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Report on the technical assessment of the proposed forest reference emission level of Nigeria submitted in 2019

Summary

This report covers the technical assessment of the voluntary submission of Nigeria on its proposed forest reference emission level (FREL) in accordance with decision 13/CP.19 and in the context of results-based payments. The FREL proposed by Nigeria covers the activity "reducing emissions from deforestation", which is among the activities included in decision 1/CP.16, paragraph 70. For its submission, Nigeria developed a national FREL. The FREL presented in the submission, for the reference period 2006–2016, corresponds to 32,397,230 tonnes of carbon dioxide equivalent per year. This report contains the assessed FREL and areas identified by the assessment team for future technical improvement in accordance with the provisions on the scope of the technical assessment contained in the annex to decision 13/CP.19.

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Abbreviations and acronyms

AD	activity data
AT	assessment team
COP	Conference of the Parties
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
EF	emission factor
FAO	Food and Agriculture Organization of the United Nations
FORMECU	Forestry Management and Evaluation Coordinating Unit of Nigeria
FREL	forest reference emission level
FRL	forest reference level
GFC	Global Forest Change
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
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 assessment
2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*

I. Introduction and summary

A. Overview

1.   This report covers the TA of the voluntary submission of Nigeria on its proposed FREL[1] submitted on 4 January 2019, in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 18 to 22 March 2019 in Bonn and was coordinated by the secretariat.[2] The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts[3] (hereinafter referred to as the AT): Craig Elvidge (New Zealand) and Manuel Estrada (Mexico). In addition, Gervais Ludovic Itsoua Madzous, an expert from the Consultative Group of Experts, participated as an observer[4] during the centralized activity in Bonn. The TA was coordinated by Dirk Nemitz (secretariat).

2.   In response to the invitation of the COP and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15 and annex, Nigeria submitted its proposed FREL on a voluntary basis. The proposed FREL is one of the elements[5] to be developed in the implementation of the activities referred to in decision 1/CP.16, paragraph 70. Pursuant to decision 13/CP.19, paragraphs 1–2, and decision 14/CP.19, paragraphs 7–8, the COP decided that each submission of a proposed FREL, as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments.

3.   The submission is supported by five appendices (in English), containing summary results for above-ground biomass, below-ground biomass and carbon stocks for different forest types in Cross River State (appendix 1); total live and dead biomass and carbon stocks for different ecological zones in Nigeria (appendix 2); sample reference data used for accuracy assessment and area estimation (appendix 3); a computation of error matrix for the stratified area estimation samples (appendix 4); and a matrix of reference data per ecological zone (sample count) (appendix 5), which enhance the transparency of the FREL.

4.   The objective of the TA is to assess the degree to which the information provided by Nigeria is in accordance with the guidelines for submissions of information on reference levels[6] and to offer a facilitative, non-intrusive, technical exchange of information on the construction of the FREL with a view to supporting the capacity of Nigeria for the construction and future improvement of its FREL, as appropriate.[7]

5.   The TA of the FREL submitted by Nigeria was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or FRLs.[8] This report on the TA was prepared by the AT following the same guidelines and procedures.

6.   Following the process set out in those guidelines and procedures, a draft version of this report was communicated to the Government of Nigeria. The facilitative exchange during the TA allowed Nigeria to provide clarifications and additional information, which were considered by the AT in the preparation of this report.[9] As a result of the facilitative interactions with the AT during the TA, Nigeria provided a modified version of its submission on 24 May 2019, which took into consideration the technical input of the AT. The modifications improved the clarity and transparency of the submitted FREL without needing to alter the approach used to construct it. This TA report was prepared in the context of the modified FREL submission. The modified submission, containing the assessed FREL, and the original submission are available on the UNFCCC website.[10]

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[1] The submission of Nigeria is available at https://redd.unfccc.int/submissions.html?country=nga.
[2] Per decision 13/CP.19, annex, para. 7.
[3] Per decision 13/CP.19, annex, paras. 7 and 9.
[4] Per decision 13/CP.19, annex, para. 9.
[5] See decision 1/CP.16, para. 71(b).
[6] Decision 12/CP.17, annex.
[7] Decision 13/CP.19, annex, para. 1(a–b).
[8] Decision 13/CP.19, annex.
[9] Per decision 13/CP.19, annex, paras. 1(b) and 13–14.
[10] http://unfccc.int/8414.

B. Proposed forest reference emission level

7. In decision 1/CP.16, paragraph 70, the COP 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 and in accordance with their respective capabilities and national circumstances, in the context of providing adequate and predictable support. The FREL proposed by Nigeria, on a voluntary basis for a TA in the context of results-based payments, covers the activity "reducing emissions from deforestation", which is one of the five activities referred to in that paragraph. Pursuant to paragraph 71(b) of the same decision, Nigeria developed a national FREL that covers its entire territory. For its submission, Nigeria applied a stepwise approach to developing its FREL in accordance with decision 12/CP.17, paragraph 10. The stepwise approach enables Parties to improve their FRELs and/or FRLs by incorporating better data, improved methodologies and, where appropriate, additional pools.

