United Nations

Framework Convention on Climate Change

FCCC/ETF/TATR.1/2024/PAN

Distr.: General
16 May 2025

English only

Technical report on the technical analysis of the technical annex to the first biennial transparency report of Panama submitted in accordance with paragraph 14 of decision 18/CMA.1 on 30 June 2024

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 Panama on 30 June 2024 through its first biennial transparency report in accordance with paragraph 45 of decision 1/CP.24 and paragraph 14 of decision 18/CMA.1. The technical annex provides data and information on the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks, which are activities included in paragraph 70 of decision 1/CP.16, and covers the same national territorial forest area as the assessed forest reference level (FRL) proposed by Panama in its modified FRL submission of January 2022.

Panama reported the results of implementing these activities for 2016–2020, which amount to 498,377 tonnes of carbon dioxide equivalent (t CO_2 eq) for 2016, 4,910,709 t CO_2 eq for 2017, 6,129,400 t CO_2 eq for 2018, 760,710 t CO_2 eq for 2019 and 6,206,390 t CO_2 eq for 2020 and were measured against the assessed FRL of –20,433,130 t CO_2 eq/year.

The data and information provided in the technical annex are in overall accordance with the guidelines contained in the annex to decision 14/CP.19. The technical analysis concluded that the data and information provided by Panama in the technical annex are generally transparent and consistent with the data and information used for establishing the assessed FRL in accordance with paragraph 71(b) of decision 1/CP.16 and section II of decision 12/CP.17. This report contains the findings from the technical analysis and a few areas identified for capacity-building and future technical improvement in accordance with paragraph 14 of decision 14/CP.19.

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
BTR	biennial transparency report
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
EF	emission factor
FRL	forest reference level
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
MPGs	modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement
MRV	measurement, reporting and verification
N_2O	nitrous oxide
NFI	national forest inventory
NFMS	national forest monitoring system
QA/QC	quality assurance/quality control
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
TA	technical analysis
TERT	technical expert review team

I. Introduction, overview and summary

A. Introduction

1. This technical report covers the TA of the technical annex provided by Panama on 30 June 2024 in accordance with paragraph 45 of decision 1/CP.24 and paragraph 14 of decision 18/CMA.1 as part of its BTR1, which was submitted in accordance with paragraph 3 of decision 18/CMA.1. In the technical annex, Panama 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 paragraph 8 of decision 14/CP.19.

2. In accordance with paragraph 14 of decision 18/CMA.1, the TA of the technical annex to the BTR is carried out concurrently with the technical expert review of the BTR referred to in Article 13, paragraph 11, of the Paris Agreement. The TERT conducted the technical expert review of the information reported in the BTR1 of Panama as per the scope of the review defined in paragraph 146 of the MPGs,[1] resulting in a separate technical expert review report.[2]

3. Panama made its first and second FRL submissions, in accordance with decision 12/CP.17, on 15 January 2018 and 3 January 2022 respectively, which were subject to 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, the Party provided a modified version of its latest FRL submission on 11 May 2022. The latest assessed FRL was included as ne of the elements of the technical annex to its BTR1 in accordance with the guidelines contained in the annex to decision 14/CP.19. The findings from the technical assessment of that FRL are included in a separate report.[3]

B. Process overview

4. The technical expert review of the BTR1 of Panama took place from 2 to 6 December 2024 as an in-country review and was undertaken by a TERT drawn from the UNFCCC roster of experts on the basis of the criteria defined in paragraphs 172–182 of the MPGs. Anatoli Poultouchidou (Greece) and Lucio Santos (Colombia) were the LULUCF experts who undertook the TA of the technical annex in accordance with paragraphs 10–13 of decision 14/CP.19. The TA was coordinated by Nalin Srivastava and Luca Birigazzi (secretariat).

5. The TA of the technical annex provided by Panama 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 accordance with paragraph 14 of decision 14/CP.19.

