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Technical report on the technical analysis of the technical annex to the third biennial update report of Mexico submitted in accordance with decision 14/CP.19, paragraph 7, on 30 June 2022

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 Mexico on 30 June 2022 through its third biennial update report in accordance with decision 14/CP.19. The technical annex provides data and information on the activities reducing emissions from deforestation and reducing emissions from forest degradation, which are activities included in decision 1/CP.16, paragraph 70, and covers the same national territorial forest area as the assessed forest reference emission level (FREL) proposed by Mexico in its modified FREL submission of July 2021.

Mexico reported the results of implementing these activities for 2017–2019, which amount to 18,123,657 tonnes of carbon dioxide equivalent and were measured against the assessed FREL of 20,245,016 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 Mexico 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.

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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
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, overview and summary

A. Introduction

1. This technical report covers the TA of the technical annex provided by Mexico on 30 June 2022 in accordance with decision 14/CP.19, paragraph 7, included in its third BUR, which was submitted in accordance with decision 2/CP.17, paragraph 41(a), and annex III, paragraph 19. In the technical annex, Mexico 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 Luca Birigazzi (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 Mexico and through a facilitative sharing of views, resulting in a separate summary report.[1]

3. Mexico made its second FREL submission, in accordance with decision 12/CP.17, on 14 January 2020, which was subject to a technical assessment following the guidance provided in decision 13/CP.19 and its annex. As a result of the facilitative interactions with the LULUCF experts during the TA, Mexico provided a modified version of its submission on 22 July 2021. The latest assessed FREL was included as one of the elements of the technical annex to its third 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]

B. Process overview

4. The TA of the third BUR of Mexico took place from 30 January to 3 February 2023 as a desk analysis 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: Bertha Iris Argueta Tejeda (Honduras), Rocio Danica Condor (Italy), Larissa Maria Felip Spalding (Paraguay), Excellent Hachileka (Zambia), Medeia Inashvili (Georgia), Dovilé Karloniené (Lithuania), Zammath Khaleel (former member of the Consultative Group of Experts from Maldives), Andrew Lister (United States of America), Brittany Meighan (Belize), Katherine Ovalle (Colombia) and Brian Zutta (Peru). Andrew Lister and Brian Zutta 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 Mexico 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 Mexico engaged in technical discussions, and Mexico provided clarifications in response to 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.

7. Following the TA of the technical annex, the LULUCF experts prepared and shared the draft technical report with Mexico 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 Mexico. This technical report on the TA of the technical annex was prepared in the context of the modified technical annex submitted by the Party.

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[1] FCCC/SBI/ICA/2022/TASR.3/MEX.
[2] FCCC/TAR/2020/MEX, published on 21 February 2022.

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, Mexico, on a voluntary basis, proposed a national FREL covering the activities reducing emissions from deforestation and reducing emissions from forest degradation (considering only a subset of forest degradation that Mexico defines as absolute forest degradation) for the purpose of a technical assessment in accordance with decision 13/CP.19 and its annex. The activities are being implemented in Mexico's national territory. The assessed FREL of Mexico is 20,245,016 t CO_2 eq/year.

9. The Party's FREL is based on its annual average historical CO_2 emissions associated with gross deforestation and absolute forest degradation (see para. 14(f–g) below) for the historical reference period 2007–2016. Mexico reported the results of implementing the activities reducing emissions from deforestation and reducing emissions from absolute forest degradation for 2017–2019, calculated against the FREL, which amount to emission reductions of 15,609,439 t CO_2 eq for deforestation and 2,514,218 t CO_2 eq for absolute forest degradation, amounting to total emission reductions of 18,123,657 t CO_2 eq or an average of 6,041,219 t CO_2 eq annually.

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

A. Technical annex

10. For the technical annex to the third BUR submitted by Mexico, see annex I.[3]

B. Technical analysis

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

(a) 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.

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

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

13. In accordance with decision 14/CP.19, paragraph 3, the data and information used by 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.

