Technical report on the technical analysis of the technical annex to the third biennial update report of Indonesia submitted in accordance with decision 14/CP.19, paragraph 7, on 20 December 2021

Summary

This technical report covers the technical analysis of the technical annex submitted on a voluntary basis, in the context of results-based payments, by Indonesia on 20 December 2021 through its third biennial update report in accordance with decision 14/CP.19. The technical annex provides data and information on the activities reducing emissions from deforestation and reducing emissions from forest degradation, which are activities included in decision 1/CP.16, paragraph 70, and covers the same national territorial forest area as the assessed forest reference emission level (FREL) proposed by Indonesia in its modified FREL submission of May 2016.

Indonesia reported the results of implementing these activities for 2018–2020, which amount to 577,449,160 tonnes of carbon dioxide equivalent and were measured against the assessed FREL.

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 Indonesia 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.

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Abbreviations and acronyms

AD	activity data
BUR	biennial update report
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
EF	emission factor
FREL	forest reference emission level
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
NFMS	National Forest Monitoring System of Indonesia
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 Indonesia on 20 December 2021 in accordance with decision 14/CP.19, paragraph 7, included in its third BUR, which was submitted in accordance with decision 2/CP.17, paragraph 41(a), and annex III, paragraph 19. In the technical annex, Indonesia 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.   In this context, Indonesia underlined that the submission of the technical annex through its third BUR is voluntary and has been done exclusively to obtain results-based payments for REDD+ activities pursuant to decision 13/CP.19, paragraph 2, and decision 14/CP.19, paragraphs 7–8.

3.   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 Indonesia and through a facilitative sharing of views, resulting in a separate summary report.[1]

4.   Indonesia made its first FREL submission, in accordance with decision 12/CP.17, on 4 January 2016, which was subject to a technical assessment following the guidance provided in decision 13/CP.19 and its annex. The assessed FREL was included as one of the elements of the technical annex to its third BUR in accordance with the guidelines contained in decision 14/CP.19, annex. The findings from the technical assessment of the Party's modified first FREL submission of May 2016 are included in a separate report.[2]

5.   Indonesia previously submitted a technical annex to its second BUR on 21 December 2018. The outcome of the TA thereof is contained in document FCCC/SBI/ICA/TATR.1/IDN. Previous FREL submissions, BURs with technical annexes and associated technical assessment and analysis reports for the Party are available online.[3]

B. Process overview

6.   The TA of the third BUR of Indonesia took place from 4 to 8 April 2022 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: Asia Adlan Mohamed Abdalla (Sudan), Njangu Lewis Aldo Jr. (Liberia), Dawa Chhoedron (Bhutan), Paulo Cornejo (Chile), Magdalena Jóźwicka-Olsen (member of the Consultative Group of Experts from the European Union), Mwangi James Kinyanjui (Kenya), Fui Pin Koh (Malaysia), Naoki Matsuo (Japan), Tahira Munir (Pakistan), Phuong-Nam Nguyen (Viet Nam), Koki Okawa (Japan), Emma Salisbury (United Kingdom of Great Britain and Northern Ireland), Hansrajie Sukhdeo (Guyana) and Janka Szemesova (member of the Consultative Group of Experts from Slovakia). Mwangi James Kinyanjui and Koki Okawa were the LULUCF experts who undertook the TA of the technical annex in accordance with decision 14/CP.19, paragraphs 10–13.

7.   The TA of the technical annex provided by Indonesia 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.

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[1] FCCC/SBI/ICA/2022/TASR.3/IDN.
[2] FCCC/TAR/2016/IDN, published on 25 November 2016.
[3] https://redd.unfccc.int/submissions.html?country=idn.

8. During the TA and subsequent exchanges, the LULUCF experts and Indonesia engaged in technical discussions, and Indonesia 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.

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

C. Summary of results

10. 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, Indonesia, on a voluntary basis, proposed a national FREL covering the activities reducing emissions from deforestation and reducing emissions from forest degradation for the purpose of a technical assessment in accordance with decision 13/CP.19 and its annex. The activities are being implemented in Indonesia's natural forests, which cover an area of 113.2 million ha (in 1990), comprising up to 60 per cent of the national territory and 78.6 per cent of the country's total forest land (i.e. plantation forests are excluded). The assessed FREL of Indonesia is 568,859,881 t CO_2 eq for 2013, increasing every year thereafter because of accumulating emissions from peat decomposition and reaching 593,329,235 t CO_2 eq for 2020.

