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Technical report on the technical analysis of the technical annex to the second biennial update report of Paraguay submitted in accordance with decision 14/CP.19, paragraph 7, on 27 December 2018

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 Paraguay on 27 December 2018 through its second 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 among the activities included in decision 1/CP.16, paragraph 70, and covers the same national territorial forest area as the assessed forest reference emission level proposed by Paraguay in its modified submission of 9 May 2016.

Paraguay reported the results of the implementation of this activity for 2015–2017, which amount to 26,793,311.02 t CO_2 eq (23,020,721.90 t CO_2 eq/year for 2015–2016 and 3,772,589.12 t CO_2 eq/year for 2016–2017) and were measured against the assessed forest reference emission level of 58,763,376.14 t CO_2 eq/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 Paraguay in the technical annex are transparent and overall consistent with the assessed forest reference emission level 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.

Contents

Abbreviations and acronyms

AD	activity data
BUR	biennial update report
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
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)
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 Paraguay on 27 December 2018 in accordance with decision 14/CP.19, paragraph 7, included in the second BUR of Paraguay, which was submitted in accordance with decision 2/CP.17, paragraph 41(a), and annex III, paragraph 19.[1] In the technical annex, Paraguay 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 Peter Iversen (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 Paraguay and through a facilitative sharing of views, resulting in a separate summary report.[2]

3.   Paraguay made its first FREL submission,[3] in accordance with decision 12/CP.17, on 4 January 2016, 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 the Party's second 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.[4]

B. Process overview

4.   The TA of the second BUR of Paraguay took place from 27 to 31 May 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: Laura Aranguren (Colombia), Liviu Gheorghe (Romania), Leticia Guimarães (Brazil), Thelma Krug (Brazil), Maria Jose Lopez (Belgium), Juan Luis Martin Ortega (El Salvador), Marieke Sandker (Netherlands), Mauro Meirelles de Oliveira Santos (Brazil), Koen Smekens (Belgium) and Alexander Valencia (Colombia). Ms. Lopez and Mr. Martin Ortega were the co-leads. Ms. Guimarães and Ms. Sandker 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 Paraguay 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 Paraguay engaged in technical discussions, and Paraguay 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. The LULUCF experts noted a number of editorial errors in the technical annex, in response to which Paraguay provided a revised technical annex,[5] without changes to applied methodologies or proposed results, in order to enhance the transparency of the submission after the TA.

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[1]   Available at https://unfccc.int/BURs.

[2]   FCCC/SBI/ICA/2019/TASR.1/PRY (at the time of the preparation of this report, the summary report was under preparation).

[3]   Available at https://redd.unfccc.int/submissions.html?country=pry.

[4]   FCCC/TAR/2016/PRY, published on 20 December 2016.

[5]   As footnote 1 above.

7. Following the TA of the technical annex, the LULUCF experts prepared and shared the draft technical report with Paraguay 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 Paraguay.

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, Paraguay, 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 Paraguay's national territory, which covers an area of 406,752 km^2. The assessed FREL of Paraguay is 58,763,376.14 t CO_2 eq/year.

9. The Party's FREL is based on its annual average historical CO_2 emissions associated with reducing emissions from deforestation, defined as the conversion of natural forest to other land uses, for the historical reference period 2000–2015. The FREL includes only the emissions from deforestation associated with natural forest cover loss and excludes any subsequent emissions and removals from the deforested areas (gross deforestation).

10. Paraguay submitted its first FREL for technical assessment in 2016. The value of the assessed FREL is 58,763,376.14 t CO_2 eq/year for the reference period 2000–2015. Measured against this value, Paraguay also submitted results amounting to 26,793,311.02 t CO_2 eq for 2015–2017, (23,020,721.90 t CO_2 eq/year for 2015–2016 and 3,772,589.12 t CO_2 eq/year for 2016–2017).

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

A. Technical annex

11. For the technical annex to the second BUR submitted by Paraguay, see annex I.[6]

B. Technical analysis

12. 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.

13. 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.

