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Revised report on the technical assessment of the proposed forest reference level of Malaysia submitted in 2019


Summary

This report covers the technical assessment of the voluntary submission of Malaysia 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 Malaysia covers the activities “reducing emissions from deforestation”, “sustainable management of forests” and “conservation of forest carbon stocks”, which are among the activities included in decision 1/CP.16, paragraph 70. For its submission, Malaysia developed a national FRL. The FRL presented in the original submission, for the reference period 2005–2015, corresponds to –205,107,000 tonnes of carbon dioxide equivalent per year. As a result of the facilitative process during the technical assessment, the FRL was modified to –205,771,000 tonnes of carbon dioxide equivalent per year. The assessment team notes that the data and information used by Malaysia 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 several areas identified by the assessment team for future technical improvement in accordance with the provisions on the scope of the technical assessment contained in the annex to decision 13/CP.19.

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Abbreviations and acronyms

AD	activity data
AT	assessment team
BUR	biennial update report
CH ₄	methane
CO	carbon monoxide
COP	Conference of the Parties
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
dm	dry matter
DOM	dead organic matter
EF	emission factor
FREL	forest reference emission level
FRL	forest reference level
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change and forestry
NFI	national forest inventory
NO _x	nitrogen oxides
N ₂ O	nitrous oxide
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
TA	technical assessment
2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>

I. Introduction and summary

A. Overview

1. This report covers the TA of the voluntary submission of Malaysia on its proposed FRL,¹ submitted on 19 January 2019, in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 18 to 22 March 2019 in Bonn and was coordinated by the secretariat.² The TA was conducted by two LULUCF experts from the UNFCCC roster of experts³ (hereinafter referred to as the AT): Carlos Bahamondez (Chile) and Zoltan Somogyi (Hungary). In addition, Gervais Ludovic Itsoua Madzous (Congo), an expert from the Consultative Group of Experts, participated as an observer⁴ during the centralized activity in Bonn. The TA was coordinated by Peter Iversen (secretariat).

2. In response to the invitation of the COP and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15 and annex, Malaysia submitted its proposed FRL on a voluntary basis. The proposed FRL is one of the elements⁵ to be developed in the implementation of the activities referred to in decision 1/CP.16, paragraph 70. Pursuant to decision 13/CP.19, paragraphs 1–2, and decision 14/CP.19, paragraphs 7–8, the COP decided that each submission of a proposed FRL, as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments.

3. The objective of the TA is to assess the degree to which the information provided by Malaysia is 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 FRL with a view to supporting the capacity of Malaysia for the construction and future improvement of its FRL, as appropriate.⁷

4. The TA of the FRL submitted by Malaysia 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 Malaysia. The facilitative exchange during the TA allowed Malaysia 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, Malaysia provided a modified version of its submission on 10 June 2019, which took into consideration the technical input of the AT. The modifications improved the clarity and transparency of the submitted FRL without needing to alter the approach used to construct it. 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

B. Proposed forest reference level

6. In decision 1/CP.16, paragraph 70, the COP encouraged developing country Parties to contribute to mitigation actions in the forest sector by undertaking a number of activities, as deemed appropriate by each Party and in accordance with their respective capabilities and national circumstances, in the context of providing adequate and predictable support. The FRL proposed by Malaysia, on a voluntary basis for a TA in the context of results-based

¹ The submission of Malaysia is available at <https://redd.unfccc.int/submissions.html?country=mys>.

² Per decision 13/CP.19, annex, para. 7.

³ Per decision 13/CP.19, annex, paras. 7 and 9.

⁴ Per decision 13/CP.19, annex, para. 9.

⁵ See decision 1/CP.16, para. 71(b).

⁶ Decision 12/CP.17, annex.

⁷ Decision 13/CP.19, annex, para. 1(a–b).

⁸ Decision 13/CP.19, annex.

⁹ Per decision 13/CP.19, annex, paras. 1(b), 13 and 14.