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

14. The LULUCF experts noted that Mexico ensured overall consistency between its assessed FREL and estimated results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation in 2017–2019 by:

(a) Using consistent methodologies and data to generate AD on gross deforestation and absolute forest degradation of natural forests, in particular using the same operational definitions and forest monitoring system to detect the annual conversion of forest to other land uses for deforestation or detect the loss of carbon stock without conversion to other land uses for absolute forest degradation;

(b) Using consistent methodologies and data to generate EFs, in particular using the same NFI data to develop EFs and the same ecoregions for the stratification of forests for the estimation of carbon stock;

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

(d) Covering the same gas: CO_2;

(e) Covering the same area: the entire national territory (the total continental territory and the island of Cozumel);

(f) Using the same definition for deforestation, namely gross deforestation where forest land is converted to other land uses;

(g) Using the same definition for forest degradation, namely absolute forest degradation where the decrease in carbon stock due to loss of woody vegetation resulting from the reduction in canopy cover is below the minimum threshold of 10 per cent and does not result in conversion from forest land to other land uses;

(h) Assuming that all forest parcels that lose forest cover and are converted to another land use (i.e. deforestation) will lose all carbon stock in the relevant year and remain unstocked throughout the reference and results periods, unless the NFI measurements of post-disturbance carbon stocks of remaining woody vegetation are available for that parcel;

(i) Assuming that soil organic carbon is lost from deforestation and forest degradation at a rate of approximately $1/20^{th}$ each year after the event by applying different change factors for categories and regions using equation 2.25 from volume 4 of the 2006 IPCC Guidelines, consistently with the estimation method described in the modified FREL submission for 2007–2016.

15. In view of the above, the LULUCF experts concluded that the results presented of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation are consistent with the assessed FREL. The LULUCF experts commend Mexico for ensuring consistency of data and methodologies between the FREL submission for 2007–2016 and the technical annex with the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2017–2019.

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

16. As part of the TA process, Mexico provided additional information, in particular that listed in table IX of the technical annex. The LULUCF experts commend Mexico for its efforts to increase the transparency and ensure the completeness[4] of the data and information provided, thus allowing for reconstruction of the results. In particular, the information on the R code "EMISIONES_REDD_BA.R" in the directories associated with the estimation of the results[5] was very helpful.

17. The AD and methodology used to estimate the results were consistent with the construction of the FREL. The AD were calculated using the Collect Earth tool developed by the Food and Agriculture Organization of the United Nations, which uses a sample-based

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[4] "Complete" here means including the information necessary for reconstructing the results.
[5] See http://file.cnf.gob.mx/Anexo_tecnico_REDD+.

approach with available satellite imagery to estimate AD at the national level. Mexico indicated that the same types of satellite imagery were used for the FREL reference period and the results period, namely high- and very-high-resolution images from Google Earth, Bing Maps and Yandex Maps and the historical time series of medium-resolution images from Landsat 5, 7 and 8 and Sentinel 2. Most of the visual interpretation used the Landsat archive, resulting in a limited ability to detect partial forest degradation; therefore, only a subset of forest degradation was identified in the FREL reference and results periods. During the TA, Mexico clarified that Landsat imagery, however, allowed the Party to detect the total loss of forest canopy (and the associated carbon stocks) in forest land (i.e. areas where conversion to other land uses was not observed). For the FREL and in the technical annex, this subset of forest degradation was referred to as absolute forest degradation. The AD for the results were based on the same plots as used for the FREL, consisting of 26,220 square plots of 1 ha (100×100 m) each, established using the central coordinates of the NFI plots.

18.   The methodology used to estimate EFs for the results period was also consistent with the methodology used for developing the FREL. Mexico used the same stock-difference approach, developed from two cycles of NFI data, to develop EFs for forest land for each ecoregion and to estimate annual changes in carbon stock throughout the FREL reference and results periods. Mexico indicated that the EFs for the carbon content of each plot were mostly derived on the basis of data from the second NFI cycle as described for the FREL.

19.   The methodology used to calculate the emissions from deforestation and absolute forest degradation was consistent between the FREL reference and results periods. Mexico used the results of the visual interpretation of satellite imagery within the Collect Earth framework and the carbon content of each plot to estimate the total carbon stocks in forest land. The total annual emissions were estimated as the difference in total forest carbon stocks between two consecutive years. For the results period, Mexico updated its multitemporal matrix of land-use class change containing 26,220 rows, where each row was a plot observed for the FREL with individual columns for each year of data for 2000–2019. In addition, Mexico continued to use the method whereby a parcel remains unstocked throughout the reference and results periods if forest cover loss is observed, unless NFI measurements of post-disturbance are available for the specific parcel.

