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Report of the technical assessment of the proposed forest reference emission level of the Democratic Republic of the Congo submitted in 2018

Summary

This report covers the technical assessment of the submission of the Democratic Republic of the Congo, on a voluntary basis, 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 the Democratic Republic of the Congo covers the activity “reducing emissions from deforestation”, which is among the activities included in decision 1/CP.16, paragraph 70. In its submission, the Party developed a national FREL. The FREL presented in the original submission based on carbon dioxide (CO₂) emissions during the reference period corresponds to 351,410,000 t CO₂ eq for the period 2000–2010 and 829,560,000 t CO₂ eq for the period 2010–2014. The FREL was constructed based on a simple linear extrapolation of historical emissions from 2000–2014 for the period 2015–2019, resulting in average emissions of 1,181,641,363 t CO₂ eq/year. As a result of the facilitative process during the technical assessment, the FREL was modified to an average of 1,078,235,017 t CO₂ eq/year for the period 2015–2019. The assessment team notes that the data and information used by the Democratic Republic of the Congo 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.

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I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of the Democratic Republic of the Congo on its proposed forest reference emission level (FREL),¹ submitted on 10 January 2018 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 19 to 23 March 2018 in Bonn, Germany, and was coordinated by the UNFCCC secretariat.² The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts³ (hereinafter referred to as the assessment team (AT)): Mr. Carlos Bahamondez (Chile) and Mr Koki Okawa (Japan). In addition, Mr. Thiago de Araujo Mendes, an expert from the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, participated as an observer⁴ during the centralized activity in Bonn. The TA was coordinated by Ms. Jenny Wong (UNFCCC secretariat).

2. In response to the invitation by the Conference of the Parties (COP) and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15, and its annex, the Democratic Republic of the Congo submitted, on a voluntary basis, its proposed FREL. This proposed FREL is one of the elements⁵ to be developed in the implementation of the activities referred to in decision 1/CP.16, paragraph 70. The COP decided that each submission of a proposed FREL and/or forest reference level (FRL), as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments, pursuant to decision 13/CP.19, paragraphs 1 and 2, and decision 14/CP.19, paragraphs 7 and 8.

3. The Democratic Republic of the Congo provided its submission in French. The submission is supported by nine annexes covering the establishment of a response system for the encoding and interpretation of reference points (annex 1), a number of theoretical and practical samples and a distribution of samples at the provincial level (annex 2), calculations of activity data and associated errors between 2000–2010 for the Kwango Province (annex 3), forest inventory methodology of a project between the Direction des Inventaires et Aménagements Forestiers (DIAF)⁶ and the Japanese International Cooperation Agency (JICA) (annex 4), a technical document on the construction of the FRELS for the Mai-Ndombe, Kwilu and Kwango Provinces (annex 5), the emission reduction programme of the Mai-Ndombe Province (annex 6), a World Wildlife Fund (WWF) carbon map and model project based on light detection and ranging (LiDAR) airborne remote sensing technology for forest biomass mapping (annex 7), the methodology for the production of the national stratification map (annex 8) and the methodology of the pre-inventory of national forests (PRE-IFN) (annex 9).

4. The objective of the TA was to assess the degree to which the information provided by the Democratic Republic of the Congo was in accordance with the guidelines for submissions of information on FRELS/FRLs⁷ 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 the Democratic Republic of the Congo for the construction and future improvement of its FREL/FRLs, as appropriate.⁸

5. The TA of the FREL submitted by the Democratic Republic of the Congo was undertaken in accordance with the guidelines and procedures for the TA of submissions from

¹ The submission of the Democratic Republic of the Congo can be found at <https://redd.unfccc.int/submissions.html?country=cod>.

² Decision 13/CP.19, annex, paragraph 7.

³ Decision 13/CP.19, annex, paragraphs 7 and 9.

⁴ Decision 13/CP.19, annex, paragraph 9.

⁵ Decision 1/CP.16, paragraph 71(b).

⁶ DIAF is the national department in charge of forest management and inventory under the Ministry of Environment and Sustainable Development.

⁷ Decision 12/CP.17, annex.

⁸ Decision 13/CP.19, annex, paragraph 1(a) and (b).