¹⁰ <http://unfccc.int/8414>.

payments, covers the activities “reducing emissions from deforestation”, “sustainable management of forests” and “conservation of forest carbon stocks”, which are three of the five activities referred to in that paragraph. Pursuant to paragraph 71(b) of the same decision, Malaysia developed a national FRL that (according to table 2 of the submission) covers its entire territory. The Malaysian territory consists of Peninsular Malaysia and the States of Sabah and Sarawak in the Malaysian Borneo separated from the peninsula by the South China Sea. For its submission, Malaysia applied a stepwise approach to developing its FRL in accordance with decision 12/CP.17, paragraph 10. The stepwise approach enables Parties to improve their FRELs and/or FRLs by incorporating better data, improved methodologies and, where appropriate, additional pools.

7. The national FRL presented in the modified submission, with the aim of accessing results-based payments for REDD+ activities for 2016–2025, corresponds to $-205,771,000$ t CO₂ eq/year.¹¹

8. The proposed FRL includes the above-ground biomass pool for all three activities selected and the below-ground biomass pool for the activities conservation of forest carbon stocks and sustainable management of forests, but excludes deadwood, litter and mineral soils. Emissions from drained peatlands are included. Regarding GHGs, the submission includes CO₂ as well as CH₄, N₂O, CO and NO_x.

9. The FRL proposed by Malaysia is its third FRL submitted in the context of the application of the stepwise approach in accordance with decision 12/CP.17, paragraph 10. Its previous national FRL was submitted on 15 January 2018 and was subject to a TA in March 2018;¹² it covered the activities “reducing emissions from deforestation”, “sustainable management of forests” and “conservation of forest carbon stocks” for 2016–2025. The previous assessed FRL corresponded to $-213,053,000$ t CO₂ eq/year and was therefore with larger net removals than the FRL proposed in the most recent submission. The assessed FRL proposed in the modified 2019 submission differs from that in the 2018 submission mainly because of the change of the reference period (from 2000–2014 to 2005–2015) and the recalculation of some estimates owing to the availability of new data and better information. For example, EFs for various types of burning were additionally reported: for CH₄ (6.8 g/kg dm), CO (104 g/kg dm), N₂O (0.2 g/kg dm) and NO_x (1.6 g/kg dm). The non-CO₂ emission estimates were also updated. The result of these and other changes is that the emissions and removals were recalculated, with the estimates of non-CO₂ emissions changing the most.

10. For clarification and transparency purposes, Malaysia provided, in the annexes to its submission, which were not subject to the TA, the following information: classification of permanent reserved forests; information on selective management systems; and detailed tables of CO₂ and non-CO₂ emissions and removals. In an additional section of the modified submission, “Procedures for National Forest Inventory”, Malaysia also provided information on its NFI.

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 used by the Party in the construction of its forest reference level

11. Of the activities Malaysia selected for its FRL, reducing emissions from deforestation refers to the conversion of forest to other land uses such as agricultural areas and settlements.

¹¹ In its original 2019 submission, Malaysia proposed a national FRL of $-205,107,000$ t CO₂ eq/year for 2016–2025. The difference between the original and the modified submission is due to the correction of typographical errors. The AT notes that the unit used in the original submission is correct only if the comma used in the numbers in table 14 on p.19 of the original submission is regarded as a decimal point.

¹² See document FCCC/TAR/2018/MYS.

Conservation of forest carbon stocks refers to forest areas that are conserved for biological diversity, soils, flood mitigation and climate amelioration. Sustainable management of forests (referred to in the submission as “sustainable forest management” or “SFM”) covers activities undertaken in forests such as forest resources assessment, logging and silvicultural practices. Activities for conservation of forest carbon stocks and sustainable management of forests are applied to all managed forests in the country. Malaysia considers about 5 per cent of all its forests to be unmanaged, which has decreased over time. Malaysia estimated reference levels separately for each of its selected activities, which are equal to the average historical net removals for 2005–2015, but totalled them to derive one composite (net) value for the FRL.

