Framework Convention on
Climate Change

Technical report on the technical analysis of the technical annex to the fourth biennial update report of Argentina submitted in accordance with decision 14/CP.19, paragraph 7, on 31 December 2021

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 Argentina on 31 December 2021 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 as the assessed forest reference emission level (FREL) proposed by Argentina in its modified FREL submission of October 2019.

Argentina reported the results of implementing this activity for 2017–2018, which amount to 109,458,580 tonnes of carbon dioxide equivalent and were measured against the assessed FREL of 101,141,848 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 decision 14/CP.19, annex. The technical analysis concluded that the data and information provided by Argentina in the technical annex are transparent and overall 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

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
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
MRV	measurement, reporting and verification
NFI	national forest inventory
NFMS	national forest monitoring system
OTF	other forest land
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
TF	forest land
TTE	team of technical experts

I. Introduction, overview and summary

A. Introduction

1. This technical report covers the TA of the technical annex provided by Argentina on 31 December 2021 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, Argentina 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 Jenny Wong (secretariat).

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

3. Argentina made its FREL submission, in accordance with decision 12/CP.17, on 8 January 2019, 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 decision 14/CP.19, annex. The findings from the technical assessment of that FREL are included in a separate report.[2]

4. Argentina previously submitted a technical annex to its third BUR on 2 December 2019. In this technical annex, Argentina reported the results of implementing the activity reducing emissions from deforestation for 2014–2016, with a total emission reduction of 165,172,705 t CO_2 eq. The outcome of the TA thereof is contained in document FCCC/SBI/ICA/2020/TATR.1/ARG. The Party's FREL submission, BURs with technical annexes and associated technical assessment and analysis reports are available online.[3]

B. Process overview

5. The TA of the fourth BUR of Argentina took place from 4 to 8 April 2022 as a desk analysis[4] 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: Zuelclady Maria Fernanda Araujo Gutiérrez (Mexico), Juliana Bempah Boateng (Ghana), Luis Caceres Silva (Ecuador), Andres B. Espejo (Spain), Ngozi Eze (Nigeria), Muhammad Arif Goheer (Pakistan), Nicolo Macaluso (Canada), Marcela Itzel Olguin-Alvarez (Mexico), Lucio Santos (Colombia), Kimberly Todd (United States of America) and Alexander Valencia (Colombia). Andres B. Espejo and Lucio Santos were the LULUCF experts who undertook the TA of the technical annex in accordance with decision 14/CP.19, paragraphs 10–13.

6. The TA of the technical annex provided by Argentina 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.

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

---

[1] FCCC/SBI/ICA/2022/TASR.4/ARG. At the time of publication of this report, the summary report was under preparation.

[2] FCCC/TAR/2019/ARG, published on 25 November 2019.

[3] https://redd.unfccc.int/submissions.html?country=AR.

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

questions raised by the LULUCF experts, in order to reach an understanding on the identification of the capacity-building needs of the Party and areas for future technical improvement.

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

C. Summary of results

9. 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, Argentina, 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 four of the country's seven native forest regions:[5] Parque Chaqueño; Yungas (Selva Tucumano Boliviana); Selva Paranaense (Selva Misionera); and Espinal (Caldenal and Ñandubay districts), which together cover an area of 49,241,852 ha (estimated in 2002), comprising approximately 65 per cent of the total area of all forest regions and representing the largest area of native forests in the country. The assessed FREL of Argentina is 101,141,848 t CO_2 eq/year.

10. The Party's FREL is based on its annual average historical CO_2 emissions associated with gross deforestation in native forest regions (with gross deforestation defined as the loss (clear-cutting) of native forest cover resulting from the conversion of TF to other land-use categories, including the conversion of native forest to forest plantation[6]) for the historical reference period 2002–2013. Native forest is divided into two classes: TF and OTF. The Party defines TF as land with at least 20 per cent tree cover from native species, with trees reaching a minimum height of 7 m. OTF is defined as land with 5–20 per cent tree cover from native species, with trees reaching a minimum height of 7 m; land with at least 20 per cent tree cover from native species, with trees reaching less than 7 m; or land with at least 20 per cent shrubland cover from native species (including palms and reed bed formations) that reaches a minimum height of 0.5 m.

