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Report on the technical assessment of the proposed forest reference emission level of Zambia submitted in 2021

Summary

This report covers the technical assessment of the voluntary submission of Zambia 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 Zambia covers the activities reducing emissions from deforestation and reducing emissions from forest degradation, which are among the activities included in decision 1/CP.16, paragraph 70.

For its submission, Zambia developed a national FREL as the sum of the annual average historical emissions of its 10 provinces. The FREL presented in the original and modified submission, for the reference period 2009–2018, corresponds to 23,520,000 tonnes of carbon dioxide per year.

The assessment team notes that the data and information used by Zambia in constructing its FREL are transparent, complete and in overall accordance with the guidelines contained in the annex to decision 12/CP.17. This report contains the assessed FREL and a few 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.

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
AT	assessment team
CO_2	carbon dioxide
COP	Conference of the Parties
EF	emission factor
FREL	forest reference emission level
FRL	forest reference level
GHG	greenhouse gas
ILUA I	Integrated Land Use Assessment Phase I
ILUA II	Integrated Land Use Assessment Phase II
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
MODIS	Moderate Resolution Imaging Spectroradiometer
NC	national communication
NFI	national forest inventory
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

I. Introduction and summary

A. Overview

1.	This report covers the TA of the voluntary submission of Zambia on its proposed FREL,[1] submitted on 10 January 2021, in accordance with decisions 12/CP.17 and 13/CP.19. The remote TA[2] took place from 22 to 26 March 2021 and was coordinated by the secretariat.[3] The TA was conducted by two LULUCF experts from the UNFCCC roster of experts[4] (hereinafter referred to as the AT): Kwame Agyei (Ghana) and Koki Okawa (Japan). In addition, an expert from the Consultative Group of Experts was invited to participate as an observer[5] during the remote session, but no representative was able to attend. The TA was coordinated by Jenny Wong (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, Zambia submitted its proposed FREL on a voluntary basis. The proposed FREL is one of the elements[6] to be developed in implementing 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.	In this context, Zambia emphasized that the submission of its proposed FREL does not prejudge its nationally determined contribution or the nationally appropriate mitigation actions it is currently undertaking, particularly in the LULUCF sector.

4.	The objective of the TA is to assess the degree to which the information provided by Zambia is in accordance with the guidelines for submissions of information on reference levels[7] 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 Zambia to construct and improve its FREL in the future, as appropriate.[8]

5.	The TA of the FREL submitted by Zambia was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or FRLs.[9] 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 Zambia. The facilitative exchange during the TA allowed Zambia to provide clarifications and additional information, which were considered by the AT in the preparation of this report.[10] As a result of the facilitative interactions with the AT during the TA, Zambia provided a modified version of its submission on 31 May 2021, 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 either the approach used to construct it or the value of the proposed FREL. 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.[11]

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[1]	The submission of Zambia is available at https://redd.unfccc.int/submissions.html?country=zmb.
[2]	Owing to the circumstances related to the coronavirus disease 2019, the TAs of the FREL and FRL submissions of developing country Parties in 2021 had to be conducted remotely.
[3]	As per decision 13/CP.19, annex, para. 7.
[4]	As per decision 13/CP.19, annex, paras. 7 and 9.
[5]	As per decision 13/CP.19, annex, para. 9.
[6]	See decision 1/CP.16, para. 71(b).
[7]	Decision 12/CP.17, annex.
[8]	Decision 13/CP.19, annex, para. 1(a–b).
[9]	Decision 13/CP.19, annex.
[10]	As per decision 13/CP.19, annex, paras. 1(b), 13 and 14.
[11]	https://redd.unfccc.int/submissions.html?country=zmb.

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 Zambia, on a voluntary basis for a TA in the context of results-based payments, covers the activities reducing emissions from deforestation and reducing emissions from forest degradation, which are two of the five activities referred to in that paragraph. Pursuant to paragraph 71(b) of the same decision, Zambia developed a national FREL that covers its entire territory of 10 provinces. For its submission, Zambia 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 or FRLs by incorporating better data, improved methodologies and, where appropriate, additional pools.

8.   The national FREL proposed by Zambia for the historical reference period 2009–2018 is the sum of the annual average historical CO_2 emissions associated with deforestation and forest degradation of its 10 provinces. Zambia noted in its submission that removals were not considered in its assessment of data for the FREL owing to challenges associated with assessing forest regrowth using remote sensing and the physiognomy of the native forest types in the country.