12. For the construction of its FRL, Malaysia used the 2006 IPCC Guidelines and IPCC software. The AD and methods used for calculating the FRL are consistent with those used for the GHG inventory for the LULUCF sector as included in the third national communication and second BUR, submitted in September 2018.

13. Malaysia used country-specific AD (e.g. deforestation area, forest area by forest type and classification based on degree of protection, and amount of commercial harvest). Deforestation AD were obtained from notices of declassification (degazettement) of the forest reserved for development purposes as reflected in the reduction in total forest area (for 2004–2009) or based on the forest converted annually (for 2009 onward). The total forest area was obtained from gazette notification and geospatial maps, which were developed through analysis of satellite images.

14. Malaysia used a combination of country-specific EFs (e.g. gross tree growth rates estimated on the basis of NFI data, the most important source of country-specific information), default EFs (e.g. biomass conversion and expansion factor from the 2006 IPCC Guidelines) and information from literature (e.g. growth rates for specific forest types). EFs were assigned on the basis of activity: for reducing emissions from deforestation, the category and type of forest converted are the criteria; for conservation of forest carbon stocks, the EF depends on whether the forest was previously logged; and for sustainable management of forests, the EF depends on the forest type. For the activity reducing emissions from deforestation, Malaysia assumed that all the vegetation was cleared and post-deforestation vegetation growth is zero. Allometric information was obtained from Brown (1997).

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

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

15. The FRL proposed by Malaysia is its third one. For all three FRLs, the 2006 IPCC Guidelines were used. The proposed FRLs were submitted in the context of the application of the stepwise approach in accordance with decision 12/CP.17, paragraph 10. The previous FRL submission was subject to a TA in 2018. In its most recent submission, Malaysia described changes (in table 14, p.18) from previously submitted information in accordance with decision 12/CP.17, annex, subparagraph (b). Since the last submission, only the reference period was changed from 2000–2014 in the previous submission to 2005–2015 in the most recent submission.

16. During the TA, the AT identified the following differences and, in some cases, associated inconsistencies in methods and data used between Malaysia’s previous and most recent FRL submissions:

(a) In the previous submission different forest areas were reported for the same categories and forest types. For example, the total area of inland permanent reserved forests in 2012 was reported as 9.54 Mha in the most recent submission, but in the previous submissions as 10.98 Mha. Malaysia explained during the TA that the figures were recalculated because new and improved data became available;

(b) Concerning deforestation areas, there are differences in the total deforestation in 2005 data between those reported in the previous and the most recent submission for the same period. There were some differences in deforestation amounts in the category forests. For example, a total deforested area for State land forests in 2008 of 1,000 ha was reported

in the most recent submission (table 8, p.21), while in the previous submission 15,000 ha was reported for the same year (table 9, p.18). Malaysia explained during the TA that the figures were revised because new and improved data became available;

(c) For the previous submission (table 8), Malaysia used a commercial harvest data set for 2000–2014. For the currently proposed FRL, that data set (table 7 of the submission) was provided for 2005–2015. The AT noted considerable differences in the harvest data for the same years in the two submissions. For example, in the previous submission, Malaysia reported a commercial harvest area of 21.79 million m³ for 2005, whereas 24.29 million m³ was reported in the most recent submission. Malaysia explained during the TA that the figures were revised because there was an error in the previous submission;

(d) The total area of the forests of the country reported in the previous submission was lower than the area reported in the most recent submission (see para. 30 below);

(e) The time series of area estimations is inconsistent between the previous and most recent submission. During the TA, the Party clarified that this is the result of including better and updated information for up until 2017; more specifically, the data on deforestation areas were improved by new information resulting from subnational initiatives.

17. In response to the areas for future technical improvement suggested in the previous TA report, Malaysia provided better and updated information on unmanaged land and peat swamp forest. The AT commends the Party for its efforts to improve transparency.