11. Argentina reported the results of implementing the activity reducing emissions from deforestation for 2017–2018, calculated against the FREL, which amount to emission reductions of 55,603,446 t CO_2 eq for 2017 and 53,855,134 t CO_2 eq for 2018, with an associated uncertainty of 17 per cent. This equates to a reduction in historical emissions from deforestation for 2017–2018 of around 54 per cent.

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

A. Technical annex

12. For the technical annex to the fourth BUR submitted by Argentina, see annex I.[7]

---

[5] Forest regions are defined on the basis of the natural distribution zones of native forests. The forest regions Bosque Andino Patagónico, Monte and Delta and Islas del Rio Paraná were not included in the FREL submission.

[6] See para. 9 of FCCC/TAR/2019/ARG and footnote 17 of the second REDD+ technical annex (see para. 1 above).

[7] As per decision 14/CP.19, para. 14(a).

B. Technical analysis

13. 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.

14. The remainder of this chapter presents the results of the TA of the technical annex to the Party's fourth BUR according to the scope outlined in paragraph 13 above.

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

15. 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.

16. The LULUCF experts noted that Argentina ensured overall consistency between its FREL and estimated results of implementing the activity reducing emissions from deforestation in 2017–2018 by:

(a) Using mostly consistent methodologies and data to generate AD on gross deforestation on the basis of data from the NFMS. The AD used for estimating the results are based on the same four forest regions and two forest classes (TF and OTF) as those used for constructing the assessed FREL. Deforestation estimates were obtained using the same methodology applied for constructing the FREL, namely by visually interpreting Landsat satellite imagery from two different time periods. However, the LULUCF experts note that full consistency is not achieved because the cartographic standards used for estimating AD for the results period were not fully consistent with those applied for constructing the FREL;

(b) Using consistent methodologies and data to generate EFs, in particular the same above- and below-ground biomass pools, volumetric equations, biomass expansion factors, wood densities, carbon fractions, and stratification of the four native forest regions for TF; and for OTF, using the same EFs derived from bibliographical reviews and expert knowledge for each forest region;

(c) Covering the same two carbon pools, namely above- and below-ground biomass, noting that sufficiently robust information for estimating the soil organic carbon, deadwood and litter pools is not available;

(d) Covering the same gas: CO_2 only;

(e) Covering the same subnational forest area: the four native forest regions mentioned in paragraph 9 above;

(f) Assuming that all biomass from the two carbon pools is lost after a deforestation event, confirmed by visual interpretation of satellite imagery owing to a lack of spatially explicit information on the carbon content of the land in its final use, and that the forest types in each forest region are homogeneous. The latter assumption applied for deriving EFs for TF and OTF;

(g) Using the same forest definition.

17.   The LULUCF experts noted that the 2022 interpretation manual provides instructions on interpreting land-use change and stipulates that forest blocks consisting of three or more Landsat pixels (approximately 90 m) must be mapped according to the latest agreed interpretation criteria. However, this was not mentioned in the interpretation manuals of previous periods (Government of Argentina, 2004, 2007). The LULUCF experts note the importance of having in place standard operating procedures for documenting these interpretation protocols that are sufficiently detailed and comprehensive to ensure consistency in the application of cartographic standards across all years and among interpreters. Argentina clarified that it is planning to apply a consistent minimum mapping unit and set of standards for interpreting satellite imagery in the future with a view to ensuring time-series consistency. The LULUCF experts commend Argentina for its intention to improve time-series consistency in this way, and note that Argentina could consider presenting an analysis of the impact of this different application of cartographic standards on the overall results.