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

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

14. 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) and (c), and decision 12/CP.17, section II.

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

(a) Using consistent methodologies and data to generate AD, in particular using the same forest monitoring system. Any loss of natural forest area in a given period is considered deforestation. Two land-use change maps covering 2015–2016 and 2016–2017 were developed by the National Forest Institute using object-based image analysis methodologies with Landsat 8 images with a minimum mapping unit of 1 ha from the online platform Google Earth Engine. The maps provided information on forest cover changes by classifying the land under stable forest, stable non-forest or forest cover change;

(b) Using consistent methodologies and data to generate EFs, in particular the same carbon stock for each of the four disaggregated forest strata. The biomass stock was estimated by combining dasometric information from Paraguay's NFI with allometric equations that were selected for each forest stratum;

(c) Including the same carbon pools: above-ground and below-ground biomass of tree vegetation and above-ground biomass of the understorey vegetation;

(d) Including the same gas: CO_2;

(e) Covering the same area: the entire national territory, of approximately 406,752 km^2;[7]

(f) Assuming that all carbon from the two carbon pools is lost in the year of the deforestation event through instant oxidation and without considering the carbon content of the land in its subsequent use. The FREL and the estimated results do not account for the enhancement of forest carbon stock, even though the forest definition includes natural regeneration and restoration;

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

16. 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 Paraguay for ensuring overall consistency of the data and methodologies described in the FREL 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**

17. The LULUCF experts noted that, as part of the TA process, Paraguay provided a link to additional information,[8] in particular on the allometric equation, forest cover and land-use change maps for 2015–2017, the accuracy assessment of the 2015–2017 maps, the methodology used for processing the data, and the emission reduction estimates. As requested by the LULUCF experts, Paraguay shared the error matrices for the two estimates that generated results. The LULUCF experts commend Paraguay for its efforts to increase

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[7] The LULUCF experts noted slight differences in the country area reported in the technical annex, in the FREL submission and in the results assessments for 2015–2016 and 2016–2017 (see para. 18 below).

[8] Available at http://www.infona.gov.py/index.php/604.

the transparency and ensure the completeness[9] of the data and information provided, allowing for the reconstruction of the results.

18. The LULUCF experts noted that Paraguay reported in its FREL and BUR submissions a total country area of 406,752 km^2, which is different from the total areas reported in the technical annex (tables 16 and 17, p.326). For the 2015–2016 assessment (table 16) the total area adds up to 397,470 km^2 and for the 2016–2017 assessment (table 17) it adds up to 400,033 km^2. The error matrices shared with the LULUCF experts show a "non-reported plantations" class in the 2015–2016 assessment corresponding to an additional 2,546 km^2, meaning the total area for the 2015–2016 assessment adds up to 400,016 km^2. In response to the observation of the LULUCF experts of the different country areas reported, Paraguay explained that the official value reported of 406,752 km^2 is based on data from the Military Geographical Institute and does not fully match the data files in geographical information system format (shapefile) because the latter do not consider the country borders that run along a water course (rivers Paraguay and Paraná). These rivers are shared with the bordering countries (Brazil and Argentina) and a part of each of them is in the territory of those countries. The LULUCF experts acknowledge this explanation of the difference between the area provided by the Military Geographical Institute and that derived from the maps created for the assessment of AD.

19. Two land-use change maps covering 2015–2016 and 2016–2017 were developed by the National Forest Institute using object-based image analysis with information on forest cover changes. For 2015–2016, 8 months of images were included in the assessment, while for 2016–2017, 13 months of images were used. The LULUCF experts asked Paraguay whether the increase in deforestation in 2016–2017 could be attributed to this difference in the window for image processing. In response, Paraguay stated that it could be that part of the deforestation in one year was included in the following year. Given that both years were part of the assessment, the difference does not have a negative impact on the overall results reported. Paraguay also mentioned that there was a three-month gap in the 2015–2017 assessment period during which some images were not analysed for various reasons (quality of images, contractual or operational issues). However, the Party indicated less than 10 per cent of images were affected by this problem; most of the images cover the period June–July 2015 to June–July 2017. The LULUCF experts noted that, in order to maintain consistency over time, Paraguay could consider maintaining the same time window for image processing for subsequent results assessments.