6. During the TA and subsequent exchanges, the LULUCF experts and Panama engaged in technical discussions, and Panama 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, Panama provided a modified version of its technical annex on 23 January 2025, which took into consideration the technical input of the LULUCF experts. The modifications improved the clarity and transparency of the submitted technical annex without needing to alter the values of estimated results.

7. Following the TA of the technical annex, the LULUCF experts prepared and shared the draft technical report with Panama for its review and comments. The LULUCF experts

[1] Decision 18/CMA.1, annex.
[2] FCCC/ETF/TERR.1/2024/PAN.
[3] FCCC/TAR/2022/PAN.

responded to the Party's comments and incorporated them into and finalized this technical report in consultation with Panama. This technical report on the TA of the technical annex was prepared in the context of the modified technical annex submitted by the Party.

C. Summary of results

8. In paragraph 70 of decision 1/CP.16 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, Panama, on a voluntary basis, proposed a national FRL covering the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks for the purpose of a technical assessment in accordance with decision 13/CP.19 and its annex. The activities are being implemented in Panama's national territory, which covers an area of 75,136 km^2. The assessed FRL of Panama is –20,433,130 t CO_2 eq/year.

9. The Party's FRL is based on its annual average historical CO_2 emissions associated with the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks for the historical reference period 2006–2015. Panama noted that it anticipated updating its FRL in January 2025. Panama reported the results of implementing the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks for 2016–2020, calculated against the FRL, which amount to total emission reductions of 18,505,586 t CO_2 eq for 2016–2020, namely 498,377 t CO_2 eq for 2016, 4,910,709 t CO_2 eq for 2017, 6,129,400 t CO_2 eq for 2018, 760,710 t CO_2 eq for 2019 and 6,206,390 t CO_2 eq for 2020. The table contained in annex II summarizes the main features of the results in the technical annex, with the aim of accessing results-based payments for REDD+ activities, including the results period, the assessed FRL, and the pools and gases included.

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

10. For the technical annex to the BTR1 submitted by Panama, see annex I.[4]

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

(a) The methodologies, definitions, comprehensiveness and information provided are consistent between the assessed FRL 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 paragraph 9 of decision 14/CP.19;

(d) The results are accurate, to the extent possible.

12. The table below describes the findings from the TA of the data, methodologies and procedures used by the developing country 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 within the scope of the TA outlined in paragraph 11 above.

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

Findings from the technical analysis of the data and information used by the developing country 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

Finding ID#	*Aspect of the scope of the TA (decision 14/CP.19, para. 11)*	*Description of the issue, additional information shared by the Party during the TA and conclusions of the LULUCF experts*	*Area for future technical improvement*
1	11(a) Consistency in methodologies, definitions, comprehensiveness and the information provided (para. 3 of the annex to decision 14/CP.19)	The LULUCF experts noted that Panama maintained consistency between its assessed FRL and estimated results of implementing the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks in 2016–2020 with regard to the following elements: (a) Using consistent methodologies and data to generate AD on deforestation, forest degradation, enhancement of forest carbon stocks, conservation of forest carbon stocks and sustainable management of forests. Panama generated AD for the FRL and the technical annex by analysing data collected from Collect Earth Online, which covered 2000–2020, using the 'mapathon' approach. The same methodologies, forest types and stratification were used for the FRL and the technical annex. Panama applied stratified random sampling for 9,800 plots using four strata (stable forests, mangroves, areas of land-use change, and other land) and post-stratification based on three climate regions. Using Collect Earth Online, the AD were obtained from the visual interpretation of annual historical time series of satellite imagery; (b) Using consistent methodologies and data to generate EFs. Panama used a combination of tier 2 EFs derived from NFI data, default tier 1 EFs from the 2006 IPCC Guidelines and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, and EFs derived from peer-reviewed papers and the judgment of experts from the Ministry of Environment; (c) Covering the same four carbon pools: above-ground biomass, below-ground biomass, deadwood and litter; (d) Covering the same gases: CO_2, CH_4 and N_2O; (e) Covering the same area: entire national territory; (f) Using the same assumption with regard to the estimation of removals resulting from the conversion of *rastrojo* to secondary forest. For both its proposed FRL submission and the REDD+ technical annex Panama assumed that all the carbon stock is available immediately after conversion. The same assumption applies to other types of conversion, such as *rastrojo* to mangrove and secondary forest to plantation; (g) Using the same forest definition: land that is more than 0.5 ha in size, with trees averaging a height greater than 5 m and a canopy cover exceeding 30 per cent; or land with trees capable of reaching these thresholds in situ, provided that the land has been declared for restoration, conservation and/or forest management purposes.	