18. During the TA, the AT requested the Party to provide clarification, references, worksheet calculations, data, information and documents. The AT commends the Party's efforts to:

(a) Explain the AD-related remote sensing issues in relation to pre-processing, methods for classification and change detection techniques;

(b) Explain the methodologies and data used for its NFI, and provide reference documents.

19. Land identification is a key step in the estimation of emissions and removals from forests. In this regard, the AT identified the following transparency issues:

(a) The total reported forest area of the country remained unchanged although the Party reported deforestation (i.e. loss of forest area). Malaysia explained during the TA that there was also an increase in the forest area owing to the implementation of two national initiatives (Central Forest Spine and Heart of Borneo) focused on connecting fragmented forests as part of landscape management. In addition, some areas have undergone natural regeneration and now meet the forest definition. The AT considers that the additional information provided by Malaysia, if included in the submission, would considerably increase the transparency of the proposed FRL;

(b) The drivers of deforestation are not thoroughly developed in the FRL submission. Malaysia clarified during the TA that development needs are the main drivers of deforestation. From 2015 to 2021 there are three major projects by the Government that will contribute to deforestation;

(c) The reported total forest area of the country comes from the gazette system and geospatial maps, which are used to determine forest boundaries of the areas included in new notifications. In response to a request from the AT, Malaysia clarified that the gazette system notification is given once the ground boundary survey has been completed;

(d) More detailed information on the geospatial maps, their origin and official status was required. Malaysia clarified during the TA that remote sensing imagery is used biennially to update the geospatial maps, which are official maps maintained and updated by the respective forest departments;

(e) Insufficient information was provided by the Party in the submission regarding the change in method used to detect deforestation. Deforestation is considered when a forest is degazetted. In its response to a question from the AT, Malaysia added that, as part of the

national forest monitoring system, changes in forest areas, whether deforestation or gaps in canopy, are monitored with geospatial methods using biannually updated images;

(f) In response to a request from the AT to explain why all the data on deforestation areas in table 8 of the submission were rounded to the nearest thousand, the Party confirmed that the data were rounded up after the land had been defined as deforested. The AT considers that reporting unrounded numbers would enhance the transparency of the proposed FRL;

(g) Further explanation was required of the monitoring applied of mountainous areas. During the TA, Malaysia explained that it uses remote sensing techniques;

(h) In response to questions raised by the AT related to the verification of and errors concerning land identification, Malaysia also explained that the verification of classification(s) was based on 50 samples, the classification method corresponded to the maximum likelihood method with a total number of training areas of 5–10, by class, and that the verification was performed by checking against ground-truthed information. Malaysia also provided the confusion matrix;

(i) Owing to insufficient information, it is not clear how unmanaged forests were delineated;

(j) For clarity, the AT requested the Party to provide a matrix identifying the methods used to estimate the areas of totally protected areas, permanent reserve forests and State land forests;

(k) The reported area damaged by fire is very small. During the TA, Malaysia explained that forest fires have not been a major concern in the country given the effective prevention and control methods applied.

20. The AT notes that most of the time series provided in the different tables in the FRL submission are highly variable. At the request of the AT, the Party explained that the variability of the deforestation time series is closely linked to the implementation of the five-year development plans undertaken by the country, and that, in years with big projects such as the construction of highways, railways or residential or commercial buildings, high rates of deforestation are expected, while much less deforestation usually occurs in the other years.

21. To estimate biomass-related emissions and removals for the activities sustainable management of forests and conservation of forest carbon stocks, Malaysia applied the gain–loss method and estimated the gross emissions from forest land converted to settlements (excluding subsequent emissions and removals from the deforested areas). The AT notes that the largest component of the submitted FRL is the net sink in forests under the activity sustainable management of forests (–195,030 kt CO₂ eq/year as reported in table 14 of the submission). The AT also notes that this is an unusually large figure and transparent information is needed to justify it. The AT further notes that a number of transparency issues related to the values of the variables used in the gain–loss equation were identified in the Party’s first FRL submission by the AT in the TA report of that submission in relation to biomass growth rate, mortality, harvests, biomass conversion expansion factor and carbon fraction.¹³ Based on the information received from Malaysia during the TA, the AT believes that these issues have not yet been appropriately addressed owing to a lack of funding and are still important areas for future improvement.