9.   The AD used in constructing the FREL were estimated using a random systematic sampling approach. The open-source Collect Earth tool was used for interpreting high- and medium-resolution spatial imagery collected through Google Earth, Bing Maps and Google Earth Engine, allowing the Party to collect data on current land use and historical land-use changes. The EFs were obtained from Zambia's NFI, which consists of ILUA I and ILUA II. The FREL presented in the modified submission, with the aim of accessing results-based payments for REDD+ activities for 2009–2018, corresponds to 23,520,000 t CO_2/year.[12] The Party noted that the FREL is considered valid for a five-year period (2019–2023).

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

11.   The FREL proposed by Zambia is its second FREL submitted in the context of applying the stepwise approach in accordance with decision 12/CP.17, paragraph 10. Its previous national FREL was submitted on 4 January 2016 and was subject to a TA in March 2016;[13] it covered the activity reducing emissions from deforestation for 2005–2014. The previous assessed FREL corresponded to 25,420,000 t CO_2/year and was therefore higher than the FREL proposed in the most recent submission (see para. 17 below for a list of the changes made for the second submission).

12.   In annex II to its modified submission, Zambia included additional detailed information on its standard operating procedure, which outlines sample design, response design and the data collection and analysis procedure.

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[12] The value of Zambia's national FREL proposed in the original submission did not change in its modified submission. The modified submission mostly involved recalculating the uncertainties associated with the FREL and enhancing the transparency of the reporting, thus allowing a technical assessment of the data, methodologies and procedures used in constructing the FREL.

[13] See document FCCC/TAR/2016/ZMB.

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

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

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

13.   For constructing its FREL, Zambia used the 2006 IPCC Guidelines and a country-specific land representation framework consisting of the six main IPCC land-use categories.

14.   In the national FREL proposed by Zambia, deforestation is defined as the conversion of natural forest land to non-forest land. Although exotic plantation forests are included in the definition of forest land, they are excluded from estimated deforestation areas. Plantation forests currently account for 50,000 ha, or approximately 0.11 per cent, of the country's total forest area of 45 million ha. The FREL includes gross emissions from deforestation associated with clear-cuts and excludes any subsequent emissions and removals from deforested areas. Forest degradation is defined as a reduction in the canopy cover of intact forests by at least two forest classes (see para. 21 below), leaving a minimum canopy cover of 10 per cent.

15.   The AD used in constructing the FREL were estimated on the basis of a random systematic sampling approach and the construction of 8 km x 8 km grids covering the entire country, resulting in 11,110 sample points. High- and medium-resolution satellite imagery (from Landsat, Sentinel, Spot and WorldView) was obtained from Google Earth, Bing Maps and Google Earth Engine and interpreted using Collect Earth. Land cover and land-cover change characteristics for 2009–2018 were recorded by 23 image interpreters. Both the systematic sampling approach and the uncertainty analysis conducted for the AD used are consistent with the 2006 IPCC Guidelines.

16.   The EFs were obtained from Zambia's NFI. Estimates of the above-ground and below-ground biomass of living and dead trees were obtained from models using information from the NFI on tree height, diameter at breast height, standard wood density and root–shoot ratio.

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

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

17.   The FREL proposed by Zambia is its second FREL submitted in the context of applying the stepwise approach in accordance with decision 12/CP.17, paragraph 10. The previous FREL submission was subject to a TA in 2016. In its most recent submission, Zambia described changes from previously submitted information in accordance with decision 12/CP.17, annex, paragraph (b) (see table 1 of the modified submission). The Party described the following changes:

(a)   The reference period was updated to cover 2009–2018;

(b)   The FREL is still national in scope but is now calculated as the sum of the FRELs for the 10 provinces;

(c)   The scope of the FREL was expanded to include the activity reducing emissions from forest degradation;

(d)   The EFs and AD were updated through improved data analysis and the collection of new data on land-use change;

(e)   The basic approach to calculating the FREL was improved and aligned with the land-use categories in the 2006 IPCC Guidelines;

(f)   The estimates were accompanied by uncertainty estimates calculated using a confidence level of 90 per cent.