18.   In view of the above, the LULUCF experts concluded that the results of implementing the activity reducing emissions from deforestation are overall consistent with the assessed FREL. The LULUCF experts commend Argentina for ensuring overall consistency of data and methodologies between the FREL submission for the reference period 2002–2013 and the technical annex with the results of implementing the activity reducing emissions from deforestation for 2017–2018.

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

19.   As part of the TA process, Argentina provided additional information, in particular cartographic information used for the reference and results periods, deforestation reports, information on the accuracy assessment of deforestation maps and spreadsheets containing calculated results and the uncertainty analysis, including weblinks to relevant data and information (see table 9 of the technical annex). The LULUCF experts commend Argentina for its efforts to increase the transparency and ensure the completeness[8] of the data and information provided, thus allowing for reconstruction of the results.

20.   The AD for the results period relating to the conversion of TF and OTF to other land uses are based on land-use changes for 2016–2017 and 2017–2018. The LULUCF experts sought clarification from Argentina on the use of these biennial periods for estimating results in relation to deforestation, indicating that the results were reported as annual values in the technical annex. Argentina clarified that these periods do not correspond to biennial periods, but rather to single years (i.e. 2017–2018 refers to both 2017 and 2018).

21.   The LULUCF experts noted that the AD from official monitoring reports on native forests in the country (Government of Argentina, 2017, 2018) are consistent with the estimates of total deforested areas reported by the Party, which is an improvement compared with the results reported in the technical annex to its third BUR. However, the LULUCF experts noted that the data on deforested areas from national digital deforestation maps (Government of Argentina, 2022b) are not consistent with the estimates reported in the official monitoring reports. For instance, for Parque Chaqueño, the digital deforestation maps show total deforestation of 138,124 ha for 2017 and 123,282 ha for 2018, whereas the reported values are 138,371 and 123,332 ha, respectively. However, the LULUCF experts are of the opinion that these differences are not significant. During the TA, Argentina clarified that these inconsistencies are due to ongoing improvements to its cartographic practices, meaning that the official monitoring reports quickly become outdated. In addition, the LULUCF experts identified a number of minor topological issues in the cartography as well as a few overlaps between deforestation polygons in the results period and the reference period, which could easily be addressed by strengthening quality assurance/quality control procedures in this area. The LULUCF experts commend Argentina for its efforts to increase transparency and improve consistency between data reported in its official monitoring reports, digital deforestation maps and technical annex.

---

[8] "Complete" here means including the information necessary for reconstructing the results.

22.   The LULUCF experts noted that, in estimating the results, Argentina applied the same EFs for each of the four forest regions as those used for constructing the FREL. The EFs were estimated on the basis of the carbon content in above- and below-ground biomass by forest region and forest class (TF or OTF). For the TF class, the carbon content values were estimated using field information obtained from the 343 sampling units used in the NFI (covering 1998–2006); for the OTF class, the values were estimated on the basis of bibliographical reviews and expert knowledge. During the TA, Argentina explained that it is in the process of conducting its second NFI, which will contain improved estimates of biomass and carbon content, enabling it to update the EFs for TF and develop country-specific EFs for the OTF class. The updated data and information derived from the NFI will enhance the accuracy of the estimates in the country's REDD+ reporting.

23.   The LULUCF experts asked Argentina to clarify the source of the wood density values used and explain how these were applied. The Party clarified that it took these values from a study by Atencia (2003), using specific volume equations for species or groups of species, and estimated the biomass in each of the sampling units by multiplying the total volume of the unit by the average density of the wood found in that unit. The LULUCF experts noted that the wood density values used appear to be densities of dry wood (i.e. dry weight and dry volume) and not basic density (i.e. oven-dry weight divided by green volume), meaning that the wood densities could be overestimated. The LULUCF experts identified two areas for technical improvement in relation to wood density and estimating biomass, namely (1) applying average wood density per tree in order to achieve more accurate estimates and (2) specifying in its reporting the source of the wood density values used and the criteria applied for determining average wood density per sampling unit in order to improve transparency.

