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Framework Convention on
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Report of the technical assessment of the proposed forest reference level of Myanmar submitted in 2018

Summary

This report covers the technical assessment of the voluntary submission of Myanmar on its proposed forest reference level (FRL), in accordance with decision 13/CP.19 and in the context of results-based payments. The FRL proposed by Myanmar covers the activities "reducing emissions from deforestation" and "enhancement of forest carbon stocks", which are among the activities included in decision 1/CP.16, paragraph 70. In its submission, Myanmar developed a national FRL. The FRL presented in the original submission, for the reference period 2005–2015, corresponds to 48,607,511 tonnes of carbon dioxide equivalent (t CO_2 eq) per year for the activity "reducing emissions from deforestation" only. As a result of the facilitative process during the technical assessment, the FRL for the activity "reducing emissions from deforestation" was modified to 53,807,463 t CO_2 eq/year. The Party also included the FRL for the activity "enhancement of forest carbon stocks", which has a value of –3,351,332 t CO_2 eq/year. The assessment team notes that the data and information used by Myanmar in constructing its FRL are transparent, complete and in overall accordance with the guidelines contained in the annex to decision 12/CP.17. This report contains the assessed FRL and a few areas identified by the assessment team for future technical improvement, in accordance with the provisions on the scope of the technical assessment contained in the annex to decision 13/CP.19.

Contents

I. Introduction and summary

A. Overview

1.   This report covers the technical assessment (TA) of the submission of Myanmar on its proposed forest reference level (FRL),[1] submitted on 8 January 2018 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 19 to 23 March 2018 in Bonn, Germany, and was coordinated by the UNFCCC secretariat.[2] The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts[3] (hereinafter referred to as the assessment team (AT)): Ms. Maria Fernanda Alcobé (Argentina) and Mr. Markus Didion (Switzerland). In addition, Mr. Thiago de Araújo Mendes (Brazil), 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. The TA was coordinated by Mr. Nalin Srivastava (UNFCCC secretariat).

2.   In response to the invitation of the Conference of the Parties (COP) and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15, and its annex, Myanmar submitted its proposed FRL on a voluntary basis. The proposed FRL 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 FRL or forest reference emission level (FREL), 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.   The objective of the TA is to assess the degree to which the information provided by Myanmar is in accordance with the guidelines for submissions of information on FRELs/FRLs[6] and to offer a facilitative, non-intrusive, technical exchange of information on the construction of the FRL with a view to supporting the capacity of Myanmar for the construction and future improvement of its FRL, as appropriate.[7]

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

5.   Following the process set out in those guidelines and procedures, a draft version of this report was communicated to the Government of Myanmar. The facilitative exchange during the TA allowed Myanmar to provide clarifications and additional information, which were considered by the AT in the preparation of this report.[9] As a result of the facilitative interactions with the AT during the TA, Myanmar provided a modified version of its submission on 28 May 2018, which took into consideration the technical inputs of the AT. The modifications improved the accuracy, completeness and transparency of the submitted FRL. This TA report was prepared in the context of the modified FRL submission. The modified submission, containing the assessed FRL, and the original submission are available on the UNFCCC website.[10]

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[1] The submission of Myanmar 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.
[9] Decision 13/CP.19, annex, paragraphs 1(b), 13 and 14.
[10] https://redd.unfccc.int/submissions.html?country=mmr.

B. Proposed forest reference level

6. The national FRL proposed by Myanmar for the historical reference period 2005–2015 is the annual average of the carbon dioxide (CO_2) emissions associated with "gross deforestation" and the "enhancement of forest carbon stocks". Deforestation is defined as the conversion of forest land use to non-forest land use. The FRL includes only the gross emissions from deforestation and excludes any subsequent emissions and removals from the deforested areas. The enhancement of forest carbon stocks is defined as the "development of new carbon pools resulting from the change of non-forest land use to forest land use". The activity data (AD) used in constructing the FRL were developed by estimating the forest area change using estimates of areas of forest, non-forest and deforestation for the period 2005–2015, excluding the areas subject to forest degradation, forest improvement and forest area gain. The emission factors (EFs) were derived from data from Myanmar's forest inventory at the district level. The FRL presented with the aim of accessing results-based payments for REDD-plus[11] activities corresponds to 53,807,463 t CO_2 eq/year for the activity "reducing emissions from deforestation" and –3,351,332 t CO_2 eq/year for the activity "enhancement of forest carbon stocks".