18.   Zambia noted in its FREL submission that for its NC3 (2020) data from ILUA II were used for estimating emissions and removals for the LULUCF sector. The same data source was used for constructing the current FREL. During the TA, the Party acknowledged that the annual deforestation estimates reported in the NC3 and the FREL submission differ significantly owing to different EFs and AD being applied. For the NC3 default EFs from the 2006 IPCC Guidelines were used, while for the FREL tier 2 EFs based on NFI data were applied. In addition, the NC3 includes emissions from wood removals for commercial timber and fuelwood, which are not included in the FREL. The Party reported that emissions from wood removals for energy consumption will be included in future FREL submissions. The AT commends Zambia for its explanation in the modified submission and considers maintaining consistency between FREL submissions and NCs as an area for future technical improvement.

19.   During the TA, the AT noted that the sum of the provincial emissions from deforestation reported in section 6.2 of the submission differ from those provided in annex 1 to the submission, which presents the national-level estimate of emissions from deforestation. Zambia explained that this is due to use of weights for the land-use change calculations at the provincial level. In the data set used for calculating these provincial emission estimates, each deforestation sampling point in each province has the same area weight. However, the area weights assigned to the deforestation points differ by province and hence there may be a slight difference between the national estimate (provided in annex 1) and the sum of the official provincial estimates (provided in section 6.2). The AT commends Zambia for its clarification and for including this information in the modified submission, thus enhancing the transparency of its reporting. The AT notes that Zambia may wish to consider applying comparable weights (e.g. using a weighted average approach) to its deforestation estimates at the provincial and national level in order to address the differences noted.

20.   The AT noted that Zambia identified forests as areas with a minimum tree cover of 10 per cent in its analysis of AD, but considered forest classes with a canopy cover of 5–10 per cent in its analysis of EFs. During the TA, Zambia explained that the forest definition used for the FREL includes young stands that have not yet reached, but are expected to reach, a crown density of 10 per cent and tree height of 5 m, and are part of temporarily understocked areas. Zambia also explained that it included these young stands when estimating EFs and consequently included forests with a canopy cover of 5–10 per cent. However, it faced difficulties in identifying changes in forest cover for young stands with a canopy cover falling below the 10 per cent threshold in its AD analysis. The AT notes that excluding these young forest stands from the AD analysis may result in changes in forest cover being underestimated and therefore notes it as a possible area for future technical improvement for enhancing the accuracy of the Party's estimates.

21.   Zambia defined forest degradation as a reduction in tree cover in forest land remaining forest land as a result of human disturbance. In determining AD for forest degradation, forest cover was classified into one of four forest classes based on predefined tree canopy cover ranges (namely 5–10 per cent, 10–40 per cent, 40–70 per cent and greater than 70 per cent). For constructing the FREL, forest degradation was defined as a reduction in the canopy cover of an intact forest by at least two classes. The AT noted that forest degradation, as defined by Zambia, could occur in both intact and secondary forests, as well as within each of the defined forest classes, and that a reduction in canopy cover by one class could also be characterized as forest degradation. During the TA, Zambia clarified that it is not able to distinguish between forest degradation occurring in intact forests and that occurring in secondary forests owing to inadequate data and the inability to disaggregate data without increasing uncertainty. The AT considers collecting additional data on forest degradation within secondary and intact forests as an area for future technical improvement. The AT acknowledges Zambia's efforts to further harmonize its AD and EF analyses to reflect changes in forest canopy cover linked to forest degradation and notes that it may wish to consider including such updates in future FREL submissions.

22.   In response to a question from the AT, Zambia explained that it used a random systematic sampling approach for estimating AD, which was considered the most practical

and replicable approach since, unlike the stratified sampling approach, it does not require complicated post-processing. However, Zambia noted that applying a stratified sampling approach to forest degradation could be helpful for disaggregating the various levels of forest degradation occurring in intact and secondary forests. The AT commends Zambia for its efforts to explore other sampling approaches, such as the stratified sampling approach, in order to increase the accuracy of its FREL estimates in accordance with the stepwise approach.