20.   According to decision 12/CP.17, paragraph 8, the FREL shall be established taking into account decision 4/CP.15, paragraph 7, and maintaining consistency with the anthropogenic forest-related GHG emissions by sources and removals by sinks reported in the Party's GHG inventory. The team assessing Mexico's FREL noted that the Party did not maintain consistency in terms of forest definition, sources of AD and EFs with those used for the GHG inventory included in its sixth national communication and second BUR. The LULUCF experts noted that this is also true for the estimated results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2017–2019. The Party's third BUR contains an estimation of annual absorption (i.e. removals) of CO_2 for forest land remaining forest land and other land uses converted to forest land (i.e. reforestation) for 2000–2019. During the TA, Mexico explained that the inconsistencies between the second FREL and the previous national GHG inventories are due mainly to the important methodological improvements incorporated into the second FREL (e.g. change of parameter in the forest definition to a minimum area of 1 ha, use of unbiased AD, subnational EFs and the stock-difference approach, and inclusion of new pools), which in turn are due to the advancements in Mexico's NFMS.

21.   The Party provided in the FREL submission a very detailed explanation of the overall procedure for estimating carbon stocks and emissions, including equations illustrating the different steps in the calculations and references to the corresponding equations in the 2006 IPCC Guidelines. The corresponding information in the technical annex refers to that in the FREL submission and is consistent with it. The LULUCF experts noted a few typographical errors in some of the formulae used for estimating carbon density and its associated uncertainty in the FREL report on which the technical annex is based. However, these do not appear to have propagated to the R code. Mexico informed the TTE that the typographical errors will be corrected in future FREL submissions.

22.   To estimate the uncertainty in the change of carbon stocks between two consecutive years, Mexico used equation 3.2 from volume 1 of the 2006 IPCC Guidelines. On the basis

of the documentation provided in the submission, it was unclear to the TTE which of the calculation files listed in table IX were used to produce the REDD+ results. Some of the Excel worksheets listed as sources of uncertainty data included inaccurate formulae and displayed output values that did not correspond with table 7 of the technical annex. The LULUCF experts noted that accurate formulae and the correct output data were generated by the R code (see para. 16 above), which, however, was not listed in table IX. They also noted that providing clearer explanations, including a link to the R code used to generate the data, would increase transparency by allowing the calculations to be more readily reconstructed. In the modified technical annex, Mexico updated the information provided in table IX, enhancing the clarity and transparency of the reported information.

23. With respect to the calculation of uncertainties of emissions, the LULUCF experts believe that the use of equation 3.2 assumes that the variables being summed or subtracted are uncorrelated, which is not the case for the national carbon stock values at the same location at two points in time. Two times the covariance of the estimate might need to be subtracted from the existing variance calculations, resulting in a lower reported variance for emissions, to correctly calculate the variance of the difference of two correlated random variables. The current method, however, is consistent with the method used for the FREL and is conservative. During the TA, Mexico indicated that this issue will be addressed in future FREL submissions.

24. Mexico calculated the per-plot values for each carbon pool separately and then added the totals and their variances to combine carbon stock estimates for each pool. However, as noted during the technical assessment of the FREL, this error propagation method assumes the independent nature of the estimates between the pools, which may not be the case. The TTE notes that, if pools are correlated, a possible approach to addressing this would be to sum all pools to the plot level, and then calculate the total and the variance of that total. In theory, the covariances need to be included in the summation (i.e. the variance of the sum of two correlated random variables equals the sum of the variances of those random variables, plus two times their covariance).

25. In addition, it was noted that, in the spreadsheet, emissions from the above-ground biomass pool were reported as 0 for certain years, yet a sampling error is provided. If the estimate of emissions is 0, it is because there is zero difference between the set of time 1 and time 2 values, in which case there is no variance. The relative error of this situation would be 0/0, which is undefined; therefore, the Party might consider not reporting an estimate as it might not be accurate to report a sampling error in this situation. In the modified technical annex, Mexico updated the uncertainty estimations referenced in table IX of the modified technical annex to take this into account. There is a clear likelihood of such emissions occurring in Mexico, but they were not detected by the current plot sampling method. The LULUCF experts note that a lack of detection of emissions with a large plot network indicates that emissions would be rare. The LULUCF experts also note that transparency could be improved by providing information on this issue in future submissions.