22. During the TA, in accordance with decision 13/CP.19, annex, paragraph 2(c), the AT attempted to reproduce the estimates reported for the activities sustainable management of forests and conservation of forest carbon stocks. The AT used three estimation methods and shared the results with the Party. One estimate was based on Malaysia’s gain–loss estimation method using data provided by the Party; the second was based on the same method but default values from the 2006 IPCC Guidelines were used (where the highest values of the range of net growth estimates were used instead of Malaysia’s mortality estimates and gross growth rates); and the third was based on the stock-difference method and area-specific biomass values were used that were provided to the AT by Malaysia during the TA. All three estimates cover CO₂ emissions from the above-ground biomass pool only. Gaps were filled

¹³ See document FCCC/TAR/2015/MYS, paras. 19–20.

where necessary using expert judgment. All three estimations undertaken by the AT resulted in much smaller amounts of removals than Malaysia had reported in its submission. In this regard, the AT notes that the difference between the area-specific biomass stock from NFI 4 of the Party (2000–2004) and NFI 5 (2010–2014), which can be used for the stock-difference estimate, is very high, even considering the strong El Niño in 1997 and 1998. For example, Malaysia reported 228.92 t dm ha⁻¹ for permanent reserve forests for NFI 5 but only 134.98 t dm ha⁻¹ for NFI 4. The difference is 94 t dm ha⁻¹, which (assuming a period of 10 years and no harvests) would require a net area-specific growth (gross growth minus mortality) of 9.4 t dm ha⁻¹ year⁻¹. As a comparison, the values presented in the 2006 IPCC Guidelines (vol. 4, chap. 4, table 4.9) for tropical rainforests or tropical moist deciduous forests in continental or insular Asia are in the range of 3–13 t dm ha⁻¹ year⁻¹ for forests >20 years and forests <20 years, respectively. The value of 9.4 t dm ha⁻¹ year⁻¹ would imply that most of the forest should be below 20 years of age, which does not seem to be the case. If harvests and mortality are factored in, the tree growth should be even higher, which seems improbable, or at least requires validation. The AT considers the analysis of this issue to be an area for future technical improvement subject to availability of funds.

23. When using country-specific forest-related data, as in the case of Malaysia's estimates, a thorough understanding of the NFI is needed, including the uncertainty of the data and how the data were verified. The AT commends the Party for providing additional information in the modified submission, thereby improving transparency.

24. Furthermore, a website is mentioned in the submission as a reference for detailed information on the calculations; however, the website does not give any information on estimations. During the TA, Malaysia explained that the site is still being upgraded because of the restructuring of ministries and their functions. The AT considers that relevant and detailed information on the calculations should be included in future submissions to ensure transparency.

25. The AT identified further transparency issues related to the estimation of biomass carbon stock changes for the activities sustainable management of forests and conservation of forest carbon stocks. It is not clear from the submission:

(a) How tree growth rate (increment) was (separately) estimated for unlogged forests, forests with a recent logging history, previously logged forests where biomass could again reach saturation of biomass because of previous growth, and mangrove forests;

(b) Whether the growth rate is gross or net (i.e. includes or excludes mortality);

(c) How mortality rates in pre-harvest and post-harvest situations, and how losses due to natural disturbances, were estimated;

(d) How biomass values (reported in table 9) are defined; specifically, whether they cover above-ground biomass only or whether they include below-ground biomass and whether these values could be used for verification.

26. The AT noted a lack of transparency in the submission regarding some other EFs, namely the area-specific biomass stock values used and the method used for estimating biomass carbon stock changes resulting from deforestation. The AT notes that completeness is necessary in this regard to ensure that the submission is completely in accordance with decision 13/CP.19, annex, paragraph 2(c) (i.e. that information is provided that allows for the reconstruction of the FRL). During the TA, Malaysia provided the AT with the necessary detailed information. The AT commends Malaysia for the clarification but considers that including this information in future submissions would increase transparency.