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 the Democratic Republic of the Congo. The facilitative exchange during the TA allowed the Democratic Republic of the Congo 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, the Party provided a modified version of its submission on 28 May 2018, which took into consideration the technical inputs of the AT. The modifications improved the clarity and transparency of the submitted FREL. This TA report was prepared in the context of the modified FREL submission. The modified submission, which contains the assessed FREL, and the original submission are available on the UNFCCC website.¹¹

B. Proposed forest reference emission level

7. In decision 1/CP.16, paragraph 70, the COP encourages 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 the provision of adequate and predictable support. The FREL proposed by the Democratic Republic of the Congo, 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 included in decision 1/CP.16, paragraph 70. Pursuant to paragraph 71(b) of the same decision, the Democratic Republic of the Congo developed a national FREL, which covers its entire national territory. Based on its national land-use stratification, four strata were included as natural forests, namely, closed dense humid forest on dry soil,¹² dense humid forest on hydromorphic soil, secondary forest, and dry or open forest. For its submission, the Democratic Republic of the Congo applied a stepwise approach to its development of the FREL, in accordance with decision 12/CP.17, paragraph 10. The stepwise approach enables Parties to improve their FRELs by incorporating better data, improved methodologies and, where appropriate, additional pools.

8. The national FREL proposed by the Democratic Republic of the Congo considers a reference period from 2000 to 2014, which was divided into two periods, 2000–2010 and 2010–2014. The FREL is based on a linear projection of the carbon dioxide (CO₂) emissions for these two reference periods (i.e. 2000–2010 and 2010–2014) and is associated with “gross deforestation”, defined as the conversion of forest land to non-forest land. The annual emissions for 2015–2019 were obtained by extrapolating the emissions from 2000–2010 and 2010–2014, based on the average annual growth rate of the corresponding emissions between these two phases of the reference period. The FREL includes only the gross emissions from deforestation that are associated with clear-cuts and excludes any subsequent emissions and removals from regrowth in the deforested areas. The activity data used in the construction of the FREL were derived using a sample-based methodology. A historical time series of satellite images (from Landsat 5, 7 and 8) for the years 2000, 2010 and 2014 were used to guide the reference data sampling. The sampling covered all 26 provinces of the country. While the ongoing national forest inventory is being finalized, the information on emission factors was obtained from several national projects (namely, the PRE-IFN, DIAF-JICA and WWF Carbon Map and Model project).

9. In its modified submission, the annual CO₂ emissions during the reference period were modified and estimated to be 483.74 Mt CO₂ eq ± 32.23 Mt CO₂ eq for the period 2000–2010 and 830.53 Mt CO₂ eq ± 66.73 Mt CO₂ eq for the period 2010–2014. The modified FREL values (in t CO₂ eq/year) for the result period 2015–2019 presented in the modified submission, based on a linear extrapolation of the historical emissions, are: 979,151,857

⁹ Decision 13/CP.19, annex.

¹⁰ Decision 13/CP.19, annex, paragraphs 1(b), 13 and 14.

¹¹ <http://redd.unfccc.int/submissions.html?country=cod>.

¹² Closed dense humid forest is equivalent to *terra firme* in French.

(2015), 1,028,693,438 (2016), 1,078,235,018 (2017), 1,127,776,598 (2018), 1,177,318,178 (2019), resulting in an average of 1,078,235,017.8 t CO₂ eq/year.¹³

10. The proposed FREL includes the above-ground and below-ground biomass pools. Regarding greenhouse gases (GHGs), the FREL includes only CO₂ emissions.

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 that was used by the Party in the construction of the forest reference emission level

11. For the construction of the FREL, the Democratic Republic of the Congo used the methodologies in the Intergovernmental Panel on Climate Change (IPCC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) to estimate the emissions from deforestation in the different forest types.

12. The scope of the FREL includes the activity “reducing emissions from deforestation”, considered by the Party as the activity for which transparent and reliable data are available. The Party selected 2000–2014 as the historical reference period because the vast majority of cartographic products related to the forest areas of the Democratic Republic of the Congo were developed in the year 2000, and 2000 is also the reference year chosen by the Party for its intended national determined contribution that was submitted to the UNFCCC. The year 2014 is the final year for the preparatory phase of REDD-plus,¹⁴ before the beginning of investments identified in the National Framework Strategy on REDD-plus.