23.   The AT noted that the Collect Earth tool provides imagery of different spatial and temporal resolutions for each sample point and thus that visual interpretation of land-use changes may be problematic if low-resolution imagery is compared with high-resolution imagery at different points in the reference period. Zambia acknowledged this observation by the AT and agreed that it is one of the drawbacks of the Collect Earth tool. However, it clarified that higher-resolution imagery was available for throughout the reference period and hence visual interpretation was not significantly distorted. The AT notes that using imagery with the same or a similar spatial resolution when interpreting each sample point may be helpful in addressing time-series inconsistencies associated with estimating AD, noting in particular the importance of using higher-resolution imagery across the entire time series for AD analysis, as accurate interpretation of tree cover change and the extent of that change is required to determine whether a deforestation or forest degradation event has taken place. The AT notes that Zambia may wish to take this into consideration when using the Collect Earth tool and considers it an area for future technical improvement.

24.   During the TA, the AT noted that, in the uncertainty calculations, use of the summation in quadrature approach for error propagation was not appropriate for the sources of errors for the parameters considered, such as allometry, tissue density and carbon fraction (Yanai et al., 2020). The Party shared with the AT an Excel spreadsheet showing how national uncertainty estimates were obtained, and which were used to update the national uncertainty estimates presented in the modified submission, without suppressing potential errors in the estimation parameters, AD and EFs. The AT notes that Zambia may wish to consider this approach of not suppressing potential errors in AD and EFs in order to avoid underestimating uncertainty for future submissions, as part of the stepwise approach.

25.   In response to a question from the AT on the reasons for the high uncertainties at the provincial level, Zambia explained that it used an 8 km x 8 km sampling grid for its submission but is exploring the possibility of using a smaller sampling grid (4 km x 4 km) and newly released high-resolution spatial and temporal data in order to reduce uncertainties over time, in accordance with the stepwise approach and subject to availability of funding. The AT commends Zambia for its intention to further reduce uncertainties in its FREL estimates at the provincial level.

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

26.   In its submission, Zambia described a number of policies, strategies and laws related to climate change that facilitate improved land-use planning and forest management. These include the National Policy on Environment (2007), National Forestry Policy (2014), National Energy Policy (2008), National Agricultural Policy (2014), National Strategy for Reducing Emissions from Deforestation and Forest Degradation (2015), the revised Forest Act (2015) and the revised Urban and Regional Planning Act (2015). These policies, strategies and legal frameworks are aligned with the country's seventh national development and Vision 2030 plans, which support the establishment of a low-carbon, climate-resilient development pathway. As the FREL is based on historical data only, no changes in policies were taken into account in its construction.

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

27.   According to decision 12/CP.17, annex, paragraph (c), reasons for omitting a pool or activity in constructing the FREL should be provided, noting that significant pools and activities should not be excluded.

28.   The pools included in the Party's FREL are above-ground biomass, below-ground biomass, deadwood and litter. Zambia explained that these pools were selected taking into

consideration the quality of the data available and the significance of the pools in terms of total emissions. Although the NFI included information on soils, Zambia decided not to include emissions from soil organic carbon in its FREL, explaining that a more thorough analysis of the available data, including measurement of the soil carbon pool in non-forest land, and enhanced understanding of soil carbon dynamics following forest degradation and deforestation are required. The AT notes that the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* provides a method for estimating carbon stock changes in soil organic carbon, including the corresponding default EF. The AT considers the treatment of emissions from soil organic carbon as an area for future technical improvement.

29.   Zambia's FREL includes only CO_2 emissions from deforestation and forest degradation. During the TA, the Party explained that non-CO_2 emissions from forests are mainly due to forest fires that burn mainly grass, leaves and woody litter, which contribute little to overall emissions. Zambia reported that non-CO_2 emissions will be considered in the future in line with the stepwise approach and as more accurate data become available. The AT considers the treatment of non-CO_2 gases as an area for future technical improvement.

30.   With regard to the EF for the litter pool, Zambia applied a default value from the 2006 IPCC Guidelines despite litter data being collected during ILUA I and ILUA II. During the TA, Zambia explained that the litter data from the NFI have not yet been processed, and indicated that it plans to request support from a technical partner to process this information. It clarified that the main challenge was that litter data from ILUA II required reprocessing in order to align them with the EFs applied for each forest class and used for constructing the FREL. The AT considers using a country-specific EF for litter as an area for future technical improvement and notes that Zambia may wish to identify this data processing as a capacity-building need for the construction of future FRELs.