27. Regarding the uncertainty of the estimations of carbon stock change, as well as other emissions, the AT noted that only some qualitative and quantitative information was reported in the submission, and no quantitative uncertainty analysis had been done. During the TA, Malaysia confirmed that this had been identified as an area for future technical improvement. The AT commends the Party for its planned efforts to make improvements in this crucial area in order to further develop the accuracy of the estimations.

28. The AT noted a lack of information on the following issues relating to estimation methodology:

(a) The scale of the Government's plan to establish large-scale forest plantations to ensure a continuous supply of timber, given that at least some of the emissions and removals caused by the programme would not be part of the FRL. During the TA, Malaysia clarified that 2 Mha forest plantations are planned for the programme;

(b) How (i.e. using which data from the GHG inventory) the various FRL components had been estimated. During the TA, Malaysia explained that conservation of forest carbon stocks and sustainable management of forests were reported using estimates reported for the GHG inventory categories land remaining forest land and land converted to forest land, whereas deforestation was considered to be equivalent to forest land converted to settlements.

29. The AT commends Malaysia for the clarifications provided during the TA, but considers reporting the information referred to above in future submissions, including on how emissions and removals from land converted to forest land are treated under either conservation of forest carbon stocks or sustainable management of forests, to be an area for future technical improvement.

30. The AT noted a lack of consistency between the FRL estimates, harvest statistics and deforestation statistics over subsequent submissions. During the TA, Malaysia clarified that there was an error in the second FRL submission of double deduction of forest plantations. The AT commends Malaysia for its efforts to improve consistency.

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

31. In the construction of its FRL, Malaysia considered the following policies: (1) the National Policy on Climate Change, which promotes prudent management of resources, enhanced environmental conservation and the strengthening of institutional and implementation capacities to reduce negative consequences of climate change; (2) the National Biological Diversity Policy (2015–2025), aimed at conserving Malaysia's biological diversity and using its components in a sustainable way; (3) directives from the National Land Council that set annual allowable cuts and maximum cutting limits; (4) the National Forest Policy; and (5) the 10th Malaysia Plan (2011–2015), which includes specific strategies to ensure the sustainable utilization of all natural resources in the country.

32. The AT noted a lack of transparency related to the time frames for the National Policy on Climate Change and the possible revision of the National Forest Policy, which was adopted in 1992. During the TA, Malaysia clarified that there is no time frame for the National Policy on Climate Change and no further review or upgrade of the National Forest Policy is planned.

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

33. According to decision 12/CP.17, annex, subparagraph (c), 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.

34. The pools included in Malaysia's FRL are above-ground biomass and below-ground biomass for the activities sustainable management of forests and conservation of forest carbon stocks, and above-ground biomass for deforestation. DOM (deadwood and litter) and organic soil carbon in mineral soils were not included on the assumption that the pools are in equilibrium. However, emissions from organic soils for drained peatlands and emissions from forest fires were considered.

35. The AT notes that carbon stock changes in the below-ground biomass and DOM pools, and possibly in mineral soils, can be significant during conversions of forest land to other land uses. During the TA, Malaysia explained that it has collected data on leaf litter but did not include them in the construction of the FRL because the current version of the IPCC software is applicable to tier 1 only. Concerning deforestation, the AT notes that the 2006 IPCC Guidelines provide default root-to-shoot ratios and a method for estimating carbon stock change in litter together with the corresponding default EFs. A similar method in combination with national data could also be applied for the deadwood pool. The AT commends Malaysia on its intention to apply better information on these pools in the future,

and considers the estimation of carbon stock changes for these pools to be an important area for future technical improvement (e.g. when an updated version of the IPCC software becomes available).

