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Technical report on the technical analysis of the technical annex to the first biennial update report of Suriname submitted in accordance with decision 14/CP.19, paragraph 7, on 5 November 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 Suriname on 5 November 2022 through its first 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 Suriname in its modified FREL submission of August 2021.

Suriname reported the results of implementing these activities for 2020–2021, which amount to 8,936,741 tonnes of carbon dioxide equivalent and were measured against the assessed FREL of 14,008,889 and 14,612,231 tonnes of carbon dioxide equivalent per year for 2020 and 2021 respectively.

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 Suriname in the technical annex are transparent and 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
C	carbon
CH_4	methane
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
IPCC good practice guidance for LULUCF	*Good Practice Guidance for Land Use, Land-Use Change and Forestry*
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
NFMS	national forest monitoring system
N_2O	nitrous oxide
NFI	national forest inventory
QGIS	quantum geographic information 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)
SOC	soil organic carbon
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 Suriname on 5 November 2022 in accordance with decision 14/CP.19, paragraph 7, included in its first BUR, which was submitted in accordance with decision 2/CP.17, paragraph 41(a), and annex III, paragraph 19. In the technical annex, Suriname 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 Keiichi Igarashi (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 Suriname and through a facilitative sharing of views, resulting in a separate summary report.[1]

3. Suriname made its second FREL submission, in accordance with decision 12/CP.17, on 8 January 2021, which was subject to a technical assessment following the guidance provided in decision 13/CP.19 and its annex. The latest assessed FREL[2] was included as one of the elements of the technical annex to its first BUR in accordance with the guidelines contained in decision 14/CP.19, annex. The findings from the technical assessment of the FREL are included in a separate report.[3]

4. Suriname simultaneously submitted a technical annex to its first BUR on 5 November 2022. The outcome of the TA thereof is contained in document FCCC/SBI/ICA/2023/TATR.1/SUR. Previous FREL submissions, BURs with technical annexes and associated technical assessment and analysis reports for the Party are available online.[4]

B. Process overview

5. The TA of the first BUR of Suriname took place from 17 to 22 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: Buket Akay (Türkiye), Irina Atamuradova (member of the Consultative Group of Experts from Turkmenistan), Bernard Ayittah (Ghana), Yen Mee Chong (Malaysia), Sangay Dorji (Bhutan), Craig William Elvidge (New Zealand), Baasansuren Jamsranjav (Mongolia), Nato Lomidze (Georgia), Anwar Sidahmed Mohamed Abdalla (Sudan), Gherghita Nicodim (Romania), Marcela Itzel Olguin-Alvarez (Mexico), Maria de los Angeles Soriano Luna (Mexico) and David Glen Thistlethwaite (United Kingdom of Great Britain and Northern Ireland). Craig William Elvidge and Maria de los Angeles Soriano Luna were the LULUCF experts who undertook the TA of the technical annex, which took place from 20 to 24 February 2023, in accordance with decision 14/CP.19, paragraphs 10–13.

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

[1] FCCC/SBI/ICA/2023/TASR.1/SUR.

[2] The Party's technical annex contained a FREL that was slightly different from the assessed FREL owing to a typographical error. In response to discussions with the LULUCF experts, Suriname included the assessed FREL and a transparent explanation of the change in a modified technical annex (see para. 31 below).

[3] FCCC/TAR/2021/SUR, published on 3 June 2022.

[4] https://redd.unfccc.int/submissions.html?country=sur.

7. During the TA and subsequent exchanges, the LULUCF experts and Suriname engaged in technical discussions, and Suriname 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. As a result of the facilitative interactions with the LULUCF experts during the TA, Suriname submitted a modified version of its technical annex on 3 April 2023.

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

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, Suriname, on a voluntary basis, proposed a national FREL covering the activities reducing emissions from deforestation and reducing emissions from forest degradation[5] for the purpose of a technical assessment in accordance with decision 13/CP.19 and its annex. The activities are being implemented in an area of 152,000 km^2, which is 100 per cent of Suriname's total forest land, comprising up to 93 per cent of the national territory. The assessed FREL of Suriname is 14,008,889 t CO_2 eq and 14,612,231 t CO_2 eq for 2020 and 2021 respectively.