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 Argentina's FREL noted that the Party did not include non-CO_2 emissions from fires, although such emissions were included in the Party's second and third BURs.[9] Argentina clarified that non-CO_2 emissions from fires were not included because the available national data on fires were not sufficiently robust to enable the estimation of emissions resulting directly from deforestation. Further, emissions from the dead organic matter pools (litter and deadwood) were not included in the national GHG inventories reported in the Party's third and fourth BURs; therefore, to maintain consistency, the Party did not consider these pools in constructing the FREL or when estimating the results of implementing the activity reducing emissions from deforestation. The LULUCF experts assessing Argentina's first REDD+ technical annex (the TA in 2020) noted that this is also true for the estimated results of implementing the activity reducing emissions from deforestation for 2014–2016, and the LULUCF experts of the current TA confirm the same finding for 2017–2018. The LULUCF experts commend Argentina for its ongoing efforts to maintain consistency in the data and information used in its national GHG inventory and REDD+ submissions.

25.   Overall, the LULUCF experts concluded that Argentina maintained consistency in the data and information (i.e. AD and EFs) used as the basis for constructing its FREL and estimating the results presented in the technical annex. They also concluded that Argentina 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, complete and accurate to the extent possible.

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

26.   Argentina provided data and information on all the required elements in accordance with the guidelines contained in decision 14/CP.19, annex, 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);

---

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

a description of the forest monitoring system 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.

27.   Argentina provided a summary table with the results of implementing the activity reducing emissions from deforestation for 2017–2018, which are consistent with the assessed FREL, thus allowing for reconstruction of the results. The emission reductions achieved are listed in table 3 of the technical annex and amount to 55,603,446 t CO_2 eq for 2017 and 53,855,134 t CO_2 eq for 2018, with a total emission reduction of 109,458,580 t CO_2 eq for the two-year period.

28.   The LULUCF experts noted that Argentina provided a description of the NFMS and a transparent summary of the roles and responsibilities of the institutions involved in MRV of the results in the technical annex, together with illustrations of how MRV for REDD+ is linked to the national GHG inventory system and monitoring of GHG emissions, and weblinks for accessing further information. The LULUCF experts commend Argentina for sharing this information.

29.   The NFMS is under the responsibility of the National Directorate of Forests and has two main components: the satellite monitoring of native forests to provide annual data and information on forest loss (used for estimating AD); and the NFI, which provides data and information for deriving EFs for estimating above- and below-ground biomass. Argentina uses geographical information systems to monitor native forests in each forest region and province, facilitating detailed mapping by forest region and province and the generation of detailed disaggregated data sets to enhance the detection of deforestation in these monitored forest areas. By combining field and remote-sensing data, the Party generates information for use in the national GHG inventory, in particular for estimating emissions and removals in the forest sector. Further, in 2018, the scope of the NFMS was extended to include monitoring of native forest loss in the Monte and Bosque Andino Patagónico regions in addition to the four regions covered in the FREL and results, thus now representing most of Argentina's natural forests and enabling the assessment of different types of forest in the country in accordance with decision 11/CP.19, paragraph 4(b).

30.   During the TA, Argentina explained that the ongoing second NFI will include the collection of field data on native forests, which will enable it to update the biomass values and revise the associated parameters, such as allometric equations and EFs, and more accurately estimate above-ground biomass. The Party also reported that it is conducting pilot studies to measure soil organic carbon, litter and deadwood, the scope of which may be extended to cover the country's forest regions, with the aim of including these carbon pools in its reporting in the future. Data from the second NFI and the pilot studies will be used for improving its AD and EFs for future REDD+ and GHG inventory submissions.

31.   During the TA, Argentina explained that it is designing its second NFI on the basis of experience from its first NFI. The second NFI, which is based on systematic sampling, uses an orthogonal 10 km by 10 km grid for which each point of intersection that contains native forest is surveyed, resulting in a total of 4,158 sampling units. In addition to dasometric information, other variables such as forest biological diversity, state of conservation and non-wood forest products are also collected. The LULUCF experts acknowledge this information and commend Argentina for its efforts to improve data collection as part of the stepwise approach.