Finding ID#	*Aspect of the scope of the TA (decision 14/CP.19, para. 11)*	*Description of the issue, additional information shared by the Party during the TA and conclusions of the LULUCF experts*	*Area for future technical improvement*
		In the latter case, when the abiotic conditions in certain areas limit trees from reaching 5 m in situ, it will be sufficient for the canopy cover to exceed 30 per cent. The definition excludes land subject to predominantly agricultural or urban use. The LULUCF experts conclude that Panama ensured overall consistency between its assessed FRL and estimated results.	
2	11(b) Accuracy – approaches	The LULUCF experts noted that transitions from cropland and grassland to *rastrojo* may involve multiple land-cover changes over time. This can result in repeated estimations of carbon stock increases from the conversion of non-forest land to forest land and of emissions from deforestation over the five-year results period, even if the areas of *rastrojo* do not meet the national forest definition thresholds. The LULUCF experts consider that, if *rastrojo* is mistakenly considered as forest (because it is known that abiotic conditions prevent the forest definition thresholds being met), an overestimation or underestimation of emissions and removals may occur, affecting the accuracy of the results. During the TA, Panama confirmed that those transitions, particularly *rastrojo* to grassland and back, can lead to overestimation or underestimation, reflecting dynamic changes in land use and management. To mitigate the risk of overestimation or underestimation, Panama employs multitemporal satellite imagery analysis to detect inter-annual changes with a high level of precision. Moreover, Panama maintained that the assumptions applied in classifying *rastrojo* are aimed at ensuring consistency with the assessed FRL, but noted that it intends to revise them for its next FRL submission to exclude areas of *rastrojo* that cannot meet the forest definition thresholds owing to abiotic conditions. The LULUCF experts commend Panama for proactively taking steps to improve the classification of *rastrojo* for its next FRL submission.	The LULUCF experts note revising assumptions related to *rastrojo*, identifying areas of *rastrojo* that cannot meet the forest definition thresholds owing to abiotic conditions or management practices, and applying a more robust multitemporal analysis to assess land-use change dynamics as areas for future technical improvement of the technical annex.
3	11(b) Transparency – EFs	The LULUCF experts noted that the table of EFs used for estimating the REDD+ results (in sheet "EF" of the Microsoft Excel file "Resultados_2018-2022") includes the same EFs reported as being used for constructing the FRL. Panama derived EFs from various sources, including NFI data, peer-reviewed papers and expert judgment, as well as using IPCC default EFs. However, the LULUCF experts noted that the sources of EFs were not clearly presented in the table and in some cases, incorrect sources were given (e.g. the sources for carbon fraction for mature forest and *rastrojo* and for above-ground biomass of plantations were reported as being the 2006 IPCC Guidelines although these EFs were generated using expert judgment). During the TA, Panama explained that the EFs used for estimating the results are consistent with those used for the FRL and that typographical errors led to some incorrect sources of EFs being presented in the Excel spreadsheet.	The LULUCF experts note enhancing the QA/QC for the calculation spreadsheets and the reported results as an area for future technical improvement of the technical annex.

