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Report of the technical assessment of the proposed forest reference level of Malaysia submitted in 2018

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 2000–2014, corresponds to –213,053,000 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 a few areas identified by the assessment team for future technical improvement, in accordance with the provisions on the scope of the technical assessment contained in the annex to decision 13/CP.19.

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I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of Malaysia on its proposed forest reference level (FRL),[1] submitted on 15 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)): Mr. Raehyun Kim (Republic of Korea) and Mr. Iordanis Tzamtzis (Greece). In addition, Mr. Thiago de Araújo Mendes, an expert from the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, participated as an observer[4] during the centralized activity in Bonn. The TA was coordinated by Mr. Peter Iversen (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, Malaysia 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 forest reference emission level (FREL) and/or FRL, as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments, pursuant to decision 13/CP.19, paragraphs 1 and 2, and decision 14/CP.19, paragraphs 7 and 8.

3. The 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 levels[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 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]

B. Proposed forest reference level

6. The FRL proposed by Malaysia for the historical reference period 2000–2014 covers the entire national territory and is based on the annual average historical net carbon dioxide (CO_2) removals associated with the activities "reducing emissions from deforestation", "sustainable management of forests" and "conservation of forest carbon stocks". Activity data (AD) were derived from geospatial maps and information obtained from gazettement notifications. Information on emission factors (EFs) was obtained from historical data sets, such as national forest inventories (NFIs), and scientific literature, as well as from the

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

Intergovernmental Panel on Climate Change (IPCC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). The proposed FRL, which is presented with the aim of accessing results-based payments for REDD-plus[10] activities for 2016–2025, corresponds to –213,053,000 tonnes of carbon dioxide equivalent (t CO_2 eq) per year.

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 Malaysia, on a voluntary basis, for a TA in the context of results-based 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 included in decision 1/CP.16, paragraph 70. Pursuant to paragraph 71(b) of the same decision, Malaysia developed a national FRL covering its entire territory. For its submission, Malaysia applied a stepwise approach to the 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. Malaysia provided information on the scope and scale of its FRL and the methodology and assumptions used in its construction in its FRL submission (sections 4.1–4.4). All forest land in the territory of Malaysia (Peninsular Malaysia and the States of Sabah and Sarawak), which covered a total area of 18,277.60 kha in 2014, is classified under three categories, namely totally protected areas (TPA), permanent reserved forest (PRF) and State land forests (SLF). For the activities "sustainable management of forests" and "conservation of forest carbon stocks", the FRL covers all managed forest land classified as TPA, PRF or SLF, accounting for a total area of 17,290.21 kha in 2014, but excludes net removals from forest plantations and unmanaged forest land. With regard to deforestation, the FRL includes gross emissions resulting from the conversion of any forest in the country (including unmanaged land and forest plantations), but excludes any subsequent emissions and removals from the deforested areas.

9. The proposed FRL includes the above-ground and below-ground biomass pools, but excludes litter and deadwood. In relation to the soil organic matter pool, only CO_2 and direct nitrous oxide (N_2O) emissions associated with the drainage of organic soils are included. Regarding greenhouse gases (GHGs), the FRL includes CO_2, methane (CH_4) and N_2O.

10. This is the Party's second FRL submission in the context of the implementation of the stepwise approach in accordance with decision 12/CP.17, paragraph 10. Its previous FRL[11] was submitted on 8 December 2014 and was subject to a TA in February 2015.[12] It covered the activity "sustainable management of forests" and was based on historical average CO_2 emissions and removals from production forests within PRF over two periods:

(a) The average net CO_2 removals in 1992–2005 of –183.55 Mt CO_2/year was used as the reference level for 2006–2010;

(b) The average net CO_2 removals in 1997–2010 of –197.83 Mt CO_2/year was used as the reference level for 2011–2015.

[10] 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.

[11] Malaysia's previous FRL submission is available at https://redd.unfccc.int/files/modified_submission_malaysia_frel_final.pdf.

[12] The report on the technical assessment of the proposed forest reference level of Malaysia submitted in 2014 is contained in document FCCC/TAR/2015/MYS.

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

11. In the construction of its FRL, Malaysia used methodologies that are consistent with the 2006 IPCC Guidelines and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* (hereinafter referred to as the Wetlands Supplement). The FRL is based on the annual average historical net CO_2 eq removals associated with the three activities covered for the reference period 2000–2014, while the results period is 2016–2025. The FRL is not subject to adjustment for national circumstances under the provisions of decision 12/CP.17, paragraph 9.

