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Report of the technical assessment of the proposed forest reference emission level of Brazil submitted in 2014

Summary

This report covers the technical assessment of the submission of Brazil, 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 Brazil covers the activity "reducing emissions from deforestation", which is one of the activities included in decision 1/CP.16, paragraph 70. In its submission, Brazil has developed a subnational FREL for the Amazonia biome, with the aim of transitioning to a national FREL in the future. The assessment team notes that the data and information used by Brazil in constructing its FREL are transparent and complete, and are 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 further technical improvement, according to the scope of the technical assessment in the annex to decision 13/CP.19.

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Contents

I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of Brazil on its proposed forest reference emission level (FREL),[1] submitted on 6 June 2014 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 25 to 29 August 2014 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 experts[3] (hereinafter referred to as the assessment team (AT)): Mr. Giacomo Grassi (European Union) and Mr. Walter Oyhantçabal (Uruguay). In addition, Ms. Estefania Ardila Robles, an expert from the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, participated as an observer[4] 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, Brazil submitted its proposed FREL on a voluntary basis. This proposed FREL is one of the elements[5] to be developed in the implementation of the activities referred to in decision 1/CP.16, paragraph 70. The COP decided that each submission of a proposed FREL and/or forest reference level, 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 decisions 13/CP.19, paragraphs 1 and 2, and 14/CP.19, paragraphs 7 and 8.

3. In this context, Brazil underlined that the submission does not modify, revise or adjust in any way the nationally appropriate mitigation actions currently being undertaken by Brazil, nor does it prejudge any nationally determined contribution by Brazil in the context of the Durban Platform for Enhanced Action.

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

5. The TA of the FREL submitted by Brazil was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or forest reference levels 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 in the same decision.

6. Following the process contained in the guidelines and procedures of the same decision, a draft version of this report was communicated to the Government of Brazil. The facilitative exchange during the TA allowed Brazil to provide clarifications and information that were considered by the AT in the preparation of this report.[8] As a result of the

[1] The submission of Brazil can be found at <http://unfccc.int/8414>.
[2] Decision 13/CP.19, annex, paragraph 7.
[3] Decision 13/CP.19, paragraphs 7 and 9.
[4] Decision 13/CP.19, 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.

facilitative interactions with the AT during the TA session, Brazil submitted a modified version on 31 October 2014, which took into consideration the technical inputs by the AT. The modifications improved the clarity and transparency of the submitted FREL, without need to alter the approach used to construct the proposed FREL. This TA report was prepared based on the context of the modified FREL submission. The modified submission that contains the assessed FREL and the original submission are available on the UNFCCC website.[9]

B. Proposed forest reference emission level

7. The FREL proposed by Brazil is a dynamic mean of the carbon dioxide (CO_2) emissions associated with gross deforestation since 1996, updated every five years, using data from the Brazilian National Institute for Space Research (INPE), Ministry of Science, Technology and Innovation, gross deforestation monitoring system. Brazil indicated that a dynamic approach was adopted voluntarily with the aim of incorporating the progress achieved over time with the implementation of policies and measures to reduce deforestation in the Amazonia biome. The FREL presented in the modified submission, with the aim of accessing payments for REDD-plus[10] results from 2006 to 2010, is the mean annual emissions from gross deforestation in the Amazonia biome for the period 1996–2005 and corresponds to 1,106,027,617 tonnes of carbon dioxide (t CO_2).[11] For results in the period 2011–2015, the FREL is the mean annual emissions from gross deforestation in the Amazonia biome for the period 1996–2010, and corresponds to 907,959,466 t CO_2.[12] The entire time series 1996–2010 and the mean emissions from gross deforestation in the Amazonia biome are presented in table 1 of the modified submission and were considered in the TA.