8. The national FREL proposed by Nigeria for the historical reference period 2006–2016 is the annual average of the CO_2 emissions associated with gross deforestation, defined as the conversion of forest land to non-forest land (cropland, grassland, settlements, wetlands and other land). Forest land classification is based on the forest definition adopted by Nigeria, and any conversion that takes the land below the thresholds of the forest definition is considered to be deforestation. The FREL includes only the gross emissions from deforestation that are associated with clear-cuts and excludes any subsequent emissions and removals from the deforested areas. The proposed FREL includes the conversion of forest plantations to other land uses. The AD used in constructing the FREL were obtained through visual interpretation of very high spatial and temporal resolution satellite data by experts skilled in interpreting remote sensing imagery and with good knowledge of the situation on the ground. The EFs were obtained from Nigeria's national forest carbon inventory. The FREL presented in the modified submission, with the aim of accessing results-based payments for REDD+ activities for 2006–2016, corresponds to an average of 32,397,230 t CO_2 eq/year.

9. The proposed FREL includes the pools above-ground biomass, below-ground biomass and deadwood, and excludes the litter and soil organic carbon pools. Regarding GHGs, the submission includes CO_2 only.

10. The FREL proposed by Nigeria is its second FREL submitted in the context of the application of the stepwise approach in accordance with decision 12/CP.17, paragraph 10. A modified version of Nigeria's 2018 subnational FREL for Cross River State was subject to a TA in 2018.[11] It covered the activity "reducing emissions from deforestation" and the reference period 2000–2014. The previously assessed FREL corresponded to 8,922,467.1 t CO_2 eq/year. The assessed FREL proposed in the 2019 modified submission is higher than the 2018 subnational FREL, because it covers the whole national territory of Nigeria and includes the deadwood pool. Additionally, a different methodology to produce AD was applied and the EFs were developed through a new national forest carbon inventory.

II. Data, methodologies and procedures used in the construction of the proposed forest reference emission level

How each element in the annex to decision 12/CP.17 was taken into account in the construction of the forest reference emission level

1. Information used by the Party in the construction of its forest reference emission level

11. For the construction of its FREL, Nigeria used methodologies consistent with the 2006 IPCC Guidelines as the basis for estimating changes in carbon stocks in living biomass and deadwood resulting from the conversion of forest land to other land uses. Accordingly, the gross emissions from deforestation were estimated for 2006–2016 by combining AD (i.e.

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[11] See document FCCC/TAR/2018/NGA.

areas of annual gross deforestation) with appropriate EFs (i.e. CO_2 emissions associated with the corresponding vegetation groups).

12.   The national FREL proposed by Nigeria is for the activity "reducing emissions from deforestation", with deforestation defined as the conversion of forest to non-forest. The historical reference period used for the construction of the FREL is 2006–2016. The FREL is based on the annual average of historical CO_2 emissions associated with deforestation in the reference period, including only the gross CO_2 emissions from deforestation as a result of the conversion of forest and excluding any subsequent emissions and removals from the deforested areas. The FREL estimated by Nigeria is not subject to adjustment for national circumstances under the provisions of decision 12/CP.17, paragraph 9.

13.   Nigeria followed a stratified random sampling approach developed by Olofsson et al. (2013; 2014) for assessing AD. The approach uses a land-cover change map to stratify the reference data points to be collected, and the resulting statistics are referred to as "stratified area estimators". Reference data were collected using the Collect Earth tool[12] followed by careful visual interpretation of very high spatial and temporal resolution satellite data by experts skilled in remote sensing imagery and with good knowledge of the situation on the ground. The interpretations of the six experts were compared, and the class with the majority vote (the mode) among the interpreters was used, as described in the recommendations of McRoberts et al. (2018), to ensure the high quality of the reference data. The points were then intersected with the ecological zone map to break down the AD by ecozone class following the methods described by Stehman (2014). Some of the AD classes within ecozones were represented by few or no sample units. Nigeria identified this as an area for future technical improvement of the AD, noting that a larger sample size and consideration of the ecozones in the stratified random sampling design would increase the accuracy of the estimates.

14.   Subsequently, Nigeria used a change map based on the GFC tree cover and loss layers (Hansen et al., 2013) for the stratification of stable forest, stable non-forest and forest loss. These layers were combined into a forest change map based on Nigeria's forest definition. The "treecover2000" layer from the GFC map, which contains information on the percentage tree cover in each 30 m pixel for 2000, was first filtered with a value of 15 per cent tree cover to match the canopy cover threshold in the forest definition. Next, all tree cover changes between 2001 and 2005 were combined with the 2000 tree cover and non-tree cover map to reclassify changes before 2006 as non-tree cover and create a 2006 tree cover and non-tree cover map. In addition, adjacent pixels with the same value were grouped into patches and any tree-cover patches smaller than six pixels were excluded from the forest class and considered "trees outside forest", while all tree-cover patches of six pixels and above were considered "forest". Similarly, the "lossyear" layer was filtered to only consider the loss occurring between 2006 and 2015. As the process was applied to distinguish forest from non-forest, all tree-cover losses with a patch size of six pixels or larger were considered "deforestation".