12. Malaysia provided information on the methodology, assumptions, AD and EFs used in the construction of the FRL in its submission (sections 4.1–4.4). The following AD were used:

(a) Historical data on total forest area obtained from gazettement notifications and geospatial maps covering the reference period 2000–2014. More specifically, data from SPOT 5 images with a spatial resolution of 10 x 10 m were used. Data are available for seven time periods: 2000–2002, 2002–2004, 2004–2006, 2006–2008, 2008–2010, 2010–2012 and 2012–2014. Additional disaggregated land area data are available for each of the three forest categories: protection areas and forests within TPA; inland forests, peat swamp forests, mangrove forests, fallow forests and unmanaged forests within PRF; and natural forests, drained peat swamp forests, fallow forests and unmanaged forests within SLF (see table 7 of the FRL submission);

(b) Disaggregated historical data on total deforestation area for SLF, PRF and peat swamp forests for the reference period 2000–2014 (see table 9 of the FRL submission);

(c) Historical data on annual commercial harvest of industrial roundwood from managed forest land (under bark) within PRF and SLF for 2000 onward (see table 8 of the FRL submission);

(d) Data on the area affected by fires in the reference period, which ranges from 6 to 2,683 ha/year. Since 1997, in accordance with Malaysia's zero burning policy, burning has only been allowed under special conditions and a permit must be issued by the Department of Environment (see table 3 of the FRL submission).

13. Malaysia used the following EFs and other parameters in the construction of its FRL:

(a) Biomass growth rates for the eight forest types taken from Malaysia's NFIs and relevant literature[13, 14] (see table 10 of the FRL submission). The net annual increment ranges from 3.4 to 11.0 t dry matter (dm) ha^{-1} $year^{-1}$;

(b) A root-to-shoot ratio of 0.48 from the Wetlands Supplement for mangrove forests and a single root-to-shoot ratio of 0.18 derived from Niiyama et al. (2010)[15] for all other forests;

[13] Ong JE. 1993. Mangroves – a carbon source or sink. *Chemosphere*. 27(6): pp.1097−1107.

[14] Kenzo T, Ichie T, Hattori D, Kendawang JJ, Sakurai K, Ninomiya I. 2010. Changes in above- and below-ground biomass in early successional tropical secondary forest after shifting cultivation in Sarawak, Malaysia. *Forest Ecology and Management*. 260(5): pp.875−882.

[15] Niiyama K, Kajimoto T, Matsuura Y, Yamashita T, Matsuo N, Yashiro Y, Ripin A, Kassim AR and Noor NS. 2010. Estimation of root biomass based on excavation of individual root systems in a primary dipterocarp forest in Pasoh Forest Reserve, Peninsular Malaysia. *Journal of Tropical Ecology*. 26(3): pp.271−284.

(c) A single biomass conversion and expansion factor (BCEF) of 1.05 (t dm) m^3 from the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.5), to expand and convert commercial roundwood volume to total above-ground biomass dry matter;

(d) A single carbon fraction (CF) of 0.47 t carbon (C) $(t\ dm)^{-1}$ from the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.3), to convert dry matter into carbon;

(e) Single average above-ground biomass stocks for inland forests, peat swamp forests and SLF (see table 10 of the FRL submission), ranging from 140 to 194 t dm ha^{-1}, derived from Malaysia's NFIs;

(f) Default EFs from the 2006 IPCC Guidelines for CO_2 emissions from drained peat swamp forests of 1.36 t C ha^{-1} $year^{-1}$ (volume 4, chapter 4, table 4.6) and 8 kg N_2O-$_N$ ha^{-1} for direct N_2O emissions from managed organic soils (volume 4, chapter 11, table 11.1).

14. The FRL is based on the assumptions that existing domestic policies will be maintained (see para. 47 below) and that harvesting will continue to be subject to a regulatory framework according to which the total harvest cannot exceed 85 m^3 ha^{-1} in order to ensure that environmental values and the productive capacity of the forests are maintained. Malaysia did not include consideration of impacts of natural disturbances (e.g. floods, forest fires) or of future changes in policy in the construction of the FRL.