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 FRL proposed by Myanmar, on a voluntary basis, for a TA in the context of results-based payments, covers the activities "reducing emissions from deforestation" and "enhancement of forest carbon stocks", which are among the five activities included in that paragraph. Pursuant to paragraph 71(b) of the same decision, Myanmar developed a national FRL, which covers its entire territory. For its submission, Myanmar applied a stepwise approach to its development of the FRL, in accordance with decision 12/CP.17, paragraph 10. The stepwise approach enables Parties to improve their FRELs/FRLs by incorporating better data, improved methodologies and, where appropriate, additional pools.

8. The proposed FRL includes the above-ground and below-ground biomass and litter pools for deforestation and the above-ground biomass pool for enhancement of forest carbon stocks. Regarding greenhouse gases (GHGs), the submission includes CO_2 only.

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

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

1. Information that was used by the Party in the construction of the forest reference level

9. For the construction of the FRL, Myanmar used methodologies provided by the Intergovernmental Panel on Climate Change (IPCC) in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) and the IPCC *Good Practice Guidance for Land Use Land-Use Change* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Emissions and removals from deforestation and enhancement of forest carbon stocks were estimated by calculating carbon stock changes in the above-ground and below-ground biomass and litter pools for deforestation and in the above-ground biomass pool for enhancement of forest carbon stocks. Myanmar used tier 2 EFs together with AD derived from stratified random samples generated

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

on the basis of the stratification used in Global Forest Change (GFC) maps,[12] which were adjusted according to Myanmar's forest definition.

10.   The FRL represents the average annual emissions and removals from deforestation and enhancement of forest carbon stocks, respectively, estimated for the reference period 2005–2015. In its original submission, Myanmar defined deforestation as the conversion of forest land use to non-forest land use resulting in a complete loss of above-ground biomass only. Following an observation made by the AT during the TA, Myanmar revised this definition to include a complete loss of carbon stocks in all three carbon pools considered (above-ground and below-ground biomass and litter). This definition does not include land that was temporarily unstocked (and subsequently restocked) during this period. Following another observation made by the AT during the TA, Myanmar revised its initial definition of enhancement of forest carbon stocks to "the establishment of new carbon sequestration capacities resulting from the change of non-forest land use to forest land use". Owing to a lack of data, enhancement of forest carbon stocks thus only includes the gains in carbon stocks in the above-ground biomass pool in land converted to forest land and excludes the gains occurring in forest land remaining forest land.

11.   The EFs for deforestation were based on changes in carbon stocks in the pools above-ground and below-ground biomass and litter. Myanmar used a tier 2 approach for estimating the above-ground biomass using a pan-tropical allometric equation for tree diameter at breast height (dbh) provided in the IPCC good practice guidance for LULUCF. The data on tree dbh were derived from forest inventory data obtained in the period 2005–2017. Myanmar estimated the carbon stocks in below-ground biomass in the four main forest types using the default ratios of above-ground to below-ground biomass provided in the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.4) and used the default values for litter carbon stocks of mature forest provided in the 2006 IPCC Guidelines (volume 4, chapter 2, table 2.2). During the TA, in response to an observation made by the AT, Myanmar explained that, on the basis of the data expected from the national forest inventory (NFI), it plans to include information on biomass carbon stocks in forest land disaggregated by forest type in its future FRL submissions. The Party also informed the AT that for its next FRL submission, planned for 2019, it plans to use different allometric equations for the 12 different forest types.

12.   Myanmar estimated the EFs for enhancement of forest carbon stocks on the basis of net emissions and removals from non-forest land converted to forest land considering both the biomass consumption due to site preparation and the net biomass increment in the above-ground biomass pool. Myanmar applied a tier 1 approach using default values for biomass consumption for all savannah grasslands (mid/late dry season burns) provided in the IPCC good practice guidance for LULUCF (table 3.A.1.13) (10 t dry matter/ha) together with the biomass increment value for tropical dry forests provided in the 2006 IPCC Guidelines (7 t dry matter/ha per year) (volume 4, chapter 4, table 4.10).

13.   Myanmar derived the AD for deforestation by estimating the extent of forest change measured in terms of gross area estimates of forest, non-forest and deforestation during the period 2005–2015, excluding the areas subject to forest degradation, forest improvement and forest area gain. The amount of deforestation (forest loss) was estimated using a sampling approach based on a forest-cover map of 2000 and gross forest-cover loss data for 2001–2015, estimated using the stratified random samples for the years 2005–2015 generated on the basis of the stratification used in GFC maps. Myanmar performed an accuracy assessment of the results using medium to very high-resolution reference data available within the Collect Earth System[13] through a survey using the Open Foris Collect[14] platform.