31.   The AT acknowledges that Zambia included in its FREL the most significant activities reducing emissions from deforestation and reducing emissions from forest degradation of the five activities identified in decision 1/CP.16, paragraph 70, in accordance with its national capabilities and circumstances. Removals were not considered in constructing the FREL owing to challenges associated with assessing forest regrowth using remote sensing. In this context, Zambia did not include the activity enhancement of forest carbon stocks in its FREL. During the TA, Zambia indicated that including this activity is a potential area for improvement for future FRELs and would be part of its efforts to include removals. Zambia noted that, in order to include enhancement of forest carbon stocks, growth curves of forest types found in Zambia will need to be studied and the increase in carbon over time estimated. The AT commends the Party for its efforts to quantify removals resulting from forest area gains and regrowth, noting this as an area for future technical improvement.

32.   Overall, the AT commends Zambia for including the activity reducing emissions from forest degradation in its FREL, which is an improvement compared with the previous submission. The AT acknowledges the Party's intention to quantify removals as part of future FREL submissions when new and adequate data and better information become available, as part of the stepwise approach.

4.   Definition of forest

33.   Zambia provided in its submission the definition of forest used in constructing its FREL. The definition of forest applied is based on its revised Forest Act (2015), which defines forest as any land with a tree canopy cover of more than 10 per cent, occupying an area greater than 0.5 ha and including young stands and/or temporarily understocked areas that have not reached, but are expected to reach, a crown density of 10 per cent and tree height of 5 m. The definition is the same as that used by the Party for its national GHG inventory, its NC2 (2014) and its reporting to the Food and Agriculture Organization of the United Nations for the Global Forest Resources Assessment (2020).[14] The Party noted that the definition includes natural forests only.

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[14] Available at http://www.fao.org/forest-resources-assessment/en/.

III. Conclusions

34.   The information used by Zambia in constructing its FREL for the activities reducing emissions from deforestation and reducing emissions from forest degradation is transparent, complete and in overall accordance with the guidelines for submissions of information on reference levels.

35.   The FREL presented in the submission is Zambia's second FREL. The previous FREL was submitted in 2016 and was subject to a TA in the same year; it covered the activity reducing emissions from deforestation for 2005–2014. The AT acknowledges the description of changes since previous submissions provided by Zambia in accordance with decision 12/CP.17, annex, paragraph (b) (see para. 17 above).

36.   The FREL presented in the most recent modified submission, for the reference period 2009–2018, corresponds to 23,520,000 t CO_2/year.

37.   The AT acknowledges that Zambia included in its FREL the most significant activities, all forest types in the country that were classified as either intact or secondary forests, with the exception of exotic plantation forests, and the most significant pools in terms of emissions from forests. The AT considers that, in doing so, Zambia followed decision 1/CP.16, paragraph 70, on activities undertaken and decision 12/CP.17, paragraph 10, on applying the stepwise approach. The AT commends Zambia for providing information on its ongoing work to develop FRELs for other activities, as well as for other pools and gases, as a step towards improving future national FRELs.

38.   As a result of the facilitative interactions with the AT during the TA, Zambia provided a modified submission that took into consideration the technical input of the AT. The AT notes that the transparency and completeness of the information provided were significantly improved in the modified FREL submission, without having to alter the approach or values used to construct the FREL, and commends Zambia on its efforts. The new information provided in the modified submission, including the data and information shared with the AT during the TA, increased the reproducibility of the FREL calculations.

39.   The AT notes that, overall, Zambia did not maintain consistency, in terms of sources of AD and EFs used for its FREL, with those used for the GHG inventory included in its NC3.[15]

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

(a)   Maintaining consistency between the latest national GHG inventory in the NC and future FRELs, particularly with regard to EFs and AD used for estimating emissions from deforestation (see para. 18 above);

(b)   Including wood removals for energy consumption in future FRELs in order to maintain consistency with the national GHG inventory (see para. 18 above);

(c)   Considering application of comparable weights to provincial and national deforestation emission estimates (see para. 19 above);

(d)   Including young forest stands with a canopy cover that falls below the 10 per cent threshold to enhance the accuracy of the AD analysis (see para. 20 above);

(e)   Collecting additional data to estimate forest degradation in both intact and secondary forests (see para. 21 above);

(f)   Harmonizing the AD and EF analyses in order to reflect changes in forest canopy cover related to forest degradation (see para. 21 above);

(g)   Using higher-resolution spatial imagery across the entire time series for the AD analysis to ensure accurate interpretation of tree-cover change and the extent of that change (see para. 23 above);

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

(h)　Quantifying removals resulting from forest area gains and regrowth with the aim of including the activity enhancement of forest carbon stocks in future FRELs (see para. 31 above).