26. While reviewing the Excel calculation spreadsheets, the LULUCF experts noted that for many plots there are no EFs listed but such plots are labelled as forest land, probably owing to the NFI plot not capturing trees but the Collect Earth plot meeting forest land criteria. In other words, the Collect Earth plots of 1 ha were visited by the NFI field crews, who measured tree variables in a subset of its area (1,600 m^2), according to the NFI sampling design. The values measured in the 1,600 m^2 are then expanded on a per hectare basis and assigned to the entirety of the Collect Earth plot. The LULUCF experts noted that this may result in an additional source of uncertainty that is currently not considered in the REDD+ results. The LULUCF experts also noted that the transparency of the reporting would be enhanced by including a discussion about the implications of this issue.

27. Mexico derived its EFs using available data from two NFI cycles, mainly from cycle 2. However, the LULUCF experts noted that it was difficult to interpret exactly how the carbon densities were assigned to plots for a given year, given the mix of cycle 1 and cycle 2 data. Provision of a schematic graphic, such as that provided in the answers to the questions during the TA, would help to clarify for readers exactly how carbon densities are assigned and enhance the transparency of the reporting. During the TA, Mexico noted that a detailed explanation of the allocation of the carbon densities to each plot for a given year, including

a schematic diagram, is presented on pages 150–155 of the modified FREL submission for 2007–2016.

28.   During the examination of R scripts used in the calculation of the results (see para. 16 above), the LULUCF experts noted that the non-response plots were not appropriately accounted in the estimation of the uncertainty associated to carbon density. These plots were treated in the calculation as plots with zero biomass, instead of being excluded as would be plots with missing values. During the TA, Mexico acknowledged that this was an oversight and indicated that correcting this error would result in differences of approximately 0.8 per cent in the confidence intervals. Mexico welcomed the observation of the TTE and decided to keep the estimations in the technical annex to maintain consistency with the assessed FREL. Nonetheless, Mexico will consider editing the code and reporting the correct uncertainty value in the next FREL submission.

29.   In response to a question from the LULUCF experts, Mexico clarified that all data (images and data leading to per-plot assessments of AD and EFs) are publicly available, which enables stakeholders to examine, if called upon, the granular data that lead to the final estimates. The LULUCF experts commend Mexico for providing transparent information and continuing to improve the accuracy of its estimates.

30.   The LULUCF experts concluded that Mexico provided the information necessary for reconstructing the results of implementing the activities reducing emissions from deforestation and reducing emissions from absolute forest degradation for stocks, emissions and uncertainties that are found in the technical annex, despite there being room for improvement in the documentation of the estimation procedure (see also para. 22 above). 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

31.   Mexico 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); a description of the national 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); and a description of how the elements contained in decision 4/CP.15, paragraph 1(c–d), have been taken into account.

32.   Mexico provided a summary table with the results of implementing the activities reducing emissions from deforestation and reducing emissions from absolute forest degradation for 2017–2019, which are consistent with the assessed FREL, thus allowing for reconstruction of the results. The emission reductions achieved are listed in table VIII of the technical annex and amount to an average of 6,041,219 t CO_2 eq/year for the three years covered.

33.   The LULUCF experts noted that Mexico provided a description of the NFMS and a transparent summary of the roles and responsibilities of the agencies and institutions involved in MRV of the results in the technical annex, together with weblinks for accessing further information. During the consultation process, Mexico explained that the NFMS consists of three components: the national forest and soils inventory, the satellite-based forest monitoring system and the national system for MRV. The description of the role of each component in obtaining forest-related data and the legal and institutional framework is included in the technical annex. The LULUCF experts commend Mexico for sharing this information.

34.   The NFMS is a national system covering the national territory. The NFMS assesses the conversion of forest to other land uses (deforestation) and forest land remaining forest land (absolute forest degradation) using a combination of remote sensing and a ground-based forest carbon inventory approach to estimate emissions, providing estimates that are transparent, consistent and as far as possible accurate and that reduce uncertainties. The national forest and soils inventory provides the forest inventory data necessary to estimate

EFs using the data available from 26,220 parcels from two cycles stratified by ecozone, the satellite-based forest monitoring system estimates annual AD using the Collect Earth tool with available satellite imagery and a sampling approach, and the national system for MRV develops the reports associated with national and subnational FRELs and provides a summary of coverage and method.

