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Report of the technical assessment of the proposed forest reference emission level of the Congo submitted in 2016

Summary

This report covers the technical assessment of the submission 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 Congo 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. In its submission, the Congo has developed a national FREL. The assessment team notes that the data and information used by 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. Some important components of the submission are still not fully transparent, accurate, consistent and complete. Most of the areas for technical improvement are related to improving accuracy in subsequent submissions, as part of the stepwise approach. This report contains the assessed FREL and a few areas identified by the assessment team for further technical improvement, according to the scope of the technical assessment as defined 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 Congo on its proposed forest reference emission level (FREL),¹ submitted on 4 January 2016 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 14 to 18 March 2016 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. Sabin Guendehou (Benin) and Mr. Valentin Bellassen (France). In addition, Mr. Kamel Djemouai, 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.

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 Congo submitted its proposed FREL on a voluntary basis. The 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/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 Congo provided its submission in French. Also, all supporting materials provided by the Congo during the TA process in order to improve transparency in response to questions raised by the AT were in French.

4. The objective of the TA was to assess the degree to which information provided by the Congo was in accordance with the guidelines for submissions of information on reference levels⁶ 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 Congo for the construction and future improvement of its FREL/FRL, as appropriate.⁷

5. The TA of the FREL submitted by the Congo was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or FRLs as contained in the annex to decision 13/CP.19. This report on the TA was prepared by the AT following the guidelines and procedures contained in the same decision.

6. Following the process contained in those guidelines and procedures, a draft version of this report was communicated to the Government of the Congo. The facilitative exchange during the TA allowed the Congo to provide clarifications and information that were considered by the AT in the preparation of this report.⁸ As a result of the facilitative interactions with the AT during the TA, the Congo submitted a modified version of its

¹ The submission of the Congo is available at <<http://unfccc.int/8414>>.

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 Decision 12/CP.17, annex.

⁷ Decision 13/CP.19, annex, paragraph 1(a) and (b).

⁸ Decision 13/CP.19, annex, paragraphs 1(b), 13 and 14.

proposed FREL on 21 September 2016, which took into consideration some of the technical inputs of the AT. The modifications improved the clarity and transparency of the submitted FREL. However, the AT is of the view that the accuracy of the modified FREL could still be significantly improved in subsequent submissions, as part of the stepwise approach of the Congo. 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.⁹

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 Congo covers deforestation and forest degradation, which are two of the five activities included in decision 1/CP.16, paragraph 70. Pursuant to paragraph 71(b) of the same decision, the Congo has developed a national FREL, which covers its entire territory. In its submission, the Congo applies 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 FREL by incorporating better data, improved methodologies and, where appropriate, additional pools.

8. The national FREL proposed by the Congo for the historical reference period 2000–2012 is the annual average of the carbon dioxide (CO₂) emissions associated with: planned deforestation, defined as the deforestation occurring in agricultural and mining concessions; unplanned deforestation, defined as the deforestation occurring without a deforestation permit; planned degradation, defined as wood harvest in forest concessions; and unplanned degradation, defined as fuel wood collection. The FREL includes the gross emissions from deforestation that are associated with clear-cuts and excludes any subsequent emissions and removals from the deforested areas. In line with the provisions contained in decision 12/CP.17, paragraph 9, the Congo adjusted its proposed FREL upward by 16 267 080 t CO₂ per year, which is 84.7 per cent higher than the historical average annual emissions for the period 2000–2012 (19 208 572 t CO₂ per year), to take into consideration planned deforestation and degradation for the period 2015–2020 (see para. 10 below). The Congo is considered to be a country with high forest cover and low deforestation, its historical deforestation rate over the period 2000–2010 being nine times lower than the regional deforestation rate.¹⁰

9. The proposed FREL includes the above-ground biomass, below-ground biomass and deadwood pools for deforestation and the above-ground biomass and below-ground biomass pools for forest degradation. Regarding greenhouse gases (GHGs), the submission includes only CO₂.

10. The FREL submitted by the Congo is 35 475 652 t CO₂ eq per year for the period 2015–2020, 55 per cent of which is derived from the average historical emissions over the period 2000–2012 and 45 per cent of which stems from the adjustment referred to in paragraph 8 above.

⁹ <<http://unfccc.int/8414>>.

¹⁰ Food and Agriculture Organization of the United Nations. 2015. *Global Forest Resources Assessment 2015*. Available at <<http://www.fao.org/3/a-i4808e.pdf>>.

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. The methods used by the Congo to construct its FREL were not fully consistent with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance for Land Use, Land-Use Change and Forestry* and the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), as discussed further below.

12. The activity data (AD) on deforestation, in particular on conversion of forest areas, used in constructing the FREL were derived from a combination of the historical time series of three different remote-sensing products developed by FACET¹¹ (for 2000, 2005 and 2010), GAF¹² (for 2000 and 2010) and Global Forest Change (GFC)¹³ (for the period 2000–2012). A decision tree was applied to the information from these products to create a new forest area (loss) map consistent with the country's forest definition. The resulting area of forest loss in each stratum was then corrected for bias, using misclassifications identified from a sub-sample of visually interpreted polygons.