15.   Nigeria considered loss patches smaller than six pixels overlaid with the forests and trees outside the forests in 2006 to identify "forest degradation" and "degradation outside the forest". This preliminary assessment suggests that forest degradation could account for 17 per cent of the total emissions from deforestation and forest degradation. This estimate for forest degradation was made to justify the omission of the activity for Nigeria's modified submission. However, no accuracy assessment was performed on the map estimation of forest degradation, and therefore Nigeria decided that the estimate was not sufficiently robust to allow the inclusion of the activity within the scope of the FREL at this time. The map-based estimate of forest degradation was moved to an appendix in the modified FREL submission. In the stratified area estimate for deforestation, forest degradation is considered to be stable forest.

16.   In order to produce deforestation area estimates, the error matrix and the stratified area estimates for the three classes (stable forest, stable non-forest and forest loss) were calculated using the formulas provided in Olofsson et al. (2014). The overall weighted

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[12] See document FCCC/TAR/2018/NGA, para. 10.

accuracy was 81 per cent, with a confidence interval for forest loss of ±46 per cent. The results were also analysed by major ecological zone.

17. Nigeria derived EFs from a new national forest carbon inventory that was designed and partially implemented to sample all main ecological zones and types of land-use cover in the country. A stratified random sampling design was used to capture the spatial variability of land-use and land-cover types and forest carbon stocks. The stratification was based on Nigeria's main ecological zones defined in a 1995 mapping project (FORMECU, 1998), namely mangrove forest and coastal vegetation, freshwater swamp forest, lowland rainforest, derived savannah, Guinea savannah, montane forest, Sudan savannah and Sahel savannah. However, the sampling was further constrained as fieldwork was avoided in some states in the country owing to the high risk conditions there.

18. In its first, subnational, FREL submission, for Cross River State, Nigeria applied a single weighted EF as the approximate value of carbon loss per ha deforestation. For its national FREL submission, Nigeria intended to improve the estimates by applying a stratification according to homogenous carbon contents following the ecological zones with the associated vegetation types as described in section 3.2 of the submission. However, to allow for sufficient representation of data per stratum (i.e. a statistically representative number of sample points for both the AD and EF estimates), Nigeria aggregated some ecological zones on the basis of the proximity and homogeneity of the carbon contents in the associated forest types.

2. Transparency, completeness, consistency and accuracy of the information used in the construction of the forest reference emission level

(a) Methodological information, including description of data sets, approaches and methods

19. The FREL proposed by Nigeria is its second FREL submitted in the context of the application of the stepwise approach in accordance with decision 12/CP.17, paragraph 10. The previous FREL submission was subject to a TA in 2018.[13] In its most recent submission, Nigeria did not describe changes from previously submitted information in accordance with decision 12/CP.17, annex, subparagraph (b). However, during the TA, Nigeria offered this information when requested by the AT, and the AT commends Nigeria for including this information in the modified submission.

20. During the TA, Nigeria described the following differences between the 2019 national FREL submission and the 2018 FREL submission for Cross River State:

(a) The previous submission was subnational and covered only Cross River State, while the current one covers the entire country;

(b) The previous submission focused on annual emissions (a single weighted EF as the approximate value of carbon loss per ha deforestation) for the entire State and was not based on ecological zones, while the current submission provides estimates on the basis of ecological zones and then on the basis of the national aggregate;

(c) Emission estimates for the deadwood pool were not included in the previous submission but they are included in the current submission;

(d) The sample design for the previous FREL was different from that used for the current submission. Previously, sample plots were randomly selected, while for the national FREL sample clusters of three plots each were randomly selected for enumeration;

(e) Owing to a lack of modern tree height measurement tools, trees were only counted without height measurements, which made it necessary to use a diameter–height equation in the previously submitted FREL, while, for the current FREL submission, TruPulse 200B Laser Rangefinder was used to measure tree heights (bole and total heights) on a sample of trees whose boles were clearly visible from base to top;

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[13] See document FCCC/TAR/2018/NGA.

(f)   For the previous submission, ground truthing or checks for areas of agricultural tree crops were not undertaken to facilitate accurate delineation, but such checks were carried out for the current submission;

(g)   Information that justifies the omission of emissions from soil organic carbon and non-CO_2 emissions from fires was provided in the current submission;

(h)   Information on forest degradation was assessed and included in an appendix to the current submission to justify the omission of the activity.