14.   Myanmar obtained the AD on enhancement of forest carbon stocks from a database on the area of forest plantations maintained by its forest department, considering only the area of plantations established since 2000, which includes state-owned plantations and commercial plantations owned by the private sector since 2006. The data available from the forest department were checked for consistency with other records and reports, such as the

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[12] GFC maps for 2013 published by Hansen, Potapov, Moore, Hancher et al, available at https://earthenginepartners.appspot.com/science-2013-global-forest.

[13] See http://www.mdpi.com/2072-4292/8/10/807/html.

[14] http://www.openforis.org/tools/collect.html.

Food and Agriculture Organization of the United Nations (FAO) Global Forest Resources Assessment (FRA)[15] and the *Statistical Yearbook* prepared by the Statistics Division of the United Nations Secretariat.[16]

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

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

15.   As explained in paragraphs 9 and 13 above, Myanmar used a combination of GFC maps, the Collect Earth tool, tools from the FAO System for Earth Observation Data Access, Processing and Analysis for Land Monitoring[17] together with the forest-cover map for 2000 as the reference to derive the AD for deforestation, and performed an accuracy assessment of the AD using medium to very high-resolution imagery available from the Collect Earth tool. The AT noted that the confusion matrix presented in the initial submission (table 7.2) indicated that the user's and producer's accuracies of the base map, while reasonable for the detection of stable forests (71 and 56 per cent, respectively), were quite low for the detection of forest loss (21 and 42 per cent, respectively).

16.   During the TA, in response to an observation made by the AT, the Party improved the producer's, user's and overall accuracies of the confusion matrix in the modified submission by identifying more change samples in the reference observations. Consequently, the user's and producer's accuracies for identifying the distribution of forest-cover loss increased to 44 and 62 per cent, respectively, while the overall accuracy of the confusion matrix increased to 61 per cent. The AT commends Myanmar for its efforts to improve the accuracy of the base map in the modified submission. However, the AT considers it important for Myanmar to continue its efforts to further improve its methodology for deriving the base map and AD for deforestation by better interpreting samples; obtaining higher-resolution imagery; increasing the sample size of the GFC-based strata map; and developing national maps and/or making better use of the local wall-to-wall maps.

17.   The AT noted that Myanmar's estimated average forest-cover loss of 428,984 ha/year over the period 2005–2015 is considerably lower than the estimate presented in FRA 2015 (546,000 ha/year over the period 2010–2015). During the TA, in response to a question from the AT, Myanmar explained that this inconsistency was caused by the different methodologies used to obtain the AD in the two reports. Myanmar noted that, as opposed to the approach based on wall-to-wall national maps and projections used for the FRA 2015, owing to a lack of information on the accuracy of the wall-to-wall local maps its FRL relies on a sampling-based estimate derived using the Collect Earth methodology and current information. The Party also explained that it is committed to avoiding inconsistencies between different data sets in the future, to the extent possible with reasonable effort. Given that the method used by Myanmar for its FRL also has some limitations (e.g. low user's accuracy), the AT considers it important that Myanmar continue to investigate the reasons for the lack of consistency between the estimates of forest-cover loss reported in the FRL and the estimates reported in other documents, such as FAO FRA and the Party's national communication, with a view to enhancing the accuracy of the FRL in future submissions, and notes this as an area for future technical improvement.

18.   Myanmar defined deforestation as the complete loss of biomass considering no post-deforestation vegetation cover. The AT noted that this assumption is likely to lead to an overestimation of emissions from deforestation because, in most cases, the biomass stocks after deforestation are not zero. During the TA, in response to a question from the AT, Myanmar explained that it used this assumption because of a lack of information and acknowledged this as an area for improvement of future submissions. The Party also explained that it will use data from the new NFI to improve the accuracy of the estimates of emissions from deforestation. The AT notes that estimating emissions from deforestation by including the values of post-deforestation biomass carbon stocks obtained from the NFI

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[15]   See http://www.fao.org/forest-resources-assessment/en/.

[16]   See https://unstats.un.org/unsd/publications/statistical-yearbook/.

[17]   See http://www.fao.org/3/CA1085EN/ca1085en.pdf.

would greatly enhance the accuracy of the FRL, and considers this as an area for future technical improvement.