Finding ID#	*Aspect of the scope of the TA (decision 14/CP.19, para. 11)*	*Description of the issue, additional information shared by the Party during the TA and conclusions of the LULUCF experts*	*Area for future technical improvement*
4	11(b) Accuracy – EFs	The LULUCF experts noted that for estimating the annual above-ground biomass growth rate for *rastrojo*, Panama used the default value of 11 t dry matter/ha/year for tropical rainforest from the 2006 IPCC Guidelines (vol. 4, chap. 4, table 4.9) for both the FRL and the REDD+ results. This value was selected on the basis of expert judgment to reflect changes in biomass carbon stocks resulting from the conversion of non-forest land (e.g. cropland, grassland, wetlands and other land) to *rastrojo* in the tropical humid climate zone. During the TA, Panama explained that using the default value of 11 t dry matter/ha/year for *rastrojo* tends to result in the overestimation of removals and that in its most recent GHG inventory, submitted with its BTR1, it has improved the accuracy of its EF for *rastrojo* by reducing the value from 11 t dry matter/ha/year to 4.9 t dry matter/ha/year. However, the Party used the value of 11 t dry matter/ha/year for the above-ground biomass growth rate for *rastrojo* to ensure consistency between the assessed FRL and the REDD+ results. In addition, Panama assumed that all the carbon stock is available immediately after conversion when calculating the enhancement of forest carbon stocks for both its FRL and REDD+ results. The LULUCF experts noted, as was highlighted during the assessment of Panama's second FRL, that this assumption could lead to an overestimation of removals. During the TA, Panama explained that it is strengthening its national capacity for REDD+ reporting in order to submit an FRL in 2025, which will include the use of new AD (geospatial data) and the latest EF for above-ground biomass growth rate for *rastrojo*, as applied for the GHG inventory. The LULUCF experts commend Panama for its plan to update the EF for future FRL submissions to ensure consistency with the GHG inventory and improve the accuracy of the estimates in future FRL submissions.	The LULUCF experts note using a more accurate value of annual above-ground biomass growth rate for *rastrojo* as an area for future technical improvement of the technical annex.
5	11(b) Transparency – AD	The LULUCF experts noted that information on the calculations used to derive the results, the sources of AD and the subcategories included for each REDD+ activity, particularly for the activity reducing emissions from forest degradation, was not clearly reported. During the TA, Panama provided additional information on the sources of AD used in estimating forest degradation. Panama explained that the AD were derived or obtained from multiple sources. Emissions from forest degradation are associated with the following land-use transitions: mangrove to *rastrojo*, broadleaf plantation to secondary forest, secondary forest to *rastrojo* and mature forest to *rastrojo*. AD for those transitions were derived from remote-sensing data using the 'mapathon' approach. Emissions from forest degradation also include non-CO_2 emissions from fires on forest land remaining forest land and emissions from	The LULUCF experts note enhancing information on calculations, sources of AD and subcategories included for each REDD+ activity as an area for future technical improvement of the technical annex.