10. The Party's FREL is based on its historical CO_2 emissions associated with the activities reducing emissions from deforestation and reducing emissions from forest degradation for the historical reference period 2000–2019. Suriname noted its intention to update its FREL by, for example, carrying out a technical improvement and including the other REDD+ activities. Suriname reported the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2020–2021, calculated against the FREL, which amount to emission reductions of 8,936,741 t CO_2 eq (4,097,351 t CO_2 eq for 2020 and 4,839,390 t CO_2 eq for 2021).

11. Suriname submitted its first FREL for technical assessment in 2018.[6] The assessed FREL was 14,627,465 (2016), 15,591,284 (2017), 16,555,103 (2018) and 17,518,922 (2019) t CO_2 eq for the reference period 2016–2019. Measured against this value, Suriname also submitted results amounting to 1,819,273 t CO_2 eq for 2016, 1,526,545 t CO_2 eq for 2017, 2,903,107 t CO_2 eq for 2018 and 2,930,053 t CO_2 eq for 2019, which were assessed in 2023.[7]

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

A. Technical annex

12. For the technical annex to the first BUR submitted by Suriname, see annex I.[8]

[5] The activity reducing emissions from forest degradation in Suriname covers emissions only from forest degradation due to roundwood and fuelwood logging and expansion of areas of shifting cultivation.

[6] See document FCCC/TAR/2018/SUR.

[7] See document FCCC/SBI/ICA/2023/TATR.1/SUR.

[8] 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 first 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 Suriname 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 2020–2021 by:

(a) Using consistent methodologies and data to generate AD on gross deforestation of natural forests and forest degradation due to timber logging, in particular applying area-based AD for deforestation and volume-based AD for forest degradation, with the same approach used to assess the deforestation area;

(b) Using consistent methodologies and data to generate EFs, in particular through forest stratification combining physical boundaries (e.g. natural boundaries) and administrative boundaries (e.g. protected areas and the southern border of the forest belt);

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

(d) Covering the same gases: CO_2, CH_4 and N_2O;

(e) Covering the same area: entire national territory;

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

(g) Using the same forest definition, namely land covered primarily by trees, but also often containing shrubs, palms, bamboo, herbs, grass and climbers, with a minimum tree cover of 30 per cent (or equivalent stocking level), the potential to reach a minimum canopy height in situ of 5 m and a minimum area of 1 ha.

17. 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 Suriname for ensuring consistency of data and methodologies between the FREL submission for 2020–2024 and the modified technical annex with the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2020–2021.

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

18. As part of the TA process, Suriname provided additional information, in particular information to demonstrate that the methodologies used to produce the results are consistent with those used to produce the FREL, worksheets containing calculated results and the uncertainty analysis of emissions from deforestation and forest degradation, including weblinks to relevant data and information. The LULUCF experts commend Suriname for its efforts to increase the transparency and ensure the completeness[9] of the data and information provided, thus allowing for reconstruction of the results.

19. Suriname used a combination of approaches 2 and 3 from the 2006 IPCC Guidelines to determine historical deforestation. Historical assessments of deforestation used a Landsat-based baseline map for 2000 and historical assessments of deforestation, also based on Landsat satellite images, for 2000–2009, 2009–2013 and then annually until 2017. Annual Sentinel 2A and 2B satellite images were used for the 2018–2019 deforestation maps. In all cases the mapping input pixel was 30 m for Landsat and 10 m for Sentinel 2A. Deforestation areas were mapped using a semi-automatic method that drew on data from the system for earth observations, data access, processing and analysis for land monitoring of the Food and Agriculture Organization of the United Nations; produced cloud-free mosaics using the median value for each year; and used a random forest classifier to stratify areas into forest or non-forest classes. This mapping was then compared with a baseline forest map for 2000 in order to determine the updated non-forest areas. Unbiased area estimates were then produced using a stratified random sampling approach based on that of Olofsson et al. (2020), namely mapping classes as strata with the addition of a buffer stratum, in order to control for the significant impact of omission errors on the large class of forest land remaining forest land in the final confidence interval estimates. Samples were evaluated by visually comparing them with the original Landsat and Sentinel data and any additional available data.