20. Paraguay applied a stratified area estimation per forest type, meaning the deforestation estimate is based on reference data stratified using a forest change map. For its response design (the reference data interpretation), Paraguay used map polygons as sampling units. Recalling that some challenges with the use of map polygons in a response design are listed by Stehman and Wickham (2011), one of them being that potentially large variation in polygon size creates practical challenges in relation to the response design protocol, the LULUCF experts observed the average polygon size to be 1.77 ha and 1.79 ha for the 2015–2016 and 2016–2017 maps, respectively, which is relatively small and therefore not expected to have a disproportional effect on the accuracy of the results. The LULUCF experts therefore found no accuracy concerns relating to the use of polygons as sampling units.

21. The LULUCF experts noted that the forest area assessed (the stratified area estimate) and reported in tables 16 and 17 of the technical annex is higher for 2017 than for 2016. Paraguay explained that this difference is because both years were assessed using a separate map and a separate stratified area estimation, which is expected to result in slight differences in the forest area assessment. However, the differences do not correspond to a net change in the forest area, meaning this result does not suggest an increase in Paraguay's forest area. The LULUCF experts, while acknowledging the explanation provided by Paraguay, consider an area for future technical improvement to be the progressive amendment of the maps and stratified area estimation, such as by adding new activities as they are assessed and adding

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

new samples in the new change areas.[10] This would increase the consistency over time of the area estimations such that the forest area at the end of a given period would be exactly the same as the area at the beginning of the next period.

22.   Despite the slight inconsistencies referred to in paragraphs 18–20 above, the LULUCF experts concluded that Paraguay used the same methodology for constructing its FREL as that used for producing the AD for estimating the results achieved from reducing emissions from deforestation in 2015–2016 and 2016–2017.

23.   The forest definition used by Paraguay for estimating the REDD+ results for 2015–2017 was the same as that used for the FREL. The LULUCF experts noted that the forest definition used by Paraguay for REDD+ differs from the forest definition used for its reporting to the Food and Agriculture Organization of the United Nations for the 2015 Global Forest Resources Assessment and for reporting under the Kyoto Protocol for the clean development mechanism. Paraguay considers two different forest cover and tree height thresholds depending on the region in which the vegetation is located, according to the region's ecological conditions (minimum forest cover of 10 per cent and minimum tree height of 3 m for the western region, and 30 per cent and 5 m for the eastern region). In practice, owing to the medium-resolution satellite images used, only areas with a minimum forest cover of 30 per cent (20–40 per cent) were identified and no different treatment was applied in relation to tree height. The LULUCF experts commend Paraguay for transparently explaining this challenge in its submission, and considers the inclusion of information on deforestation of forest areas with cover of between 10 and 30 per cent in the western region as an area for future technical improvement.

24.   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 Paraguay's FREL noted that the information used in the construction of the Party's FREL was not fully consistent with the information on GHG emissions provided in the national GHG inventory included in the Party's first BUR (2015), in particular for 2011 and in terms of carbon pools and gases included. The FREL submission included only CO_2 emissions from gross deforestation, while the information contained in the BUR also took into account CO_2 removals after the conversion of forest land to cropland.

25.   The LULUCF experts noted that the AD used for the estimation of the results of the implementation of the activity reducing emissions from deforestation for 2015–2017 and those reported in the GHG inventory in Paraguay's second BUR are fully consistent (technical annex, table 5, p.279; annex D to the second BUR, rows 3.B.2.b.i and 3.B.6.b.i, p.164). The LULUCF experts noted a small difference between the EF reported in the technical annex and in the GHG inventory (technical annex, table 2, p.272; annex E to the second BUR, p.180). The reported REDD+ results are consistent with the assessed FREL, for which EFs are based on interim data from the NFI, whereas the EFs for the national GHG inventory are based on the final NFI data (which became available after the submission of the FREL). The difference in the EFs is negligible for the three forest types – "Bosque Húmedo de la Región Oriental", "Bosque Seco del Chaco" and "Bosque Sub Húmedo del Cerrado" – and the EF used in the BUR is 13.5 per cent lower compared with the FREL EF for the forest type containing "Bosque Sub Húmedo Inundable del Río Paraguay" and "Bosque Palmar". The LULUCF experts noted that the difference in EFs means that the emissions reported in the GHG inventory for 2015 are approximately 2 per cent lower than those in the FREL submission.