19.   Myanmar estimated the EFs on the basis of a total of 11,284 inventory plots in 40 of Myanmar's 68 districts owing to difficulties in obtaining inventory data for the remaining 28 districts. The AT noted that the forest inventory primarily covers forests inside permanent forest estates (PFEs) although the forests outside PFEs comprise more than 50 per cent of the total forest area considered in the FRL. While acknowledging that the lack of representation of 28 districts and disproportionally high representation of PFEs may result in biased EFs, Myanmar explained in the FRL submission, and during the TA, that the inventory data do include most of the areas where forest-cover change occurred during the reference period, including forests in 11 out of 15 states and regions of Myanmar comprising all tropical and subtropical forest types, except for mangroves and high mountain temperate hardwood and conifer forests. The Party further explained that, considering this as an area for future technical improvement, it plans to estimate the EFs by including the data from the new NFI that will better represent the districts and areas outside PFEs. The AT notes that, in order to increase the accuracy of the FRL estimates, Myanmar may wish to estimate the EFs by including inventory data for the remaining 28 districts not covered in the NFI, ensuring a balanced representation of the forests outside PFEs, and considers this as an area for future technical improvement.

20.   In its FRL submission (annex 1), Myanmar identified eight dominant forest types in the country. However, Myanmar did not estimate above-ground biomass separately for each of these forest types by stratifying the forest area by forest type; instead it used a single pan-tropical allometric equation from the IPCC good practice guidance for LULUCF to derive the above-ground biomass. During the TA, in response to a question from the AT, Myanmar explained that the value of above-ground biomass for the entire forest obtained using a single pan-tropical equation was only 12 per cent higher than the estimate obtained using different equations according to forest or ecotype, and thus, owing to the insignificance of the difference, it used a single above-ground biomass value to simplify the calculations. The Party further explained that it nevertheless intends to use allometric equations disaggregated by forest type and ecozone in place of a single pan-tropical allometric equation for the next FRL submission (see para. 11 above). The AT, while noting that the 12 per cent difference in the values of above-ground biomass is significant enough to justify further efforts to improve the accuracy of the estimates, considers that stratifying the forests and applying more representative allometric equations according to the forest type would greatly improve the accuracy of Myanmar's FRL, and notes this as an area for future technical improvement. The AT also notes that, for this purpose, Myanmar may consider developing national or regional allometric equations, potentially in consultation with neighbouring countries with similar forest types.

21.   To estimate the removals from forest plantations, Myanmar used an adapted form of an equation from the 2006 IPCC Guidelines together with the default value of net biomass increment for plantations for tropical dry forests from the 2006 IPCC Guidelines. The Party explained in the FRL submission that it used the lower of the default values of the net above-ground biomass increment for tropical dry forests and tropical moist deciduous forests from table 4.10 of the 2006 IPCC Guidelines (7 and 8 t dry matter/ha per year) without providing information on the areas of forest plantations by the two forest types. During the TA, in response to a question from the AT, the Party explained that it used the lower of the two values provided in the 2006 IPCC Guidelines to ensure conservativeness of estimates because it was not possible to distinguish between these two forest types in plantations. The Party further explained that, although the spatial data on plantations included in the new NFI will make it possible to subdivide plantation areas by age class, it did not consider it very relevant to do so for the FRL because the growth values used are the annual average values over standard rotation cycles (mostly 30 years) and, as such, the differences in biomass increment stemming from age classes would balance out over the period of observation. The AT notes, however, that, as per the concept of good practice in the 2006 IPCC Guidelines, estimates of emissions or removals should be accurate (i.e. neither over- nor underestimates so far as can be judged) and not conservative. The AT also notes that, given that the historical reference period used for the FRL (2005–2015) is shorter than the rotation period of a typical forest plantation, using the average value of biomass increment instead of an age-specific one will

lead to an inaccurate estimate of removals. The AT therefore believes that efforts towards identifying forest type and conditions of plantation (e.g. age class) would greatly improve the accuracy of the estimates in the FRL for enhancement of forest carbon stocks, and notes this as an area for future technical improvement. The AT further notes that this may be possible through the new NFI as detailed in the FRL submission (section 10.2).