20. The same approach was used to determine actual deforestation in 2020–2021 using wall-to-wall AD from Sentinel 2A and 2B imagery. For producing the deforestation maps, a semi-automatic classification was applied in the desktop geographic information system QGIS (Inglada and Christophe, 2009), followed by post-processing for supervised classification (Foundation for Forest Management and Production Control, 2021) and applying the methodology recommended by Olofsson et al. (2020).

21. Suriname's deforestation EFs used for the FREL and the results for 2020–2021 were based on the average total carbon stock of the three carbon pools (above-ground biomass, below-ground biomass and deadwood) for each of the four forest strata, assuming instantaneous oxidation of all carbon stocks (see tables 4.10 and 4.11 of the modified FREL submission). The data were from a national database of information from 212 forest inventory plots scattered across the country and 11 additional mangrove NFI plots in the coastal area (Foundation for Forest Management and Production Control, 2019). EFs for shifting cultivation were based on a peer-reviewed paper by Pelletier, Codjia and Potvin (2012), the geographical scope of which was Panama.

22. The AD and EFs used for the FREL and technical annex were consistent. The AD for forest degradation were estimated applying the same historical periods as applied for deforestation. Regarding forest degradation due to shifting cultivation, namely the transition from forest to shifting cultivation, AD were produced by taking the location of observed tree cover loss compared with the baseline forest map for 2000 and aggregating detected losses consistently smaller than 1 ha, following the assumption that small clearings would be part of the shifting cultivation cycle. Suriname characterized areas of shifting cultivation by location in terms of clearing size, temporal dynamics regarding agriculture and subsequent regeneration of tree cover.

23. Regarding forest degradation due to roundwood logging, the volume-based AD were determined from the total volume of annual timber production, which was taken from the records of the Sustainable Forestry Information System Suriname (an upgraded log tracking system that replaced LogPro in 2019) and of the Foundation for Forest Management and

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

Production Control. The data of the Foundation for Forest Management and Production Control on roundwood production are not derived from the spatial monitoring of logging activities but from data recorded in its "cutting register", which registers all legally produced roundwood. AD on log volumes were estimated using felled tree log dimensions.

24. Regarding forest degradation due to fuelwood logging, AD were derived from data collected annually by the General Bureau of Statistics on household fuelwood for 2020, with an extrapolation applied for 2021. Suriname derived its EF for forest degradation due to shifting cultivation by taking the difference between the biomass quantities estimated for each of the four forest strata and the average biomass estimates reported by Pelletier, Codjia and Potvin (2012) for areas of early cycle shifting cultivation in Panama. The first six years of the rotation were considered in deriving these EFs.

25. Regarding forest degradation due to legal logging of industrial roundwood, the EF for forest degradation was estimated assuming instantaneous oxidation of the direct loss in living biomass due to logging, namely the extracted logs, unextracted wood, incidental logging-related damage to other trees caused by tree felling, and establishment of haul roads and skid trails. Since the IPCC good practice guidance for LULUCF and the 2006 IPCC Guidelines do not provide enough detail on how to calculate emissions from logging activities, Suriname applied the methodology developed by Pearson et al. (2014).

26. According to that methodology, the total EF (in t C emitted/m^3 timber extracted from selective logging) was estimated as the sum of the carbon from the extracted logs plus the carbon from deadwood due to logging on the logging site and the carbon from deadwood due to the establishment of skid trails and haul roads, all measured in t C/m^3 timber extracted. The methods used to determine the EF for forest degradation due to logging (CO_2 emitted/m^3 timber produced) are described in Zalman et al. (2019). The biomass of trees was estimated using an equation for pantropical forests developed by Chave et al. (2014) based on diameter at breast height, environmental stress and wood density values.

27. 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 Suriname's FREL noted that the Party maintained consistency in terms of sources of AD and EFs with those used for the GHG inventory included in its first BUR.[10] The LULUCF experts noted that this was also true for the estimated results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2020–2021.