13. The emission factors (EFs) used were obtained from the Congo's National Forest Inventory (NFI), the 2006 IPCC Guidelines and other country-specific studies. The EFs used to estimate emissions from deforestation were derived mostly from the NFI conducted during the period 2007–2015, applying the field manual developed for the Congo by the Food and Agriculture Organization of the United Nations (FAO).¹⁴ A systematic sampling approach was adopted by the Congo, which consists of selecting a sampling unit every 15 minutes of latitude and longitude. In total, 452 sampling units of 1 km by 1 km were distributed across the whole country. Within each sampling unit, four plots of 20 m by 250 m were arranged in a square configuration and three pairs of subplots were installed within each plot. A pair of subplots consisted of a subplot of 20 m by 10 m (first level) containing a circular subplot with a radius of 3.99 m (second level). During the NFI, the subplots were used to measure both the trees in lower diameter classes (10–20 cm) and regeneration (diameter below 10 cm). Measurements at other plots included parameters such as diameter at breast height at 1.3 m above the ground (dbh), stem height, total height, and information on the local population living on or around the sampling unit. Measurements were taken at 337 sampling units out of 452, representing a 75 per cent success rate. The Congo explained that the remaining 115 sampling units were located mostly in marshy areas that were difficult to access and were not affected by historical deforestation. In total, 42,677 trees were measured using a non-destructive sampling approach, including 42,227 living trees. The data collected from the NFI are stored in a database developed with the support of FAO.

¹¹ Forêts d'Afrique centrale évaluées par télédétection (Monitoring the forests of Central Africa using remotely sensed data sets). See <<http://osfac.net/facet-congo>>.

¹² Bureau d'étude allemand en matière de SIG et télédétection (German office for the study of geographic information systems and remote sensing).

¹³ See <<https://earthenginepartners.appspot.com/>>.

¹⁴ Centre national d'inventaire et d'aménagement des ressources forestières et fauniques–FAO. 2010. *Résultats de l'inventaire forestier national*. Volumes 1 and 2.

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

14. To convert areal estimates of historical deforestation into estimates of emissions from deforestation, the Congo used the classification scheme from Sayre et al. (2014),¹⁵ which identified five strata. Two other stratification strategies from FACET (2012) and Olson et al. (2001)¹⁶ were also evaluated, but the Sayre et al. strategy was retained by the Party as it minimized intra-stratum variability. Detailed information, including classes and the area of each stratum, was provided in an annex to the Congo's submission. The AT found that the total area reported for the strata was 81 per cent lower than the total area of the Congo. During the TA, the Congo explained that the area reported in the annex was actually the number of pixels. By multiplying the area of a pixel (230 m by 230 m) by the total number of pixels, the AT found that the area of the strata was 2 per cent lower than the total area of the Congo. The AT finds this difference acceptable and commends the Congo for the consistency of the land area.

15. For the historical AD on deforestation, the Party used a combination of three available forest cover maps developed on the basis of forest monitoring by remote sensing. The three maps were developed by: FACET (2012) using 60 m resolution and accounting for forest loss for the years 2000, 2005 and 2010; GAF (2013) using 20 m resolution and representing forest gain and loss with 1 ha as the minimum unit of the mapping; and GFC using 30 m resolution to estimate annual forest loss. The simultaneous use of the three maps (combination of maps) involved four steps: (1) segmentation of the land area of the Congo into polygons on the basis of the GFC raster maps; (2) allocation of classes to each polygon by means of a decision tree that uses the three initial maps; (3) integration of the road layers; and (4) evaluation of the precision of the mapping. The AT sought a number of clarifications on this protocol and commends the Congo for the clear answers provided during the TA. The information provided by the Congo was sufficiently transparent to enable an understanding of how the historical AD were derived. However, the consideration of roads in the decision tree used to describe the protocol was not sufficiently clear. If some roads taken into account in the mapping were built prior to the reference period, the estimated deforested area in the reference period would have been slightly overestimated. During the technical exchange of views, the Congo clarified that the roads detected were the result of deforestation after 2000 and that more evidence will be provided in future submissions.

16. In total, 28 scenes covering the whole territory of the Congo were used. The polygons derived from the GFC scenes had a minimum mapping unit of 0.5 ha, in line with the national definition of forest of the Congo. More than 50 million polygons were generated to detect deforestation for the reference period 2000–2012 used for the calculation of the FREL. The AT noted that two of the three remote-sensing products used

¹⁵ Sayre R, Dangermond J, Frye C, Vaughan R, Aniello P, Breyer S, Cribbs D, Hopkins D, Nauman R, Derrenbacher W, Wright D, Brown C, Convis C, Smith J, Benson L, Paco VanSistine D, Warner H, Cress J, Danielson J, Hamann S, Cecere T, Reddy A, Burton D, Grosse A, True D, Metzger M, Hartmann J, Moosdorf N, Dürr H, Paganini M, DeFourny P, Arino O, Maynard S, Anderson M and Comer P. 2014. *A New Map of Global Ecological Land Units — An Ecophysiological Stratification Approach*. Washington, D.C.: Association of American Geographers.