21.   The AT noted that, on page 29 of the submission, while discussing the creation of the forest area change map for stratification, Nigeria explains that all tree-cover change between 2001 and 2005 was combined with the 2000 tree cover and non-tree cover to reclassify change before 2006 as non-tree cover and create a 2006 tree cover and non-tree cover map. However, it was not clear from the text of the submission why this was done. Nigeria clarified that this was aimed at estimating change before 2006 given that the GFC tool does not provide annual maps of tree and non-tree cover, but only offers maps of tree cover for 2006 (and 2016), and average annual tree cover loss. So, in order to obtain a map of tree cover for a year between 2006 and 2016, Nigeria subtracted tree-cover loss. The AT welcomes this explanation from Nigeria and considers including it in future FREL submissions to be an area for future technical improvement for transparency.

22.   The AT noted that the land-use and land-cover classification described in section 3.3 of the modified submission is not consistent with the classes used to estimate the FREL (particularly in the case of savannahs). In response, Nigeria provided the AT with definitions of the types of savannah, which it included in section 3.2 of the modified submission. The AT found it challenging to reconcile the aggregated ecozones presented in table 7 (total emissions for 10 years, 2006–2016) with the land-cover classification explained in section 3.3 of the modified submission. At the beginning of that section, Nigeria explains that the classification system it has adopted is based on a national land-use and land-cover classification scheme developed in the 1995 mapping project of Nigeria (FORMECU, 1998), consisting of 36 land-use and land-cover classes, but it was deemed necessary to aggregate the classes into a few easily mapped classes that can be distinguished with high confidence on satellite imagery. Therefore, the 36 classes were aggregated into 12 classes, which were further grouped into forest and non-forest classes. These 12 classes are not easily mapped against the five aggregated ecozones presented in table 7 of the modified submission. During further exchanges with the AT, Nigeria noted that the content of sections 3.2 and 3.3 was merely a description of how Nigeria arrived at the classification scheme of 12 land-use classes and that such a scheme was in no way linked to the AD used for the FREL. Nigeria provided these explanations in section 3.3 of the modified submission. Nevertheless, the AT considers that this issue is relevant to the estimation of AD because the description of land-use classes is linked to EF and carbon stock quantification. The AT believes that it is important that the submission explains how actual land-use classes have been considered and stratified, and the implications of this for the accuracy of the FREL estimates. Consequently, the AT considers enhancing the clarity of the relationship between the identified land-cover classification and other classifications in the modified submission to be an area for future technical improvement in order to increase the transparency of future submissions.

23.   The AT noted that no information on the type and resolution of satellite imagery used to determine historical reference data was provided in the FREL submission. During the TA, Nigeria explained that the source of the image used, as indicated in section 6.1.3 of the submission, is version 1.4 of the GFC product.[14] The AT welcomed this explanation, and commends Nigeria for including this information in its modified submission, which enhanced the transparency and completeness of the information on the type and resolution of satellite imagery used to determine historical reference data.

24.   The AT considered that it was not clear from the explanations provided in the submission why Nigeria had to use the GFC data to develop a stratification of the AD instead of using the reference data. Nigeria clarified that the GFC data were used to generate the forest change map with three classes (stable forest, stable non-forest and forest loss). As

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[14] See https://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.4.html.

described in the FREL submission, the reference data generated were used for accuracy assessment and stratified estimation; that is, the change map derived from GFC data was used to stratify the reference data, since such data were generated from high-resolution data available in Collect Earth and in addition to the interpreters' extensive knowledge of the landscape. Thus, the reference data were essentially used to correct misclassifications in the GFC data to produce the stratified area estimates. The AT welcomes this explanation from Nigeria and considers including it in future FREL submissions to be an area for future technical improvement for transparency.

25.   The AT pointed out that figure 9 on page 33 of the modified submission aims to, according to the accompanying text, provide an example of omission of loss from the forest change map (i.e. the forest change map had classified the pictured location as stable forest, whereas the reference data interpretation suggested that the reference point concerned forest loss). During the TA, Nigeria explained that the two images in figure 9 are the reference data, and that the images for 2005 and 2014 were displayed to underscore the reliability of the reference data, since it could be visually discerned from the two images that the pictured location was forested in 2005 but had been deforested (forest loss) in 2014. Meanwhile, this same location in the change map in figure 8 (though location was not highlighted there) was classified as stable forest. Reference data are point data, as can be seen overlaid on the change map in figure 8. Nigeria further pointed out that the process of stratification of the reference data using the change map would then have corrected the misclassification or "commission error". While Nigeria made further improvements to the description and clarity of figures 8 and 9 in the modified submission, the AT still found their presentation confusing, as the title and paragraph above figure 9 give the impression that the figure shows a comparison between the forest change map and the reference data, while in fact both images represent reference data but at two different points in time (2005 and 2014). The AT commends Nigeria for the additions made during the TA and considers the continued improvement of the transparency of the descriptions of how the reference data are mapped and interpreted to be an area for future technical improvement.