8. 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 Brazil, 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 paragraph 70 of this decision. Pursuant to paragraph 71(b) of the same decision, Brazil has developed a subnational FREL (for the Amazonia biome) with the aim of transitioning to a national FREL in the future, incorporating all biomes in the country. According to the submission, the Amazonia biome covers 4,197,000 km^2, corresponding to almost half (49.29 per cent) of the national territory, and is responsible for 50.8 per cent of the net CO_2 emissions of Brazil in 2010 (second national communication of Brazil, 2010[13]). In this submission, Brazil applies a step-wise approach to its development of the FREL, in accordance with decision 12/CP.17, paragraph 10. The step-wise approach enables Parties to improve the FREL by incorporating better data, improved methodologies and, where appropriate, additional pools.

[9] <http://unfccc.int/8414>.

[10] REDD-plus refers to the five activities in decision 1/CP.16, paragraph 70: reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks in developing countries.

[11] This figure has been modified from the one in the original submission based on the technical exchange of information between Brazil and the AT. This modified figure was provided to the AT during the assessment session in Bonn. See figure 9 and table 1 of the modified FREL submission.

[12] See previous footnote.

[13] At the time of the TA, the second national communication of Brazil to the UNFCCC was the latest available. The second national communication can be found at <http://unfccc.int/2979>.

9. The proposed FREL includes the pools "above-ground biomass", "below-ground biomass" and "litter", while "dead wood" and "soil organic carbon" are not included. Regarding greenhouse gases (GHGs), the submission includes CO_2.

10. The annex to the modified submission was not subject to the TA and includes preliminary information on the ongoing work on the development of FRELs for other activities and biomes: (i) forest degradation in the Amazonia biome (annex III of the modified FREL submission) and (ii) Cerrado and Mata Atlântica biomes (annex IV of the modified FREL submission).

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 of the Amazonia biome, Brazil used the methodology provided in the 2003 Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) as a basis for estimating changes in carbon stocks in forest land converted to other land-use categories. Accordingly, the gross emissions from deforestation were estimated from 1996 onwards by combining activity data (i.e. the area of annual gross deforestation) with the appropriate emission factors (i.e. CO_2 emissions associated with the corresponding forest type).

12. The activity data used for the construction of the FREL in the Amazonia biome were based on a historical time series from INPE. Through PRODES,[14] INPE has been assessing annual gross deforestation[15] in the Legal Amazonia[16] since 1988 using Landsat-class satellite data on a wall-to-wall basis, with a minimum mapping unit of 6.25 ha. The areas included in the Legal Amazonia but not in the Amazonia biome (i.e. areas from the Cerrado and Pantanal biomes) were excluded from the construction of the FREL. Activity data (area deforested) are available in analogue format until 1997 and in digital format from 1998 onwards. Only since 2001 are data in digital format available annually. No ground truth was required for the Amazonia biome owing to the unequivocal identification of the clear-cut patches. In response to technical input by the AT, Brazil clarified that gross deforestation under cloud-covered areas has been estimated, so as not to under- or over-estimate deforestation in any particular year, by using an approach (adjusted deforestation increment) that evenly distributes the area of the deforestation polygons observed in the satellite image for the first time over previously cloud-covered areas over the year of the observation and all previous year(s) with persistent cloud cover in the same area.

13. With regard to the emission factors, the carbon stock of the different forest types in the Amazonia biome was estimated by combining sample-plot information (i.e. circumference at breast height (CBH)) from RADAMBRASIL,[17] with various equations[18]

[14] PRODES is the gross deforestation monitoring programme in Amazonia; <www.obt.inpe.br/prodes>.

[15] Brazil considers as deforestation any clear cut in areas of primary forests.

[16] According to the submission, the Legal Amazonia (5,217,423 km^2) is 24.3 per cent bigger than the Amazonia biome.

[17] The RADAMBRASIL project, conducted between 1970 and 1985, collected geo-referenced data from 2292 sample plots, including CBH and height of all trees above 100 cm in CBH.

to convert CBH into total carbon stock in living biomass (above and below ground, including palms and vines and small trees) and litter. Country-specific data for the water content in fresh biomass and carbon content in dry matter, as well as carbon in litter, vines and palms, were also used. Based on this information, and complemented by data from the literature,[19] a carbon density map including 22 different forest types was constructed. Brazil assumed that the biomass immediately after forest conversion was zero and did not consider any subsequent CO_2 removal after deforestation.

