



Technical report on the technical analysis of the technical annex to the second biennial update report of Costa Rica submitted in accordance with decision 14/CP.19, paragraph 7, on 23 December 2019

Summary

This technical report covers the technical analysis of the technical annex submitted on a voluntary basis, in the context of results-based payments, by Costa Rica on 23 December 2019 through its second 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 enhancement of forest carbon stocks, 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)/forest reference level proposed by Costa Rica in its modified FREL submission of May 2016.

Costa Rica reported the results of the implementation of these activities for 2014 and 2015, which amount to 14,794,747 tonnes of carbon dioxide equivalent and were measured against the assessed FREL of 4,365,159 tonnes of carbon dioxide equivalent.

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 Costa Rica in the technical annex are transparent and largely consistent with the assessed FREL established in accordance with decision 1/CP.16, paragraph 71(b), and decision 12/CP.17, section II. This report contains the findings from the technical analysis and a few areas identified for capacity-building and future technical improvement in accordance with decision 14/CP.19, paragraph 14.



Abbreviations and acronyms

AD	activity data
BUR	biennial update report
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
EF	emission factor
FREL	forest reference emission level
FRL	forest reference 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
N ₂ O	nitrous oxide
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
2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>

I. Introduction

A. Introduction

1. This technical report covers the TA of the technical annex provided by Costa Rica on 23 December 2019 in accordance with decision 14/CP.19, paragraph 7, included its second BUR, which was submitted in accordance with decision 2/CP.17, paragraph 41(a), and annex III, paragraph 19. In the technical annex, Costa Rica 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 Costa Rica and through a facilitative sharing of views, resulting in a separate summary report.¹

3. Costa Rica made its first FREL/FRL submission, in accordance with decision 12/CP.17, on 23 May 2016, which was subject to a technical assessment following the guidance provided in decision 13/CP.19 and its annex. The assessed FREL/FRL was included as one of the elements of the technical annex to its 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/FRL are included in a separate report.²

B. Process overview

4. The TA of the second BUR of Costa Rica took place from 9 to 13 March 2020 as a desk analysis³ 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: Kwame Agyei (Ghana), Laura Aranguren (Colombia), Kenel Delusca (member of the Consultative Group of Experts from Haiti), Jenny Mager (Chile), Jorge Eduardo Morfín Ríos (Mexico), Elisabeth Pagnac-Farbiaz (France), Lilian Portillo (former member of the Consultative Group of Experts from Paraguay), Atsushi Sato (Japan), Inês Sousa Mourão (Cabo Verde), Marcelo Theoto Rocha (Brazil) and Silke (Sina) Wartmann (Germany). Mr. Agyei and Mr. Sato 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 Costa Rica 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 Costa Rica engaged in technical discussions, and Costa Rica provided clarifications, including a revised technical annex, 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.

7. Following the TA of the technical annex, the LULUCF experts prepared and shared the draft technical report with Costa Rica for its review and comments. This technical report on the TA of the technical annex was prepared in the context of the revised technical annex

¹ FCCC/SBI/ICA/2020/TASR.2/CRI (under preparation at the time of publication of this report).

² FCCC/TAR/2016/CRI, published on 3 April 2017.

³ Owing to the circumstances related to the coronavirus disease 2019, the technical analysis of the BUR submitted by Costa Rica had to be conducted remotely.

submission (see para. 23 below). The LULUCF experts responded to the Party's comments and incorporated them into and finalized this technical report in consultation with Costa Rica.

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, Costa Rica, on a voluntary basis, proposed a national FREL/FRL covering the activities reducing emissions from deforestation and enhancement of forest carbon stocks for the purpose of a technical assessment in accordance with decision 13/CP.19 and its annex. While the activity reducing emissions from deforestation leads to reduced emissions and the activity enhancement of forest carbon stocks leads to enhanced removals, the net value of the FREL/FRL is the sum of these two activities. The activities are being implemented in Costa Rica's national territory, excluding Cocos Island. The assessed FRELs/FRLs of Costa Rica are emissions of 14,911,467 t CO₂ eq per year and 4,365,159 t CO₂ eq per year for 1997–2009 and 2010–2025, respectively.⁴