¹⁶ Olson D, Dinerstein E, Wikramanayake ED, Burgess N, Powell G, Underwood E, D'Amico J, Itoua I, Strand H, Morrison J, Loucks G, Allnutt T, Ricketts T, Kura Y, Lamoreux J, Wettengel W, Hedao P and Kassem K. 2001. Terrestrial Ecoregions of the World: A New Map of Life on Earth: A new global map of terrestrial ecoregions provides an innovative tool for conserving biodiversity. *BioScience*. 51(11): pp.933–938.

by the Party to construct the FREL only cover the period 2000–2010. In the view of the AT, either changing the reference period to 2000–2010 or transparently documenting how time-series consistency is ensured for 2011 and 2012, when two out of the three remote-sensing data sources do not cover these years, is an area for technical improvement.

17. Between 2000 and 2012, the forest cover loss amounted to 145,000 ha, representing a deforestation rate of 0.05 per cent. The AT found this rate to be consistent with the value used by the Congo for reporting to FAO as part of the *Global Forest Resources Assessment 2015*.¹⁷ To assess the accuracy of the approach used by the Party and to create area estimates corrected for map classification errors (bias-corrected), 908 points were randomly selected from the classes. For the majority of the classes (forest and non-forest), the Collect Earth tool¹⁸ was used to visually assess the points using images from Google Earth,¹⁹ Bing maps²⁰ and HERE maps,²¹ while for the rare classes (mainly losses) the points were visually assessed using SPOT²² images for 2010, and all available very high-resolution imagery resources from Google Earth, Bing maps, Here maps and yearly Landsat²³ archives for 2000–2012 using Google Earth Engine. Of the 908 points selected, 870 points for which the operator was certain about the visual interpretation were analysed. The precision reported ranged from 73 per cent for loss to 91 per cent for forest, suggesting that the approach used for the detection of deforestation is acceptable. Regarding deforestation mapping, no major accuracy issues were identified by the AT.

18. Based on an ad hoc calibration, the method used considers each polygon with more than 30 per cent deforestation as deforested. The Congo provided a confusion matrix to assess the precision of each class of the land-cover change map. One category – forest gains – was not mapped, and the Congo explained that forest gains are currently excluded given the low certainty of information thereon from the different products. The AT considers the provision of a transparent and complete land-transition matrix, including gains, as an area for technical improvement.

19. To estimate the above-ground living biomass densities, the Congo applied a single allometric equation developed by Chave et al. (2014)²⁴ using dbh, wood density and environmental stress as variables. During the TA, the Congo clarified that it did not conduct research to assess the validity of the equation in Congo, and underscored that the lack of country-specific allometric equations justified the use of the equation from Chave et al. The Congo used data on dbh and environmental stress from the NFI and wood densities from Zanne et al. (2009)²⁵ to compute the above-ground biomass. During the TA, the Congo provided a list of the tests performed on the raw data from the NFI to detect outliers. The AT commends the Congo for performing this procedure, which corresponds to quality control procedures as defined in the 2006 IPCC Guidelines. The AT considers that it would

¹⁷ As footnote 10 above.

¹⁸ <<http://www.openforis.org/tools/collect-earth.html>>.

¹⁹ <<https://www.google.com/earth/>>.

²⁰ <<https://www.bing.com/maps>>.

²¹ <<https://here.com/>>.

²² <<http://www.intelligence-airbusds.com/en/65-satellite-imagery>>.

²³ <<https://landsat.usgs.gov/>>.

²⁴ Chave J, Rejou-Mechain M, Burquez A, Chidumayo E, Colgan MS, Delitti WBC, Duque A, Eid T, Fearnside PM, Goodman RC, Henry M, Martinez-Yrizar A, Mugasha WA, Muller-Landau HC, Mencuccini M, Nelson BW, Ngomanda A, Nogueira EM, Ortiz-Malavassi E, Pelissier R, Ploton P, Ryan CM, Saldarriaga JG and Vieilledent G. 2014. Improved allometric models to estimate the aboveground biomass of tropical trees. *Global Change Biology*. 20: pp.3177–3190.

²⁵ Zanne AE, Lopez-Gonzalez G, Coomes DA, Ilc J, Jansen S, Lewis SL, Miller RB, Swenson NG, Wiemann MC and Chave J. 2009. *Global Wood Density Database*. Available at <<http://datadryad.org/resource/doi:10.5061/dryad.234>>.

be useful to include this information in the FREL submission. In response to a question raised by the AT, the Congo explained that the development of allometric equations is a component of the NFI project that will cover dominant tree species in forests using destructive sampling. Furthermore, the Congo explained that, when country-specific allometric equations and basic wood densities are available, the FREL will be recalculated.