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, Mexico explained that the continental territory (including the island of Cozumel) was stratified into seven ecoregions, which are biogeographic regions with characteristic ecosystems and physiography, to obtain homogeneous forest types. Sampling intensity varied by ecoregion, with sampling distances of 5×5 km for temperate and tropical forests, 10×10 km for dry and semi-arid communities and 20×20 km for arid communities. This approach is consistent between the FREL and the technical annex. It is important to note that in the FREL submission and the technical annex Mexico did not observe the conversion of natural forest to forest plantations. Consistently with the modified FREL submission for 2007–2016, Mexico considered this conversion as a degradation event, as they are both considered forest land use.

36. On the basis of the available information, the LULUCF experts noted that, so far, there is no evidence of displacement of emissions.

37. Mexico 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 total national forest area, Mexico used the methodology provided in the 2006 IPCC Guidelines for estimating carbon stocks in forest land converted to other land uses. Accordingly, the emissions from deforestation and absolute forest degradation were estimated for 2007–2019 by using the difference in total forest carbon stocks between two consecutive years and combining AD (i.e. areas of annual deforestation) with the appropriate EF (i.e. emissions associated with the corresponding forest type).

38. In constructing its FREL and estimating the results, Mexico included the most significant pools. The treatment of non-CO_2 GHGs was previously identified as an area for future technical improvement of the FREL and these emissions were not included in the technical annex. The LULUCF experts commend Mexico for its intention to obtain 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 estimated the results of implementing the activities reducing emissions from deforestation and reducing emissions from absolute forest degradation in the total national territory using a transparent and consistent approach. They commend Mexico for its significant long-term efforts to build up a robust NFMS that is capable of providing transparent estimates of emissions from deforestation.

40. Both the established FREL and the results obtained for 2017–2019 from implementing the activities are based on the assumption that deforestation occurs in natural, intact forests that are converted to other land uses. Mexico did not observe the conversion of natural forest to forest plantation. The carbon content is developed from NFI data and carbon gain is not used for the FREL or technical annex. For deforestation, carbon stock is lost in the relevant year and the land remains unstocked throughout the reference and results periods, unless the NFI measurements indicate a remaining carbon stock after the deforestation event, except for the soil organic carbon pool, for which carbon loss is estimated as a 1/20th of the original stock for each subsequent year after the deforestation event. For absolute forest degradation, carbon stock is lost in the relevant year except for soil organic carbon, which loses a fraction of the original amount each year subsequent to the disturbance event. No partial forest degradation is recorded, owing to technical limitations, which could lead to an underestimation of emissions. Mexico indicated that it did not observe absolute degraded areas converted to other land uses (deforested) during the reference and results periods.

41. As mentioned in paragraph 24 above, Mexico provided information related to the analysis of uncertainty of the emission estimates based on an error propagation method that

assumes the independent characteristic of the estimates between the pools. This approach was consistently used for the reference and results periods. During the technical assessment of the FREL, this limitation in the application of the error propagation method was noted. The LULUCF experts also noted this limitation and the impact on the overall uncertainty. The LULUCF experts commend Mexico for reviewing this matter and considering adjustments for future FREL and technical annex submissions. They concluded that the results are accurate to the extent possible.

C. Areas identified for future technical improvement

42. The LULUCF experts concluded that the following areas for future technical improvement identified in the report on the technical assessment of Mexico's FREL also apply to the provision of information on the results of implementing the activities reducing emissions from deforestation and reducing emissions from absolute forest degradation:

(a) Improving the classification of land that was unstocked but did not undergo a land-use change;

(b) Considering the estimation of emissions that may occur due to illegal conversion from natural forests to forest plantations in forest land remaining forest land;

(c) Improving consistency between the national GHG inventory and the FREL submissions;

(d) Continuing to improve the consistency of the national forest definition between the FREL and other international reporting;

(e) Including non-CO_2 gases;

(f) Covering the full scope of the activity reducing emissions from forest degradation, including partial forest degradation;

(g) Investigating and improving monitoring (using new satellite inputs and field data) of carbon stock change after absolute forest degradation.

43. Furthermore, the LULUCF experts noted that Mexico could consider the following:

(a) Improving the clarity of the information related to the auxiliary files, codes and calculation worksheets used in the estimation to facilitate the process of reconstructing the results;

(b) Including biomass gains in forest land remaining forest land and land converted to forest land;

(c) Estimating forest soil carbon uncertainty in a manner similar to that used for estimating other pools;

(d) Using high-resolution imagery to assign a land-use label to each point in the plot (as opposed to assigning a majority value to each plot, as is currently done), to improve the precision of the estimates of forest area and the mapping of partial forest degradation;

(e) Improving the uncertainty estimation procedure to take into account the covariance between the pools calculated on the plots.