32.   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. During the TA, Argentina explained that there is no risk of emissions from the four native forest regions considered in the FREL and results periods being displaced to other forest regions. The forests in the two regions not considered (Monte and Bosque Andino Patagónico) are sparse and located in remote areas; as such, deforestation in these regions only accounts for around 3 per cent of total deforestation in the country. On the basis of the available information, the LULUCF experts noted that, so far, there is no evidence of

displacement of emissions. The LULUCF experts commend Argentina for its efforts to monitor emission displacement at the national level as part of the NFMS.

33. During the TA, Argentina explained that, in its fourth BUR, it included the additional forest regions (i.e. Monte and Bosque Andino Patagónico) in its GHG inventory, in order to move closer to a national monitoring system in accordance with the stepwise approach. The LULUCF experts commend Argentina for continuing to improve the comprehensiveness of the coverage of its NFMS as part of its efforts to move to a national FREL and monitoring of results, taking into account the stepwise approach in accordance with decision 12/CP.17, paragraphs 10–11.

34. Argentina 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 four native forest regions reported in the technical annex, Argentina used the methodology provided in the 2006 IPCC Guidelines for estimating carbon stocks in TF converted to other land uses. Accordingly, gross emissions from deforestation were estimated for 2017–2018 by combining AD (i.e. areas of annual deforestation) with the appropriate EF (i.e. emissions associated with the corresponding forest type) and associated uncertainty.

35. In constructing its FREL and estimating the results, the Party covered the most significant pools (above- and below-ground biomass) and CO_2 emissions only. Overall, the exclusion of the litter, deadwood and soil organic carbon pools and non-CO_2 gases was adequately justified. The LULUCF experts consider the treatment of non-CO_2 gases as an area for future technical improvement so as to maintain consistency with the GHG inventories included in the second, third and fourth BURs. The LULUCF experts commend Argentina for its intention to obtain better information on the litter, deadwood and soil organic carbon pools 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

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

37. As mentioned in paragraph 19 above, Argentina provided some information related to the uncertainties of estimated gross emissions from deforestation at the level of each forest region for 2002–2013 for the FREL, and shared the worksheet it used for calculating the uncertainties of the estimated emission reductions for 2014–2016 and 2017–2018 for the results. For estimating the overall uncertainty of emissions from gross deforestation, Argentina applied equations using approach 1 of the 2006 IPCC Guidelines (vol. 1, chap. 3.2.3.1, equations 3.1–3.2), reporting a total uncertainty of 2 per cent for 2017–2018. In agreement with the LULUCF experts who assessed the results of implementing the activity reducing emissions from deforestation for 2014–2016 in the first technical annex, the LULUCF experts are of the opinion that the overall uncertainty was not calculated correctly, as the assumption that all polygons have independent sources of uncertainty is incorrect. As described in Yanai et al. (2020), considering that different land types have independent sources of uncertainty leads to underestimation of the overall uncertainty; as such, IPCC equations should be applied on the basis of the uncertainty of the parameters used. In this case, the LULUCF experts noted that each AD estimate, rather than each polygon, should be considered as one parameter.

38. To demonstrate the accuracy of its AD, the Party provided a methodological report on the accuracy assessment of its deforestation maps from the NFMS, which included the error matrices and uncertainty estimates used, by forest region, for both the FREL and the results. Argentina mentioned in the technical annex that it used Olofsson et al. (2014) to guide its sampling and response design for evaluating the accuracy of its forest maps in the four forest regions. The LULUCF experts noted that Argentina's assumption that the uncertainty of the AD relates to the overall error per forest region is not accurate as the overall error relates to the map as a whole, including the stable classes; hence, it is largely influenced by the stable