9. The Party's FRELs/FRLs are based on its annual average historical net CO₂ emissions associated with the activities reducing emissions from deforestation and enhancement of forest carbon stocks for the contiguous historical reference periods of 1986–1996 and 1997–2009. The reference period 1986–1996 is used for the first FREL/FRL to assess results in 1997–2009 and the reference period 1997–2009 is used for the second FREL/FRL to assess results in 2010–2025. Costa Rica reported the results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks in 2014 and 2015, calculated against the FREL/FRL, which amount to emission reductions of 7,489,243 t CO₂ eq for 2014 and 7,305,504 t CO₂ eq for 2015, which total 14,794,747 t CO₂ eq for the two-year period.

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

A. Technical annex

10. For the technical annex to the second BUR submitted by Costa Rica, see annex I.⁵

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) There is consistency in the methodologies, definitions, comprehensiveness and information provided between the assessed FREL/FRL 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.

⁴ Note that for the assessment of results reported for 2014 and 2015 only the FREL/FRL for 2010–2025 was used.

⁵ In accordance with decision 14/CP.19, para. 14(a).

12. 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.

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

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

14. The LULUCF experts noted that Costa Rica ensured overall consistency between its FREL/FRL and its estimation of the results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks in 2014 and 2015 by:

(a) Using consistent methodologies and data to generate AD on land-use changes of forest land converted to non-forest land and non-forest land converted to forest land using the same satellite land monitoring system, the same land-use categorization system and the same minimum mapping unit (see paras. 21, 24 and 25 below);

(b) Using consistent methodologies and data to generate EFs, in particular the same stratification of forest types, age class and land-use categories (see para. 36 below);

(c) Including the same four carbon pools: above-ground biomass, below-ground biomass, deadwood and litter for both activities;

(d) Including the same gases: CO₂ only (see para. 16 below);

(e) Covering the same area: the entire national territory, except for Cocos Island (see para. 34 below), areas subject to natural disturbance and areas covered by clouds and shadows in the remote sensing images (see paras. 17 and 35 below);

(f) Using the same forest definition as that used in constructing its FREL/FRL.

15. The technical annex also contains information regarding emission reductions achieved by Costa Rica by implementing the two activities reducing emissions from deforestation and enhancement of forest carbon stocks in 2010–2013. However, the technical annex focuses on the results achieved in 2014 and 2015.

16. Biomass burning and related emissions of CH₄ and N₂O were included in the estimates related to the conversion of forests to cropland and grassland for 1986–1996, and excluded from the estimates for after 1996, given that conversion of forest became illegal in 1997 with the adoption of the Forest Law, which led to a dramatic decrease in slash-and-burn activities. Therefore, the FREL/FRL for 2010–2025, which is based on the historical reference period of 1997–2009, and the results for 2014–2015 are consistent, include CO₂ only and exclude CH₄ and N₂O. During the review, the LULUCF experts asked whether wildfire incidences drive deforestation, resulting in a release of non-CO₂ gases. Costa Rica explained that it has a low incidence of forest fires as a result of the effective control policy launched in 2000 when droughts associated with El Niño/Southern Oscillation caused major forest fires in Costa Rica.

17. Areas subject to natural disturbances, such as volcanic activity, earthquakes, flooding and changes in river courses, and areas covered by clouds and shadows in the remote sensing images were excluded from the construction of the FREL/FRL and the estimation of emissions and removals during 2014–2015 used for calculating the results. Costa Rica explained during the TA that no additional natural disturbances occurred in 2014 or 2015, and essentially the same areas covered by clouds and shadows were excluded from construction of the FREL/FRL and calculation of the results of implementing the activities (a small discrepancy in the areas is detailed in para. 39 below).

18. In view of the above, the LULUCF experts concluded that the results presented of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks are consistent with the assessed FREL/FRL. The LULUCF experts

commend Costa Rica for ensuring consistency of the data and methodologies described in the FREL/FRL submission for 2010–2025 and in the technical annex with the results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks for 2014 and 2015.