22.   The AT noted some inconsistencies between the value of area planted annually reported in the FRL submission and that included in Myanmar's country report in FRA 2015.[18] During the TA, in response to a question from the AT, the Party explained that although the reported area planted annually by the Government is the same in the FRL submission as in FRA 2015, the data on private plantations reported in FRA 2015 are the total area of private plantations permitted and not the actual area planted annually. Myanmar further explained that the corrected data on private plantations will be included in FRA 2020. The AT considers that, in order to enhance the transparency of the FRL submission, Myanmar may include an explanation of any lack of consistency in the areas of forest plantations between the FRL and other reports, such as FAO FRA.

23.   The AT noted a lack of transparency in the description of enhancement of forest carbon stocks. Myanmar defined "enhancement of forest carbon stocks" in the modified FRL submission (section 3.3) as "the development of new carbon pools resulting from the change of non-forest land use to forest land use". The AT notes that the terminology "development of new carbon pools" is misleading because it is not consistent with that used in UNFCCC decisions or IPCC guidelines. The AT also noted that some sections of the FRL submission do not accurately describe the pools included in the two activities (above-ground and below-ground biomass and litter for deforestation, and only above-ground biomass for enhancement of forest carbon stocks). For example, section 3.2 states that four carbon pools are included in the calculations of EFs, whereas three pools are considered; and section 5.2 mentions that the FRL includes above-ground and below-ground biomass and litter, without clarifying that it does not include below-ground biomass and litter for the activity enhancement of forest carbon stocks. The AT further noted that references to the 2006 IPCC Guidelines are not correct in some places. For example, section 7.2.2 of the FRL submission refers to "table 3A.13, page 3.184, IPCC, 2006". The AT noted that although there is no such table in the 2006 IPCC Guidelines (the relevant table in the 2006 IPCC Guidelines is table 2.4, in volume 4, chapter 2) the IPCC good practice guidance for LULUCF does contain a table with the relevant fuel biomass consumption values (table 3.A.1.13). The AT considers that Myanmar may enhance the transparency of its future submissions by (1) revising the terminology "development of new carbon pools" to "increase in carbon stocks" or similar wording consistent with that used in IPCC guidelines; (2) accurately describing the pools included in the activities included in the FRL; and (3) providing correct references to the tables in the 2006 IPCC Guidelines for data sources. The AT noted that, in response to its findings, Myanmar revised its definition of enhancement of forest carbon stocks in the modified FRL submission (see para. 10 above).

Description of relevant policies and plans, as appropriate

24.   The AT notes that Myanmar included in its FRL submission limited information on relevant policies and plans, including assumptions about future changes to domestic policies. The FRL submission refers to the National Forestry Master Plan (2001–2030) and the National Biodiversity Strategy and Action Plan of 2015–2020, without elaborating how they would impact future emissions and removals from forests. During the TA, in response to a question from the AT, Myanmar explained that currently policies in several relevant sectors are under development or review and that it will include in its next FRL submission a chapter with more detailed information on relevant policies and plans, including the 10-year Myanmar Reforestation and Rehabilitation Plan (2017–2026); the national REDD-plus strategy; the National Land Use Policy 2016; the Climate Change Strategy and Action Plan; the nationally determined contribution; and the Forest Law Enforcement and Governance and Trade programme. The AT notes that elaboration on relevant policies and plans would enhance the transparency of future submissions.

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[18]   Available at http://www.fao.org/3/a-az283e.pdf.

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

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

26.   The pools included in the FRL are above-ground and below-ground biomass and litter for deforestation and above-ground biomass for enhancement of forest carbon stocks.

27.   Myanmar did not include soil organic carbon in the FRL because of a lack of robust and reliable information at the national level. The Party explained in the submission that it excluded the soil organic carbon pool from the FRL because existing national data on soil organic carbon in forest soils are only from site-specific studies based on non-standardized data collection protocols that have not yet been correlated with land-cover classes at the national scale. Myanmar also noted that the tier 1 default parameters for soil organic carbon stocks in the IPCC good practice guidance for LULUCF are very high and thus do not represent the average conditions of forest soils in Myanmar. The Party further explained that it is developing strategic plans to facilitate the inclusion of soil carbon in future FRL submissions. The AT commends Myanmar for its efforts to obtain better information on soil organic carbon with the aim of including it in future submissions. However, the AT notes that Myanmar did not include a justification for the exclusion of the soil organic carbon pool based on its insignificance. The AT further notes that carbon stock changes in the soil organic carbon pool in tropical forests can be quite significant in the case of land-use conversions and, as such, Myanmar may wish to either undertake efforts (e.g. through national studies and monitoring networks) to include this pool in future FRL submissions or provide a transparent justification for its exclusion based on its insignificance.