classes, which are usually much more accurate. They noted, however, that the confusion matrix provided by the Party during the TA contains very useful information on AD uncertainty: for instance, user accuracy is 71–81 per cent for TF and 13–40 per cent for OTF. The LULUCF experts also noted several areas for technical improvement: (1) including the confusion matrices in future submissions to enhance transparency; (2) presenting the commission and omission errors together with confidence intervals in future submissions to enhance transparency to provide an indication of the range of error values; (3) considering use of confusion matrices to compute statistical areas and confidence intervals in order to define the statistical uncertainty of the AD; (4) computing separate uncertainties for TF and OTF to account for their very different uncertainties; and (5) better identifying areas requiring improvement in its uncertainty management process.

39.   In terms of EFs, uncertainty was estimated separately for above- and below-ground biomass per ha for all four forest regions and included the error estimates in the parameters used, such as volume estimation (for above-ground biomass), root–shoot ratio (for below-ground biomass), density values for wood sourced locally and values of carbon content of biomass from the 2006 IPCC Guidelines. The EF uncertainty for the forest class TF is associated with the sampling error from the first NFI and has a 95 per cent confidence interval. For the forest class OTF, the EFs applied are assumed to have the same error as those for TF in each of the forest regions owing to insufficient information on the parameters considered.

40.   As noted in paragraph 23 above, Argentina used average wood densities per sampling unit instead of values specific to species or groups of species. Moreover, Argentina appeared to use dry wood densities instead of basic densities for estimating biomass, which could lead to the estimates being overestimated. The LULUCF experts noted that the Party could improve accuracy by converting dry wood densities to basic wood densities or wood-specific gravity values using the equations described in Chave et al. (2006).

C.   Areas identified for future technical improvement

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

        (a)   Using available species-specific wood density values for estimating biomass values in order to develop more accurate EFs;

        (b)   Using ground reference data to derive EF estimates for OTF instead of using bibliographical reviews and expert judgment;

        (c)   Enhancing the data-collection process for the OTF class to include new methods that facilitate the accurate identification of areas of deforestation;

        (d)   Including non-CO_2 gases, in order to maintain consistency with the GHG inventory included in the Party's national communication or BUR, and considering including additional carbon pools in future FREL submissions and technical annexes to the BUR.

42.   Furthermore, the LULUCF experts noted that Argentina could consider the following:

        (a)   Developing standard operating procedures documenting its deforestation interpretation protocols that are sufficiently comprehensive and detailed to ensure consistency in the application of cartographic standards across all years and among interpreters (see para. 17 above);

        (b)   Strengthening quality assurance/quality control procedures in relation to the data and information used for estimating the results of implementing the activity reducing emissions from deforestation (see para. 21 above);

        (c)   Using basic wood densities or wood-specific gravity values instead of dry wood densities for deriving the biomass values used in obtaining EFs and applying wood density values per tree to increase accuracy (see paras. 23 and 40 above);

(d)   Clarifying the source of the wood density values used and the criteria applied for determining average wood density per sampling unit (see para. 23 above);

(e)   Optimizing EFs in the light of new data from the second NFI and AD generated as a result of technical improvements, thus enabling the forest types to be distinguished from one and another (see paras. 30–31 above);

(f)   Refining the stratification of the forest regions (e.g. phytogeographical provinces) and forest classes in the second NFI to enable land-use changes to be identified at the forest type level (see para. 29 above);

(g)   Reporting that there is no displacement of emissions (see para. 32 above);

(h)   Moving from subnational to national coverage of its REDD+ implementation and covering all forest regions and forest types in the country, in line with the stepwise approach (see para. 33 above);

(i)   Considering the inclusion, in future submissions, of estimates for the soil organic carbon, litter and deadwood pools using data from the second NFI as they become available and the treatment of non-CO_2 gases in order to maintain consistency with the national GHG inventory (see paras. 30 and 35 above);

(j)   Enhancing transparency and accuracy by improving the uncertainty analysis, such as by providing confusion matrices in future submissions and using them to compute statistical areas and confidence intervals for AD estimates, presenting commission and omission errors together with the confidence intervals and computing separate uncertainties for TF and OTF classes (see para. 38 above).