Finding ID#	*Aspect of the scope of the TA (decision 14/CP.19, para. 11)*	*Description of the issue, additional information shared by the Party during the TA and conclusions of the LULUCF experts*	*Area for future technical improvement*
		biomass losses due to fuelwood removal and forest clearance. AD for estimating those emissions were obtained from national statistics, including permit records. The LULUCF experts conclude that including information on the calculations used for deriving the REDD+ results and disaggregating emissions from forest degradation into emissions arising from biomass burning, fuelwood removal and forest clearance would further improve the transparency of the technical annex.	
6	11(b) Accuracy – AD	During the TA, Panama presented the results of a confusion matrix comparing land-use classification derived through visual interpretation of AD obtained from Collect Earth Online with field observations, compiled as part of the QA/QC process for AD collection. The LULUCF experts noted that, out of 64 plots identified as *rastrojo* in the field, only 18 were correctly identified by visual interpretation of AD obtained from Collect Earth Online. Most of the misidentification involved incorrect classification of *rastrojo*, secondary forest and grassland; for example, 21 plots were classified as secondary forest on the map but were identified as *rastrojo* on the basis of field observations. Panama explained that areas of *rastrojo* experience constant dynamic change because of fluctuations in land-use and management practices. From an ecological perspective, areas of *rastrojo* are in a state of ecological transition and are highly sensitive to human disturbances, such as crop rotation and extensive livestock grazing, as well as being subject to natural regeneration when abandoned. This type of land cover can alternate rapidly between states of high and low vegetation density, depending on local conditions such as rainfall (i.e. different patterns in dry and wet seasons) and on socioeconomic pressures driving land-use changes. In terms of carbon stock estimation, this characteristic of *rastrojo* presents a challenge because standard methodologies assume more stable land-use change. To address this challenge, Panama uses multitemporal analysis of satellite imagery, which enables the detection of inter-annual changes with a high level of accuracy. In addition, parameters such as the spectral response of vegetation at different stages of succession aid visual interpretation, and are supported by indices such as the Normalized Difference Vegetation Index and the Enhanced Vegetation Index, which reflect variations in land cover and biomass density. Panama is strengthening its use of methodologies based on historical data of at least five years to capture land-use transitions and to calculate more accurate carbon balances in *rastrojo*. The LULUCF experts commend Panama for its efforts to increase the accuracy and reduce the interpretation error in land identification and classification.	The LULUCF experts note strengthening the QA/QC process for land identification and classification, particularly for *rastrojo*, and improving methodologies for calculating carbon balances in *rastrojo* as areas for future technical improvement of the technical annex.
7	11(c) Consistency with the guidelines in paragraphs 1–2 of the annex to decision	Panama provided a summary table with the results of implementing the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of	The LULUCF experts note enhancing QA/QC procedures applied in compiling the submission, particularly those aimed

Finding ID#	*Aspect of the scope of the TA (decision 14/CP.19, para. 11)*	*Description of the issue, additional information shared by the Party during the TA and conclusions of the LULUCF experts*	*Area for future technical improvement*
	14/CP.19 (summary table and results)	forests and enhancement of forest carbon stocks for 2016–2020, including the assessed FRL and the activities implemented. However, the LULUCF experts noted the following: (1) inconsistencies in Panama's use of positive and negative signs in reporting the REDD+ results, (2) a discrepancy in the subtotal for 2020 between the technical annex (–26,616,808.88 t CO_2 eq) and the Excel file "Resultados_anexo_2018_2022" (–26,639,520 t CO_2 eq) and (3) a discrepancy in the total results reported between the technical annex (–18,482,875.58 t CO_2 eq) and the Excel file (18,505,586 t CO_2 eq). During the TA, Panama explained that negative REDD+ results had been incorrectly interpreted as removals rather than as increases in emissions. The Party also explained that the values reported in the technical annex did not incorporate the actual 2020 data for activities related to fuelwood and wood removal. The correct values for the REDD+ results are those provided in the Excel file, that is,–26,639,520 t CO_2 eq for the subtotal and 18,505,586 t CO_2 eq for the total. Panama clarified that these inconsistencies arose as the result of an error made by an external party during the editing process. Panama corrected all the inconsistencies related to the positive and negative signs of REDD+ results in the modified submission. The LULUCF experts commend Panama for correcting the inconsistencies and erroneous values identified in the original submission and for strengthening QA/QC procedures for the modified submission, which enhanced the transparency of its submission.	at ensuring the accuracy and consistency of units and figures, as an area for future technical improvement of the technical annex.
8	11(c) Consistency with the guidelines in paragraph 4 of the annex to decision 14/CP.19 (NFMS)	The LULUCF experts noted that Panama provided a description of the NFMS and a transparent summary of the regulatory framework underpinning the NFMS and of the roles and responsibilities of the agencies and institutions involved in the MRV of the results in the technical annex, together with weblinks for accessing further information. The NFMS is a national system, covering 7,513,577 ha. The system consists of terrestrial satellite monitoring through remote sensing, a national forest and carbon inventory and a GHG inventory for the LULUCF sector. The components are managed by the Directorate of Climate Change of the Ministry of Environment in accordance with the functions established by an executive decree. During the TA, Panama explained that additional information on its NFMS is available online on its national climate transparency platform.[a]	
9	11(c) Consistency with the guidelines in paragraph 5 of the annex to decision	The LULUCF experts noted that, from the description of the estimation of the annual increase in biomass carbon related to enhancement of forest carbon stocks, it is unclear whether the area (in ha) used in the equation from the 2006 IPCC	The LULUCF experts note that revising the assumption in line with the 2006 IPCC Guidelines (vol. 4, chap. 4.3.1.3) to