13. Deforestation is defined as the conversion of forest land to non-forest land. Forest lands include four types of forest vegetation, namely, closed dense humid forest on dry soil,¹⁵ dense humid forest on hydromorphic soil, secondary forest, and the dry or open forest (or clear forest). The analysis to obtain activity data for the reference period 2000–2014 was based on the visual interpretation of very high spatial resolution satellite images, when available, or otherwise, Landsat satellite images with a spatial resolution of 30 m. The main steps taken to detect land-cover change and to construct activity data for deforestation are as follows:

(a) Generation of Landsat mosaics (for the initial year and the final year of the period of interest, i.e. the historical reference period);

(b) Training the change-detection model and generation of the land-cover change map. This map stratifies the country into “stable forests”, “stable non-forests” and “deforestation” during the period of interest;

(c) Stratified random sampling of reference samples in the change map;

¹³ In its original submission, the Party proposed a national FREL based on CO₂ emissions corresponding to 351,410,000 t CO₂ eq for the period 2000–2010 and 829,560,000 t CO₂ eq for the period 2010–2014. The linear extrapolation of these historical emissions for the result period of 2015–2019 produced emissions (in t CO₂ eq/year) of 1,040,105,885 (2015), 1,110,873,624 (2016), 1,181,641,363 (2017), 1,252,409,103 (2018) and 1,323,176,842 (2019), resulting in an annual average of 1,181,641,363 t CO₂ eq/year. The difference between the original and modified submissions is mostly due to the inclusion of new/additional reference samples from less represented provinces, resulting in changes in activity data.

¹⁴ In decision 1/CP.16, paragraph 70, the COP encourages developing country Parties to contribute to mitigation actions in the forest sector by undertaking the following activities: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks.

¹⁵ See footnote 12 above.

(d) Visual interpretation of the reference samples;

(e) Computation of the relevant statistics such as the identified forest strata and associated errors at each of the provincial levels, which are then aggregated to obtain national-level estimates.

14. Emission factors used to construct the FREL were obtained by taking into account the biomass carbon stock of different vegetation types after the land-use conversion. Estimates of biomass carbon stocks were obtained using the allometric equations for the pan-tropical regions.¹⁶ Country-specific inventory data applied to the allometric equations were collected from several sources, namely, PRE-IFNs for several provinces, a cooperation project between DIAF and JICA, and data contributed by WWF. In addition, the Party used the default root-to-shoot ratios according to the vegetation types, as provided in the 2006 IPCC Guidelines, to obtain below-ground biomass estimates.

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

Methodological information, including description of data sets, approaches and methods

15. The AT noted that the information on the methodology and data used for estimating the FREL in the modified submission, together with an updated bibliography to support the methodological choices employed, enhanced the transparency of the submission. During the TA, the Democratic Republic of the Congo provided additional information in an Excel spreadsheet format, including the land-use change and emission factor matrices, error matrices and the number of pixels for the provinces of Haut-Lomami, Haut-Katanga and Kwango for the periods of 2000–2010 and 2010–2014, which facilitated the reconstruction of the FREL by the AT. The AT considers that the data in the spreadsheet format, if made publicly accessible through the Party's website, would further improve the transparency and completeness of the FREL submission and help build confidence in the estimated emissions.

16. To obtain the FREL values for 2015–2019, the Democratic Republic of the Congo employed a linear model that extrapolates the trend in emissions observed during the two periods, 2000–2010 and 2010–2014. The AT noted that, although this model is simple and transparent, it is based on two data points only and that it is not enough to establish a robust trend in emissions. Thus, its use may result in significant statistical errors. The AT also noted that other models may be constructed with the same data that could yield different results. In response to this observation by the AT, the Democratic Republic of the Congo clarified that it did not use a historical mean or derive the FREL estimate from the 2010–2014 emission estimates because the former would have underestimated the FREL while the latter would have assumed that the emissions will remain stagnant in the future. The Democratic Republic of the Congo strongly believes that the emissions from forests will increase in the near future owing to the drivers identified (see section 9.1 of the modified submission). Nevertheless, the AT commends the Democratic Republic of the Congo for providing in the modified submission additional information on the quantitative relationship between the drivers and the FREL that supports the expectation of increasing emissions in 2015–2019. In the light of such existing information, the AT notes that the Democratic Republic of the Congo may wish to include more data points and supporting information in future FREL submissions in order to increase the accuracy of the estimates, as part of the stepwise approach.