43.   Since the technical assessments of its FREL and the results (for 2014–2016), Argentina has successfully launched its second NFI, which will enable it to include additional sampling units in the four forest regions, thereby increasing the accuracy of estimates and improving the EF for the OTF class. The LULUCF experts commend Argentina for the technical improvements made as part of the stepwise approach.

D.   Comments and responses of the Party

44.   During the consultation process, Argentina noted a number of areas of capacity-building needs. Addressing those needs could enable Argentina 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, Argentina identified the following capacity-building needs:

(a)   Training personnel to generate robust data in a continuous way and in accordance with requirements under UNFCCC reporting processes (e.g. relating to BURs, GHG inventories and REDD+ submissions);

(b)   Training personnel to standardize and systematize data collection, which would facilitate the updating of data and their use for other mitigation measures at the subnational and national level;

(c)   Developing institutional arrangements among national agencies to facilitate the provision of data and information in a continuous and efficient manner;

(d)   Developing methodologies and building capacity for quantifying the regeneration and degradation of forests, implementing the new operational definition of forests and making the corresponding adjustments within the NFMS;

(e)   Strengthening capacity to improve allometric models for biomass and including other carbon pools in future submissions;

(f)   Facilitating and enhancing access to predictable financial resources that support capacity-building and implementation of the technical improvements identified during the TA.

III. Conclusions

45. The LULUCF experts conclude that Argentina reported the results of implementing the activity reducing emissions from deforestation for 2017–2018 on the basis of the assessed FREL for the same activity for 2002–2013. Argentina's subnational FREL and results associated with gross deforestation covered the same four native forest regions: Parque Chaqueño, Yungas (Selva Tucumano Boliviana), Selva Paranaense (Selva Misionera) and Espinal (Caldenal and Ñandubay districts). The results include estimates of CO_2 emission reductions from two carbon pools: above- and below-ground biomass. The results of the activity were reported using methodologies, AD, EFs, definitions, assumptions and information that are overall consistent with those used for constructing the assessed FREL.

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

47. 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.

48. The results are accurate to the extent possible based on the assumptions used. The LULUCF experts note that Argentina has initiated a number of activities for assessing possible displacement of emissions while taking steps to implement an NFMS (see paras. 32 and 42(g) above on areas identified for future technical improvement).

49. In conclusion, the LULUCF experts commend Argentina 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 Argentina 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.[10] The LULUCF experts also acknowledge that the TA process was an opportunity for a facilitative and constructive technical exchange of views and information with Argentina.[11]

---

[10] As per decision 2/CP.17, para. 57.
[11] 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 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 Argentina

	Key elements	*Remarks*
Results reported	109 458 580 t CO_2 eq/year	See paragraph 11 of this document
Results period	2017–2018	See paragraph 11 of this document
Assessed FREL	101 141 848 t CO_2 eq/year	The subnational FREL covers CO_2 emissions from the activity reducing emissions from deforestation. The technical assessment report (FCCC/TAR/2019/ARG) is available at https://redd.unfccc.int/submissions.html?country=AR (see para. 9 of this document)
Reference period	2002–2013	See paragraph 10 of this document
National/subnational	Subnational	Four of the country's seven native forest regions are covered: Parque Chaqueño, Yungas (Selva Tucumano Boliviana), Selva Paranaense (Selva Misionera) and Espinal (Caldenal and Ñandubay districts), covering around 90 per cent of the country's TF (see para. 9 of this document)
Activity included	Reducing emissions from deforestation	Deforestation is defined as the conversion of native forests to non-forest land, including the conversion of native forests to plantations. The submission covers emissions from gross deforestation (see para. 10 of this document)
Pools included	Above-ground biomass Below-ground biomass	The deadwood, litter and soil organic carbon pools were not included owing to a lack of reliable information (see para. 35 of this document)
Gas included	CO_2	Treatment of non-CO_2 gases was identified as an area for future technical improvement with a view to maintaining consistency with the GHG inventory (see para. 35 of this document)
Consistency with assessed FREL	Methods, definitions and information used for the assessed FREL are consistent with those used for the results	See paragraphs 16–18 of this document
Description of NFMS and institutional roles	Included	The NFMS enables the assessment of different forest types in the country (see paras. 28, 29 and 32 of this document)
Identification of future technical improvements	Included	Several areas for future technical improvement have been identified (see paras. 41–42 of this document)

Annex III

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

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.