11. The Party's FREL is based on its annual average historical CO_2 emissions associated with carbon losses in above-ground biomass due to deforestation and forest degradation and on the linear trend of historical CO_2 emissions associated with carbon losses in soil due to peat decomposition for the historical reference period 1990–2012. Indonesia reported the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2018–2020, calculated against the FREL, which amount to emission reductions of 192,483,053 t CO_2 eq annually and 577,449,160 t CO_2 eq in total for 2018–2020.

12. Measured against the same FREL, Indonesia also submitted results amounting to 244,892,137 t CO_2 eq for 2013–2017, which were assessed in 2019.[4]

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

A. Technical annex

13. For the technical annex to the third BUR submitted by Indonesia, see annex I.[5]

B. Technical analysis

14. 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;

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[4] See document FCCC/SBI/ICA/2019/TATR.1/IDN.
[5] As per decision 14/CP.19, para. 14(a).

(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.

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

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

16.   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.

17.   The LULUCF experts noted that Indonesia 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 2018–2020 by:

(a)   Using consistent methodologies and data to generate AD on the deforestation area (with deforestation defined as the loss of natural forest cover below a certain threshold and conversion to non-forest land, without considering subsequent regrowth after forest cover loss, that is, gross deforestation), the forest degradation area (with forest degradation defined as a change from primary forest to disturbed secondary forest) and the decomposed peat area (peatlands where deforestation or forest degradation have occurred). The areas of deforestation and forest degradation were both derived from land-cover data using the same method, procedures and stratification. These data were generated from Landsat satellite images from different time points with a minimum mapping unit of 6.25 ha and 23 land-cover classes. Deforestation was identified by a change from natural forest land (six classes) to non-forest land, excluding subsequent regrowth. Forest degradation was identified by a change from primary natural forest land to secondary natural forest land. The AD used for area of peat decomposition were all obtained from a peatland spatial map provided by the Ministry of Agriculture and several associated maps, field surveys and ground checks;

(b)   Using consistent methodologies and data to generate EFs, in particular using the same EFs associated with specific land-cover changes based on consistent land-cover stratification;

(c)   Covering the same carbon pools: above-ground biomass and SOC;

(d)   Covering the same gases: CO_2;

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

(f)   Using the same assumption: that all peatlands where deforestation or forest degradation has occurred are considered as degraded (drained);

(g)   Using the same forest definition as that used in constructing the FREL.

18.   During the TA, in response to a request from the LULUCF experts, Indonesia provided Excel spreadsheets containing land-use matrices for deforestation area and forest degradation area for each year of 2018–2020. The LULUCF experts confirmed that the emissions reported as results in the technical annex could be reconstructed using the data provided by the Party.

19.   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 Indonesia for ensuring consistency of data and methodologies between the FREL submission for 1990–2012 and the technical annex with the results of implementing the

activities reducing emissions from deforestation and reducing emissions from forest degradation for 2018–2020.

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

20. As part of the TA process, Indonesia provided additional information, in particular Excel spreadsheets that contain the AD, EFs and classification of the land-cover types used in calculating emissions for deforestation, forest degradation and peat decomposition for each of the reported years, as well as the calculations themselves. In addition, Indonesia explained clearly during the TA the methods used to generate EFs and AD, which are consistent with those used to develop the FREL. It also explained the application of automated image processing as a tool supporting visual interpretation, which has been used for generating historical AD. The LULUCF experts commend Indonesia for its efforts to increase the transparency and ensure the completeness[6] of the data and information provided, thus allowing for reconstruction of the results. The LULUCF experts also commend the Party specifically for making improvements to its mapping method, including by integrating automated image processing (since 2018), which allows the results from visual interpretation to be validated and thus enhances the accuracy of the AD.

21. The primary source of the data used in calculating EFs for deforestation and forest degradation was the national forest inventory, namely its countrywide plots. For forest types (e.g. mangroves) that did not have representative national forest inventory plots at the time of assessment, data from supplementary research plots were used to fill information gaps. The EFs for peat decomposition were from the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. During the TA, Indonesia explained that using country-specific data to calculate emissions from peat decomposition will further enhance its understanding of the dynamics of those emissions and will guide improvements for future reporting.