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

19. The LULUCF experts noted that all data, including the calculation files (such as the spreadsheet tool referred to as FREL TOOL CR), are publicly available and the relevant weblinks are referenced in the technical annex, which enables stakeholders to examine the estimation process transparently and reconstruct the results. The LULUCF experts commend Costa Rica for providing transparent information and continuing to improve the accuracy of its estimates.

20. The LULUCF experts noted that, as part of the TA process, Costa Rica provided additional information, in particular on technical details and estimation methods. The LULUCF experts commend Costa Rica for its efforts to increase the transparency and ensure the completeness⁶ of the data and information provided, allowing for the reconstruction of the results.

21. The LULUCF experts noted that the AD for 2014–2015 (contained in the technical annex) and the AD for 1997–2009 (contained in the FREL submission) used to construct the FREL/FRL were derived from satellite images using the same method and process. The parameters were derived from the national studies and the NFI.

22. According to decision 12/CP.17, paragraph 8, the FREL/FRL 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 Costa Rica's FREL/FRL noted that the Party did not maintain consistency in terms of sources of AD and EFs with the GHG inventory included in its first BUR.⁷ During the TA, Costa Rica provided additional information on consistency based on the latest GHG inventory included in its second BUR. The LULUCF experts noted that full consistency between the GHG inventory and the estimated results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks for 1997–2009 and 2014–2015 has not yet been achieved.

23. The LULUCF experts noted that the calculation file does not have a specific rule for addressing decimal places for the results and the FREL/FRL. This created a small inconsistency between the assessed FREL/FRL figures referred to in the report of the technical assessment of Costa Rica's proposed FREL/FRL and those in the calculation file, amounting to a few tonnes of carbon (e.g. the FREL/FRL for 2010–2025 is expressed as 4,365,160 and 4,365,159 t CO₂ eq per year, respectively). During the TA, Costa Rica also recognized that there were mistakes in tables containing the time series of emissions and removals used for the construction of the FREL/FRL (tables 1 and 4 of the technical annex) and in the tables providing the uncertainty levels of estimated carbon stocks for each category and pool (tables 14–15 of the technical annex). During the TA, Costa Rica submitted a new technical annex containing revised data. The data are consistent with those in the calculation file, but this also means that the FREL/FRL changed by 1 t CO₂ eq from the assessed number. The LULUCF experts consider that this change is reasonable and does not affect the overall accuracy of the results.

24. The emissions from deforestation are calculated separately for primary forest and secondary forest. A different carbon stock per area is estimated for each forest type as well as for each different age-class for secondary forests. The associated carbon losses are then calculated on the basis of the available AD using the same classification. This method is fully consistent between the FREL/FRL and the results. However, during the TA, the LULUCF

⁶ "Complete" here means the provision of the information necessary for the reconstruction of the results.

⁷ Available at <https://unfccc.int/BURs>.

experts identified some technical issues related to the accuracy of estimates of emission reductions from deforestation (see para. 38 below).

25. The enhancement of forest carbon stocks includes net carbon stock changes in the secondary forest category. This category consists of existing secondary forest in 1986 and new forest expansion since 1986. In response to a question from the LULUCF experts, Costa Rica explained that new forests are only included after they are visible through the use of satellite images of the NFMS, and that this occurs when trees in new forest areas are four years old or, for some forest types, eight years old. This method is fully consistent between the FREL/FRL and the results.

26. Costa Rica explained that, for mangroves and palm forests, a linear function was assumed for estimating carbon stocks as a function of age. The LULUCF experts are of the view that this assumption could lead to overestimation of carbon stocks and removals over time for mangroves and palm forests.

27. The LULUCF experts concluded that Costa Rica provided the necessary information to allow for the reconstruction of the results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks. 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

28. Costa Rica 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/FRL; results in t CO₂ eq per year, consistent with the assessed FREL/FRL; a demonstration that the methodologies used to produce the results are consistent with those used to establish the assessed FREL/FRL (as outlined in chap. II.B.1 above); a description of forest monitoring systems and the institutional roles and responsibilities in the MRV of the results; the information necessary for the reconstruction of the results (as outlined in chap. II.B.2 above); and a description of how the elements contained in decision 4/CP.15, paragraph 1(c–d), have been taken into account.