17. The AT noted that the estimates of emissions were obtained from the comparison of satellite images between 2000 and 2010 (10 years), and between 2010 and 2014 (4 years). The AT considered that, together with the use of a linear trend model with two data points, this asymmetry in periods may lead to an overestimation of the FREL. According to various cycles of shifting cultivation in the Democratic Republic of the Congo,¹⁷ some of the deforested areas can revert to the state of secondary forests within 10 years. Thus, the visual

¹⁶ Chave J, Réjou-Méchain M, Búrquez A, et al. 2014. Improved allometric models to estimate the aboveground biomass of tropical trees. *Global Change Biology*. 20(10): pp.3177–3190.

¹⁷ Molinario G, Hansen MC and Potapov PV. 2015. Forest cover dynamics of shifting cultivation in the Democratic Republic of Congo: A remote sensing-based assessment for 2000–2010. *Environmental Research Letters*. 10-094009. A corrigendum for this article was published in 2017 *Environmental Research Letters*. 12-089501.

interpretation will detect less deforestation during the period 2000–2010 (10 years) than the period 2010–2014 (4 years), resulting in a bias in the estimates of emissions from these two data points. In response to the question from the AT during the TA, the Democratic Republic of the Congo provided, in the modified submission, a substantial section (see section 5.1.1) explaining that slash and burn agriculture in general consists of a few crop cycles and it is unlikely that secondary forests regenerate within 10 years. This is because the increasing pressure for agricultural lands as a consequence of population growth leads to shortened fallow periods of about three to five years.^{18,19} The Democratic Republic of the Congo also noted in its response to the AT that in its analyses of reference samples of stable forests for the periods 2000–2010 and 2010–2014 it found, for both periods, that loss of primary forests was replaced by secondary forests in fewer than 2 per cent of the samples (i.e. 1.53 per cent and 0.66 per cent, respectively). In addition, the Party stated that major changes to the methodology, such as the modification of the reference period or adding subperiods, was not feasible during the current TA. The AT notes that the Democratic Republic of the Congo has agreed to explore a more consistent approach which takes into account the dynamics of regeneration after deforestation, for example, by setting up consistent timespans to assess deforestation (e.g. 2000–2005, 2005–2010, 2010–2015) in future FREL submissions.

18. In relation to the requirements of decision 12/CP.17, paragraph 8, the AT noted that the methods employed by the Democratic Republic of the Congo in its most recent national GHG inventory (included in the Party's third national communication submitted in 2015²⁰) are different from those used in the submitted FREL. Therefore, the AT notes that consistency in methodologies applied in the national GHG inventory and in the FREL submission has not been maintained. During the TA, the Party explained that, in the GHG inventory, deforestation estimates (and hence related CO₂ emissions) were obtained using a pixel-count methodology, which consists of estimating deforestation areas by counting pixels labelled as deforested. In the present FREL, deforestation estimates are based on a sample-based approach, which enables the estimation of area and the assessment of accuracy of land-use change. Using the pixel-count versus the sample-based methodology thus leads to different results.

19. The AT also notes that the FREL does not maintain consistency, in terms of sources of activity data and emission factors, with the GHG inventory included in the third national communication. In response to this observation by the AT, the Party indicated that this is the consequence of three major improvements that were put in place during the development of the FREL. These are: (1) the use of the methodology described in Olofsson et al. (2014)²¹ related to the good practices for estimating activity data, instead of applying the pixel-count approach, which introduces a bias in the deforestation area estimation,²² as was used in the GHG inventory in the third national communication (see para. 18 above); (2) the development of specific emission factors according to the country's forest types using forest inventory data to estimate the biomass per strata instead of the default values provided in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines); and (3) the use of the 2006 IPCC Guidelines instead of the Revised 1996 IPCC Guidelines applied in the national GHG inventory. The Democratic Republic of the Congo also informed the AT that it is currently harmonizing the definitions, methods and results in the framework of the national forest monitoring system (NFMS). As a result of this harmonization, the improved data sources used for the FREL are being incorporated into the national GHG inventory, national

¹⁸ Vermeulen C, Dubiez E, Proce P, et al. 2011. Enjeux fonciers, exploitation des ressources naturelles et Forêts des Communautés Locales en périphérie de Kinshasa, RDC. *Biotechnology, Agronomy, Society, and Environment*. 15(4): pp.535–544.