20. The AT found that the above-ground biomass densities calculated for each stratum by the Congo (136.6–225.6 t dry matter (tdm)/ha) were within the range reported in the 2006 IPCC Guidelines (130–510 tdm/ha), while the average estimated by the Congo (207.5 tdm/ha) was 33 per cent lower than the default from the 2006 IPCC Guidelines (310 tdm/ha). Also, the AT identified that the carbon density (101.7 t carbon (C)/ha) derived from the average biomass density (207.5 tdm/ha) using the carbon fraction (0.49) from the 2006 IPCC Guidelines was only 13.8 per cent lower than the carbon density (118 t C/ha) reported by Saatchi et al. (2011)²⁶ for the Congo. The Congo applied equation 2.16 from the 2006 IPCC Guidelines (chapter 2, volume 4) together with country-specific data to estimate the initial change in biomass carbon stocks on forest land converted to cropland. The AT identified that the country-specific value of 0 t C/ha for the carbon stock of annual crops used by the Congo was lower than the IPCC default value of 5 t C/ha and does not reflect the reality as annual crops have a non-zero carbon content. During the TA, the Congo explained that country-specific measurements gave values of 0.9 t C/ha for annual crops, 20.9 t C/ha for perennial crops and 6.4 t C/ha for fallows in the Congo. The Congo lacks detailed information on the land uses replacing forest land though most forest land is thought to be replaced by annual crops. The AT considers that the current value is inaccurate and that the application of a more accurate value for the biomass carbon pool after deforestation is an urgent area for technical improvement. The AT welcomes the Congo's plans to use a more accurate value for future submissions.

21. For the estimation of emissions from both deforestation and forest degradation, the Congo used a value of 0.37 for the ratio of below-ground to above-ground biomass. This value, which is provided in the 2006 IPCC Guidelines, originates from a study specific to the Amazon (Fittkau and Klinge, 1973).²⁷ The same table of the 2006 IPCC Guidelines (table 4.4, chapter 4, volume 4) contains a value of 0.24 from a more recent and pan-tropical study (Mokany et al., 2006).²⁸ During the TA, the Congo provided two reasons for selecting the older, Amazon-specific value: consistency with other official documents; and the attribution of a value from Mokany et al. to “tropical deciduous forests” in the 2006 IPCC Guidelines. The AT understands the former reason and notes that there is an attribution error for the Mokany et al. figure in the 2006 IPCC Guidelines: the original article applies to all tropical rainforest and not only to deciduous forests. Considering that the Mokany et al. value is much more recent and geographically more consistent with the Congo, the AT considers the application of a more appropriate value for the below-ground to above-ground biomass ratio as an area for technical improvement.

22. During the TA, the Congo explained that forest degradation is considered as a decrease in biomass stock. When estimating emissions from historical forest degradation, the Congo divided forest degradation into two subcategories: planned forest degradation and non-planned forest degradation. Planned forest degradation is the extraction of

²⁶ Saatchi SS, Nancy LH, Brown S, Lefsky M, Mitchard ETA, Salas W, Zutta BR, Buermann W, Lewis SL, Hagen S, Petrova S, White L, Silman M and Morel A. 2011. *Benchmark map of forest carbon stocks in tropical regions across three continents*.

²⁷ Fittkau EJ and Klinge H. 1973. On Biomass and Trophic Structure of the Central Amazonian Rain Forest Ecosystem. *Biotropica*. 5(1): pp.2–14.

²⁸ Mokany K, Raison RJ and Prokushkin AS. 2006. Critical analysis of root : shoot ratios in terrestrial biomes. *Global Change Biology*. 12: pp.84–96.

industrial roundwood from natural forest, while non-planned degradation is biomass loss associated with extraction of fuel wood. For planned forest degradation, data on the extracted tree stem volume were collected from official documents on forest management, annual censuses, forest harvesting companies and statistics from the FAO *Global Forest Resources Assessment 2005* and *2010*.²⁹ The emissions were then estimated using average damage factors per extracted volume for certified and non-certified forests for the time series 2000–2012 together with the average basic wood density (from Zanne et al., 2009), biomass expansion factor for Gabon (from Ngomanda et al., 2014³⁰) and carbon fraction from the 2006 IPCC Guidelines.

23. The original FREL submission explained that the emissions from forest degradation are the sum of a “gross degradation” and a “regrowth” component. The latter corresponds to the sequestration of carbon from forests recovering from selective harvest, and the method described in the original submission for calculating the “regrowth” component is in line with the 2006 IPCC Guidelines. During the TA, the AT noted that the value submitted by the Congo for the “regrowth” component was inconsistent with the description provided in the submission. In its modified submission, the Congo decided not to account for the “regrowth” component, explaining that it would lead to a decrease in net emissions over the period 2015–2020 compared with the average over the period 2000–2012 owing to the relatively high degradation rate over the period 2008–2012. The AT agrees that accounting for post-harvest forest recovery and using a method that is consistent with the 2006 IPCC Guidelines would decrease the FREL. Indeed, in its modified submission, the Congo demonstrated that not accounting for forest recovery leads to overestimating the FREL. The AT therefore considers that accounting for post-harvest forest recovery is a priority area for technical improvement in order to improve the accuracy of the FREL and its consistency with the 2006 IPCC Guidelines.