Finding ID#	*Aspect of the scope of the TA (decision 14/CP.19, para. 11)*	*Description of the issue, additional information shared by the Party during the TA and conclusions of the LULUCF experts*	*Area for future technical improvement*
	14/CP.19 (reconstruction of the results)	Guidelines (vol. 4, chap. 2, equation 2.9) for estimating carbon gains refers to the area converted during the previous year or the total accumulated area converted over the past 20 years. During the TA, Panama explained that the area (in ha) used in the equation is derived directly from the land-use change matrix and, therefore, does not represent the total accumulated area converted over the past 20 years.	estimate removals from land-use changes contributing to the activity enhancement of forest carbon stocks, identified in the TA of the FRL submitted in 2022 as an area for future technical improvement (see document FCCC/TAR/2022/PAN, para. 25), also applies to the technical annex being analysed.
10	11(c) Consistency with the guidelines in paragraph 6 of the annex to decision 14/CP.19 (how the elements contained in para. 1(c–d) of decision 4/CP.15 have been taken into account)	Panama provided a description of how IPCC guidance and guidelines were taken into account in accordance with paragraph 1(c) of decision 4/CP.15. For estimating emission reductions and removals in the national territory, including continental and island territory, with a total area of 7,513,577 ha, Panama used the methodology provided in the 2006 IPCC Guidelines for estimating annual carbon stock changes in forest land converted to other land uses and other land uses converted to forest land, and for forest land remaining forest land.	

[a] Available at https://transparencia-climatica.miambiente.gob.pa/ (available in Spanish only).

III. Conclusions

13. The LULUCF experts conclude that Panama reported the results of implementing the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks. The results include estimates of CO_2, CH_4 and N_2O emissions from four carbon pools: above-ground biomass, below-ground biomass, deadwood and litter for 2016–2020. 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 FRL.

14. The LULUCF experts conclude that the results presented of implementing the five activities are consistent with the assessed FRL. The LULUCF experts commend Panama for ensuring consistency of data and methodologies between the FRL submission for 2006–2015 and the technical annex with the results of implementing the activities for 2016–2020.

15. The LULUCF experts conclude that Panama provided the information necessary for reconstructing the results of implementing the activities. The data and information provided in the technical annex are considered to be generally transparent, consistent, complete and mostly accurate, to the extent possible.

16. The LULUCF experts acknowledge that the technical annex includes summary information from the final report containing the assessed FRL; results in t CO_2 eq/year consistent with the assessed FRL; a demonstration that the methodologies used to produce the results are consistent with those used to establish the assessed FRL; a description of the forest monitoring system and institutional roles and responsibilities in MRV of the results; the information necessary for reconstructing the results; and a description of how the elements contained in paragraph 1(c–d) of decision 4/CP.15 have been taken into account. The LULUCF experts conclude that the data and information provided in the technical annex are consistent with the guidelines referred to in paragraph 9 of decision 14/CP.19.

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

18. Pursuant to paragraph 14 of decision 14/CP.19, the LULUCF experts identified areas for future technical improvement (see the table above).