28.   Myanmar did not include deadwood in the FRL owing to a lack of robust and reliable information at the national level as well as the unavailability of default values of carbon stocks in these pools in the 2006 IPCC Guidelines and the IPCC good practice guidance for LULUCF. While acknowledging the justification provided, the AT notes that Myanmar did not provide a justification for the exclusion of deadwood from the FRL based on its insignificance and did not present plans to estimate and include this pool in future FRL submissions. During the TA, in response to a question from the AT, the Party explained that it could potentially include deadwood carbon stocks in future FRL submissions on the basis of the measurements of deadwood carried out as part of the planned NFI. The AT therefore notes that, as part of the stepwise approach, Myanmar may wish to either undertake efforts to include the deadwood pool in future FRL submissions or provide a transparent justification for its exclusion based on its insignificance.

29.   Myanmar did not include the below-ground biomass pool in the FRL for the activity enhancement of forest carbon stocks. During the TA, in response to a question raised by the AT, Myanmar explained that the default ratios of below-ground biomass to above-ground biomass provided in the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.4) can be used only to estimate below-ground biomass stocks and not below-ground biomass increment. The AT acknowledges the justification provided by Myanmar. Myanmar also noted that because it is expensive to develop country-specific ratios of below-ground to above-ground biomass at the national scale, it will likely use default values of such ratios from the IPCC guidelines in the future. The AT notes, however, that in order to improve the accuracy of its estimate Myanmar may wish to include below-ground biomass for the activity enhancement of forest carbon stocks by undertaking efforts to develop country-specific ratios of below-ground to above-ground biomass, or by estimating the changes in carbon stock in the below-ground biomass pool using the stock-difference method, applying the above-ground biomass carbon stocks together with the default ratios of below-ground to above-ground biomass carbon stocks provided in the 2006 IPCC Guidelines. The AT also notes that Myanmar may exclude this pool only if it provides sufficient justification for its exclusion based on its insignificance. The AT further notes that Myanmar may consider collaborating with other countries in the region in order to develop more accurate ratios in a cost-effective way.

30.   Myanmar did not include the litter pool for the activity enhancement of forest carbon stocks and did not provide a justification for omitting this pool, although the litter pool is included for the activity reducing emissions from deforestation. The AT noted that it may be

possible for Myanmar to include litter using the IPCC default values, as was done for deforestation. During the TA, in response to question from the AT, Myanmar explained that it could potentially include the litter pool in future FRL submissions on the basis of the measurements of deadwood carried out as part of the planned NFI. The AT considers that the Party may wish to include the litter pool to improve the accuracy of its future FRL submissions or provide a transparent justification for its exclusion based on its insignificance.

31.   In its FRL, Myanmar included CO_2 emissions only. While acknowledging that, as reported in its initial national communication, there were non-CO_2 emissions from land clearing and forest fires, it decided not to include them in the FRL because of their insignificance (non-CO_2 emissions of 637 Gg CO_2 eq out of total emissions of 102,264 Gg CO_2 eq over the reference period). Myanmar also explained in the FRL submission that it did not consider shifting cultivation as deforestation. The AT noted that, in its initial national communication, Myanmar considered all deforested lands to be burned and reported non-CO_2 emissions that were significantly different to those reported in the FRL submission (e.g. for 2005 alone, the non-CO_2 emissions from deforestation reported in the national communication amounted to approximately 6,000 Gg CO_2 eq).

32.   In its response to a question from the AT during the TA, Myanmar explained that it did not include non-CO_2 emissions from shifting cultivation in the FRL because of its inability to distinguish between shifting cultivation areas with long and short fallow periods, noting that it considered the shifting cultivation areas with long fallow period as temporarily unstocked and thus not subject to deforestation. Myanmar further explained that it chose to exclude such emissions owing to the limited availability of reliable data on burned area and forest fires in the spatial database and of information on methods for the estimation of emissions of non-CO_2 gases. The Party noted that in the estimates in its initial national communication it assumed all the deforested lands to be burned, for conservativeness, owing to a lack of reliable data. The Party also noted that it might consider including these emissions with the provision of funding and capacity-building support. The AT noted, however, that shifting cultivation is usually associated with forest fires and, given its importance as a production system in the country, could potentially be a source of a significant amount of non-CO_2 emissions. The AT therefore considers the treatment of non-CO_2 emissions from forest fires (inclusion of these emissions or the provision of more information to justify their exclusion) as an area for future technical improvement so as to maintain consistency with the GHG inventory included in the national communication. Myanmar may consider making efforts to develop accurate databases on burned area and forest fires, including disaggregated data on areas subject to long and short fallow period shifting cultivation, and to use this information together with appropriate EFs and methodological guidance from the 2006 IPCC Guidelines to estimate these emissions.