22. The estimations of emissions from deforestation, forest degradation and peat decomposition were conducted for the implementation phase (2018–2020) of the REDD+ activities and concentrated on AD for areas still covered by natural forest in late 2012. Emissions were calculated in accordance with the FREL construction method, that is, by multiplying the transition matrix of the land-cover change area with the transition matrix for the EF associated with that specific land-cover change. Peat decomposition has occurred owing to deforestation and forest degradation over peatlands since 1990. Owing to the cumulative effect of peat decomposition, the increase in emissions from peat decomposition is a result of inherited emissions following deforestation and forest degradation occurrence on peatlands.

23. Above-ground biomass was included for all forest strata, while SOC was included only for deforestation or forest degradation occurring on peatlands.

24. According to decision 12/CP.17, paragraph 8, the FREL shall be established taking into account decision 4/CP.15, paragraph 7, and maintaining consistency with the anthropogenic forest-related GHG emissions by sources and removals by sinks reported in the Party's GHG inventory. The team assessing Indonesia'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 third BUR.[7] In response to a question on consistency of data raised by the LULUCF experts during the TA, the Party clarified that the data set used for the technical annex is the same as that used for the third BUR, but the categorization of emissions by sources and removals by sinks is different. In the technical annex, "deforestation" and "forest degradation" refer to the REDD+ activities, while in the BUR, categorization follows IPCC categories.[8] The LULUCF experts confirmed that this categorization was appropriate

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

[7] Available at https://unfccc.int/documents/403577.

[8] Namely, forest land (3.B.1), cropland (3.B.2), grassland (3.B.3), wetlands (3.B.4), settlements (3.B.5) and other land (3.B.6).

for estimating the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2018–2020.

25.   During the TA, the Party explained that visual interpretation of satellite imagery, complemented by automated image processing and deforestation alerts, has enabled an assessment of the uncertainty of AD. Beginning in 2019, land-cover change uncertainty has been calculated using a sample-based estimation method, with the 23 land-cover classes being grouped into five land-cover changes: deforestation, forest degradation, forest gain/growth, stable forest and stable non-forest. However, in the technical annex, Indonesia did not provide information on the uncertainty associated with the emission estimates, only referencing a publication (Tosiani, 2020) that describes the uncertainty calculation process.

26.   In response to a question from the LULUCF experts, Indonesia clarified that all data (images and annual maps) are publicly available, which enables stakeholders to reconstruct annual increments of forest stocks. The LULUCF experts commend Indonesia for providing transparent information and continuing to improve the accuracy of its estimates.

27.   The LULUCF experts concluded that Indonesia provided the information necessary for reconstructing the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation. 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.   Indonesia 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. 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 chap. 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.   Indonesia provided a summary table with the results of implementing the activities reducing emissions from deforestation and reducing emissions from forest degradation for 2018–2020, which are consistent with the assessed FREL, thus allowing for reconstruction of the results. The emission reductions achieved are listed in table 3-2 of the technical annex and amount to 192,483,053 t CO_2 eq/year for the three years covered.

30.   The LULUCF experts noted that Indonesia provided a description of the NFMS and a transparent summary of the roles and responsibilities of the agencies and institutions involved in MRV of the results in the technical annex, together with weblinks for accessing further information. During the consultation process, Indonesia explained that the NFMS is web-based and changes are assessed using data obtained from a land-cover map of Indonesia covering 23 land-cover classes. The land-cover maps were produced every four to six years from 1990 to 2000, every two to three years from 2000 to 2011 and annually thereafter.

31.   The NFMS is a national monitoring system covering all forest lands (land-cover data). The system also covers national forest inventory plots at altitudes below 1,000 m (i.e. excluding mountain forests; see para. 21 above) and contains data on forest resources. It also monitors forest and other land fires (burn scar data). The NFMS is managed by the Directorate of Forest Resources Inventory and Monitoring under the Directorate General of Forestry Planning and Environmental Governance of the Ministry of Environment and Forestry. Estimation of emissions and validation of the estimates were conducted by the Directorate General of Climate Change. The LULUCF experts commend Indonesia for sharing this information and the information that the NFMS is continuously being improved.

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. The technical annex to Indonesia's second BUR and the additional information provided to the LULUCF experts during the TA indicate that NFMS coverage includes dryland forest, swamp forest

and mangrove forest, both primary and secondary strata. Further, the Party noted during the TA that the NFMS is continuously being improved to increase the accuracy of the data it generates.