14. To estimate annual emissions from deforestation, the following procedure was applied: the area of each deforested polygon under a certain forest type and RADAMBRASIL volume was multiplied by the emission factor (i.e. carbon density in tonnes of carbon per hectare (t C/ha)) of the corresponding forest type and RADAMBRASIL volume and by 44/12 (to convert carbon into CO_2). Then, for each year, the emissions from all the areas deforested were summed up. An adjustment was applied to consider deforestation under clouds.

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 construction of the FREL in the Amazonia biome was based on a historical time series of gross deforestation developed by INPE for the Legal Amazonia. Maps and estimates of gross deforestation since 2003 are available on the INPE website.[20] According to Brazil's modified submission, the deforestation areas for the Legal Amazonia have been obtained from PRODES and "adjusted to consider only deforestation within the Amazonia biome". In assessing the extent to which the FREL is consistent with the information and descriptions provided by the Party, the AT compared the time series of deforestation in the FREL (for the Amazonia biome) with PRODES deforestation rate data (for the Legal Amazonia) available on the INPE website and in figure a.2 of annex 1 of the FREL submission. Based on this comparison, it was noted that for several years (1996–2003 and 2005), gross deforestation in the Amazonia biome, which is a subset area of the Legal Amazonia, was larger than that in the whole of the Legal Amazonia.

16. In response to this observation, Brazil clarified that in the period 1996–2010, emissions from deforestation in the Legal Amazonia were approximately 4 per cent higher than in the Amazonia biome. Furthermore, in the modified submission, Brazil's clarification on this difference in the data sets was that there were several approaches for estimation of the areas deforested and the associated emissions from gross deforestation. While data from PRODES express the "rate" of gross deforestation (adjusting for cloud-covered areas and reference satellite imagery dates), the FREL submission introduces a different approach based on adjusted gross deforestation "increment", which adjusts for cloud cover. As explained in the modified submission of the FREL (box 2), the main differences between "deforestation rates" and "adjusted deforestation increments" are the temporal observation window and a different procedure for cloud correction. As a result, for single years, an estimate of deforestation based on adjusted increments may be higher or lower than the deforestation estimated based on the rate. Brazil clarified that the use of adjusted deforestation increments to estimate emissions from gross deforestation provides a more accurate, verifiable figure for the deforested area through time, as the analysis is carried out retrospectively, and deforestation increments can be redistributed over time. The AT notes the effort made by Brazil to improve the cloud correction of the activity data. The

[18] Equations 5 to 9 in the modified FREL submission.

[19] Refer to table 5 in the modified submission for literature and references consulted.

[20] <http://www.obt.inpe.br/prodes/index.php>.

AT considers that the additional information provided by Brazil in the modified submission considerably increases the transparency of the proposed FREL and clarifies the difference between FREL and PRODES data.

17. Digital deforestation maps are used to enable association of each deforestation polygon with the carbon stocks of the corresponding forest type. According to the FREL submission, digital information on deforestation is available only from 1998 onwards (aggregated for the period 1998–2000, and on a yearly basis thereafter), while data for 1996 and 1997 are only available in analogue format. To overcome this limitation in the data (i.e. to combine the correct emission factor with certain activity data), Brazil assigned the average emissions of the period 1998–2000 to the years 1996 and 1997. According to the FREL submission, 1996 was selected as the starting year for the FREL, in order to leave out the high deforestation that occurred in 1995 and also to maintain consistency with other initiatives and policies in Brazil. The AT notes that information provided for the years 1996 and 1997 is less accurate (as the data were not based on measured data) and less consistent over the time series compared to the time series constructed from 1998 onwards. In response to this observation, Brazil indicated that it is seeking to complete the annual digital time series with data from 1996 to 2000, and that this will improve the accuracy of the estimates provided in the submission for the years 1996 and 1997,[21] as well as for the individual years 1998, 1999 and 2000. Overall, the AT considers that a better estimation of deforestation estimates for the years 1996–1997 (i.e. through the digitalization of the deforestation maps) is an area for future technical improvement. Alternatively, in future FREL submissions, Brazil could provide information showing that the current estimates for 1996–1997, as assessed in this report, are conservative.