19. The LULUCF experts concluded that the following areas for future technical improvement identified in the report on the technical assessment of Panama's second FRL are also applicable to the provision of information on the results of implementing the activities reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks (see document FCCC/TAR/2022/PAN, para. 42(a–e)):

(a) Reviewing the sampling method to avoid any bias that may be introduced by the current approach, in which sampling points for locations that are inaccessible or hazardous are replaced with other points in accessible or safe areas;

(b) Using more robust methodologies to detect areas of *rastrojo* that meet the national definition of forest;

(c) Conducting regional surveys or local studies documenting fuelwood extraction in forests and improving the documentation of forest concession contracts and tree harvesting permits;

(d) Subjecting NFI plots to a new sampling cycle with a view to remeasuring the relevant data and obtaining new data on carbon stock changes related to land use and land-use change;

(e) Revising its assumption in line with the 2006 IPCC Guidelines (vol. 4, chap. 4.3.1.3) for the estimation of removals from land-use changes contributing to the activity enhancement of forest carbon stocks.

20. The LULUCF experts acknowledged and welcome the Party's intention to:

(a) Include the soil organic carbon pool in future FRL submissions;

(b) Increase the number of samples available for visual interpretation by adopting a systematic sampling design;

(c) Update the EF to maintain consistency with the latest GHG inventory and to improve the accuracy of future FRL submissions;

(d) Strengthen QA/QC procedures for future FRL submissions;

(e) Revise the forest definition to enable the exclusion of areas of *rastrojo* that cannot meet the forest definition thresholds.

21. After exchanges with the LULUCF experts, Panama identified strengthening national technical capacities to estimate changes in carbon stock in soil as a capacity-building need.

22. In conclusion, the LULUCF experts commend Panama 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 FRL. Some areas for future technical improvement and a capacity-building need identified by Panama 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.[5] The LULUCF experts also acknowledge that the TA process was an opportunity for a facilitative and constructive technical exchange of views and information with Panama.[6]

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

[6] As per decision 14/CP.19, paras. 12–13.

Annex I

Technical annex to the biennial transparency report

Owing to the complexity and length of the submitted technical annex to the BTR, and in order to maintain the original formatting, the technical annex has not been reproduced here; it is available at https://unfccc.int/first-biennial-transparency-reports.

Annex II

Summary of main features of reported results of implementing activities referred to in paragraph 70 of decision 1/CP.16 based on information provided by Panama

Key element		*Remark(s)*
Results reported	498 377 t CO_2 eq for 2016 4 910 709 t CO_2 eq for 2017 6 129 400 t CO_2 eq for 2018 760 710 t CO_2 eq for 2019 6 206 390 t CO_2 eq for 2020	See paragraph 9 of this document. See also finding ID# 7 in the table in this document
Results period	2016–2020	See paragraph 9 of this document
Assessed FRL	–20 433 130 t CO_2 eq/year	See FCCC/TAR/2022/PAN and the modified version of its latest FRL submission of May 2022. See paragraphs 3 and 8 of this document
Reference period	2006–2015	See paragraph 9 of this document
National/subnational	National	See paragraph 8 of this document
Activities included	Reducing emissions from deforestation Reducing emissions from forest degradation Conservation of forest carbon stocks Sustainable management of forests Enhancement of forest carbon stocks	Panama included the five REDD+ activities, but reported on the activities conservation of forest carbon stocks and sustainable management of forests in aggregate. See paragraph 9 of this document. See also finding ID# 1 in the table in this document
Pools included	Above-ground biomass Below-ground biomass Deadwood Litter	See finding ID# 1 in the table in this document
Gases included	CO_2, CH_4, N_2O	See finding ID# 1 in the table in this document
Consistency with assessed FRL	Methods, definitions and information used for the assessed FRL are consistent with those used for the results	See finding ID# 1 in the table in this document
Description of NFMS and institutional roles	Included	See finding ID# 8 in the table in this document
Identification of future technical improvements	Included	Several areas for future technical improvement have been identified (see finding ID#s 2–7 and 9 in the table and para. 19 in this document)

Annex III

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

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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 technical annex:

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