33.   The AT acknowledges that Myanmar included the most significant activity (reducing emissions from deforestation) of the five activities identified in decision 1/CP.16, paragraph 70, in accordance with its national capabilities and circumstances. The AT notes that, owing to the importance of shifting cultivation with long fallow periods (not considered as deforestation) and the extent of degraded forests shown in the forest-cover status map of Myanmar (1989) provided by the country during the TA, forest degradation could also be significant. According to Myanmar, while further work is required to monitor that activity with confidence, discussions on its definition and methodologies to enable its inclusion in future submissions are currently ongoing. The AT therefore considers the inclusion of the activity "degradation" in the FRL as an area for significant technical improvement of future submissions.

4.   Definition of forest

34.   Myanmar provided in its submission the definition of forest used in the construction of its FRL. The definition is the same as the one the Party uses for its national GHG inventory and its reporting for FAO FRA (i.e. minimum area of 0.5 ha, height of 5 m or more and at least 10 per cent canopy cover).

III. Conclusions

35.   The information used by Myanmar in constructing its FRL is mostly transparent and complete and in overall accordance with the guidelines for submissions of information on FRELs/FRLs (as contained in the annex to decision 12/CP.17).

36.   The FRL presented in the modified submission, for the reference period 2005–2015, corresponds to 53,807,463 t CO_2 eq/year for the activity "reducing emissions from deforestation" and to –3,351,332 t CO_2 eq/year for the activity "enhancement of forest carbon stocks".

37.   The AT acknowledges that Myanmar included in the FRL the most significant activities and the most significant pools in terms of emissions from forests. In doing so, the AT considers that Myanmar followed decision 1/CP.16, paragraph 70, on activities undertaken, paragraph 71(b), on elaboration of a national FRL, and decision 12/CP.17, paragraph 10, on implementing a stepwise approach. The AT commends Myanmar for the information provided on the ongoing work on the development of an FRL for degradation, which it considers a priority.

38.   As a result of the facilitative interactions with the AT during the TA, Myanmar provided a modified submission, which took into consideration the technical inputs of the AT. The AT notes that the accuracy, transparency and completeness of information were improved in the modified FRL submission and commends Myanmar for the efforts made. The new information provided in the modified submission includes a more detailed description of the approach used to derive AD for deforestation. Myanmar also included a new activity, enhancement of forest carbon stocks, in the FRL as part of the modified submission.

39.   The AT notes some inconsistencies in terms of coverage of gases and sources for the AD between the FRL and the GHG inventory included in Myanmar's initial national communication[19] and commends Myanmar for its plans to achieve consistency in data and methods between the FRL and the national GHG inventory to be included in future national communications and biennial update reports.

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

        (a)   Improvement in the methodology for deriving the base map and AD for deforestation by better interpreting samples; obtaining higher-resolution imagery; increasing the sample size of the GFC-based strata map; and developing national maps and/or making better use of the local wall-to-wall maps (see para. 16 above);

        (b)   Investigation of the reasons for the lack of consistency between the estimates of forest-cover loss reported in the FRL and the estimates reported in other documents, such as FAO FRA and the Party's national communication (see para. 17 above);

        (c)   Estimation of the emissions from deforestation by including values of post-deforestation biomass carbon stocks obtained from the NFI (see para. 18 above);

        (d)   Estimation of the EFs by including inventory data for the remaining 28 districts not covered in the NFI, ensuring a balanced representation of the forests outside PFEs (see para. 19 above);

        (e)   Stratifying the forests and using more representative allometric equations according to forest type (see para. 20 above);

        (f)   Identifying forest type and conditions of plantation (e.g. age class) for enhancement of forest carbon stocks (see para. 21 above);

        (g)   Including an explanation on any lack of consistency in the areas of forest plantations between the FRL and other reports, such as FAO FRA (see para. 22 above);

        (h)   Enhancing transparency by (1) using the correct terminology (e.g. "increase in carbon stocks") in place of "development of new carbon pools" for enhancement of forest

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

carbon stocks; (2) accurately describing the pools included for the activities included in the FRL; and (3) providing correct references to the tables in the 2006 IPCC Guidelines for data sources (see para. 23 above);

(i)   Elaboration on relevant policies and plans to enhance the transparency of future submissions in terms of justifying the use of historical average emissions and removals as the FRL (see para. 24 above).