18. In addition, the AT sought a number of clarifications on the estimation of activity data from Brazil. The most important were:

(a) Brazil's submission specified that the minimum mapped deforestation area was 6.25 ha, but little information was provided on the rationale behind this value and on possible underestimation of emissions from deforestation (i.e. for deforested areas below this threshold). In the modified FREL submission (box 1, annex I), Brazil explained that in 1988, PRODES started to map deforestation over hard copy prints of Landsat images at the 1:250,000 scale. The minimum mapping unit was defined as 1 mm^2, which is equivalent to 6.25 ha on the surface. The digital PRODES data maintained this threshold to ensure consistency of the time series. Since 2008, the small deforestation patches under the minimum mapping area are monitored by INPE, and are retrieved later by PRODES if they evolve into an area larger than 6.25 ha. The AT commends Brazil for the effort and encourages Brazil to continue monitoring small deforestation events and to provide information on the extent of deforestation areas that are not retrieved later by PRODES, with the aim of showing that no significant deforestation is excluded from the FREL;

(b) In response to a request for clarification by the AT, in the modified FREL submission, Brazil clarified that PRODES considers deforestation not only as the clear cuts in "intact" primary forest, but also as the clear cuts in areas of primary forest that may have been previously subjected to a process of degradation (e.g. selective logging). The emissions from deforestation of these areas are estimated using the same carbon map. The AT notes that the carbon density of the areas previously subjected to selective logging is likely to be lower than the carbon density of corresponding intact primary forests. As a consequence, the AT notes that for these areas the emission estimates used in the construction of the FREL include both the emissions from deforestation (clear cuts) and the emissions from degradation processes that occurred previously. The AT acknowledges the

[21] Brazil indicated that INPE is seeking funds for the improvement of the historical data for the years before 2000.

complexity of separating emissions between the two activities. Furthermore, the modified FREL submission clarified that the extent of degraded area that is subsequently deforested is small (see table b.1 in annex III of the modified FREL submission). The AT notes that, whenever emissions from degradation are included in future FREL submissions, Brazil will have to define a methodology to avoid double counting of emissions reported under degradation and deforestation;

(c) In response to a question from the AT, Brazil clarified that the deforestation of secondary forests (i.e. areas previously detected as deforested by PRODES (at any point in time since 1988) and which subsequently regained tree cover) is not included in the FREL. Land-use dynamics, including secondary vegetation, is tracked by a separate project by INPE (TerraClass[22]). According to Brazil, the rationale for not including these emissions in the FREL submission is that gains and losses should balance out in these areas (i.e. both the emissions from deforestation of secondary forests and any removals associated with the forest regrowth are excluded from the FREL, owing to the dynamics of secondary forests in Brazil). The modified FREL submission (box 1) clarified that approximately 20 per cent of the land deforested is abandoned to regrowth (i.e. secondary forests), and that deforestation of areas other than primary forest represents a marginal contribution (1.57 per cent) to the total emissions from deforestation. The AT commends Brazil for providing this information.

19. The AT notes that the "carbon map" used in the FREL, based on the RADAMBRASIL database combined with an allometric equation (to relate above-ground fresh biomass to carbon densities), represents a significant effort aimed at recognizing the heterogeneity in carbon densities within the Amazonia biome, and commends Brazil for this. Nevertheless, the AT noted that: (i) table 4 of the FREL submission (i.e. carbon densities in different forest types and volumes) shows some apparent inconsistencies[23] and (ii) the allometric equation used was not developed for the entire Amazonia, and hence it could not be completely representative of all areas.

20. In response to these observations, Brazil explained that the apparent inconsistencies in the carbon map are partly associated with the specific circumstances of the region (e.g. soil types, climatic conditions and flood regimes), and noted that the widely used RADAMBRASIL database is the best information available. Furthermore, Brazil indicated that the carbon map can be expected to improve in the future (e.g. with the new data from the first national forest inventory of Brazil, estimated to be finalized by 2017). Overall, the AT commends Brazil for the information provided in the revised FREL submission on ongoing efforts to estimate carbon densities, including detailed information on uncertainties. The AT commends Brazil for continuing to work on updating and improving the carbon map, noting it as an area for future technical improvement.