¹⁹ Ikcowitz A, Slayback D, Asanzi P, et al. 2015. *Agriculture and deforestation in the Democratic Republic of the Congo: A synthesis of the current state of knowledge*. Occasional Paper 119. Bogor, Indonesia: Center for International Forestry Research.

²⁰ Available at <https://unfccc.int/documents/89096>.

²¹ Olofsson P, Foody GM, Herold M, et al. 2014. Good practices for estimating area and assessing accuracy of land change. *Remote Sensing of Environment*. 148: pp.42–57.

²² Tyukavina A, Baccini A, Hansen MC, et al. 2015. Aboveground carbon loss in natural and managed tropical forests from 2000 to 2012. *Environmental Research Letters*. 10-074002.

communications and the biennial update report. The AT notes that such harmonization is a major improvement that has been realized by the Party.

20. The AT noted that the total area of the country derived from the activity data presented in the submission is not consistent within the submission, and that the total area differs from the figure reported elsewhere; for example, the Party's report to the 2015 Global Forest Resources Assessment (FRA) of the Food and Agriculture Organization of the United Nations (FAO).²³ During the TA, the Democratic Republic of the Congo explained that these small differences within the former (and representing less than 0.001 per cent of the country area) are due to the treatment of clouds in the Landsat images, and that the differences in the latter are due to the use of different methodologies and sources of geographic information system data. The Party also included the updated reference map for the year 2000 in the modified submission, and indicated that it is working to finalize, validate and make available a single official digital map for the country. The Democratic Republic of the Congo noted that, since 2015, it has been putting in place the NFMS, which will become the unique channel through which official estimates of forest areas in the Democratic Republic of the Congo will be made available to the public. The AT acknowledges that, with these initiatives, the reporting in the country's national communications and future submissions of FRELs will be harmonized in terms of definitions, methods and results.

21. In the light of the limited description of interpretation of reference samples in the original submission, the AT requested the Democratic Republic of the Congo to describe how the operational definition of forests (spatial unit of 0.09 ha, canopy cover of 50 per cent) were applied in the visual interpretation of the satellite images. In response to this request, the Party included in the modified submission a clear description of the interpretation protocol (see annex 1 in the modified submission), including the application of the operational definition and the relevant scientific literature that describes the methodology used in the construction of the FREL. The AT acknowledges that the additional information improved the transparency of the modified submission.

Description of relevant policies and plans, as appropriate

22. The FREL submission of the Democratic Republic of the Congo adequately describes the relevant national policies, the processes that underpin the evolution of REDD-plus in the country and the choice of the reference period. The first generalized effort to develop national forest maps using satellite imagery started in 2000, which is also when the first systematic and comparable information on forests was collected. A second turning point was in 2009 when the Democratic Republic of the Congo joined the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries²⁴ and the World Bank's Forest Carbon Partnership Facility to initiate work on the readiness phase of REDD-plus and to set up its NFMS. The technical coordination structure for REDD-plus, known as the National REDD-plus Coordination,²⁵ was created in the same year under the Ministry of Environment and Sustainable Development. The national strategy on REDD-plus, which was adopted in 2012, aims to address different drivers of deforestation in order to stabilize the national forest cover at 63.5 per cent by 2030. The National REDD-plus Fund (FONAREDD), established in 2012, is co-supervised by the Ministry of Finance and Ministry of Environment and Sustainable Development. FONAREDD acts as the financial tool for the implementation of the national REDD-plus strategy. In 2015, the Democratic Republic of the Congo joined the Central Africa Forest Initiative, which led to the validation of its investment plan and facilitated major investments targeted at addressing the drivers of deforestation and curbing deforestation. In view of these policy developments, the Democratic Republic of the Congo decided to submit its national FREL based on the historical period 2000–2014.

²³ Available at <http://www.fao.org/3/a-az198f.pdf>.

²⁴ The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries was launched in 2008 and builds on the convening role and technical expertise of the FAO, the United Nations Development Programme and the United Nations Environment Programme.

²⁵ In French: *Coordination Nationale REDD de la République Démocratique du Congo* or known by its acronym "CN-REDD" in the country.