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. In its FRL submission Malaysia did not provide an overall description of changes from previously submitted information in accordance with decision 12/CP.17, annex, subparagraph (b); rather, such information can be found across several sections of the submission. The Party has made the following changes to its FRL since the previous submission:

(a) The previous FRL did not cover the entire forest area of the national territory and covered only the activity "sustainable management of forests" for production forests within PRF. The FRL now proposed by Malaysia covers the conversion of any forest in the country for "reducing emissions from deforestation", and all managed forest land within TPA, PRF and SLF, excluding forest plantations and unmanaged forest land, for "sustainable management of forests" and "conservation of forest carbon stocks" (see para. 8 above);

(b) For the previous FRL, the average of net CO_2 removals for 1992–2005 of –183.55 Mt CO_2/year was used as the reference level for 2006–2010, and the average of net CO_2 removals for 1997–2010 of –197.83 Mt CO_2/year as the reference level for 2011–2015. The currently proposed FRL is based on the annual average historical net CO_2 eq removals in 2000–2014 of –213.053 Mt CO_2 eq/year, used as the reference level for 2016–2025;

(c) For the previous FRL, Malaysia used a land area data set for inland, peat swamp and mangrove forests within PRF for 1990–2012 (see table 14 of the previous FRL submission). For the currently proposed FRL, the data set for the total forest area (see table 7 of the FRL submission) was recalculated for those two forest types for 2000–2012, but an explanation for the recalculation has not been provided. For example, in the previous FRL submission an area of 11.42 Mha inland forests in 2012 was reported, whereas in the current submission Malaysia reported an area of 10.20 Mha. The changes in the reported areas between the submissions range from –11 per cent for 2012 to –16 per cent for 2008 for inland forests, from –1 per cent for 2004 to +2 per cent for 2005 for peat swamp forests, and from –2 per cent for 2004 to +2 per cent for 2012 for mangrove forests;

(d) For the previous FRL, Malaysia used a commercial harvest data set for 1990–2012 (see table 15 of the previous FRL submission). For the currently proposed FRL, that data set (see table 8 of the FRL submission) was recalculated for 2000–2012, but an explanation for the recalculation was not provided. For example, in the previous FRL submission Malaysia reported a commercial harvest of 15.89 million m^3 for 2012, whereas in the current submission 14.65 million m^3 was reported. The changes in commercial harvest between the submissions range from –3 per cent for 2000 to –8 per cent for 2012;

(e) The previous FRL did not include CO_2 or direct N_2O emissions associated with drained organic soils, or CO_2, CH_4 and N_2O emissions from biomass burning, whereas such emissions are included in the current FRL.

16. The difference between the currently proposed and previous FRL amounts to –29.50 Mt CO_2 eq/year (–16.07 per cent) (for the first period of the previous FRL) and –15.22 Mt CO_2 eq/year (–7.69 per cent) (for the second period of the previous FRL).

17. The AT notes that the inclusion of a specific section presenting a description and explanation of all changes from previously submitted information in accordance with decision 12/CP.17, annex, subparagraph (b), would further enhance the transparency of the FRL submission.

18. In response to the areas for future technical improvement identified by the previous AT in relation to the Party's previous FRL, Malaysia has implemented a number of improvements. The current AT commends Malaysia for its efforts to:

(a) Include additional activities in the FRL, namely "reducing emissions from deforestation" and "conservation of forest carbon stocks" (see paras. 28 and 35(h) of the report on the technical assessment of Malaysia's previous FRL (TAR 2015));

(b) Provide information (in table 9) on the gross areas of conversion of forest land to other land uses for 2000–2014 (see para. 31 of TAR 2015);

(c) Provide estimates of CO_2 and direct N_2O emissions from drainage of forest organic soils (see para. 26 of TAR 2015);

(d) Provide estimates of non-CO_2 emissions from forest fires (see paras. 27 and 35(b) of TAR 2015);

(e) Provide (in section 5) uncertainty estimates along with brief qualitative information on the source of the errors associated with the AD and EFs (see paras. 22 and 35(g) of TAR 2015). The AT notes, however, that Malaysia provided brief quantitative information on the uncertainty values for the aggregated AD and EFs for forest land remaining forest land and deforestation without citing the source of the values. The AT also notes that the provision of disaggregated information on the uncertainty values for the AD and EFs, along with information on the source of the values, would further enhance the transparency of the FRL submission.

19. The AT further notes that the inclusion of a specific section (e.g. in tabular format) in the FRL submission listing the areas for future technical improvement identified during the previous TA and the status of implementation of such improvements would further increase the transparency of the FRL submission.