24. As a result of its exchange with the AT, the Congo modified the EF for forest degradation, decreasing it by 43.96 per cent from 0.91 t C/extracted m³ to 0.51 t C/extracted m³ for reduced-impact logging and from 1.82 t C/extracted m³ to 1.02 t C/extracted m³ for conventional logging. In addition, the Congo accounted for the below-ground biomass pool for planned degradation in its modified submission. As a result, the estimated emissions from planned degradation over the period 2000–2012 decreased by 16 per cent as reported in the modified submission. The Congo justified the lower value for the EF for reduced-impact logging by referring to the value reported by Pearson et al. (2014)³¹ for the Sangha concession in the Congo, and the higher value for the EF for conventional logging by referring to the national forest harvesting code. The AT noted several transparency and accuracy issues concerning these values. The value of 0.51 t C/extracted m³ for reduced-impact logging (corrected from the value of 0.50 t C/extracted m³ reported in the original article quoted by the Congo as advised by the author of the study) already includes the below-ground biomass pool. In the Congo’s modified submission, it is not clear whether the Congo later applied a 0.37 below-ground to above-ground biomass ratio: the sixth step of the estimation mentions the application of the below-ground to above-ground biomass ratio but the Congo stated that it had corrected its estimates. If the ratio were applied, the

²⁹ Available at <<http://www.fao.org/forest-resources-assessment/past-assessments/fra-2005/en/>> and <<http://www.fao.org/forest-resources-assessment/past-assessments/fra-2010/en/>>, respectively.

³⁰ Ngomanda A, Engone Obiang NL, Lebamba J, Moundounga Mavouroulou Q, Gomat H, Mankou GS, Loumeto J, Midoko Iponga D, Kossi Ditsouga F, Zinga Koumba R, Botsika Bobé KH, Mikala Okouyi C, Nyangadouma R, Lépengué N, Mbatchi B and Picard N. 2014. Site-specific versus pantropical allometric equations: Which option to estimate the biomass of a moist central African forest? *Forest Ecology Management*. 312: pp.1–9.

³¹ Pearson TRH, Brown S and Casarim FM. 2014. Carbon emissions from tropical forest degradation caused by logging. *Environmental Research Letters*. 9(3).

below-ground pool would be counted twice (double counting). Though the original article does not refer to reduced-impact logging, the Congo clarified that the author of the article confirmed that the study had to have been undertaken in a reduced-impact logging concession.³² With regard to the 50 per cent difference in harvest damage per extracted m³, the AT was not able to find the figure in the national forest harvesting code provided by the Congo. More specific studies on reduced-impact logging have identified a difference of 0.1–0.33 t C/extracted m³ (Pinard and Putz, 1996;³³ and Putz et al., 2008³⁴) between conventional and reduced-impact logging, which is at most 35 per cent less than the difference of 0.51 t C/extracted m³ used by the Congo. The Party explained that the value used of 1.02 t C/extracted m³ is well within the range of damage of 0.5–1.26 t C/extracted m³ provided by Pearson et al., which covers a broad damage calculation including skid trails. However, the AT is of the view that the Pearson et al. study is not a suitable reference for the difference between conventional and reduced-impact logging as it only considered one site and one practice per country. The AT therefore considers that the values used by the Congo for logging damage are not sufficiently justified and hence also considers the improvement of the transparency and accuracy of the EF for planned degradation as an area for technical improvement.

25. For the estimation of emissions from degradation, the Congo considered that 78 per cent of the wood energy originated from deforested land and that only 22 per cent should therefore be accounted for as emissions from forest degradation. During the AT, the Congo explained that the 22 per cent corresponds to deforested plots that are too small and regrow too quickly to be detected by the forest monitoring system. The AT commends the Congo for providing this information and for avoiding double counting of emissions from deforestation and forest degradation. The AT considers the adaptation of the definition of forest degradation to include small forested clear-cut patches as an area for technical improvement.

26. Compared with other tropical forest countries, the deforestation rate of the Congo is very low (0.05 per cent/year). To construct the FREL, the historical emissions from deforestation and forest degradation between 2000 and 2012 were adjusted to the national circumstances to take into account future emissions associated with planned deforestation and forest degradation between 2015 and 2025. According to the scenario developed by the Congo, 10 million ha will be deforested, in line with the national development plan to intensify the production of cash crops such as coffee, cocoa and oil palm trees in order to diversify the economy and boost the economic growth of the Congo.³⁵ The Government of the Congo is also planning to use these lands to increase the production of food crops with a view to ensuring the food safety of the country. The national development plan also includes the development of the mining sector such as iron production, whose implementation will result in loss of forest cover, according to the environmental impact studies reported by the Congo. The Party explained that other emerging sectors, including settlements and energy, were not considered in the adjustment owing to a lack of data. Taking these adjustments to the national circumstances into consideration results in a FREL that is 84.7 per cent higher than the historical average for the reference period.

³² S Brown, personal communication.

³³ Pinard MA and Putz FE. 1996. Retaining forest biomass by reducing logging damage. *Biotropica*. pp.278–295.

³⁴ Putz FE, Zuidema PA, Pinard MA, Boot RGA, Sayer JA, Sheil D, et al. 2008. Improved Tropical Forest Management for Carbon Retention. *PLoS Biology*. 6(7): pp.1368 and 1369. Available at <<https://doi.org/10.1371/journal.pbio.0060166>>.