29. In its submission, Costa Rica provided a summary table with the results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks for 2014 and 2015, consistent with the assessed FREL/FRL and allowing for the reconstruction of the results. The emission reductions achieved are listed in table 4 of the technical annex and amount to 7,489,243 and 7,305,504 t CO₂ eq for 2014 and 2015, respectively.

30. The LULUCF experts noted that Costa Rica provided a description of the NFMS and a summary of the institutional roles and responsibilities for the MRV of the results in the technical annex, together with weblinks for accessing further information. The roles and responsibilities of the agencies and institutions involved in MRV were transparently explained. In the technical annex, Costa Rica explained that the National Meteorological Institute is responsible for preparing the national GHG inventory and the BUR, including the REDD+ technical annex. The National Meteorological Institute and the REDD+ Secretariat are in charge of the satellite land monitoring system, while the National System for Conservation Areas is responsible for the NFI. The LULUCF experts commend Costa Rica for sharing this information.

31. The forest monitoring system used is a national system. AD are generated through consistent land-use maps developed by the National Meteorological Institute in accordance with the satellite land monitoring protocol developed by Agresta et al. (2015) and the protocol for post-processing developed by Carbon Decisions International. Costa Rica undertook its first NFI in 2014 to quantify the stock of forest resources in the country and determine the EFs required for MRV of carbon emissions within the framework of the national REDD+ strategy. The NFMS also includes an official platform, called the National System for Monitoring Land Use, Land Cover and Ecosystems, which coordinates and integrates institutions and sectors in order to facilitate the management and dissemination of knowledge and information regarding land cover, land use and ecosystems. In the technical annex, Costa

Rica noted that it has identified areas for improvement in its NFI. Currently, the National System of Conservation Areas, with support from the Forest Service of the United States of America and the Food and Agriculture Organization of the United Nations, together with members of the technical working groups of the National System for Monitoring Land Use, Land Cover and Ecosystems are working on the required adjustments and improvements to the NFI, prior to the next measurement cycle, scheduled for 2020. The LULUCF experts commend Costa Rica for its efforts to improve its NFI.

32. 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. In its technical annex, Costa Rica explained that classification of land use and land cover was based on 56 different land classes. These land classes included four different forest types: forests, mangroves, palm forests and forest plantations. The forest types were stratified into primary and secondary forests, and further stratified on the basis of their ecological zones into wet and rain forests, moist forests, dry forests, mangroves and palm forests. During the TA, Costa Rica explained that forest plantations were mapped as secondary forests and described to the LULUCF experts how harvesting activity in forest plantations, including final clear cuts followed by replanting, are taken into account. Costa Rica explained that clear cutting as part of the harvesting cycle of forest plantations is detected as deforestation, and, after replanting, the carbon gain is detected as enhancement of forest carbon stocks.

33. As indicated by the team of LULUCF experts that assessed the FREL/FRL, Costa Rica assumes that primary forests are unmanaged and, consequently, emissions and removals are not estimated for primary forests except when they are deforested. This assumption is in line with the 2006 IPCC Guidelines, which designate managed land as a proxy for estimating anthropogenic emissions and removals from the various land-use categories, and their treatment of conversion from unmanaged land to managed land (i.e. calculating emissions due to deforestation that occurs on unmanaged forest land). However, the LULUCF experts noted that for future submissions Costa Rica could consider providing additional information, including adequate justification that all designated primary forests are not subject to anthropogenic activities, or applying an approach that treats primary forest as managed land where carbon stocks are in a steady state.

34. In its technical annex, Costa Rica explained that the NFMS covers the entire continental territory of the country (5,133,939.5 ha) but excludes Cocos Island (238,500 ha). The Party explained that Cocos Island was designated a World Heritage Site by the United Nations Educational, Scientific and Cultural Organization and is inhabited solely by park rangers and not subject to anthropogenic interventions. Costa Rica further explained that Cocos Island is also too distant from the continental territory to experience displacements that may be caused by its REDD+ activities.