33.   Indonesia provided a description of how IPCC guidance and guidelines were taken into account in accordance with decision 4/CP.15, paragraph 1(c). For estimating emission reductions in natural forests across the country, Indonesia used the methodologies provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. Accordingly, the emissions from deforestation and from forest degradation were estimated for 2018–2020 by combining AD (i.e. areas of annual gross deforestation and forest degradation detected by land-cover transition matrices) with the appropriate EF (i.e. emissions associated with the land-cover changes corresponding to each forest type).

34.   The carbon pools covered are above-ground biomass and SOC. Both activities, deforestation and forest degradation, covered the same carbon pools: above-ground biomass and SOC on peatlands. Below-ground biomass, litter, deadwood and SOC for soils other than those on peatlands were not included. The estimation of the results includes CO_2 only. The carbon pools and gases covered in constructing the FREL and estimating the results are fully consistent.

4.   Accuracy of the results proposed in the technical annex

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

36.   Both the established FREL and the results obtained for 2018–2020 from implementing the activities are based on the assumption that the above-ground biomass in a specific forest cover class (primary forest or secondary forest) does not change over time. In addition, all losses of carbon in above-ground biomass are estimated as CO_2 emissions in the year of land-cover change (i.e. by applying instantaneous oxidation), regrowth after land-cover change is not considered, and all peatlands where deforestation or forest degradation have occurred are treated as having undergone peat decomposition. The LULUCF experts noted that the application of instantaneous oxidation most likely results in an overestimation of emissions. They also noted that the uncertainty of emissions from peat decomposition (described in the FREL submission and the technical annex to Indonesia's third BUR as being up to 50 per cent) coupled with the cumulative effect of peat decomposition over time on deforested and degraded peatlands calls for a more dedicated effort to develop accurate EFs to estimate these emissions, which, in the technical annex, were reported to have been the main source of emissions in the agriculture, forestry and other land use sector. The LULUCF experts, however, noted that, because Indonesia has used a consistent methodology for estimating emissions in establishing the FREL and the results in the technical annexes to its second and third BURs, the net effect will partially cancel out.

37.   As mentioned in paragraphs 25 and 36 above, Indonesia provided some information related to the uncertainties of AD and peat decomposition. However, this information was not used in assessing the uncertainty of the emission estimates. Thus, the effect of the uncertainty on the accuracy of the results of implementing the activities could not be assessed. Despite this, and given the assumptions used, the LULUCF experts concluded that the results are accurate to the extent possible.

C.   Areas identified for future technical improvement

38.   The LULUCF experts concluded that the following areas for future technical improvement identified in the report on the technical assessment of Indonesia'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)   Inclusion of REDD+ activities – sustainable management of forests and conservation of forest carbon stocks;

(b)   Inclusion of other pools and gases – inclusion of dead organic matter in the estimation of emissions and removals from deforestation and forest degradation, and enhancement of forest carbon stocks;

(c)   EF improvement:

(i)   Developing an EF for use with the tier 2 methodology for estimating emissions from mangrove conversion to cultivated land;

(ii)   Developing removal factors for rehabilitation efforts;

(iii)   Estimating the depth of peat burns on the basis of fire frequency;

(iv)   Developing an EF and a baseline for peatland rewetting;

(d)   AD improvement:

(i)   Generating AD for enhancement of carbon stocks in degraded forests;

(ii)   Monitoring the potentially significant impact on emission reductions of the rewetting of peatlands.

D.   Comments and responses of the Party

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

(a)   Preparation of reports in accordance with the principles of transparency, accuracy, completeness, comparability and consistency:

(i)   Developing methodologies for estimating emissions from other REDD+ activities;

(ii)   Including forest fires and fires on other land types in the estimate, as well as improving the accuracy of and uncertainty related to burn area maps;

(iii)   Developing the estimation of the carbon pools of dead organic matter (deadwood and litter) and SOC in mineral soils;

(iv)   Improving the uncertainty assessment of land-cover change (by applying an area-based estimation error method);

(b)   Enhancement of the NFMS and monitoring of other natural resources including peatlands:

(i)   Developing and managing the database for AD, EFs and removal factors;

(ii)   Developing quality assurance/quality control procedures;

(iii)   Estimating the depth of peat burns and modelling peatland rewetting and the depth of the water table in order to estimate emissions from peat decomposition;

(iv)   Improving AD, including developing a methodology for mapping forest degradation (to cover the second level of degradation) based on automated image processing, developing a remote-sensing approach to monitor peatland rewetting and the depth of the water table, and assessing the enhancement of forest carbon stocks.