B. UNFCCC documents

FREL submission of Argentina. Available at https://redd.unfccc.int/submissions.html?country=AR.

"Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels". Decision 13/CP.19, annex. 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". Decision 12/CP.17, annex. Available at https://unfccc.int/sites/default/files/resource/docs/2011/cop17/eng/09a02.pdf#page=19.

Report on the TA of the proposed FREL of Argentina submitted in 2019. FCCC/TAR/2019/ARG. Available at https://redd.unfccc.int/submissions.html?country=AR.

Report on the TA of the technical annex to the third BUR of Argentina submitted in 2019. FCCC/SBI/ICA/2020/TATR.1/ARG. Available at https://redd.unfccc.int/submissions.html?country=AR.

C. Other documents

The following references may not conform to UNFCCC editorial style as some have been reproduced as received or as cited in the submission:

Atencia ME 2003. Densidad de maderas (Kg/m^3) ordenadas y nombre científico. INTI–CITEMA. Available at https://www.inti.gob.ar/publicaciones/descargac/365

Chave J, Muller-Landau HC, Baker TR, et al. 2006. Regional and phylogenetic variation of wood density across 2456 Neotropical tree species. *Ecol Appl.* 16(6): pp. 2356-67. Available at https://doi.org/10.1890/1051-0761(2006)016[2356:RAPVOW]2.0.CO;2.

Government of Argentina. 2004. *Manual de Teledetección. Primer inventario nacional de bosques nativos.* Proyecto de Bosques Nativos y Áreas Protegidas BIRF 4085-AR.

Government of Argentina. 2007. *Manual de Teledetección–Segunda Etapa*. Primer inventario nacional de bosques nativos–Segunda etapa. Inventario de campo de la región Espinal: Distritos Caldén y Ñandubay.

Government of Argentina. 2017. *Informe de monitoreo de la superficie de bosque nativo de la república Argentina - Regiones forestales Parque Chaqueño, Yungas, Selva Paranaense y Espinal*.

Government of Argentina. 2018. *Informe de monitoreo de la superficie de bosque nativo de la república Argentina - Regiones forestales Parque Chaqueño, Yungas, Selva Paranaense, Bosque Andino Patagónico, Espinal y Monte.*

Government of Argentina. 2022a. *Monitoreo de la Pérdida de bosque nativo*. Sistema Nacional de Monitoreo de Bosques Nativos. Power point presentation on "Monitoreo_metodología_simplificada_2020_12".

Government of Argentina. 2022b. *Digital deforestation maps 2014–2018 and associated information.* ESRI Shapefiles. National GHG Inventory (INGEI).

Government of Argentina. 2022c. Digital deforestation maps 1998–2006 and 2007–2014 plus associated information. ESRI Shapefiles. INGEI.

Government of Argentina. 2022d. GHG calculation spreadsheets for the FREL and for the results period, including uncertainty analysis.

Olofsson P, Foody GM, Herold M, et al. 2014. Good practices for estimating area and assessing accuracy of land change. *Remote Sensing of Environment*. 148: pp.42–57. Available at http://dx.doi.org/10.1016/j.rse.2014.02.015.

Yanai RD, Wayson C, Lee D, et al. 2020. Improving uncertainty in forest carbon accounting for REDD+ mitigation efforts. *Environmental Research Letters*. 15(12). https://doi.org/10.1088/1748-9326/abb96f.