³⁵ Ministère de l'Économie, du Plan, de l'Aménagement du Territoire et de l'Intégration. 2012. Congo Plan National de Développement: Document de stratégie pour la croissance, l'emploi et la réduction de la pauvreté (DSCERP 2012–2016).

27. The majority of the adjustment is due to planned deforestation, which refers to concessions of forest areas granted by the Government of the Congo for farming. The AT identified that, depending on national circumstances, this granting of forest areas for farming may decrease deforestation, as people forgo 'slash-and-burn' agriculture to work in agricultural concessions (Sunderlin et al., 2000).³⁶ However, the AT found that this possible reduction of (unplanned) deforestation expected to take place outside the concessions had not been integrated into the adjustment. Given this finding, the AT considers that adding only the planned deforestation within concessions as an adjustment to the FREL is not accurate. The Congo could either include both the increase in deforested areas within concessions and the decrease in deforested areas outside concessions in the adjusted FREL, or omit them both entirely. The AT considers the correct treatment of planned deforestation in the adjustment as an area for technical improvement.

28. The total area of new agricultural and mining concessions was added as an adjustment to the historical reference without removing the area conceded during the reference period to the FREL. The impact of past concessions on deforestation is therefore implicitly included in the FREL, on top of the expected impact of future concessions. The AT therefore considers that the FREL was adjusted twice for a similar source of deforestation, namely agricultural and mining activities. The Congo explained that there were no large-scale concessions granted over the reference period. Yet, the Congo listed agriculture and mining as two important deforestation drivers over the reference period. The AT considers the consistent application of the same method for calculating the impact of agricultural and mining activities between the historical reference and the FREL as an area for technical improvement.

29. In addition, the major cash crops that are expected in the agricultural concessions are palm, cocoa and coffee. These three crops meet the biophysical criteria of the national definition of forest provided in the FREL submission, but are nevertheless excluded from the national definition. In addition, it was not clear from the submission and the exchange with the Congo whether the remote-sensing products used to monitor deforestation classify these crops as forest or non-forest areas. Yet, the Congo explained that these three crops represent only 0.1 per cent of the Congo's forest area. The AT considers the provision of documentation on how these crops are classified by the remote-sensing monitoring system an area for technical improvement. Moreover, the Congo did not consider the removals from such plantations established following deforestation. The AT identified that this results in an overestimation of the FREL.

30. The Congo implicitly assumed that 100 per cent of the area conceded for agriculture will be deforested within the next five years. The FREL submission does not document which proportion of recent concessions has actually been deforested and the amount of time taken to do so. The AT considers conducting further research on the assumption that 100 per cent of the area conceded for agriculture will be deforested within the next five years as an area for technical improvement.

31. The Congo applied two adjustments for forest degradation. First, 10 new forest concessions covering 2,585,000 ha have recently been granted by the Government of the Congo, which increases the area subject to degradation by 25 per cent. Second, the Congo applied a certification ratio (the area of concessions certified by the Forest Stewardship Council over the total concession area) of 0 per cent to these new concessions, contrasting with 33 per cent during the reference period. The Congo explained that none of the new

³⁶ Sunderlin WD, Ndoye O, Bikié H, Laporte N, Mertens B and Pokam J. 2000. Economic crisis, small-scale agriculture, and forest cover change in Southern Cameroon. *Environmental Conservation*. 27(3): pp.284–290.

concessions were certified as at 2015. However, the AT does not understand why this is relevant given that work and harvesting in these new concessions will start in 2016 at the earliest and that certification can only be obtained after the verified implementation of sustainable management practices. The Congo clarified that no certification was ongoing for the new concessions. Yet, in its submission, the Congo mentioned the importance of unsustainable logging as a forest degradation driver and the role of forest certification in its REDD-plus³⁷ strategy. The AT considers the transparent explanation of all assumptions for the certification ratio in new concessions and how they are consistent with the Congo's REDD-plus strategy as an area for technical improvement.

32. Pursuant to decisions 12/CP.17 and 13/CP.19, with regard to consistency with corresponding anthropogenic forest-related GHG inventories, the AT compared the emissions related to deforestation used to calculate the FREL with those associated with forest and grassland conversion reported by the Congo, in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, in the most recent GHG inventory, which at the time of the TA was that included in the second national communication, submitted in 2009. In the GHG inventory, emissions from forest and grassland conversion are reported together, and the estimates are three times higher than the historical emissions associated with deforestation included in the FREL. Given the lack of disaggregation between emissions from forest conversion and grassland conversion, no conclusion on the consistency with the FREL could be reached. With regard to forest degradation, the AT found insufficient information on forest carbon stock loss in the second national communication to assess the consistency with the FREL. During the facilitative technical exchange, the Congo explained that the development of the third national communication and the first biennial update report was at an early stage and that the GHG inventory in those submissions would include information and estimates that are fully consistent with the FREL with regard to definitions, biomass equations, AD and EFs. The Congo also explained that data and information from the FREL were used in the elaboration of its intended nationally determined contribution.