36. Regarding GHGs, the FRL includes CO₂, CH₄ and N₂O. In relation to the soil organic matter pool, only CO₂ and direct N₂O emissions associated with the drainage of organic soils are included. No clear information was provided on the estimation methods or, more specifically, on the equations used for estimating CO₂ and non-CO₂ emissions from biomass burning and forest fires. The AT notes as an area for future technical improvement the reporting of transparent information on non-CO₂ gases and how consistency is maintained in this regard with the GHG inventory included in the Party's national communication or BUR.

37. The AT acknowledges that Malaysia included three of the five activities identified in decision 1/CP.16, paragraph 70, in accordance with its national capabilities and circumstances. The AT notes that other activities may also be significant, in particular forest degradation. The AT considers including forest degradation to be an area for future technical improvement, and acknowledges the Party's intention to further improve future FRL submissions when new and adequate data and better information become available, as part of the stepwise approach.

4. Definition of forest

38. Malaysia provided in its submission the definition of forest used in the construction of its FRL. The definition is the same as the one used for the national GHG inventory but different from that used for reporting to the Food and Agriculture Organization of the United Nations for the Global Forest Resources Assessment. The reason for the difference is that applying the same definition would mean that some agricultural land and rubber plantations would be considered as forest for the FRL, but these areas are not subject to the National Forestry Act. In relation to the FRL, the forest definition threshold values are minimum area of 0.5 ha, height of 5 m or more at maturity and at least 30 per cent canopy cover at maturity. Rubber plantations are considered cropland.

III. Conclusions

39. In general, the information used by Malaysia in constructing its FRL for “reducing emissions from deforestation”, “sustainable management of forests” and “conservation of forest carbon stocks” is transparent, complete and in overall accordance with the guidelines for submissions of information on reference levels. However, the AT identified several areas for future technical improvement relating to transparency, completeness and accuracy during the TA. The AT considers that all the additional information provided by Malaysia during the TA facilitated a better understanding of the elaboration of the FRL and the identification of future improvements.

40. The FRL presented in the submission is Malaysia's third FRL. The previous FRL was submitted on 15 January 2018 and was subject to a TA in 2018; it covered the same three activities for 2016–2025.

41. The FRL presented in the most recent modified submission, for the reference period 2016–2025, corresponds to –205,771,000 t CO₂ eq/year (see para. 7 above).

42. The AT acknowledges that Malaysia included in its FRL the most significant activities (see para. 37 above) as well as the most significant pools and gases (see paras. 34 and 36 above) in its estimates. The AT considers that, in doing so, Malaysia followed decision 1/CP.16, paragraph 70, on activities undertaken, and decision 12/CP.17, paragraph 10, on applying the stepwise approach. The AT commends Malaysia for continuing its work to develop FRLs for other activities as a step towards including in its FRL all the activities listed in decision 1/CP.16, paragraph 70.

43. As a result of the facilitative interactions with the AT during the TA, Malaysia provided a modified submission. The AT commends Malaysia for its efforts. However, the AT notes that the modified submission only represents minor improvements (see para. 9 above) and does not build on the technical input of the AT (see para. 22 above). The AT also

notes that including in the FRL submission the information provided during the TA would significantly improve transparency and completeness.

44. The AT notes that, overall, the FRL maintains consistency, in terms of sources of AD and EFs, with the GHG inventory included in Malaysia's third national communication and second BUR.¹⁴

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

- (a) Improving the system used for land identification and its description (see para. 19 above);
- (b) Improving time-series consistency (see para. 20 above);
- (c) Re-estimating the net sink in forests under the activity sustainable management of forests using the technical input from the TA of the first FRL submission and the technical input of the current AT (see paras. 21–22 above);
- (d) Improving the transparency of the reporting (see para. 25 above), especially relating to gross and net growth rates, mortality, losses due to natural disturbances, and post-harvest growth (see para. 25(c) above), as well as to some EFs and the method used for estimating biomass carbon stock changes resulting from deforestation (see para. 26 above);
- (e) Providing a more detailed uncertainty analysis (see para. 27 above);
- (f) Providing additional information on estimation methodology (see para. 28 above);
- (g) Improving consistency between reported statistics over subsequent submissions and explaining any differences (see para. 30 above);
- (h) Improving transparency relating to some policy issues (see para. 32 above).