20. In accordance with the requirements of decision 13/CP.19, annex, paragraph 2(a), the AT identified differences between the FRL submission and the latest national GHG inventory contained in the Party's first biennial update report (BUR);[16] in particular:

(a) For the FRL submission global warming potential values from the IPCC Fourth Assessment Report were used, while for its first BUR Malaysia used values from the IPCC Second Assessment Report;

(b) For the FRL submission EFs for non-CO_2 emissions from biomass burning from the 2006 IPCC Guidelines were used, while for the first BUR values from the IPCC *Good Practice Guidance for Land Use, Land-Use Change and forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) were used;

(c) For the FRL submission the CF value used is from the 2006 IPCC Guidelines (0.47 t C (t dm)$^{-1}$), while for the first BUR the value provided in the IPCC good practice guidance for LULUCF was used (0.5 t C (t dm)$^{-1}$);

(d) For the FRL submission an annual increment rate for TPA and SLF of 4.33 t dm ha^{-1} year^{-1} was used, while for the first BUR a net annual increment rate of 4.3 t dm ha^{-1} year^{-1} was used;

[16] Available at https://unfccc.int/documents/180659.

(e) In the FRL submission (table 8) the commercial harvest values reported include harvesting of land within PRF and SLF, while in the first BUR (table 7) only commercial harvesting of land within PRF was considered.

21. Malaysia explained that the 2006 IPCC Guidelines were used in the construction of its FRL and will also be used for the preparation of its second BUR and third national communication, to be submitted in 2018.

22. The AT notes that the inclusion of a section in the FRL submission listing the differences between that submission and the latest GHG inventory, and how the differences will be addressed in the context of the next national communication, would enhance the transparency of the submission.

23. The AD used in constructing the FRL were obtained from gazettement notifications and geospatial maps using satellite images (SPOT 5). Malaysia defined 2000 as the reference year for identifying changes and mapping for the periods 2000–2002, 2002–2004, 2004–2006, 2006–2008, 2008–2010, 2010–2012 and 2012–2014. In response to a question raised by the AT on how 2000 was used as the reference year for identifying changes in periods other than 2000–2002, Malaysia explained that the geospatial maps were used to determine the boundaries of forest areas, followed by ground verification and gazettement notifications. For older gazettement, most of the area was mapped onto the geospatial images and verified. Deforestation within SLF was identified from the geospatial images, while for deforestation within PRF and TPA the necessary information was obtained from gazettement notifications. The AT notes that it remains unclear how 2000 was used as the reference year for identifying changes in periods other than 2000–2002, and encourages Malaysia to provide a clear description of the combined use of geospatial maps and gazettement notifications for identifying land representation and of how time-series consistency has been ensured. Further, the AT notes that providing information on the technical specification of the maps used for the land representation, the classification protocol followed, the quality control procedures followed and the assessment of the accuracy of the map production would enhance the transparency of the FRL submission.

24. Malaysia provided information on the activities covered in the FRL in various parts of the submission. However, no specific definition of the activities included in the FRL could be found in the submission. During the TA Malaysia explained that the activity "sustainable management of forests" covers productive and managed forests and their resources (termed PRF), covering the forest area managed under sustainable management principles. TPA cover wildlife sanctuaries and national and State parks that are conservation areas, while SLF are forests reserved for future development. The activity "conservation of forest carbon stocks" covers the forest area conserved for its flora and fauna, ecosystems, water and soil. Lastly, the activity "reducing emissions from deforestation" covers all forest land conversion to any other land uses. The AT notes that the inclusion of explicit definitions of these activities in a specific part of the FRL submission would increase transparency.

25. Malaysia provided in the FRL submission information on the forest land classification system (section 2.1) and AD for the different forest land areas found in the country, which were based partly on a mix of characteristics, including forest and vegetation type, but predominantly on the forest protection regime (see table 7 of the FRL submission). During the TA, the AT requested further information on the following elements:

(a) Whether all forest land in the country is classified under the three main categories of TPA, PRF and SLF;

(b) Whether plantation forest is the only type of forest in the country excluded from the FRL (based on table 7 of the FRL submission);

(c) Which forest land areas are covered by the activity "reducing emissions from deforestation";

(d) Clarification of the inclusion of "unmanaged" forest strata under forest categories governed by a regulatory regime, which defines their sustainable management, or categories that involve human intervention, and on how the Party defines "managed" and "unmanaged" land. The AT noted that Malaysia included an "unmanaged" strata under the PRF and SLF categories in table 7 of the FRL submission. However, in accordance with the

National Forestry Policy and section 2.1 of the FRL submission, PRF areas are managed in accordance with the principles of sustainable forest management. On the other hand, the SLF category in table 7 of the submission includes a "natural forest" stratum, which could feasibly relate to forest areas characterized by an unmanaged regime;

(e) Why forest plantations are excluded from the FRL, since according to the Party the FRL considers all managed forest land;

(f) How fallow forest land is defined.