26.   The LULUCF experts noted that in the national GHG inventory included in the second BUR a lower level of emissions from forest land conversion was reported than in the FREL submission (12 per cent lower for 2015). As explained in paragraph 25 above, the LULUCF experts found the difference in EFs to be responsible for reported emissions in the GHG inventory being 2 per cent lower for 2015. Furthermore, the inclusion of one-year post-

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[10] Taking into consideration, however, that the map's polygon-based sampling design may become obsolete for accuracy assessment if the map undergoes a revision that changes the map polygons, adding, eliminating or changing them as the map is revised (Stehman and Wickham, 2011).

deforestation growth resulted in emissions reported in the GHG inventory being approximately 10 per cent lower for 2015. Paraguay explained that, in addition to the differences due to the inclusion of removals from one year's growth after forest land conversion and the use of the updated EFs, the GHG inventory has a slightly different scope; it also considers removals from the category forest land remaining forest land in the overall assessment of emissions and removals from forest. The LULUCF experts commend Paraguay for seeking to maintain consistency between the REDD+ estimates and its latest GHG inventory report.

27.   During the assessment, the LULUCF experts sought clarification on the treatment of regrowth after deforestation and the potential double counting of emissions from areas that had been deforested during the reference period but subsequently regenerated naturally and later were again deforested, noting that Paraguay's forest definition includes areas that have been naturally regenerated or restored. In response, Paraguay clarified that, owing to technical and capacity issues, it does not track the subsequent enhancement of forest carbon stocks. It only considers the forest cover (layer) in the previous year to identify the change (deforestation) in the analysis period. It does not consider the forest gains by regeneration in the layer corresponding to stable non-forest. However, Paraguay further explained that, in order to avoid including the same area twice, it only considers the forest cover (layer) in the previous year to identify the change (deforestation) in the analysis period and uses the resulting forest cover as a mask to evaluate changes in the period analysed. It does not consider forest gains by regeneration in the layer corresponding to stable non-forest cover. The LULUCF experts consider this approach to be sufficient for the time being, and consider the tracking of regrowth to be an area for future technical improvement.

28.   The LULUCF experts also sought clarification on how areas of planted forest had been treated and whether the same methods applied for the reference map for 2011 were also replicated in the following years. Paraguay clarified that areas of forest loss or native forest plantations that may occur in stable non-forest (outside the forest mask) are not included in the map. However, the map is used for stratification only. The deforestation area estimate is based on the reference data, and omissions of forest loss outside the forest mask are corrected for in the estimate, if they are detected in the reference data. Paraguay indicated its intention to improve the identification on the map of regeneration, forest plantations and other changes that may occur in non-forest areas. The LULUCF experts asked Paraguay about the need for ground truthing of the reference data. In response, Paraguay stated that there is no ground truthing of the reference data, which are collected by the interpreters through visual interpretation of satellite images.

29.   The LULUCF experts noted that no confidence intervals had been provided in the technical annex for the deforestation area estimates. In response, Paraguay shared the error matrices for the AD for 2015–2016 and 2016–2017 that were used to assess the uncertainty of the AD (45 per cent for 2015–2016 and 28 per cent for 2016–2017). The LULUCF experts noted that the shared information and uncertainty calculations increased transparency and completeness and commend Paraguay for its efforts.