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

23. According to decision 12/CP.17, annex, subparagraph (c), 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. The AT notes that the Democratic Republic of the Congo included the carbon pools above-ground biomass and below-ground biomass in its construction of the FREL. The carbon pools of deadwood, litter and soil organic carbon were not included.

24. The AT noted that emissions from deadwood and litter may be significant, because in its submission the Democratic Republic of the Congo indicated that these two pools together account for 8.13 per cent of emissions from living biomass lost. Responding to the questions during the TA, the Party included in the modified submission the justification that deadwood and litter were estimated for illustrative purposes only, using the default values for tropical forests presented in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Furthermore, the available field data for these two carbon pools cover only 3 of the 26 provinces in the Democratic Republic of the Congo, that is Kwango, Kwilu and Mai-Ndombe Provinces. The available data from these three provinces were considered not representative of the entire country, and hence could not be used as default values. The Democratic Republic of the Congo noted that the national forest inventory launched in 2017 would circumvent the lack of data for these carbon pools, which would then make it possible to integrate these pools in a future submission (see section 10, point (f) of the modified submission). The AT commends the Democratic Republic of the Congo for its efforts to obtain better data and information on these carbon pools, with the aim of including these carbon pools in future submissions as part of the stepwise approach.

25. The AT considers that the exclusion of the soil organic carbon pool, particularly the non-CO₂ emissions from hydromorphic organic soils, is adequately justified by the Democratic Republic of the Congo. The AT commends the Democratic Republic of the Congo for its efforts to obtain better information on this carbon pool, in order to monitor the impacts of deforestation and with the aim of including the carbon pool in future submissions, as part of the stepwise approach.

26. The Democratic Republic of the Congo explained that non-CO₂ gases were not included in the construction of the FREL in order to maintain consistency with its third national communication, in which the GHG inventory excludes these gases. The national GHG inventory indicated that the emissions of non-CO₂ gases consisted mainly of methane and nitrogen dioxide emissions associated with slash and burn agriculture, and the level of these emissions is less than 1 per cent of the average annual emissions due to deforestation during the period 2000–2010. The AT considers that the non-inclusion of non-CO₂ gases has been adequately explained in the modified submission. In response to a request by the AT, the Democratic Republic of the Congo provided a detailed listing of official sources, including its national communications and FAO-FRA that support the exclusion of non-CO₂ gases in the submission.

27. The AT acknowledges that the Democratic Republic of the Congo 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 reducing emissions from forest degradation and the enhancement of forest carbon stocks. According to the Party, forest degradation may indeed represent a significant part of forest emissions at the national level, but this activity has not been included at this stage because of the lack of historical data. On the other hand, the modified submission (see sections 3.2.1 and 4.2) indicated that a fraction of the forest degradation was also taken into account in the construction of the FREL, owing to the operationalization of the official definition of forest. The AT commends the Democratic Republic of the Congo for its future plans to obtain a consensus on the definition of forest degradation and to determine the best methodology for estimating historical emissions, and building upon existing technical cooperation projects as part of the stepwise approach.

4. Definition of forest

28. For the construction of its FREL, the Democratic Republic of the Congo defined forest as land of more than 0.5 ha with trees of 3.0 m height or more and a canopy cover of at least 30 per cent, or trees able to reach these thresholds in situ. The definition is the same as the one that the Party uses for its national GHG inventory. The definition of forest in the Democratic Republic of the Congo converges on certain points, such as area size and land uses, with the definition adopted in the FAO-FRA 2015.

29. In the estimation of activity data, the operational definition of forest applied is consistently with the scale at which deforestation is detected by Landsat. The operational forest definition allows for the estimation of areas of stable forests, stable non-forests and deforestation through stratified random sampling, and with each sample being a square of 30 m on the side or an area of 0.09 ha. The operational definition also considers a canopy cover of at least 50 per cent, which makes it easier to technically identify non-forest areas from forest areas than with a threshold of 30 per cent. This operational definition of forest implicitly takes into account the height of trees. The Democratic Republic of the Congo provided further justification on this in its modified submission (see section 3.2.2 of the modified submission). It reported that the operational definition was adopted to reduce errors in activity data estimates. Simultaneously, this operational definition is more relevant for the tracking of changes in forest cover that may be affected by the main direct drivers of deforestation, such as small-scale slash and burn agriculture and exploitation of wood.