21. The AT noted that the emission factors used varied along the time series. To understand the reason for this variation, the AT asked Brazil to provide information on annual deforestation area by forest type. In response to this request, Brazil provided a very detailed example for the year 2003 (in annex II of the modified FREL submission) showing how emissions from deforestation were calculated. This example includes data on deforestation areas by forest type, RADAMBRASIL volume and the associated carbon densities. The AT commends Brazil for this huge effort. The AT also notes that providing basic information on deforestation area (e.g. by forest type only) for all years would further improve the transparency and reproducibility of future FREL submissions.

[22] <http://www.inpe.br/cra/ingles/project_research/terraclass2010.php>.

[23] For example: (i) the carbon densities of the forest types "La" (forested campinarana) and "Ld" (wooded campinarana), typically associated with a rather low or open vegetation, appear very high and (ii) in some cases, for a given volume, an "open" forest type has a higher carbon density than the corresponding "dense" forest type.

22. In addition, the AT considers that the information provided in the modified FREL submission on "verification activities" performed (e.g. comparison of the carbon map with data from the scientific literature) is useful, because it helps to build confidence in the estimated emissions.

Description of relevant policies and plans, as appropriate

23. As the proposed FREL is based entirely on historical data, no assumptions about future changes to domestic policies have been included in the FREL submission. Annex I, section II, of the submission provides a description of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazonia.

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

24. According to decision 12/CP.17, subparagraph (c) of the annex, 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.

25. The pools included in the FREL are those that were available from the construction of the carbon map that used information from RADAMBRASIL. These pools are living biomass (above and below ground) and litter. Dead wood and soil organic carbon were not included.

26. Changes in soil carbon can be significant when forest land is converted to grassland or cropland. Brazil explained in its submission that it does not have data on the dynamics of forest conversion for all years in the period considered in the FREL. However, Brazil mentioned two sources of information that were used as proxies to estimate the fate of soil carbon during forest conversion to other uses. First is the GHG inventory included in Brazil's second national communication (2010),[24] which includes data from a spatially explicit database for conversion to other lands from 1994 to 2002 per biome, including the Amazonia. This source shows clearly that the main conversion in this period was from forest land to grassland (88.5 per cent). The second source of information is TerraClass, which estimated forest transitions for 2008 and 2010, according to which, the dominant conversion for 2008 and 2010 is again from forest land to grassland (approximately 80 per cent). Given this information, Brazil carried out a literature review[25] to assess the impact of forest conversions to pasture on soil organic carbon stocks. This literature review indicates that, while generally there is a loss of carbon after the first years of conversion, the subsequent trend is strongly influenced by pasture management, with carbon levels under pasture being lower, similar to or even higher than those under native forests. The soil depth and the timespan considered also influence this analysis. The conclusion by Brazil is that the available literature has limitations and may not be representative of many situations that might occur in the Amazonia biome. Brazil will intensify efforts to better understand the dynamics of carbon in soils after conversion, including expanding the literature review and stimulating new research, bearing in mind that changes may not occur rapidly after the conversion and that they are dependent on pasture management. The AT considers that the exclusion of soil organic carbon is adequately justified by Brazil and commends the efforts to obtain better information on this pool in the future, with the aim of including it as part of the step-wise approach.

27. Regarding emissions from organic soils, in the modified FREL submission, Brazil provided information on the distribution of main soil types in the Amazonia basin. It was noted that no histosols were present. The AT concludes that emissions from organic soils

[24] Refer to footnote 13 for web link to the second national communication.

[25] Refer to the modified submission for the literature on this matter cited by Brazil.

when gross deforestation occurs are likely to be insignificant and their non-inclusion is justified.