35. A total area of 115,364.16 ha of Costa Rica's national territory was excluded during the estimation of Costa Rica's FREL/FRL as a result of the presence of cloud cover and shadow. In response to a question from the LULUCF experts, Costa Rica explained that no additional areas (outside of those excluded from the reference period) with cloud cover or shadows were excluded during the monitoring period. The LULUCF experts noted that, as a result of the lack of information on the areas excluded in the reference period owing to the presence of shadows and cloud cover, it may be impossible to conclude that no displacement of emissions has occurred. The LULUCF experts consequently noted that Costa Rica could consider filling the data gaps during the future revision of its FREL/FRL as part of the stepwise approach, in accordance with decision 12/CP.17, paragraph 10.

36. Costa Rica 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 carbon stock changes, Costa Rica used the stock difference method, applying equation 2.5 from the 2006 IPCC Guidelines (vol. 4, chap. 2). With regard to AD for the activities, emission reductions from deforestation and enhancement of forest carbon stocks were estimated by combining land-use maps created for 2013–14 and 2015–2016 in a geographical information system and then extracting the values of the forest areas that remained in the same category, areas that were converted to forests or forest areas converted to other land uses, using the combined set of multi-temporal data. Accordingly, the annual emissions from deforestation and annual removals from carbon stock enhancement were estimated for 2014 and 2015 by

combining AD (i.e. areas of annual deforestation) with the appropriate EF and removal factors (i.e. emissions associated with the corresponding forest type) using the spreadsheet tool (see para. 19 above). For the 2014–2015 monitoring period, uncertainties of the results were estimated using approach 2 from the 2006 IPCC Guidelines, using Monte Carlo simulations, and the uncertainties are reported in terms of 90 per cent confidence intervals.

4. Accuracy of the results proposed in the technical annex

37. The LULUCF experts noted that the Party's estimation of the results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks in the national area of Costa Rica was undertaken using a transparent and consistent approach. The LULUCF experts commend Costa Rica for its significant long-term efforts to build up a robust NFMS that is capable of providing transparent estimates of emissions from deforestation.

38. The LULUCF experts noted that because Costa Rica used a consistent methodology and assumptions for estimating emissions in the establishment of the FREL/FRL and the results of implementing the activities for 2014 and 2015, the net effect of issues relating to accuracy will partially cancel out. These assumptions and the related observations of the LULUCF experts are noted below:

(a) As noted in paragraph 15(c) of the report of the technical assessment of Costa Rica's proposed FREL/FRL submitted in 2016,⁸ the carbon stock of the pre-1986 secondary forest was estimated on the basis of the assumption that each age class up to 400 years old had equal proportions of areas. Thus, a relatively large carbon stock was estimated for this forest. Although this carbon stock value was used consistently to estimate both the FREL/FRL and the results, the LULUCF experts noted that this method could cause an overestimation of emission reductions and could therefore be considered by Costa Rica as one of the priority issues to be addressed in the future revision of its FREL, in line with the stepwise approach;

(b) As noted in paragraph 32 above, plantation forest is included in the secondary forest category. However, the assumptions used for calculating emissions and removals may not be appropriate for this type of forest, as they could lead to an overestimation of the deforestation area and the associated emissions and subsequently an overestimation of the area of forest expansion and the associated removals.

39. As mentioned in paragraph 35 above, Costa Rica provided some information related to the areas excluded from carbon accounting as a result of the presence of cloud cover and shadow in the remote sensing images. In response to a question from the LULUCF experts, Costa Rica explained that a total area of 115,364 ha was excluded from carbon accounting for all years evaluated in the FREL/FRL. However, Costa Rica indicated that, for 2014 and 2015, a total area of 115,291 ha was excluded as a result of cloud cover and shadows, noting that the difference of 73 ha between the excluded areas used in the reference period and those reported in the results is due to reclassification issues resulting from overlaying the 2013 and 2015 land-use and land-cover maps. The Party added that the errors can be corrected if the overlay classification of the two maps is done again. The LULUCF experts noted that addressing the errors associated with reclassification of composite land-use maps by Costa Rica will further enhance the accuracy of future estimates of REDD+ results as part of the stepwise approach.