30. The AT noted that the operational definition that includes a canopy cover of 50 per cent may lead to an over- or underestimation of the activity data. In response to this question by the AT, the Democratic Republic of the Congo provided additional information in the modified submission and explained that a canopy cover with a 30 per cent threshold would provide a forest cover estimate of 190 Mha, while with a 50 per cent threshold, the forest cover is estimated to be approximately 156 Mha. The difference in forest cover between these two canopy cover thresholds is approximately 34 Mha. However, from the viewpoints of total forest area and spatial forest distribution, the 50 per cent threshold gives the most realistic result with respect to the national circumstances, as described in several studies available in the literature.²⁶ Therefore, the 50 per cent threshold is routinely used by remote-sensing experts in the country to map the Party's forests. The AT acknowledges that the impact analysis and the comparison with other published studies improves the transparency and accuracy of the modified submission.

III. Conclusions

31. The information used by the Democratic Republic of the Congo in constructing its FREL for deforestation is transparent, complete and in overall accordance with the guidelines for submission of information on FRELs (as contained in the annex to decision 12/CP.17).

32. The FREL values (in t CO₂ eq/year) presented in the modified submission, for the reference period 2015–2019, are 979,151,857 (2015), 1,028,693,438 (2016), 1,078,235,018 (2017), 1,127,776,598 (2018) and 1,177,318,178 (2019) (see para. 9 above).

33. The AT acknowledges that the Democratic Republic of the Congo included in its FREL the most significant activity and the most significant pools in terms of emissions from forests. In doing so, the AT considers that the Democratic Republic of the Congo followed decision 1/CP.16, paragraph 70, on activities undertaken and paragraph 71(b), and decision 12/CP.17, paragraph 10, on implementing a stepwise approach. The AT commends the Democratic Republic of the Congo for the information provided about its ongoing work on the development of a FREL for the other activities in decision 1/CP.16, paragraph 70 and for continuing the development of new and improved data and information (see para. 27 above).

34. As a result of the facilitative interactions with the AT during the TA session, the Democratic Republic of the Congo provided a modified submission, which took into

²⁶ See, for example: Potapov PV, Turubanova SA, Hansen MC, et al. 2012. Quantifying forest cover loss in Democratic Republic of the Congo, 2000–2010, with Landsat ETM+ data. *Remote Sensing of Environment*. 122: pp.106–116.

consideration the technical inputs of the AT. The AT notes that the transparency and completeness of information improved significantly in the modified FREL submission and commends the Democratic Republic of the Congo for the efforts made. The new information provided in the modified submission, and the examples shared with the AT on how estimates of CO₂ emissions from deforestation were calculated, increased the reproducibility of the FREL calculations. The Democratic Republic of the Congo informed the AT that it is planning to make available the relevant data and information (e.g. the data used in estimates as shown in sections 6.8 and 6.9 of the modified submission) on its NFMS website.²⁷

35. The AT notes that the FREL does not maintain consistency, in terms of methodology and sources of activity data and emission factors, with the GHG inventory included in the third national communication. The AT acknowledges the efforts by the Party to improve the consistency between the FREL and the national GHG inventory. It encourages the Party to continue with these efforts as well as with harmonizing within the framework of the NFMS the data and information used in its national communication with those used to construct the FREL. (see paras. 18–19 above).

36. The AT acknowledges and welcomes the intention expressed by the Democratic Republic of the Congo (see chapter 10 on improvement plans for future FRELS in the modified submission) to:

(a) Set up descriptive and spatial criteria to differentiate those land-use changes that are due to human intervention and practices for productive, ecological and social purposes from those changes that are due to non-human intervention and practices, allowing it to comply with the IPCC guidelines and categorization;

(b) Take into account the enhancement of forest carbon stocks through reforestation, allowing it to report in a comprehensive manner the changes taking place in the country's forest cover;

(c) Include forest degradation activities and the conservation of forest carbon stocks in future FRELS, because the Democratic Republic of the Congo acknowledges that forest degradation could represent a significant portion of the emissions from forests and that doing so would take into account the work on this activity that is currently under way;

(d) Classify industrial agricultural plantations in the cultivated land category instead of in the forest land category in future FRELS through the implementation of the NFMS action plan;

(e) Set up a procedure for reinterpreting a certain percentage of the reference samples by all operators working on the activity data and by quantifying the interpretation error and reducing this error to a minimum;

(f) Improve the above-ground biomass estimates for all land-use classes and include in future submissions the other carbon pools that have not been considered in this submission. The data needed for these improvements will be collected during the national forest inventory which started during the last quarter of 2017 and results are expected within four years.