28. With regard to emissions from dead wood, the AT requested clarification on the reasons for the omission of this pool. In response to this question, in its modified submission, Brazil explained that the rationale behind the non-inclusion of this pool was based on the consideration that emissions from dead wood are not avoided when deforestation is reduced, as they are part of the natural process of decomposition (i.e. "the issue is related only to the time when the emissions are released"). The AT considers that when deforestation occurs, there are emissions from dead wood to the atmosphere that would need to be estimated. Furthermore, the AT notes that the IPCC good practice guidance for LULUCF provides a method for estimating carbon stock changes in dead wood (refer to chapter 3.4.1.2.1 for forest land converted to grassland: dead wood "should be assumed oxidized following land conversion") and the corresponding default emission factor (refer to table 3.2.2: 18.2 t C/ha for dead wood stock in tropical forests). The AT considers the treatment of emissions from dead wood (i.e. the inclusion of this pool or the provision of more information justifying its omission) as an area for future technical improvement of the FREL.

29. The FREL includes CO_2 emissions. Brazil explained in its submission that emissions from gases other than CO_2 (non-CO_2 gases) in the Amazonia biome are normally associated with the recurrent burning of tree residues left on the ground after deforestation activities. The exclusion of non-CO_2 gases is justified by Brazil as a means to be conservative, because a decrease of deforestation is associated with a decrease of non-CO_2 gases. Brazil indicated that it may revisit this approach if it considers that the data available are reliable and consistent. In addition, in box 7 of the modified FREL submission, Brazil provides information on available estimates of non-CO_2 gases associated with pasture establishment. The information in box 7 shows that there are activity data of burned pastures at least for the period 2002–2008 and emission estimates for the period 2003–2008.[26] The AT considers the treatment of non-CO_2 gases as an area for future technical improvement to maintain consistency with the GHG inventory included in the national communication.

30. Brazil provided information on forest degradation in annex 2 of the original FREL submission; this was for information purposes as degradation was not included in the FREL. The AT commends Brazil for sharing this information in the annex. Noting that the annex is for information purposes and not part of the assessment, the AT observed that the value of emissions from degradation shown in figure b.2 in the annex is expressed in carbon and not CO_2 (i.e. values should be multiplied by 44/12). This was corrected in Brazil's modified FREL submission (Annex III, figure b.3). As a consequence, for the period 2007–2010, the emissions associated with degradation in the Amazonia biome in the modified submission correspond to approximately 59 per cent of the emissions from deforestation.

31. The AT acknowledges that Brazil included the most significant activity (reducing emissions from deforestation) of the five activities identified in paragraph 70 of decision 1/CP.16, in accordance with national capabilities and circumstances. The AT notes that other activities could also be significant in the Amazonia biome, in particular, degradation (see para. 30 above). According to Brazil, the time series available for degradation is too short to allow adequate understanding of the degradation process. The AT notes that, based on the data currently available, degradation trends are not uniform; but overall, for the Amazonia biome, there has been a decreasing trend in forest degradation in recent years.

[26] In addition, the GHG inventory included in the second national communication reports non-CO_2 GHG emissions from biomass burning after forest conversion to agricultural uses for the period 1990–2005.

Furthermore, according to Brazil, the increase in degradation in specific years (e.g. in 2008 and 2011; see figure b.1 in annex III of the modified FREL submission) may be associated with very dry conditions in the previous year. Overall, based on the available information (figure b.3 in annex III of the modified FREL submission), for the entire Amazonia biome, there is no clear evidence that a decrease in deforestation is associated with an increase in degradation. Therefore, the AT notes that the current exclusion of degradation from the FREL appears to be conservative. Overall, the AT commends Brazil for the information provided in annex III of the modified FREL submission, which is already a good starting point for understanding the dynamics of degradation, and for the continuous process in place to improve the quality of these estimates. The AT acknowledges the intention expressed by Brazil to: (i) continue monitoring forest degradation to assess whether the reduction of deforestation is leading to an increase in forest degradation activities (displacement of emissions) and (ii) include emissions from degradation in future FREL submissions when new, adequate data and better information become available.

4. Definition of forest

32. Brazil provided in its submission the definition of forest used in the construction of the FREL. This definition is the same as the one that the Party uses in its national GHG inventory (i.e. minimum area of 0.5 ha, height of 5 m or more and at least 10 per cent canopy cover).