26.   From the information in the original submission, the AT found it difficult to understand why Nigeria did not use images from more than two years of the reference period (2006 and 2016) for estimating AD, considering that figure 9 shows imagery from 2005 and 2014, which seems to suggest that images for more than two years in the reference period were available, and that at least the image from 2014 could have been considered in estimating AD. During the TA, Nigeria explained that it used only images from two points in time (2006 and 2016) to conform with the Forest Carbon Partnership Facility methodological framework (which recommends using a recent 10-year reference period) and the Green Climate Fund pilot programme for REDD+ results-based payments (which recommends using a 10–15 year reference period). Nigeria provided an additional explanation during the TA, clarifying that, for the reference data, all available imagery around and between 2006 and 2016 were looked at during the assessment. Nigeria also provided additional information in the modified submission on how the reference points were constructed and land use identified.

27.   The AT commends Nigeria for improving transparency in the modified submission concerning how the reference points were constructed. However, the AT considers further increasing the transparency and understanding of the AD and the images used in the construction of the reference period to be an area for continued future technical improvement.

28.   The AT found that harvested plantation areas and other areas with temporary cover losses may be considered as deforested areas. Nigeria acknowledged this in responding to a question from the AT thereon, stating that, if a forest area was converted to a temporarily unstocked area in a target year, it may be classified as stable forest or forest loss (deforestation) depending on the magnitude of conversion. In response to a follow-up question, Nigeria explained that images of the years around and between 2006 and 2016 were also looked at to enable a progressive assessment of the transition (or otherwise) of the concerned areas in the reference data. Nigeria confirmed that it is not possible to distinguish temporarily unstocked forest areas from the images, unless such areas recover quickly enough to reach the minimum threshold of 15 per cent cover to determine stable forest. The AT considers that, even if the affected areas were above the 15 per cent threshold, it would

not always be possible to identify temporarily unstocked areas if they had been recently cleared and no regrowth was yet detected. Consequently, the AT considers continuing to work on approaches to effectively differentiate between temporarily unstocked forest areas and deforestation to be an area for future technical improvement.

29.   Additionally, the AT pointed out that section 6.1 of the submission on AD does not include a description of how the tree crop areas were identified and deducted from the forest areas. Nigeria stated that ground truthing or field checks were undertaken, combined with the data obtained during the national forest carbon inventory where land use and land cover in the plots were described and their coordinates taken. Furthermore, in response to a question from the AT, Nigeria specified that about 252 field checks were conducted for some unresolved classes in the images. The points were taken at random in four states where the ambiguities occurred; namely, Niger, Nasarawa in the savannah ecosystem, and Oyo and Ogun in the rainforest zones of the country. This additional information provided by Nigeria improves the transparency and understanding of how the tree crop areas were identified and distinguished from forest areas. The AT commends Nigeria for including this information in the modified submission (section 6.1.4).

30.   In its modified submission Nigeria explained that a national forest carbon inventory was designed and partially implemented to sample all main ecological zones and land-use and land-cover types in the country. Additionally, footnote 2 on page 40 of its original submission pointed out that, because of budgetary constraints and time limitations, barely half of the clusters in the design were visited and data collected from them. The AT noted that it was not clear, from the information presented in the submission, whether there are any plans to fully implement the national forest carbon inventory and how this affected the accuracy of EF estimates. Nigeria explained that 116 of 240 (48.3 per cent) clusters designed to be sampled were eventually assessed. However, according to Nigeria, the constraints responsible for the incomplete enumeration did not significantly affect the accuracy of the estimates given that the sampled clusters, comprising a total of 348 plots (116 plots times 3), covered all ecological zones. Nonetheless, Nigeria is of the opinion that sampling more clusters could reduce uncertainty and improve the accuracy of the EFs. In that regard, since improvement is a continuous process, Nigeria expressed its intention to fully implement the national forest carbon inventory as soon as funds are available. The AT welcomes this intention and considers fully implementing the national forest carbon inventory to be an area for future technical improvement that could enhance the accuracy of future FREL submissions.

31.   The AT notes that, overall, the FREL does not maintain consistency, in terms of sources of AD and EFs, with the GHG inventory included in Nigeria's second national communication.[15] As noted in section 7.3 of the modified FREL submission, the second national GHG inventory did not include a forest definition and was using forest data available at the time, which are likely to have been focused on tropical high forest only. The AT commends Nigeria for improving the data and information for the FREL, but considers improving consistency between future FREL submissions and national GHG inventories to be an area for future technical improvement.

32.   The AT found that the original submission did not contain an explanation of how uncertainties had been estimated for AD, EFs and the FREL estimates. Only section 7.4.2 offers the short explanation that all biomass estimates were reported with 95 per cent uncertainty values. Nigeria indicated that the Excel spreadsheets provided to the AT allow recalculation of the uncertainties and that, because explaining these calculations in the text is very difficult, it refers to the paper by Olofsson et al. (2014), which provides a detailed explanation of the uncertainty calculation of AD. On the basis of its discussions with the AT during the TA, Nigeria included a summary of the uncertainties in the modified FREL submission. The AT noted the high level of uncertainty in the deforestation area estimates and considers including information on how uncertainties have been calculated to be an area for future technical improvement. The FREL submission would be further improved if it contained an explanation of any measures that could be used to reduce this uncertainty, and the AT considers this also to be an area for future technical improvement.