41.   In assessing the pools and gases included in the FRL, pursuant to decision 13/CP.19, annex, paragraph 2(f), the AT identified the following additional areas for future technical improvement:

(a)   Treatment of emissions from soil organic carbon and deadwood in the FRL (i.e. the inclusion of the pools or the provision of more information to justify their omission) (see paras. 27 and 28 above);

(b)   Treatment of emissions from below-ground biomass and litter in the FRL for enhancement of forest carbon stocks (i.e. the inclusion of the pool or the provision of more information to justify its omission) (see paras. 29 and 30 above);

(c)   Treatment of non-CO_2 emissions from forest fires (inclusion of these emissions or the provision of more information to justify their exclusion) to maintain consistency with the GHG inventory included in the national communication (see para. 32 above).

42.   The AT acknowledges and welcomes the intention expressed by Myanmar to:

(a)   Extend the FRL to other activities such as degradation in future FRL submissions when new and adequate data and better information become available, as part of efforts to move towards a more comprehensive FRL;

(b)   Improve the EFs by expanding the forest inventory to the whole forest area of the country; improving the accuracy of the geolocation of sample plots; and better integrating remote sensing data and forest inventory data;

(c)   Standardize the image interpretation methodology in order to improve the detection of different land-cover changes;

(d)   Collect and analyse soil data in order to monitor soil organic carbon.

43.   In conclusion, the AT commends Myanmar for showing a strong commitment to the continuous improvement of its FRL estimates in line with the stepwise approach. A number of areas for future technical improvement of Myanmar's FRL have been identified in this report. At the same time, the AT acknowledges that such improvements are subject to national capabilities and policies, and notes the importance of adequate and predictable support.[20] The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Myanmar.

44.   The table contained in the annex summarizes the main characteristics of Myanmar's proposed FRL.

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

Annex

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

Main features of the FRL		Remarks
Proposed FRL for deforestation (in t CO_2 eq/year)	53 807 463	Myanmar estimated its FRL as gross emissions from deforestation (see para. 6 of this document)
Proposed FRL for enhancement of forest carbon stocks (in t CO_2 eq/year)	–3 351 332	Enhancement currently considers only plantations on land converted to forest and excludes enhancements on forest land remaining forest land (see para. 10 of this document)
Type and duration of FRL	FRL = annual average historical emissions and removals 2005–2015	See paragraphs 6 and 10 of this document
Adjustment for national circumstances	No	
National/subnational	National	Myanmar's FRL covers the whole national territory (see para. 7 of this document)
Activities included	Deforestation	See paragraph 10 of this document
	Enhancement of forest carbon stocks	
Pools included	AB, BB and L for deforestation; AB for enhancement of forest carbon stocks	Myanmar did not include the soil organic carbon and deadwood pools for the activities deforestation and enhancement of forest carbon stocks owing to a lack of robust and reliable data (see paras. 27 and 28 of this document)
		Myanmar did not include BB and L for the activity enhancement of forest carbon stocks owing to lack of information (see paras. 29 and 30 of this document)
Gases included	CO_2	Myanmar did not include non-CO_2 gases owing to their insignificance and a lack of accurate data (see para. 31 of this document)
Forest definition	Included	Minimum area of 0.5 ha, height of 5 m or more and at least 10 per cent canopy cover (see para. 34 of this document). The forest definition used in the FRL is the same as that used in the GHG inventory and in reporting to other international organizations
Relationship with latest GHG inventory	Methods used for the FRL are not fully consistent with latest	Myanmar confirmed that it will work to achieve consistency with the national GHG inventory in the

Main features of the FRL		Remarks
	GHG inventory reported in Myanmar's initial national communication (2012)	future (see para. 39 of this document)
Description of relevant policies and plans	Included	Myanmar reported a limited description of relevant policies and plans in its FRL (see para. 24 of this document)
Description of assumptions on future changes in policies	Not applicable	
Description of changes to previous FREL	Not applicable	
Future improvements identified	Yes	See paras. 27–33 of this document

Abbreviations: AB = above‑ground biomass, BB = below‑ground biomass, FRL = forest reference level, GHG = greenhouse gas, L = litter.