III.   Conclusions

40.   The LULUCF experts conclude that Indonesia reported the results of implementing two activities, reducing emissions from deforestation and reducing emissions from forest

degradation, for its entire territory. Deforestation is defined as the loss of natural forest cover below a certain threshold and conversion to non-forest land, without considering subsequent regrowth after forest cover loss. Forest degradation is defined as a change from primary forest to disturbed secondary forest. Plantation forests are excluded from Indonesia's REDD+ activities. The results include estimates of emissions of CO_2 from two carbon pools: above-ground biomass and SOC from deforestation and forest degradation occurring on peatlands identified with a minimum mapping unit of 6.25 ha for 2018–2020. 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 FREL.

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

42.   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.

43.   The results are accurate to the extent possible based on the assumptions used, which are described in paragraph 36 above.

44.   In conclusion, the LULUCF experts commend Indonesia 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 Indonesia 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.[9] The LULUCF experts also acknowledge that the TA process was an opportunity for a facilitative and constructive technical exchange of views and information with Indonesia.[10]

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[9] As per decision 2/CP.17, para. 57.
[10] 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 Indonesia

	Key elements	*Remarks*
Results reported	192 483 053 t CO_2 eq/year	The results are reported as emission reductions (see para. 11 of this document)
Results period	2018–2020	See paragraph 11 of this document
Assessed FREL	568 859 881 t CO_2 eq/year (for 2013) 593 329 235 t CO_2 eq/year (for 2020)	The technical assessment report (FCCC/TAR/2016/IDN) was published on 25 November 2016 See paragraph 10 of this document
Reference period	1990–2012	The FREL is based on the annual average of historical CO_2 emissions from carbon losses in above-ground biomass due to deforestation and forest degradation and on the linear trend of historical CO_2 emissions from carbon losses in soil due to peat decomposition for the historical reference period 1990–2012 (see para. 11 of this document)
National/subnational	National	Indonesia has developed a national FREL that covers all land areas covered by natural forests in 1990 (113.2 million ha), which is 60 per cent of the total land area of Indonesia (see para. 10 of this document)
Activities included	Reducing emissions from deforestation Reducing emissions from forest degradation	The activities include gross emissions from deforestation (i.e. without considering forest regeneration) and emissions from forest degradation (conversion of primary forests to secondary forests) (see paras. 11, 17(a) and 19 of this document)
Pools included	Above-ground biomass SOC	Above-ground biomass is included for all strata. SOC is included only for deforestation and forest degradation occurring on peatlands. Below-ground biomass, deadwood and litter are not included. SOC for soils other than those on peatlands is also not included. The pools are consistent with those of the FREL (see paras. 17(c) and 34 of this document)
Gases included	CO_2	The gas is consistent with that of the FREL (see paras. 17(d) and 34 of this document)
Consistency with assessed FREL	Methods, definitions and information used for the assessed FREL are consistent with those used for the results	Indonesia used consistent methodologies and data to generate AD and the same EFs for both estimating the results and constructing the FREL (see paras. 17 and 19 of this document)
Description of NFMS and institutional roles	Included	The NFMS is a web-based integrated monitoring system that provides spatial forest data and summary reports (see paras. 30–31 of this document)
Identification of future technical improvements	Included	Several areas for future technical improvement have been identified (see para. 38 of this document)

Annex III

Reference documents

A.   Reports of the Intergovernmental Panel on Climate Change

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at http://www.ipcc-nggip.iges.or.jp/public/wetlands/.

B.   UNFCCC documents

First and modified FREL submissions of Indonesia. Available at https://redd.unfccc.int/submissions.html?country=idn.

"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 Indonesia submitted in 2015. FCCC/TAR/2016/IDN. Available at https://redd.unfccc.int/submissions.html?country=idn.

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:

System Monitoring Hutan Nasional
https://nfms.menlhk.go.id/

Tosiani, A., 2020. Akurasi Data Penutupan Lahan Nasional Tahun 1990-2016. Direktorat Inventarisasi dan Pemantauan Sumber Daya Hutan, Ditjen Planologi Kehutanan dan Tata Lingkungan, Kementerian Lingkungan Hidup dan Kehutanan
https://sigap.menlhk.go.id/sigap-trial/files/download/akurasi-data-penutupan-lahan-nasional-tahun-1990-2016.pdf

WebGIS Ministry of Environment and Forestry
https://sigap.menlhk.go.id/sigap