30.   The LULUCF experts also noted that the technical annex did not include aggregate uncertainties of emissions over the results period, or aggregate uncertainties for the emission reductions. In response, Paraguay calculated the aggregate uncertainty, propagating the error of AD and EFs at 23 per cent for the emission estimates for 2015–2017. The LULUCF experts commend Paraguay for calculating the aggregate uncertainty of the emission estimates for 2015–2017.

31.   The LULUCF experts concluded that Paraguay 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 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

32.   Paraguay 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 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 the NFMS and the institutional roles and responsibilities in measuring, reporting and verifying 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) and (d), have been taken into account.

33.   In its submission, Paraguay provided a summary table with the results of the implementation of the activity reducing emissions from deforestation for 2015–2016 and 2016–2017, consistent with the assessed FREL and allowing for the reconstruction of the results. The emission reductions achieved are listed in table 5 (annex I) of the technical annex and amount to total emission reductions of 26,793,311.02 t CO_2 eq for the two years covered (23,020,721.90 t CO_2 eq/year in 2015–2016 and 3,772,589.12 t CO_2 eq/year in 2016–2017).

34.   The forest monitoring system used by Paraguay is national, covering the entire country. It is managed by the Ministry of Environment and Sustainable Development[11] and the National Forest Institute. Both institutions work in a coordinated manner on the generation of products and the validation of processes. The NFMS has three pillars: a satellite land monitoring system, which allows for tracking land-cover changes (AD); the NFI, which generates information on EFs for each carbon deposit for different forest types; and the GHG inventory for the forestry sector. The NFMS was established in 2014 with the development of the first NFI and in 2015 the first maps of land-use cover and land-use change were generated. The main activities of the system are the generation of forest cover and land-use change maps and the resampling of 50 per cent of the sampling units of the first NFI.

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, Paraguay explained that its AD are based on augmented visual interpretation of samples stratified with land-use change maps assessing change over four periods for the FREL and two periods (annual) for the estimation of REDD+ results. The map uses 2011 as the base year against which change is assessed. By geoprocessing, forest plantation areas were subtracted from the 2011 forest cover map. During the TA, the LULUCF experts asked how Paraguay treated forest plantation areas in subsequent years. Paraguay explained that potential planted forests in subsequent years were not considered. The NFMS does not provide information on forest degradation, but on the basis of external data, notably the global tree cover data set of Hansen et al. (2013), the LULUCF experts found no evidence that the reduction in deforestation resulted in an increase in forest degradation.

36.   Paraguay 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 emissions from deforestation in the country, Paraguay used the methodology provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* for estimating changes in carbon stock in forest land converted to other land uses. Accordingly, the emissions from the deforestation of natural forests were estimated by combining AD (i.e. areas of annual deforestation) with the appropriate EF (i.e. emissions associated with the corresponding forest type).

37.   Paraguay included in its REDD+ results estimates of above-ground and below-ground biomass for tree vegetation and estimates of above-ground biomass for the understorey vegetation. Deadwood, litter and soils were not reported, which was adequately justified by the Party. Paraguay expressed its intention to obtain better information on soil organic carbon with the aim of including the pool in future FREL submissions and estimates of results as part of the stepwise approach. The LULUCF experts, noting the magnitude of the preliminary results on soil carbon stock provided by Paraguay, commend the Party for this intention, and consider the assessment of the significance of the emissions from this pool as an area for future technical improvement that should be addressed once the necessary information is available.

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[11] Ministerio del Ambiente y Desarrollo.

38.   With regard to gases, only CO_2 emissions were estimated and reported in the technical annex and the FREL submission. Paraguay clarified that, as part of the stepwise approach, future submissions may include the estimation of other gases and carbon pools providing that accurate information is available at that time. The LULUCF experts commend Paraguay for expressing its intention to obtain better information on non-CO_2 gases with the aim of including them in future FRELs and estimates of results as part of the stepwise approach.

4.   Accuracy of the results proposed in the technical annex

39.   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 was undertaken using a transparent and consistent approach. They commend Paraguay for its significant long-term efforts to build up a robust NFMS that is capable of providing transparent estimates of gross emissions from deforestation.