Description of relevant policies and plans, as appropriate

33. At the time of the submission, the national REDD-plus strategy had not yet been finalized. As a result, the submission mainly includes general strategic tools and objectives, with the exception of an explicit objective that all forest concessions have a management plan by 2016.

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

34. 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.

35. The carbon pools reported under deforestation by the Congo are above-ground biomass, below-ground biomass and deadwood, while above-ground and below-ground biomass were the only pools reported for forest degradation. As explained by the Congo, the reason for selecting these pools was the availability of reliable and consistent data to quantify the pools and verify their estimates. As a result, the other pools under deforestation (litter and soils) and forest degradation (litter, deadwood and soils) were not reported owing

³⁷ In decision 1/CP.16, paragraph 70, the COP encouraged 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.

to a lack of data. The Congo and the AT agree that soil is likely to be a significant pool and that the exclusion of this non-biomass pool will probably reduce the estimated volume of emission reductions associated with the implementation of REDD-plus activities. During the TA, the Congo explained that the missing pools could be included in future FREL submissions when better data and scientific information become available to quantify carbon dynamics in tropical forest ecosystems.

36. Only CO₂ emissions associated with changes in carbon stocks in the above-mentioned carbon pools were reported. The Congo indicated that non-CO₂ emissions, including methane and nitrous oxide from fires associated with deforestation, were not included in the calculation of the FREL because they were insignificant. No verifiable information was provided to demonstrate their insignificance. The AT noted that the 2006 IPCC Guidelines provide methods and default EFs to estimate these emissions. The AT considers the inclusion of non-CO₂ emissions in future FREL submissions as an area for technical improvement.

37. Among the eligible activities according to decision 1/CP.16, paragraph 70, the Congo chose deforestation and forest degradation for the calculation of its FREL. During the TA, the Congo explained that it is planning to include “enhancement of forest carbon stocks” in future FREL submissions, in line with the stepwise approach, and to evaluate the inclusion of the activities “conservation of forest carbon stocks” and “sustainable management of forests”, bearing in mind the overlap between these activities and those already reported in the submitted FREL. The Congo did not provide more detailed information on the significance of these activities and its plans for future FREL submissions.

4. Definition of forest

38. The AT found that the Congo did not include a definition of forest in its second national communication. Consistent with the discussion referred to in paragraph 32 above, the Congo explained that the same definition of forest will be used for the GHG inventory included in the first biennial update report and the third national communication, which are currently under preparation.

III. Conclusions

39. The information used by the Congo in constructing its FREL for deforestation and forest degradation and the additional information provided during the TA are in overall accordance with the guidelines for submissions of information on reference levels (as contained in the annex to decision 12/CP.17). Some important components of the submission are still not fully transparent, accurate, consistent and complete. Most of the areas for technical improvement are related to improving accuracy in subsequent submissions, as part of the stepwise approach.

40. The AT acknowledges that the Congo included in the FREL the most significant activities and the most significant pools in terms of emissions from forests. In doing so, the AT considers that the Congo followed decision 1/CP.16, paragraph 70, on activities undertaken, and paragraph 71(b), on elaboration of a national FREL/FRL, and decision 12/CP.17, paragraph 10, on implementing a stepwise approach. However, no verifiable information was provided to demonstrate that the missing activities and pools were not significant. The AT commends the Congo for the information provided on the ongoing work on the development of its FREL in relation to other activities.

41. As a result of the facilitative interactions with the AT during the TA, the Congo submitted a modified FREL submission, which took into consideration the technical inputs

of the AT. The AT noted that the transparency and completeness of the information provided by the Congo was improved in the modified FREL submission, and commends the Congo for the efforts made. The new information provided in the modified FREL submission increased the replicability of the FREL calculations.

42. The AT did not identify sufficient information to confirm that the FREL maintains consistency, in terms of sources of AD and EFs, with the GHG inventory included in Congo's national communication submitted in 2009.³⁸ The AT noted that the Congo used updated data, compared with the second national communication, for the construction of the FREL. The Congo explained that it will include in its third national communication and first biennial update report, which are currently under development, information and estimates that are fully consistent with the FREL with respect to definitions, biomass equations, AD and EFs.

43. In assessing the pools and gases included in the FREL, pursuant to decision 13/CP.19, annex, paragraph 2(f), the AT noted that the current omission of pools and gases is likely to have reduced the estimated volume of emissions in the context of the FREL. Conversely, the omission of some activities, such as enhancement of forest carbon stocks through post-harvest regrowth, afforestation and reforestation, is likely to have increased the estimated volume of emissions in the context of the FREL.