41.　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 Zambia 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 areas for future technical improvement regarding pools and gases excluded from the FREL:

(a)　Treatment of emissions from soil organic carbon (i.e. including the pool or providing more information to justify its omission) (see para. 28 above);

(b)　Treatment of non-CO_2 gases, in particular emissions from forest fires (see para. 29 above);

(c)　Developing a country-specific EF for litter (see para. 30 above).

42.　The AT acknowledges and welcomes the Party's intention to:[16]

(a)　Collect data that could be used for quantifying removals resulting from forest area gains and regrowth;

(b)　Analyse collected data on soil organic carbon in order to include the pool in future FRELs;

(c)　Process the data on litter collected as part of ILUA I and ILUA II and generate a country-specific EF for litter;

(d)　Include emissions associated with fires in future FRELs, combining spatial data capturing fire occurrences (e.g. through the use of MODIS 6 burn scar maps) with EF data collected as part of the NFI;

(e)　Improve estimates of emissions from forest degradation by improving support materials, reviewing the definition of forest degradation in the context of standard operating procedures and disaggregating forest degradation by intact and secondary forests;

(f)　Use a higher-resolution sampling grid (4 km x 4 km) when estimating AD from spatial imagery available through the Collect Earth tool.

43.　In conclusion, the AT commends Zambia for showing strong commitment to continuously improving its FREL estimates in line with the stepwise approach. A number of areas for the future technical improvement of Zambia'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.[17] The AT also acknowledges that the TA was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Zambia.

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

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[16]　See chap. 7 of the modified submission.
[17]　As per decisions 13/CP.19, annex, para. 1(b); and 12/CP.17, para. 10.

Annex I

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

Main features of the FREL		Remarks
Proposed FREL	23 520 000 t CO₂/year	The FREL includes emissions from deforestation and forest degradation but excludes any removals (see para. 8 of this document)
Type and reference period of FREL	FREL = annual average of historical emissions in 2009–2018	The FREL was constructed on the basis of the total annual average of historical emissions from deforestation and forest degradation in the country's 10 provinces. The FREL is valid for 2019–2023 (see paras. 8–9 of this document)
Application of adjustment for national circumstances	No	
National/subnational	National	The FREL covers all 10 provinces in the country (see para. 7 of this document)
Activities included	Reducing emissions from deforestation Reducing emissions from forest degradation	See paragraphs 7, 14 and 31 of this document
Pools included	Above-ground biomass Below-ground biomass Deadwood Litter	Soil organic carbon was not included as a more thorough analysis of the available data is required (see paras. 28 and 30 of this document)
Gas included	CO₂	Non-CO₂ gases were not included owing to lack of data (see para. 29 of this document)
Forest definition	Included	The forest definition is a minimum tree crown cover of 10 per cent, minimum land area of 0.5 ha and minimum tree height of 5 m (see para. 33 of this document)
Consistency with latest GHG inventory	Methods and data used for estimating the FREL are not consistent with those used for the national GHG inventory in the NC3	Different EFs and AD were used. Emissions from wood removals for commercial timber and fuelwood were included in the national GHG inventory only (see para. 18 of this document)
Description of relevant policies and plans	Included	A short list of relevant policies was included for information purposes (see para. 26 of this document)

Main features of the FREL		*Remarks*
Description of assumptions on future changes to domestic policy, if included in constructing the FREL	Not applicable	
Description of changes to previous FREL	Included	The current FREL includes an updated reference period, the activity reducing emissions from forest degradation, the litter pool and a different methodological approach (see paras. 7, 10 and 17 of this document)
Identification of future technical improvements	Included	Several areas for future technical improvement have been identified (see paras. 40–41 of this document)

Annex II

Reference documents

A.   Reports of the Intergovernmental Panel on Climate Change

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

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

B.   UNFCCC documents

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

"Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels". Annex to decision 13/CP.19. Available at https://unfccc.int/sites/default/files/resource/docs/2013/cop19/eng/10a01.pdf#page=36.

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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 submission:

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