D. Comments and responses of the Party

44. During the consultation process, Mexico noted a number of areas of capacity-building needs. Addressing those needs could enable Mexico to improve its data and methodologies, and include additional activities and gases in future FREL submissions. Mexico identified the following capacity-building needs:

(a) Estimating carbon stock gain in forest land remaining forest land;

(b) Including non-CO_2 gases;

(c)   Improving the propagation of uncertainty, particularly from field measurements;

(d)   Improving the systematization of estimations and the quality assurance/quality control process;

(e)   Incorporating new data from the NFI to update the carbon pools and EFs;

(f)   Including data on carbon removals;

(g)   Accessing and using very-high-resolution satellite images and analysis tools from international partners to address the assessment of absolute and partial forest degradation, and forest land recovery.

III.   Conclusions

45.   The LULUCF experts conclude that Mexico reported the results of implementing two activities, reducing emissions from deforestation and reducing emissions from absolute forest degradation, following a national approach covering the total continental territory and the island of Cozumel. Deforestation is defined as the permanent change from forest land to non-forest land. Absolute forest degradation is defined as a portion of forest land that is completely unstocked with no detection of land-use change, which is a subset of the total forest degradation. The results include estimates of emissions of CO_2 from five carbon pools: above-ground biomass, below-ground biomass, deadwood, litter and soil organic carbon. Emissions from CO_2 were identified from deforestation, resulting from clear-cuts, and absolute forest degradation, resulting from any reduction in canopy cover or forest loss below the thresholds of Mexico's forest definition, which are within the minimum sample-based unit of 1 ha for 2017–2019. The results of the activities were estimated and reported using methodologies, definitions, assumptions and information that are 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.

49.   In conclusion, the LULUCF experts commend Mexico 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 Mexico 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.[6] The LULUCF experts also acknowledge that the TA process was an opportunity for a facilitative and constructive technical exchange of views and information with Mexico.[7]

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[6] As per decision 2/CP.17, para. 57.
[7] 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 Mexico

	Key elements	*Remarks*
Results reported	6 041 219 t CO_2 eq/year	The total reductions in emissions from deforestation and absolute forest degradation are estimated to be 15 609 439 and 2 514 218 CO_2 eq respectively. See paragraph 9 of this document
Results period	2017–2019	See paragraph 9 of this document
Assessed FREL	20 245 016 t CO_2 eq/year	The report on the technical assessment of Mexico's FREL (FCCC/TAR/2020/MEX), published on 21 February 2022, is available at https://redd.unfccc.int/submissions.html?country=mex (see para. 8 of this document)
Reference period	2007–2016	See paragraph 9 of this document
National/subnational	National	The results cover Mexico's total continental territory and the island of Cozumel, which includes all forest regions and forest types (see para. 14(e) of this document)
Activities included	Reducing emissions from deforestation	Deforestation is defined as the permanent conversion from forest land to non-forest land
	Reducing emissions from forest degradation	Forest degradation is defined as absolute forest degradation; that is, a portion of forest land that is completely unstocked with no permanent land-use change (see para. 14(g) of this document)
Pools included	Above-ground biomass	See paragraph 14(c) of this document
	Below-ground biomass	
	Deadwood	
	Litter	
	Soil organic carbon	
Gas included	CO_2	Non-CO_2 emissions are not included (see para. 38 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 paragraph 14(b) of this document
Description of NFMS and institutional roles	Included	See paragraphs 33–35 of this document
Identification of future technical improvements	Included	Several areas for future technical improvement have been identified (see para. 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

"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 technical assessment of the proposed FREL of Mexico submitted in 2020. FCCC/TAR/2020/MEX. Available at https://unfccc.int/sites/default/files/resource/tar2020_MEX.pdf.

Second modified FREL submission of Mexico. Available at https://redd.unfccc.int/files/nref_2020_modificado_mexico_23072021_nt_20220103_clean.pdf.

C. Other documents

The following reference may not conform to UNFCCC editorial style as it has been reproduced as received or as cited in the submission:

CONAFOR. 2022. Procedimiento operativo estándar 3 (SOP3): fotointerpretación (Protocol for the photointerpretation with Collect Earth).