40. Costa Rica estimated uncertainty for the results period using a combination of approaches 1 and 2 from the 2006 IPCC Guidelines. The LULUCF experts noted that there were high levels of uncertainty associated with both the AD and EFs. Costa Rica reported very low user and producer accuracy (the figures are close to zero in each case) for both conversion of forest to non-forest (deforestation) and non-forest to forest. In addition, high uncertainty levels were associated with some of the input data for estimating the EFs, particularly data for the deadwood pool, which have an uncertainty of up to 141 per cent at the 90 per cent confidence interval. In response to a question from the LULUCF experts regarding the high uncertainty level of the AD, Costa Rica indicated that it is evaluating two options for addressing the issue. The first option is to develop a new time-series analysis of

⁸ FCCC/TAR/2016/CRI.

land-use change using Landsat images with enhanced processing and analytical approaches to ensure a more accurate detection of deforestation. The second option involves preparing a new estimate of the area of forest gain/loss for 1998–2018 using sample-based area estimation methodology. Costa Rica plans to assess both options in 2020 and 2021, but this will require licensing and capacity-building for the national forest monitoring team on using terraPulse methodology for supervised classification of satellite images, and the purchase of permanent licenses to access high-resolution imagery to produce sample-based estimates of deforestation and regeneration. The LULUCF experts commend Costa Rica for its efforts to address uncertainties as part of the stepwise approach.

C. Areas identified for technical improvement

41. The LULUCF experts concluded that the following areas for technical improvement identified in the report on the technical assessment of Costa Rica's FREL⁹ also apply to the provision of information on the results of the implementation of the activities reducing emissions from deforestation and enhancement of forest carbon stocks:

(a) Identification of primary and secondary forests: the LULUCF experts noted that the submission lacks a clear description of how primary and secondary forests were distinguished in the 1978/1980 map);

(b) Assumption of age-class distribution of secondary forests in 1985–1986: the LULUCF experts recommend that the Party provide more robust data to support the assumption that secondary forests in 1985–1986 are representative of all possible age classes, up to 400 years old, with equal proportion of areas; or introduce an alternative age-class assumption for secondary forests in those years;

(c) Representativeness of the carbon growth model: the sampling process on which the carbon growth model is based may result in a partial representativeness of the forests included in the FREL/FRL; the LULUCF experts recommend that Costa Rica revise and increase the sampling plots on which the carbon growth model is based in order to ensure the representativeness of all the forest included in the FREL/FRL;

(d) Accuracy of the carbon growth model: the data from Cifuentes do not take into account the carbon stock losses due to rotation in plantations that have been classified as secondary forests, and may thus be underestimating carbon losses;

(e) Consistency of methodologies between the GHG inventory and REDD+: Costa Rica could complete the harmonization process with the GHG inventory to achieve consistency between the GHG inventory and the data used in REDD+;

(f) Inclusion of the below-ground deadwood in the below-ground biomass pool: those pools are excluded from the accounting. Costa Rica could include those pools in the future revision of its FREL;

(g) Treatment of emissions from soil organic carbon: soil organic carbon is excluded from the accounting. Costa Rica could include this pool in the future revision of its FREL or provide more information justifying its omission;

(h) Inclusion of additional REDD+ activities: Costa Rica expressed the intention to include additional REDD+ activities such as reducing emissions from forest degradation and sustainable management of forest.

42. Furthermore, the LULUCF experts noted that Costa Rica could consider the following activities:

(a) Investigating the appropriateness of the carbon stock of annual crops when developing its next FREL/FRL. The use of biomass from sugarcane plantation as post-deforestation carbon stock gives a very high carbon stock, but the submission does not confirm how well this value represents the whole annual cropland after a deforestation event;

⁹ FCCC/TAR/2016/CRI.

- (b) Filling the data gaps of areas excluded from carbon accounting owing to the presence of cloud cover and shadows when estimating the FREL/FRL and emissions during the results period;
- (c) Providing clarity or further justification regarding whether primary forests are managed or unmanaged. Although the technical annex designates primary forests as “non-managed”, there are occurrences of deforestation in these areas;
- (d) Addressing errors associated with overlaying maps to create reclassified composite maps to estimate AD;
- (e) Applying an approach to distinguish between temporary loss of forest resulting from rotation of forest plantations from permanently deforested secondary forests;
- (f) Including parameters in addition to age (e.g. stocking, tree diameter) to determine carbon stock changes over time in mangroves and palm forests.