28. All data, images and annual maps are publicly available, which enables stakeholders to reconstruct annual increments of forest stocks. Suriname, as a developing country, is seeking for possibilities to implement an NFI, which is expected to provide data that will help to improve the accuracy of its estimates. The LULUCF experts commend Suriname for providing transparent information and continuing to improve the accuracy of its estimates.

29. The LULUCF experts concluded that Suriname provided the information necessary for reconstructing the results of implementing the activity reducing emissions from deforestation and reducing emissions from forest degradation for 2020–2021. 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

30. Suriname 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 forest monitoring system and institutional roles and responsibilities in MRV of the results; the information necessary for reconstructing the results (as outlined in

[10] Available at https://unfccc.int/documents/622910.

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.

31. Suriname provided a summary table with the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2020–2021, which are consistent with the assessed FREL, thus allowing for reconstruction of the results. The emission reduction results, which are listed in table 9 of the modified technical annex, amount to 8,936,741 t CO_2 eq (4,097,351 t CO_2 eq for 2020 and 4,839,390 t CO_2 eq for 2021). The results have been calculated in relation to the value in the modified FREL submission of 14,008,889 t CO_2 eq for 2020 (which replaced the value of 14,008,882 t CO_2 eq entered in error in the original FREL submission) and a consistent value of 14,612,231 t CO_2 eq for 2021.

32. The LULUCF experts noted that Suriname 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. The LULUCF experts commend Suriname for sharing this information.

33. Suriname's NFMS incorporates the Sustainable Forestry Information System Suriname and a near real-time monitoring system. Suriname noted that these will strengthen the monitoring of AD and EFs for different types of logging, including both legal and illegal logging. The NFMS includes an MRV function and other monitoring functions. Suriname's NFMS consists of six components: a satellite land monitoring system, a near real-time monitoring system, a sustainable forestry information system, the involvement of communities in forest monitoring, an NFI and reporting.

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

35. Suriname 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, Suriname used the methodology provided in the 2006 IPCC Guidelines for estimating carbon stocks in forest land converted to other land uses. Suriname used a combination of approaches 2 and 3 from the 2006 IPCC Guidelines to determine historical deforestation. Historical assessments of deforestation for 2000–2009, 2009–2013, 2013–2014, 2014–2015, 2015–2016 and 2016–2017 were based on Landsat satellite images and for 2017–2018 and 2018–2019 were based on Sentinel 2A and 2B imagery, which were used for the base map and all deforestation maps. Accordingly, the emissions from deforestation were estimated for 2020–2021 by combining AD (i.e. areas of annual deforestation) with the appropriate EFs (i.e. emissions associated with the corresponding forest stratification).

36. The Party's second FREL submission includes the above-ground biomass, below-ground biomass and deadwood pools. It excludes litter and SOC in the absence of adequate data. Regarding GHGs, the second FREL was based on the estimated trends in CO_2, CH_4 and N_2O emissions from deforestation and CO_2 emissions from forest degradation. Overall, the exclusion of the litter and SOC pools and non-CO_2 gases was adequately justified. The LULUCF experts commend Suriname for its intention to obtain better information on litter, SOC and 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

37. The LULUCF experts noted that the Party estimated the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation using a transparent and consistent approach. They commend Suriname for its significant long-term efforts to build up a robust NFMS that is capable of providing transparent estimates of emissions from deforestation.

38. Both the established FREL and the results obtained for 2020–2021 from implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation are based on the assumption that all carbon stocks from all carbon pools included in the analysis are lost immediately at the time of conversion to another land use (see para. 21 above) and that instantaneous oxidation of the direct loss in living biomass due to logging

occurs (see para. 25 above). The LULUCF experts noted that an overestimation of emissions from deforestation and forest degradation could result from assuming that instantaneous oxidation occurs. They also noted that, because Suriname has used a consistent methodology for estimating emissions in establishing the FREL and for the results for 2020–2021, the net effect would cancel out.

39. As mentioned in paragraph 18 above, Suriname provided some information related to the uncertainties of estimated emissions from deforestation and forest degradation for 2000–2019 from the FREL and shared worksheets containing an uncertainty analysis for AD, EFs and emissions for 2020–2021. For estimating the overall uncertainty of emissions from deforestation, Suriname applied the error propagation method proposed in the IPCC good practice guidance for LULUCF. Suriname mentioned in the technical annex that the accuracy assessment of AD for deforestation was determined using the map accuracy assessment suggested by Olofsson et al. (2014) and the Global Forest Observation Initiative (2017).