III. Conclusions

33. The information used by Brazil in constructing its FREL for deforestation in the Amazonia biome is transparent and complete and is in overall accordance with the guidelines for submission of information on FRELs (as contained in the annex to decision 12/CP.17).

34. The AT acknowledges that Brazil included in the FREL the most significant activity, the most important biome and the most significant pools in terms of emissions from forests. In doing so, the AT considers that Brazil followed decision 1/CP.16, paragraph 70, on activities undertaken, paragraph 71(b), on elaboration of a subnational FREL as an interim measure, and decision 12/CP.17, paragraph 10, on implementing a step-wise approach. The AT commends Brazil for the information provided on the ongoing work into the development of FRELs for other activities, as well as for other biomes as steps towards a national-level FREL.

35. As a result of the facilitative interactions with the AT during the TA session, Brazil submitted a modified submission that took into consideration the technical inputs by the AT. The AT notes that the transparency and completeness of information improved significantly in the modified FREL submission, without the need to alter the approach or values used to construct the FREL, and commends Brazil for the efforts made. The new information provided in the modified submission, including through the data made available on websites[27] and the examples on how estimates of CO_2 emissions from deforestation were calculated, increased the reproducibility of FREL calculations.

36. The AT notes that, overall, the FREL maintains consistency, in terms of sources for the activity data and the emission factors, with the GHG inventory included in Brazil's national communication.[28]

[27] See the modified FREL submission for the websites referred to by Brazil.

[28] In reference to the scope of the TA, decision 13/CP.19, annex, paragraph 2(a).

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

(a) Digitalization of deforestation maps: it was noted that estimates of deforestation for the years 1996–1997 are less accurate than the rest of the time series. The AT considers that a better estimation of estimates for the years 1996–1997 may be achieved through digitalization of the deforestation maps;

(b) Continuation of improvement of the carbon map: the AT acknowledges the significant efforts made thus far by Brazil to assess the spatial distribution in carbon densities in the Amazonia biome and commends Brazil for continuing to work on updating and improving the carbon map based on new and improved ground data from its first national forest inventory.

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

(a) Treatment of emissions from dead wood (i.e. the inclusion of this pool or the provision of more information on the justification of its omission);

(b) Treatment of non-CO_2 gases, to maintain consistency with the GHG inventory included in the national communication.

39. In assessing the activities included in the FREL,[29] the AT considers that degradation is a significant activity based on the estimates provided by Brazil. The justification provided by Brazil to omit this activity is that the time series available is too short to allow an adequate understanding of the degradation process. Based on the available information, the AT notes that, so far, there is no evidence of displacement of emissions (i.e. decreased deforestation in the Amazonia biome resulting in increasing degradation). In addition, the AT notes that the current exclusion of degradation appears to be conservative in the context of constructing the FREL. Overall, the AT considers better understanding of the relationship between degradation and deforestation as an area for future technical improvement of the FREL. The AT notes that, when emissions from degradation are included in the FREL, Brazil will need to demonstrate how double counting of emissions included under degradation and deforestation is avoided (e.g. for forests that were subject to selective logging and subsequently clear cut).

40. The AT acknowledges and welcomes the intention expressed by Brazil to:

(a) Continue monitoring degradation, in order to assess whether the reduction of deforestation is leading to the displacement of emissions, and to include emissions from degradation in future FREL submissions when new, adequate data and better information become available;

(b) Extend the FREL to other biomes, as a part of efforts to move towards a national FREL;

(c) Continue the ongoing efforts on monitoring complex forest cover change dynamics in the Amazonia biome (including forest regrowth, deforestation of secondary forest and deforestation of previously degraded areas) and of small deforestation events, with the aim of showing that no significant deforestation area is excluded in future FREL submissions.

41. In conclusion, the AT commends Brazil for showing a strong commitment to continuous improvement of its FREL estimates, in line with the step-wise approach. A

[29] In reference to the scope of the TA, decision 13/CP.19, annex, paragraph 2(f).

number of areas for future technical improvements of Brazil's FREL have been identified in this report. At the same time, the AT acknowledges that these improvements are subject to national capabilities and policies, and notes the importance of adequate and predictable support.[30] The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Brazil.

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