D. Comments and responses of the Party

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

- (a) Techniques for conducting supervised classification of satellite images (e.g. Random Forest) in order to better separate forest plantations from natural forest;
- (b) Addressing the following issues in order to improve the NFI:
 - (i) Data deficiencies that resulted in the exclusion of the activities reducing emissions from forest degradation and sustainable management of forests from the FREL/FRL;
 - (ii) Lack of measurement of carbon stocks of some of the land-use categories considered in the national GHG inventory and the FREL/FRL, such as the non-forest land-use categories and categories of age class of secondary forests;
 - (iii) Differences in the forest classifications used in the NFI and the national GHG inventory.

III. Conclusions

44. The LULUCF experts conclude that Costa Rica reported the results of the implementation of two activities: reducing emissions from deforestation and enhancement of forest carbon stocks for 2014 and 2015. The technical annex covers the entire continental territory (5,133,939.5 ha), excluding Cocos Island (238,500 ha), which is not subject to anthropogenic interventions. The results include estimates of emissions of CO₂ from the carbon pools above-ground biomass, below-ground biomass, deadwood and litter. The results of the activities were reported using overall consistent methodologies, definitions, data, assumptions and information with those used for the assessed FREL/FRL.

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

46. 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.

47. The results are mostly accurate to the extent possible, based on the assumptions used. The LULUCF experts noted that Costa Rica intends to take steps to address the high uncertainty level associated with the estimation of AD for the activities reducing emissions from deforestation and enhancement of forest carbon stocks.

48. In conclusion, the LULUCF experts commend Costa Rica 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/FRL. Some areas for future technical improvement and capacity-building needs identified by Costa Rica 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 Costa Rica.¹¹

¹⁰ In accordance with decision 2/CP.17, para. 57.

¹¹ In accordance with decision 14/CP.19, paras. 12–13.

Annex I

Technical annex to the biennial update report

Owing to the complexity and length of the submitted technical annex to the BUR, and in order to maintain the original formatting, the technical annex is not reproduced here. It is available on the UNFCCC website at <https://unfccc.int/BURs>.

Annex II

Summary of the main features of the proposed results of the implementation of the activities referred to in decision 1/CP.16, paragraph 70, based on information provided by Costa Rica

	<i>Key elements</i>	<i>Remarks</i>
Results reported	7 489 243 t CO ₂ eq (2014) 7 305 504 t CO ₂ eq (2015)	See paragraphs 9 and 15 of this document
Results period	2014 and 2015	See paragraphs 9 and 15 of this document
Assessed FREL/FRL	14 911 467 t CO ₂ eq/year (for 1997–2009) 4 365 159 t CO ₂ eq/year (for 2010–2025)	These are the assessed numbers in the technical assessment report published on 3 April 2017 (FCCC/TAR/2016/CRI) based on the FREL submitted by Costa Rica in 2016. ^a Due to the rounding of decimals in the calculation file, the FREL/FRL for 2010–2025 was reduced by 1 t CO ₂ eq in the calculation of the results (see para. 23 of this document)
Reference period	1997–2009	The FREL/FRL for 2010–2025 was set from the 1997–2009
National/subnational	National	All forest land in the national territory except for Cocos Island is included. However, forest areas covered by shadows and clouds in the remote sensing images were technically excluded from the assessment. In addition, the areas subject to natural disturbance were not considered to be relevant to anthropogenic deforestation and also excluded (see paras. 14(e), 17, 34 and 35 of this document)
Activities included	Reducing emissions from deforestation Enhancement of forest carbon stocks	Deforestation covers net emissions (carbon losses due to conversion and subsequent carbon gains after conversion) occurring in primary and secondary forests. Enhancement of forest carbon stocks is the annual average removals of secondary forest, and new forest land created through plantation or natural regeneration of forest in non-forest lands since 1986 (see paras. 24–25 of this document)
Pools included	Above-ground biomass Below-ground biomass Deadwood Litter	Both activities include the four carbon pools (see para. 14(c) of this document)
Gas included	CO ₂	Non-CO ₂ emissions are not considered after 1997. Thus, the results include CO ₂ only (see para. 16 of this document)
Consistency between assessed FREL and the results	Methods, definitions and information used for the assessed FREL/FRL are consistent with the results	Consistency between FREL and the results was ensured (see para. 18 of this document)
Description of NFMS and institutional roles	Included	The relevant information is provided in the technical annex (see paras. 30–31 of this document)
Identification of future technical improvements	Included	Several areas for future technical improvement were identified (see paras. 41–43 of this document)