C. Areas identified for future technical improvement

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

(a) Establishing independent in-country capacity for data processing;

(b) Providing additional details on the standard operating procedures used for processing the samples used to produce unbiased AD estimates for deforestation and forest degradation due to shifting cultivation;

(c) Providing better evidence that the shift from Landsat data to Sentinel 2A data did not affect the comparability of the data across the time series;

(d) Calculating uncertainty estimates for the projections and their goodness of fit for the results period;

(e) Presenting detailed information on how bias in the interpretation of the samples is avoided in order to produce unbiased estimates of AD for deforestation and shifting cultivation;

(f) Collecting more accurate data in order to estimate emissions from illegal logging;

(g) Providing clear information on where a stock-change approach and where a gain–loss approach was used in the calculations;

(h) Elaborating EFs for forest degradation due to shifting cultivation.

41. Furthermore, the LULUCF experts noted that Suriname could consider continuing its ongoing efforts to develop an NFI in order to improve AD (deforestation area), EFs (carbon stock change for each forest type) and estimates of forest degradation in order to improve the accuracy of the results.

D. Comments and responses of the Party

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

(a) Developing a cost-efficient NFI with statistical estimation procedures, including developing a carbon inventory, and gathering information on the co-benefits of REDD+ for the timber production sector;

(b) Integrating MRV systems at the national and community level and building capacity at those levels through, for example, information or awareness-raising sessions about MRV, in order to support the NFMS and the implementation of the national REDD+ strategy;

(c) Building a harmonized NFMS database that provides up-to-date reports of emissions for the GHG inventory, including uncertainty estimates, and for reporting on criteria and indicators for, for example, the Convention on Biological Diversity, the Global Forest Resources Assessment and the International Tropical Timber Organization;

(d) Using consistent methods to calculate EFs related to conversion from forest land to a land-use type with remaining biomass, such as agriculture and pasture;

(e) Conducting research on the carbon stock changes and associated EFs related to rotational shifting cultivation activities;

(f) Further strengthening capacity for reporting on emissions from forest degradation using field-based measurements and applying approach 3 from the 2006 IPCC Guidelines to determine the AD;

(g) Conducting research on including other REDD+ activities in the FREL;

(h) Conducting research on establishing FREL projections based on calculations of average emissions for historical periods.

III. Conclusions

43. The LULUCF experts conclude that Suriname reported the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation. The results include estimates of emissions of CO_2, CH_4 and N_2O from three carbon pools, above-ground biomass, below-ground biomass and deadwood, for 2020–2021. 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.

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

45. 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.

46. The results are accurate to the extent possible based on the assumptions used.

47. In conclusion, the LULUCF experts commend Suriname 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 Suriname 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.[11] The LULUCF experts also acknowledge that the TA process was an opportunity for a facilitative and constructive technical exchange of views and information with Suriname.[12]

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

[12] 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 Suriname

Key elements		*Remarks*
Results reported (t CO_2 eq/year)	4 097 351 (2020) 4 839 390 (2021)	Presented as emission reduction amounts over two years. See paragraph 10 of this document
Results period	2020–2021	See paragraph 10 of this document
Assessed FREL (t CO_2 eq/year)	14 008 889 (2020) 14 612 231 (2021) 15 215 572 (2022) 15 818 913 (2023) 16 422 255 (2024)	See the report on the technical assessment of Suriname's proposed FREL (FCCC/TAR/2021/SUR) and paragraph 9 of this document
Reference period	2000–2019	See paragraph 9 of this document and paragraph 12 of the report on the technical assessment of Suriname's proposed FREL
National/subnational	National	Suriname developed a national FREL covering its entire territory and incorporating all forests in the country (see para. 9 of this document and para. 59 of the report on the technical assessment of Suriname's proposed FREL)
Activities included	Reducing emissions from deforestation Reducing emissions from forest degradation	See paragraph 10 of this document
Pools included	Above-ground biomass Below-ground biomass Deadwood	See paragraph 16 of this document
Gases included	CO_2, CH_4, N_2O	The FREL is based on the estimated trends in CO_2, CH_4 and N_2O emissions from deforestation and CO_2 emissions from forest degradation (see para. 16 of this document)
Consistency with assessed FREL	Methods, definitions and information used for the assessed FREL are consistent with those used for the results	Consistent parameters, land-use maps and estimation equations were applied for both the assessed FREL and the results. See paragraphs 16–17 of this document
Description of NFMS and institutional roles	Included	See paragraph 33 of this document
Identification of future technical improvements	Included	Several areas for future technical improvement have been identified (see para. 40 of this document)