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[15] In reference to the scope of the TA, as per decision 13/CP.19, annex, para. 2(a).

33. The AT noted that national circumstances were not described in Nigeria's FREL submission. During the TA, Nigeria noted that it had conducted some research to better understand deforestation drivers for the construction of the FREL. The AT considers including this information in the submission to be an area for future technical improvement.

34. The AT noted that Nigeria made reference to a number of appendices and spreadsheets in the original submission, but they were in fact not included and there was no indication of how or where the spreadsheets may be accessed. During the TA, Nigeria made available the spreadsheets to the AT and included the appendices in the modified submission. The AT considers that the inclusion of the appendices increased the transparency and completeness of the FREL submission, and identified adding a link to the spreadsheets in the submission text as an area for future technical improvement.

35. Additionally, the AT commends Nigeria for correcting some table numbers in the modified submission, which increased transparency.

(b) Description of relevant policies and plans, as appropriate

36. Nigeria did not include a description of relevant policies and plans in the FREL submission. As a result of the facilitative interactions with the AT during the TA, Nigeria provided description of the relevant policies and plans, and subsequently included this information in the modified submission. The AT commends Nigeria for including this information in the modified FREL submission, consistently with decision 12/CP.17.

3. Pools, gases and activities included in the construction of the forest reference emission level

37. According to decision 12/CP.17, annex, subparagraph (c), the reasons for omitting a pool and/or activity from the construction of the FREL should be provided, noting that significant pools and/or activities should not be excluded.

38. The pools included in the FREL are above-ground and below-ground biomass and deadwood. While litter and soil organic carbon were not included, some information on the potential significance of the pools was provided as well as an explanation of the challenges related to the availability of data for including the pools.

39. Nigeria's previous FREL submission excluded emissions from deadwood, but deadwood was included in its current FREL submission. According to the FREL, deadwood is estimated to comprise around 7.7 per cent of the total live and dead carbon stock in rainforest and montane forests. The AT commends Nigeria for this improvement.

40. With regard to emissions from soil organic carbon, the AT requested clarification of the reasons for the omission of the pool. In response, Nigeria explained that it included all available information on peatlands in the submission to justify omission of the pool but that this requires further investigation. It noted that the areas envisaged to be peatlands are very similar to the mangrove and freshwater swamp ecological zones, and assessed these forest types as representing as little as 4 per cent of all deforestation in the country. The AT notes that, from the information and analysis presented by Nigeria, it does not seem likely that emissions from deforestation of peatland in Nigeria would be significant given the current information available.

41. The AT acknowledges that Nigeria included the most significant activity, "reducing emissions from deforestation", of the five activities identified in decision 1/CP.16, paragraph 70, in accordance with its national capabilities and circumstances. The AT notes that other activities could also be significant, in particular forest degradation. However, according to Nigeria during the TA, there are not enough data or sufficient resolution imagery to produce estimates with acceptable accuracy. To increase understanding of why forest degradation cannot be included at this time, the AT considers that it would be useful if Nigeria were to include information on the limitations and on the additional data required for forest degradation in the FREL submission, and the AT identifies this as an area for future technical improvement. Moreover, Nigeria pointed out its interest in including enhancement of forest carbon stocks in order to assess the performance of its afforestation and restoration efforts, but noted that no reliable data on forest enhancement are currently available so the activity

was not included in the current FREL submission. Therefore, the AT also considers including forest degradation to be an area for future technical improvement.

42.　In order to assess the significance of emissions from forest degradation, Nigeria compared its estimates with the sum of emissions from deforestation and those from forest degradation. The AT noted that such comparison should be made against the emissions included in the FREL only (i.e. only deforestation emissions) in order to have an idea of the significance of forest degradation with respect to the proposed FREL. Nigeria indicated that the estimate contained in the submission that forest degradation could account for 17 per cent of the total emissions from deforestation and forest degradation was an unrealistic estimate based on a preliminary assessment and that it plans to follow the stepwise approach to include forest degradation at a later stage. Nigeria added that providing the requested estimate in t CO_2 eq may not be practically possible because the corresponding EF for forest degradation was not factored in during the inventory design, and that, to prevent further concerns from being raised, it had decided not to include the forest degradation approximation in the modified FREL submission. The AT noted that this modification negatively affected the transparency of the modified submission by removing the information on the significance of emissions from forest degradation. Nigeria consequently included such information as appendix 5 to the modified submission.