^a See https://redd.unfccc.int/files/frel_costa_rica_modified.pdf.

Annex III

Documents and information used during the technical analysis

A. Reference documents

Agresta, Dimap, University of Costa Rica, et al. 2015. *Índice de cobertura como base para la estimación de la degradación y aumento de existencias de carbono [Coverage rate as a basis for estimating losses and gains in carbon stocks]. Generating a consistent historical time series of activity data from land use change for the development of Costa Rica's Redd Plus reference level.* Available at <http://reddcr.go.cr/en/node/570>.

Cifuentes M. 2008. Aboveground Biomass and Ecosystem Carbon Pools in Tropical Secondary Forests Growing in Six Life Zones of Costa Rica. Available at http://reddcr.go.cr/sites/default/files/centro-de-documentacion/cifuentes_m_2008_-_dissertation_agb_secondary_forests_cr.pdf.

First and modified FREL/FRL submissions of Costa Rica. Available at <https://redd.unfccc.int/submissions.html?country=cri>.

“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/2011/cop17/eng/09a02.pdf#page=19>.

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>.

Report of the technical assessment of the proposed FREL of Costa Rica submitted in 2016. FCCC/TAR/2016/CRI. Available at <https://redd.unfccc.int/submissions.html?country=cri>.

B. Additional information provided by the Party

The following documents¹ were provided by the Party in response to requests for clarification or additional information during the TA:

Accuracy assessment tool for R. Available at <https://github.com/openforis/accuracy-assessment>.

FAO NFMA paper N46: Map accuracy assessment and area estimation. Available at <http://www.fao.org/3/a-i5601e.pdf>.

FREL tool with Monte Carlo analysis and summary of Monte Carlo results. Available at <https://drive.google.com/open?id=1BjxEscZrONIQOPYX267xfidbXKvemxGo>.

FREL & MRV TOOL CR.xlsx. Available at https://drive.google.com/open?id=1WzEZbNwUmO_x74R7udQSD4YmcO5GiFF4.

FREL & MRV TOOL CR MapaIMN15V3.xlsx. Available at https://drive.google.com/open?id=1ZV7eYpA5ab75VLKLF3KGp8rfPJ_U3wpz.

Nivel de Referencia de Emisiones y Absorciones Forestales de Costa Rica ante el Fondo de Carbono de FCPF. Available at <http://reddcr.go.cr/sites/default/files/centro-de-documentacion/3.4.6- nivel de referencia de costa rica - informe final 18.09.2015.pdf>.

¹ Reproduced as received from the Party.

SpatialDataSubmission20122016.gdb. Available at
https://drive.google.com/open?id=1FPBf5l23qnMcUe7lH_4ajDs3s177SpQS.

Table1_reviewed.xlsx. Available at
<https://drive.google.com/open?id=1l23FubxDBwpeBw5zhpMpCPCASkuFCUOT>.

Technical Work Group of Costa Rica's National land use, land cover and ecosystems monitoring system. Available at <https://simocute.go.cr>.

Terrapulse. Available at <https://www.terrapulse.com/solutions.html#Forests>.

The full list of consulted sources may be found in the sheet "1. Referencias" of the Excel file "BaseDeDatos_v5 (28.12.2015).xlsx". Available at
https://drive.google.com/open?id=12F9Y9-_WZ_TFdsxL4hfzp6RY4NlFPwV4.