46. Pursuant to decision 13/CP.19, annex, paragraph 2(f), in assessing the pools and gases included in the FRL, the AT noted that, with the exception of the DOM and, possibly, mineral soils pool, the pools excluded by Malaysia are likely to be insignificant in the context of the FRL. Nevertheless, pursuant to decision 13/CP.19, annex, paragraph 3, the AT considers assessing these additional pools and including forest degradation (see paras. 35 and 37 above) to be further areas for future technical improvement.

47. The AT acknowledges and welcomes the Party's intention to:

- (a) Obtain better information on soil organic carbon;
- (b) Report transparent information on non-CO₂ gases, which is considered by the AT as an issue of consistency with the GHG inventory included in the Party's national communication or BUR;
- (c) Provide better, relevant and more detailed information on the development of the FRL together with an uncertainty analysis.

48. In conclusion, the AT commends Malaysia for showing strong commitment to the continuous improvement of its FRL estimates in line with the stepwise approach. A number of areas for the future technical improvement of Malaysia'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 providing adequate and predictable support.¹⁵ The AT also acknowledges that the TA was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Malaysia.

49. The table contained in annex I summarizes the main features of Malaysia's proposed FRL.

¹⁴ In reference to the scope of the TA, as per decision 13/CP.19, annex, para. 2(a).

¹⁵ Per decision 13/CP.19, annex, para. 1(b), and decision 12/CP.17, para. 10.

Annex I

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

	<i>Main features of the FRL</i>	<i>Remarks</i>
Proposed FRL	-205 771 000 t CO ₂ eq/per year	See paragraph 7 of this document
Type and reference period of FRL	FRL = average of historical emissions and removals in 2005–2015	See paragraph 11 of this document
Application of adjustment for national circumstances	No	
National/subnational	National	See paragraph 6 of this document
Activities included	Reducing emissions from deforestation Conservation of forest carbon stocks Sustainable management of forests	The FRL includes gross emissions from deforestation resulting from the conversion of forests and excludes any subsequent emissions and removals from the deforested areas (see para. 14 of this document). For sustainable management of forests and conservation of forest carbon stocks, the FRL includes net removals (see para. 21 of this document)
Pools included	Above-ground biomass and below-ground biomass for sustainable management of forests and conservation of forest carbon stocks; above-ground biomass for deforestation	The carbon stock changes in the DOM and soil carbon pools were assumed to be in equilibrium (see para. 34 of this document)
Gases included	CO ₂ , CH ₄ and N ₂ O	Non-CO ₂ emissions from forest fires and drained organic soils were reported (see para. 36 of this document)
Forest definition	Included	Minimum area of 0.5 ha with minimum crown cover of 30% and minimum tree height of 5m at maturity. Rubber plantations are excluded (see para. 38 of this document)
Consistency with latest GHG inventory	Methods used for estimating the FRL are consistent with the latest GHG inventory (2018)	Malaysia used the 2006 IPCC Guidelines for its FRL and IPCC software (see para. 12 of this document)
Description of relevant policies and plans	Included	See paragraphs 31–32 of this document

<i>Main features of the FRL</i>		<i>Remarks</i>
Description of assumptions on future changes to domestic policies	Not applicable	
Description of changes to previous FRL	Included	For changes identified in the submission, see paragraph 15 of this document. For other changes, see paragraph 16 of this document
Identification of future technical improvements	Included	Several areas for future technical improvement were identified (see paras. 45–46 of this document)

Annex II

Documents and information used during the technical assessment

Reference documents

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

Reports on the TA of the proposed FRLs of Malaysia submitted in 2015 and 2018. FCCC/TAR/2015/MYS and FCCC/TAR/2018/MYS. Available at <https://redd.unfccc.int/submissions.html?country=mys>.