40.   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 deforestation takes place in areas of intact forest and that instant oxidation occurs, and subsequent land use is not taken into account. Accordingly, the gross emissions from deforestation were estimated for 2015–2017 following the same approach as used for the FREL. The LULUCF experts noted that, if the carbon densities in these areas had been reduced (e.g. due to forest fires) or increased (e.g. due to natural regeneration or restoration) before a deforestation event, then emissions from deforestation could have been either overestimated or underestimated. In response, Paraguay explained that enhancement of forest carbon stocks after 2000 was not included in the mask used to track deforestation. Paraguay also stated its intention to include other activities (degradation and enhancement of forest carbon stocks) in its future submissions as part of the stepwise approach. The LULUCF experts also noted that not considering the carbon content of the land in its subsequent use may lead to an overestimation of the emissions from deforestation and the reduction thereof. In response, Paraguay stated its intention to include removals from the land following deforestation in future submissions as part of the stepwise approach.

41.   During the assessment, the LULUCF experts noted that the 2015–2016 period was assessed using a shorter observation window for image processing (8 months) than the 2016–2017 period (13 months), and that the total period assessed is three months shorter than two years. Paraguay explained that deforestation that was not assessed in 2015–2016 may have been assessed in 2016–2017, which may have contributed to deforestation being higher for 2016–2017 than for 2015–2016. However, the difference in the time window of the two annual assessments is not expected to have a significant impact on the overall results for the 2015–2017 assessment period.

42.   In response to a question from the LULUCF experts, Paraguay explained that all reference data samples were interpreted by three independent interpreters as a QA/QC procedure, applying a majority decision for the selection of the final reference data set. Samples not initially agreed upon by the independent interpreters were revisited by all three interpreters who analysed them together until agreement was reached. The interpreters also recorded their level of confidence in the interpretation. As requested by the LULUCF experts, Paraguay shared the reference data points, allowing the LULUCF experts to verify their interpretation. They verified a random selection of 20 points, for which no obvious incorrect interpretations were detected. The LULUCF experts commend Paraguay for applying QA/QC procedures in the collection of reference data, and consider as an area for future technical improvement the documentation of this procedure, including information on the level of agreement among the independent interpreters on the reference data, to enhance the transparency of future submissions.

C. Areas identified for technical improvement

43. The LULUCF experts concluded that the following areas for technical improvement identified in the report on the technical assessment of Paraguay's FREL[12] also apply to the provision of information on the results of the implementation of the activity reducing emissions from deforestation:

(a) Development of an improved system for collecting AD that enables the assessment of deforested areas in line with the adopted forest definition as well as the spatially explicit identification of palm areas;

(b) Continuation of work on the forest definition to ensure consistency across official submissions and in its practical implementation when assessing deforestation;

(c) Consideration of carbon removals from land following deforestation to improve consistency with the GHG inventory and to avoid overestimation of emission reductions associated with the activity reducing emissions from deforestation;

(d) Collection of information on the dynamics of carbon stocks in the deadwood, litter and mineral soils pools after forest conversion in order to assess the significance, in terms of emissions, of these pools;

(e) Collection of the information needed to estimate emissions from organic soils subject to deforestation or to justify the omission of the emissions on the basis of their insignificance;

(f) Treatment of non-CO_2 emissions, specifically emissions from the practice of slash and burn;

(g) Improvement of consistency in terms of pools and gases included with the national GHG inventory.

44. Furthermore, the LULUCF experts noted that Paraguay could consider:

(a) Maintaining the same time window for image processing for subsequent assessments of results, ensuring that the same observation window is maintained for all years assessed;

(b) Fully harmonizing the stratified area estimates for the assessment of different results by assessing the same classes (stable forest, stable non-forest and deforestation);

(c) Progressively amending the maps and stratified area estimation by adding new activities as they are assessed and adding new samples in the new change areas;

(d) Including information about deforestation of forest areas with cover of between 10 and 30 per cent in the western region;

(e) Documenting the QA/QC procedures applied in relation to the reference data, and providing detailed information on the number of samples omitted because of interpreter disagreement, the level of interpreter agreement and the level of confidence in the interpretation.

