomass and litter. In reporting these results Brazil applied approaches, assumptions, methodologies, AD and EFs consistent with those used for the assessed FREL for the Amazon biome.

42. The LULUCF experts consider the data and information provided in the technical annex to be transparent, consistent, complete and accurate.

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

44. The results are accurate to the extent possible, based on the assumptions used. Brazil reported and provided detailed information on how gross deforestation areas were derived using well-established time-series data made available through PRODES and adjusted for cloud-covered areas. The Party indicated that there is no risk of emission displacement from the Amazon biome to other biomes. In addition, it clarified its plan to expand systematic forest monitoring to other Brazilian biomes (see paras. 20 and 30 above).

45. In conclusion, the LULUCF experts commend Brazil for showing a strong commitment to the continuous improvement of the data and information used for calculating the results, in line with the stepwise approach, which are consistent with those used to establish its assessed FREL. Some areas for future technical improvement 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.[16] 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.[17]

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

[17] 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 Brazil

Key elements		*Remarks*
Results reported	377 344 006.03 t CO_2 (2016) and 391 656 866.92 t CO_2 (2017); 769 000 872.94 t CO_2 (total emission reductions)	See paragraph 11 of this document
Results period	2016–2017	See paragraph 11 of this document
Assessed FREL	751 780 503.37 t CO_2/year	See paragraph 10 of this document
Reference period	1996–2015	See paragraph 10 of this document
National/subnational	Subnational	The FREL and proposed results cover the Amazon biome (see paras. 10–11 of this document)
Activity included	Reducing emissions from deforestation	See paragraph 10 of this document
Pools included	Above-ground biomass Below-ground biomass Litter	Deadwood and soil organic carbon are not included. In the TA of the FREL, the omission of emissions from the deadwood and soil organic carbon pools from FREL C is considered to be conservative for reporting on emissions from deforestation (see paras. 32 and 38 of this document and document FCCC/TAR/2018/BRA, para. 32)
Gas included	CO_2	The FREL C and results include CO_2 emissions only (see paras. 10 and 32 of this document)
Consistency between assessed FREL and the results	Methods, definitions and information used for the assessed FREL are consistent with the results	See paragraphs 16–18 of this document
Description of NFMS and institutional roles	Included	See paragraphs 27–29 of this document
Identification of future technical improvements	Included	Several areas for future technical improvement were identified (see paras. 36–37 of this document)

Annex III

Documents and information used during the technical analysis

A. Reference documents

Adami M, Gomes AR, Belluzzo A, et al. 2017. A confiabilidade do PRODES: estimativa da acurácia do mapeamento do desmatamento no estado Mato Grosso [PRODES reliability: accuracy estimates of mapping deforestation in the state of Mato Grosso]. *In*: *Proceedings of the 18th Brazilian Symposium on Remote Sensing, Santos, Brazil, 28–31 May 2017*. São José dos Campos: INPE. pp.4189–4196. Available at http://www.dsr.inpe.br/sbsr2017/.

First FREL submission 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/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/resource/docs/2011/cop17/eng/09a02.pdf#page=19.

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/gpglulucf/gpglulucf.html.

Original and modified FREL C submission of Brazil. Available at https://redd.unfccc.int/submissions.html?country=bra.

Report on the TA of the proposed FREL C of Brazil submitted in 2018. FCCC/TAR/2018/BRA. Available at https://redd.unfccc.int/submissions.html?country=bra.

B. Additional information provided by the Party

The documents and information set out below[1] were provided by the Party in response to requests for clarification or additional information during the TA:

- Simple guide to the reconstruction of the results 2011–2016 for Amazonia biome
- Summary of the method applied for the annual adjusted CO_2 emissions (2016–2017).

Brazil adjusted the increments of deforestation (2016 to 2017) until 2013 to avoid over or under-estimating the emissions from deforestation, due to the non-observation of potential deforestation polygons in areas covered by clouds. The cloud adjustment was performed only for the 4 years prior to the most recent increment of deforestation, since it has been the period with the largest variations (as reported in FREL C, Table 1).

In Table 3 of the Technical Annex Brazil reports the annual CO_2 emissions as well as the adjusted one. During the consultation Brazil provide the TAT with the emission data for 2016 and 2017 as well as a "Simple guide to the reconstruction of the results 2011–2016 for Amazonia biome".

With this information and the Worksheet-Planilha-Calculo the method applied to conduct the adjustment as well as the steps within the method became clearer.

Steps within the adjustment

[1] Reproduced as received from the Party.

The adjustment is conducted in 4 steps for the area of increments of deforestation:

- Step 1 is the determination of the 'potential' area. This is the area of deforested area and area under cloud cover
- Step 2 is the subtraction of the area under cloud cover, as it cannot be assessed for deforestation
- Step 3 is the addition of the area under cloud previously is now identified as deforested
- Step 4 is the resulting adjusted area.

For the areas in each step the emissions from increments of deforestation are estimated, using the same emission factors as in the FREL C.

In the table the numbers of these steps are presented for the years 2013–2017. The numbers in the last column (final emissions) are equal to those presented in the column "Annual adjusted CO_2 emissions (2016–2017) until 2013" of table 3, page 56 of the Technical Annex.

	Area of increments of deforestation	Area (+)	Area (-)	Final area	Emission from increments of deforestation	Emission (+)	Emission (-)	Final emission
2013	537,857.10	3,180.30		541,037,40	301,847,850.91	2,110,994.84		303,958,845.74
2014	490,851.45	7,587.07		498,438.52	273,591,600.59	4,554,673.31		278,146,273.90
2015	524,057.09	53,655.16		577,712.25	287,664,204.33	31,519,665.24		319,183,869.56
2016	698,896.18	22,309.62	55,513.93	665,691.87	390,270,304.94	15,766,402.32	31,600,209.92	374,436,497.34
2017	665,800.11		31,218.22	634,581.89	382,475,162.24		22,351,525.78	360,123,636.45