44. The AT sought a number of clarifications on the methods used by the Congo to construct the FREL. The Congo provided transparent replies to many of the requests for clarification of the AT, demonstrating the accuracy of the information used. With regard to some issues, however, the AT found that the FREL still lacks important transparency and accuracy. Pursuant to decision 13/CP.19, annex, paragraph 3, the AT identified the following areas for future technical improvement:

- (a) Documentation of how time-series consistency is ensured for 2011 and 2012 (see para. 16 above);
- (b) Provision of a transparent and complete land-transition matrix, including gains (see para. 18 above);
- (c) Testing of the validity of generic allometric equations before their application in order to assess their reliability and associated uncertainty, or development of country-specific allometric equations (see para. 19 above);
- (d) Consideration of carbon stocks on land (in particular cropland) following deforestation (see para. 20 above);
- (e) Application of a more appropriate value for the below-ground to above-ground biomass ratio (see para. 21 above);
- (f) Improvement of the accuracy of the EF used for forest degradation (see paras. 23 and 24 above);
- (g) Adaptation of the definition of forest degradation to include small forested clear-cut patches (see para. 25 above);
- (h) Monitoring of the implementation of the national development plan scenario used by the Congo to adjust historical emissions and predict future emissions associated with planned deforestation and forest degradation between 2015 and 2025 (see para. 26 above);

³⁸ In accordance with the scope of the TA as defined in decision 13/CP.19, annex, paragraph 2(a).

(i) Improvement of the transparency and consistency of the adjustment for future agricultural and mining activities (see paras. 27–30 above);

(j) Improvement of the transparency of the assumption on the ratio of certified logging concessions for the period 2015–2020 (see para. 31 above);

(k) Consistent application of the methods and data used in the construction of the FREL and in the GHG inventory included in the national communication and biennial update report (see para. 32 above);

(l) Treatment of emissions from soils and litter for deforestation and from deadwood and litter for forest degradation (i.e. the inclusion of these pools and gases or the provision of more information justifying their omission) (see para. 36 above).

45. The AT acknowledges and welcomes the intention expressed by the Congo to:

(a) Improve the accuracy of the EFs for forest degradation in future FREL submissions (see para. 24 above);

(b) Extend the FREL to other pools, gases and REDD-plus activities, as part of efforts to move towards a national FREL (see para. 35 above).

46. In conclusion, the AT commends 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 Congo's FREL have been identified in this report. The AT acknowledges that such improvements are subject to national capabilities and policies, and notes the importance of adequate and predictable support.³⁹ The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with the Congo.

47. The table contained in the annex summarizes the main characteristics of the Congo's proposed FREL.

³⁹ Decision 13/CP.19, annex, paragraph 1(b), and decision 12/CP.17, paragraph 10.

Annex

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

<i>Main feature of the FREL</i>		<i>Remarks</i>
Proposed FREL (in t CO ₂ eq/year)	35 475 652	The FREL includes gross emissions from deforestation and forest degradation (i.e. those associated with clear-cuts and excluding any subsequent emissions and removals from deforested and degraded areas) (see paras. 20, 23 and 43)
Type and duration of FREL	FREL based on historical average emissions for 2000–2012 plus adjustment	Estimates of deforestation and forest degradation for the period 2000–2012 were used (paras. 8, 12 and 16)
Adjustment for national circumstances	Yes	The proposed FREL was adjusted upward by 84.7 per cent compared with the historical average annual emissions (for the period 2000–2012) to take into consideration planned deforestation and degradation for the period 2015–2020 (para. 8). The AT considers that the impact of agricultural concessions is not accurately assessed in the adjustment (para. 28)
National/subnational ^a	National	–
Activities included ^b	Reducing emissions from deforestation and forest degradation	The Congo explained that forest degradation was considered as a decrease in biomass stock and that the process of defining forest degradation on the basis of criteria such as rate of harvest and rate of loss is being considered (para. 22)
Pools included ^b	AB, BB and DW	For the reported pools, it was assumed that the carbon immediately after deforestation is zero. Soil organic carbon was not included owing to a lack of accurate data (para. 9)
Gases included	CO ₂	No verifiable information on non-CO ₂ gases was provided (paras. 9 and 36)
Forest definition ^c	Included	The Congo used a minimum tree crown cover of 30 per cent; a minimum land area of 0.5 ha; and a minimum tree height of 3 m (para. 16)
Relationship with latest GHG inventory	Methods used for the FREL differ from those for the latest GHG inventory (2009)	Differences in methods are due to the availability of more recent data and Intergovernmental Panel on Climate Change guidance used for the FREL compared with the GHG inventory. The GHG inventory to be reported in the third national communication and first biennial update report is at an early stage of preparation and will incorporate updated methods and data (see para. 23)

<i>Main feature of the FREL</i>		<i>Remarks</i>
Description of relevant policies and plans ^d	Included	Brief summary information was included for information purposes (para. 24)
Description of assumptions on future changes in policies ^d	Not applicable	–
Descriptions of changes to previous FREL	Not applicable	–
Future improvements identified	Yes	Several areas for future technical improvement were identified (see paras. 44–46)

Abbreviations: AB = aboveground biomass, AT = assessment team, BB = belowground biomass, DW = deadwood, FREL = forest reference emission level, GHG = greenhouse gas.

^a If subnational, comments should include information on the treatment of displacement of emissions.

^b In the case of omitted pools or activities, comments should include the justification provided by the country.

^c The forest definition should be summarized, and it should be stated if it differs from the definition used in the GHG inventory or in reporting to other international organizations.

^d May be relevant to the description of national circumstances, which is required in the case of adjustment.