D. Comments and responses of the Party

45. During the consultation process, Paraguay noted a number of areas of capacity-building needs. Addressing those needs could potentially enable Paraguay to improve its data and methodologies, enhance the accuracy of its estimates and include additional activities and gases in future submissions. After exchanges with the LULUCF experts, Paraguay identified the following capacity-building needs:

(a) The need to train technical professionals for estimating and propagating uncertainties and applying higher-tier methodologies;

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[12] FCCC/TAR/2016/PRY.

(b)   The need to train technical professionals and develop manuals and protocols for data collection;

(c)   The need to create and operate a national information system on climate change with the aim of collecting and systematizing useful data for the development of the national GHG inventory via a platform;

(d)   The need to foster inter-institutional coordination of the different mitigation and adaptation initiatives developed at the national level;

(e)   The need to collect national information in a single database, as well as ensure the availability of processing information according to the requirements established in the methodology used at the national level.

III.   Conclusions

46.   The LULUCF experts conclude that Paraguay reported the results of the implementation of one activity, reducing emissions from deforestation, which is defined as the gross CO_2 emissions from deforestation of natural forests, and followed a national approach covering its entire territory. The results include estimates of emissions of CO_2 from the above-ground and below-ground biomass carbon pools. The results of the activity were reported using methodologies, definitions, assumptions and information consistent with those used for the assessed FREL.

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

48.   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 11.

49.   The results are accurate to the extent possible, based on the assumptions used. The LULUCF experts noted that Paraguay is taking steps to use updated information from the most recent NFI to improve EFs and to improve the accuracy of the assessment, and is considering including additional activities and carbon pools in subsequent FREL submissions.

50.   In conclusion, the LULUCF experts commend Paraguay 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 and capacity-building needs identified by Paraguay 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 Paraguay.[14]

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[13]   In accordance with decision 2/CP.17, para. 57.
[14]   In accordance with decision 14/CP.19, paras. 12 and 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 Paraguay

	Key elements	*Remarks*
Results reported	23 020 721.90 t CO_2 eq/year (2015–2016) 3 772 589.12 t CO_2 eq/year (2016–2017)	See paragraph 10 of this document
Results period	2015–2017	Most of the results were achieved in 2015–2016 (see para. 10 of this document)
Assessed FREL	58 763 376.14 t CO_2 eq/year	Refer to document FCCC/TAR/2016/PRY and paragraph 8 of this document
Reference period	2000–2015	See paragraph 9 of this document
National/ subnational	National	See paragraph 15 of this document
Activity included	Reducing emissions from deforestation	The activity included in the results period estimates is the same as for the FREL (i.e. estimates associated with loss of forest cover of natural forests excluding any previous or subsequent emissions and/or removals) (see para. 15 of this document)
Pools included	Above-ground biomass Below-ground biomass	Above-ground and below-ground biomass of tree vegetation, and above-ground biomass of the understorey vegetation (see para. 15 of this document)
Gas included	CO_2	See paragraph 15 of this document
Consistency between assessed FREL and the results	Methods, definitions and information used for the assessed FREL are overall consistent with the results	There is overall consistency between the FREL and the estimates that were used to generate the results (see paras. 15 and 16 of this document)
Description of NFMS and institutional roles	Included	See paragraphs 34 and 35 of this document
Identification of future technical improvements	Included	Several areas for future technical improvement were identified (see paras. 43–45 of this document)

Annex III

Documents and information used during the technical analysis

Reference documents

"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.

"Guidelines for submissions of information on reference levels". Annex to decision 12/CP.17. Available at https://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf.

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IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

Modified first FREL submission of Paraguay. Available at https://redd.unfccc.int/submissions.html?country=pry.

Report on the TA of the proposed FREL of Paraguay submitted in 2016. FCCC/TAR/2016/PRY. Available at https://redd.unfccc.int/submissions.html?country=pry.

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