Annex III

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

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

First and second modified FREL submissions of Suriname. Available at https://redd.unfccc.int/submissions.html?country=sur.

"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 Suriname submitted in 2021. FCCC/TAR/2021/SUR. Available at https://unfccc.int/sites/default/files/resource/tar2022_SUR.pdf.

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:

Chave, Jérôme, Maxime Réjou-Méchain, Alberto Búrquez, Emmanuel Chidumayo, Matthew S. Colgan, Welington B. C. Delitti, Alvaro Duque, Tron Eid, Philip M. Fearnside, Rosa C. Goodman, Matieu Henry, Angelina Martínez-Yrízar, Wilson A. Mugasha, Helene C. Muller-Landau, Maurizio Mencuccini, Bruce W. Nelson, Alfred Ngomanda, Euler M. Nogueira, Edgar Ortiz-Malavassi, Raphaël Pélissier, Pierre Ploton, Casey M. Ryan, Juan G. Saldarriaga, and Ghislain Vieilledent. 2014. "Improved Allometric Models to Estimate the Aboveground Biomass of Tropical Trees." Global Change Biology 20(10):3177–90. doi: 10.1111/gcb.12629. 1–11. doi:10.1007/s004420050201.

Global Forest Observation Initiative, Global Observation of Forest and Land Dynamics, Norwegian Space Center, 2017. 2nd Expert workshop on lessons learned from Accuracy Assessments in the context of REDD +. Oslo, pp. 1–12.

Inglada. J and Christophe, E., 2009. "The Orfeo toolbox remote sensing image processing software," in IEEE International Geoscience and Remote Sensing Symposium, IGARSS'09, Cape Town, South Africa, 2009.

Olofsson, P., Foody, G.M., Herold, M., Stehman, S. V., Woodcock, C.E., Wulder, M.A., 2014. Good practices for estimating area and assessing accuracy of land change. Remote Sens. Environ. doi:10.1016/j.rse.2014.02.015.

Olofsson, P., Arevalo P., Espejo A., Green C., Lindquist E., McRoberts R., Sanz M., 2020. Mitigating the effects of omission errors on area and area change estimates. Remote Sensing of Environment. doi:10.1016/j.rse.2019.111492.

Pearson, T.R.H., Brown, S., Casarim, F.M., 2014. Carbon emissions from tropical forest degradation caused by logging. Environ. Res. Lett. 9, 34017.

Pelletier, Johanne, Claude Codjia, and Catherine Potvin. 2012. “Traditional Shifting Agriculture: Tracking Forest Carbon Stock and Biodiversity through Time in Western Panama.” Global Change Biology 18(12):3581–95. doi: https://doi.org/10.1111/j.1365-2486.2012.02788.x.

Foundation for Forest Management and Production Control, 2019. GCCA+ Suriname Adaptation Project. Setting up a mangrove biodiversity monitoring system. November 2019. Paramaribo, Suriname.

Foundation for Forest Management and Production Control, 2021. Technical report: Forest cover monitoring in Suriname using remote sensing techniques. Stichting voor Bosbeheer en Bostoezicht, directoraat Onderzoek en Ontwikkeling, afdeling Forest Cover Monitoring Unit. Juni 2021, Paramaribo.

Zalman, Joey, Peter W. Ellis, Sarah Crabbe, and Anand Roopsind. 2019. “Opportunities for Carbon Emissions Reduction from Selective Logging in Suriname.” Forest Ecology and Management 439:9–17. doi: 10.1016/j.foreco.2019.02.026.