43.　The AT noted a lack of information demonstrating how the activities carried out to reduce emissions from deforestation will not increase emissions from forest degradation if forest degradation is not included in the FREL. Nigeria indicated that it has put in place a safeguard information system that includes policies and measures to reduce the displacement of emissions, and that such actions are also outlined in its environmental and social management framework as well as its REDD+ strategy and action plan. The measures were outlined during the TA to show how it is tackling the identified activities that may lead to emissions from both deforestation and forest degradation. Furthermore, Nigeria noted that, among the policies and measures being promoted to address the risks of reversals and other related issues, it has fostered sustainable forest management, especially among forest communities, including sustainable exploitation of non-timber forest products, alternative livelihood options, training and involvement of communities in forest monitoring, community land-use plans and collaboration with stakeholder agencies on alternative energy sources. The AT notes that the description of these actions and their effect on any potential leakage should be explained in the submission and considers this an area for future technical improvement.

44.　Nigeria considered only CO_2 emissions in the FREL submission, explaining that forest fires in Nigeria are not severe enough to bring about deforestation because they are mostly controlled. In most cases, farmers set bushes on fire after trees have been removed for agricultural purposes, and, where fires occur within the forest, they only cause forest degradation, since the forest cover remains above the forest threshold. Nigeria also referred to the lack of reliable, accurate and consistent data as a reason for this omission. On the basis that an average 12,571 ha/year forest is burned (FAO, 2015) and using default IPCC EFs, Nigeria calculated that non-CO_2 gases contribute around 1.1 per cent of the total emissions. The AT agrees that, on the basis of the AD used, non-CO_2 emissions are likely to be insignificant in terms of their contribution to emissions from deforestation. However, the AT considers the treatment of non-CO_2 gases and the collection of AD relating to forest fires to be an area for future technical improvement.

4.　Definition of forest

45.　Nigeria provided in its submission the definition of forest used in the construction of its FREL, which was developed in 2016 for the purpose of the FREL. Until then Nigeria had been using the default definition for reporting to FAO for the Global Forest Resources Assessment (i.e. minimum area of 0.5 ha, height of 5 m or more and at least 10 per cent canopy cover). The definition used for the FREL is country specific and applies to the whole country. The definition considers an ecological community predominated by trees and other layers of woody plants with a minimum area of 0.5 ha, a minimum tree height of 3 m and a minimum tree canopy cover of 15 per cent, or stands with potential to reach such thresholds in situ. Nigeria noted in the modified submission that the definition used for the FREL would be used for future GHG inventory reporting, national communications and biennial update reports.

46. The AT identified a lack of clarity regarding the treatment of plantations and tree crops in estimating AD, namely which tree crop types were included in the FREL (i.e. which tree crop types were considered forest) and which were not, thus reducing the transparency of the submission (see para. 29 above). In a written response, Nigeria stated that the forest definition it had adopted excludes tree crop plantations for agricultural purposes because plantations lead to conversion of natural forest to other uses. However, forest plantations such as teak (*Tectona grandis*) and gmelina (*Gmelina arborea*) are specifically for timber production and are used for reforestation and afforestation projects, as can be observed in the dry savannah. Nigeria explained that, although it wants to discourage conversion of natural forest to plantation forest, wherever such plantations occur within the natural forest they are bound to be classified as forest. The AT noted that, if natural forests are being converted to plantations, Nigeria should be able to identify the areas associated with this land-use change and deduct them from the FREL (i.e. explicitly exclude them from the forest definition). Nigeria indicated that the conversion of natural forests to forest plantations has hardly occurred in the country since the end of afforestation projects in the early 1990s, since which the country has consistently taken steps to ensure the avoidance of such conversion. Additionally, Nigeria clarified that most of the existing forest plantations are those converted under the above-mentioned afforestation projects, and that some were mostly in the form of enrichment planting of existing degraded forests. The AT commends Nigeria for providing additional information in its modified submission on the difficulties in mapping and differentiating between natural forest and plantation forest where the boundaries overlap. The AT notes the development of methodologies for deducting the areas of forest plantations from the areas of natural forest as an area for future technical improvement.

III. Conclusions

47. The information used by Nigeria in constructing its FREL for the activity "reducing emissions from deforestation" is mostly transparent and in overall accordance with the guidelines for submissions of information on reference levels.

48. The FREL presented in the submission is Nigeria's second FREL. The previous FREL was submitted in 2018 and was subject to a TA in 2018; it was subnational in scope and covered the activity "reducing emissions from deforestation" in Cross River State for 2000–2014.

49. The FREL presented in the most recent modified submission, for the reference period 2006–2016, covers the entire national territory of Nigeria and corresponds to 32,397,230 t CO_2 eq/year.

50. The AT acknowledges that Nigeria included in its FREL the most significant activities, the most important forest types and most significant pools in terms of emissions from deforestation. The AT considers that, in doing so, Nigeria followed decision 1/CP.16, paragraph 70, on activities undertaken, and paragraph 71(b), on elaboration of a subnational FREL as an interim measure, and decision 12/CP.17, paragraph 10, on applying the stepwise approach. The AT commends Nigeria for providing information on its ongoing work to develop a FREL for forest degradation.

51. As a result of the facilitative interactions with the AT during the TA, Nigeria provided a modified submission that took into consideration some of the technical input of the AT. The AT notes that the transparency and completeness of the information provided were improved in the modified FREL submission, without having to alter the approach or values used to construct the FREL, and commends Nigeria on its efforts.