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

(a) Including more data points (because the current FREL is based on only two data points) and supporting information, such as relevant scientific literature, that would support the selection of a linear trend model (see para. 16 above);

(b) Applying a more consistent approach that takes into account the dynamics of regeneration after deforestation (see para. 17 above);

(c) Ensuring that the new data and methodology used in the construction of the FREL maintain consistency with those reported in the national GHG inventory, national

²⁷ In French: *Système National de Surveillance des Forêts (SNSF)*. Available in French and English at <http://www.rdc-snsf.org/?lang=fr>.

communications and the biennial update report, including harmonizing the definitions, methods and results in the framework of the NFMS (see paras. 18–19 and 35 above);

(d) Applying one single national cartographic initiative that provides one official source of data and information which would allow consistency to be maintained between future FRELs and the national GHG inventory (see para. 20 above);

(e) Providing plans to obtain a consensus on the definition of forest degradation and to determine the best methodology for estimating such historical emissions, and building upon existing technical cooperation projects as part of the stepwise approach (see para. 27 above).

38. In assessing the pools and gases included in the FREL, pursuant to decision 13/CP.19, annex, paragraph 2(f), the AT notes that the current omissions of pools and non-CO₂ gases are likely to be conservative in the context of the FREL. Nevertheless, the AT identified the following additional areas for future technical improvement:

(a) Include emissions from the deadwood and litter pools to increase the accuracy of future FRELs (see para. 24 above);

(b) Monitor the non-CO₂ emissions from hydromorphic organic soils (see para. 25 above);

(c) Consider the inclusion of non-CO₂ emissions from slash and burn agriculture (see para. 26 above);

(d) Include the activities “reducing emissions from forest degradation” and “enhancement of forest carbon stocks” (see para. 27 above).

39. In conclusion, the AT commends the Democratic Republic of the Congo for showing a 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 the Party’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 adequate and predictable support.²⁸ The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with the Democratic Republic of the Congo.

40. The table contained in the annex summarizes the main characteristics of the Democratic Republic of Congo’s proposed FREL.

²⁸ Decision 13/CP.19, annex, paragraph 1(b), and decision 12/CP.17, paragraph 10.

Annex

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

| <i>Main features of the FREL</i> | | <i>Remarks</i> |
|--|---|---|
| Proposed FREL (in t CO ₂ eq/year) | 979 151 857 (2015) | Linear trend model based on historical emissions 2000–2014 (para. 9) |
| | 1 028 693 438 (2016) | |
| | 1 078 235 018 (2017) | |
| | 1 127 776 598 (2018) | |
| | 1 177 318 178 (2019) | |
| Type and duration of FREL | FREL based on historical emissions 2000–2014 | Paragraph 8 |
| Adjustment for national circumstances | No | |
| National/subnational | National | Paragraphs 7–8 |
| Activities included | Reducing emissions from deforestation | Forest degradation may be significant (paras. 7 and 27) |
| Pools included | AB, BB | DW and L may be significant (paras. 23–24) |
| Gases included | CO ₂ | Paragraphs 10 and 26 |
| Forest definition | Included | An operational definition is chosen to more effectively detect land-cover change (paras. 28–30) |
| Relationship with latest GHG inventory | Methods used for FREL are not consistent with the latest GHG inventory (2015) | The FREL is based on a sample-based approach, which will be reflected in future GHG inventories (paras. 18–19) |
| Description of relevant policies and plans | Included | Auxiliary reports, such as the investment plan and analysis of drivers on deforestation, were provided (para. 22) |
| Description of assumptions on future changes in policies | Not applicable | |
| Descriptions of changes to previous FREL | Not applicable | |
| Future improvements identified | Yes | Several areas for future technical improvements were identified (paras. 37–38) |

Abbreviations: AB = above-ground biomass, BB = below-ground biomass, DW = deadwood, FREL = forest reference emission level, GHG = greenhouse gas, L = litter.