52. Pursuant to decision 13/CP.19, annex, paragraph 3, the AT identified the following areas for future technical improvement:

(a) Enhancing the clarity of the relationship between the identified land-cover classification and the AD and EFs (see para. 22 above);

(b) Including more information on the methodologies for using reference data (see paras. 24–25 above);

(c)   Continuing to work on approaches to effectively differentiate between temporarily unstocked forest areas and deforestation (see para. 28 above);

(d)   Fully implementing the national forest carbon inventory to enhance the accuracy of future FREL submissions, noting that this is conditional on available funding (see para. 30 above);

(e)   Improving consistency between future FREL submissions and future national GHG inventories (see para. 31 above);

(f)   Including information on how uncertainties have been estimated regarding AD, EFs and the FREL, and an explanation of the measures that could be taken to reduce the uncertainty of FREL estimates (see para. 32 above);

(g)   Including a description of national circumstances (see para. 33 above);

(h)   Adding a link in the submission to the spreadsheets containing the estimates of the FREL (see para. 34 above);

(i)   Including forest degradation and enhancement of forest carbon stocks (see paras. 41–42 above);

(j)   Including a description of the actions taken to avoid the displacement of emissions from deforestation to degradation as well as of their effect on such leakage (see para. 43 above);

(k)   Improving the treatment of non-CO_2 gases and the collection of AD relating to forest fires (see para. 44 above);

(l)   Including a forest definition that clearly states whether different types of plantation are considered to be forest, and developing methods for deducting the areas of forest plantations from those of natural forests (see para. 46 above).

53.   Pursuant to decision 13/CP.19, annex, paragraph 2(f), in assessing the pools and gases included in the FREL, the AT noted that the pools and gases excluded by Nigeria are likely to be insignificant in the context of the FREL. Nevertheless, pursuant to decision 13/CP.19, annex, paragraph 3, the AT identified the following additional area for future technical improvement regarding the exclusion of pools and gases from the FREL: collecting information on forest fires and their related non-CO_2 emissions, recognizing that these emissions are likely to be insignificant and forest fires are not often associated with deforestation (see para. 44 above).

54.   The AT acknowledges and welcomes the Party's intention to:

(a)   Improve AD estimates by making further improvements to the land-use and land-cover maps (see paras. 13–15 above);

(b)   Reduce the level of uncertainty associated with EFs, subject to the availability of funds to carry out additional and intensive inventories (see para. 32 above);

(c)   Include emissions from forest degradation and enhancement of forest carbon stock by sinks resulting from afforestation activities (see paras. 41–42 above).

55.   In conclusion, the AT commends Nigeria for showing strong commitment to the continuous improvement of its FREL estimates in line with the stepwise approach. A number of areas for future technical improvement of Nigeria's FREL have been identified in this report. At the same time, the AT acknowledges that such improvements are subject to national capabilities and policies, and notes the importance of providing adequate and predictable support.[16] The AT also acknowledges that the TA was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Nigeria.

56.   The table contained in annex I summarizes the main features of Nigeria's proposed FREL.

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[16] Per decision 13/CP.19, annex, para. 1(b), and decision 12/CP.17, para. 10.

Annex I

Summary of the main features of the proposed forest reference emission level based on information provided by Nigeria

Main features of the FREL		Remarks
Proposed FREL	32 397 230 t CO_2 eq/per year	See paragraph 8 of this document
Type and reference period of FREL	FREL = average of historical emissions in 2006–2016	The FREL was set by Nigeria as the average of historical emissions for the reference period (see para. 8 of this document)
Application of adjustment for national circumstances	No	–
National/subnational	National	See paragraph 7 of this document
Activity included	Reducing emissions from deforestation	See paragraph 12 of this document
Pools included	Above-ground biomass Below-ground biomass Deadwood	Nigeria provided an explanation of the significance of the litter and soil organic carbon pools (see paras. 38–40 of this document)
Gases included	CO_2	Nigeria considers that non-CO_2 gases from forest fires are insignificant (see para. 44 of this document)
Forest definition	Included	Country specific and specifically developed for FREL. The definition used for the FREL considers a minimum area of 0.5 ha, a minimum tree height of 3 m and a minimum tree canopy cover of 15 per cent, or stands with potential to reach such thresholds in situ (see paras. 45–46 of this document)
Consistency with latest GHG inventory	Methods used for estimating the FREL are not consistent with the latest GHG inventory	See paragraph 31 of this document
Description of relevant policies and plans	Not included	Included in the modified submission (see para. 36 of this document)

Main features of the FREL		*Remarks*
Description of assumptions on future changes to domestic policies, if included in the construction of the FREL	Not applicable	–
Description of changes to previous FREL	Included	A description of the changes since the previous FREL was included
Identification of future technical improvements	Included	Several areas for future technical improvement were identified (see paras. 52–54 of this document)

Annex II

Documents and information used during the technical assessment

Reference documents

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