26. During the TA Malaysia explained that all of its forest land is included in one of the three categories. It also clarified that the FRL excludes unmanaged forest land strata and provided the AT with an updated table presenting "unmanaged forest land" as part of the forest area that is excluded from the FRL and including updated AD. Malaysia further explained that, with regard to deforestation, table 9 of the FRL submission contains the most disaggregated AD available, and that all forest land, including unmanaged land, is covered by that activity. Malaysia explained that managed forest land is defined as forest where human intervention or activities (e.g. boundary survey and monitoring, sustainable management and enforcement) take place. "Unmanaged" PRF refers to areas that have been designated as PRF but are yet to be managed owing to accessibility issues. Some of these areas were designated as PRF during the pre-independence period. For plantation forests, Malaysia explained that the Government provides incentives for forest plantations, and hence they are not currently considered in the FRL in order to avoid double incentives. Lastly, fallow forest area is defined as abandoned forest left to naturally regenerate.

27. The AT notes that the inclusion of explicit information on which forest areas are included in and excluded from the FRL, which forest areas are covered by each activity, and how the consistency of the treatment of forest areas across the time series has been ensured in the development of the FRL would increase the transparency of the submission. The AT also notes that clear information on how Malaysia defines "managed" and "unmanaged" land, as well as on the different forest strata (e.g. fallow land), would increase the transparency of the submission. The AT further notes the importance of ensuring consistency across the time series with regard to the land-use and land-cover definitions used and the classification of land as managed or unmanaged. The AT encourages Malaysia to consider including all forest areas meeting the forest definition and directly affected by human intervention in the FRL (including forest plantations), noting that the exclusion of forest land from the FRL could be associated with the displacement of emissions from forest land areas included in the FRL to those excluded.

28. Malaysia followed IPCC approach 1 for land representation for the activities "sustainable management of forests" and "conservation of forest carbon stocks" and provided (in table 9) information on gross annual areas of deforested land subdivided into three categories (SLF, peat swamp forest and PRF). During the TA, the AT analysed the AD provided in tables 7 and 9 of the FRL submission as well as information provided during the TA (see para. 26 above) and information provided by the Ministry of Water, Land and Natural Resources.[17] The AT sought further clarification from Malaysia on the following:

(a) Inconsistencies in the values presented in table 7 of the FRL submission and the updated table provided during the TA with regard to plantations (i.e. an area of 692,771 ha in the updated table provided during the TA compared with 495,714 ha reported in table 7) and unmanaged land (i.e. an area of 294,624 ha in the updated table provided during the TA compared with 294,624 ha reported in table 7) for 2014;

(b) The notable trends and dynamics in relation to the different forest types; for example: there was a sudden increase in the protection forest area from 2010; the area of natural forests shows significant variability throughout the time series; the area of fallow forest land within SLF shows a sudden drop in 2014; unmanaged PRF shows a sudden drop in area from 2012; unmanaged SLF shows a drop in area in 2002 and an increase thereafter; and the area of plantation forest constantly increased over the time series;

[17] See http://www.kats.gov.my/en-my/forestry/Pages/Forest-Types-In-Permanent-Reserved-Forest.aspx.

(c) Inconsistencies in the reported deforestation area for peat swamp forests between tables 7 and 9 of the FRL submission, taking into account that the area of drained peat swamp forest land (within SLF) is stable throughout the reference period and assuming that deforestation occurs in peat swamp forests within PRF. For example, in table 9 Malaysia reported 20 kha deforestation for 2000, while the decrease in the forest area for the same year reported in table 7 is 90 kha;

(d) Inconsistencies between the total deforested area for the reference period presented in table 9 of the FRL submission (770 kha) and the total decrease in forest area presented in the updated table provided during the TA (515 kha), calculated as the difference between the forest area at the end of the current year and the forest area at the end of the previous year;

(e) Differences between the inland and plantation forest areas for the whole time series as presented in table 7 of the FRL submission, the data provided during the TA and the online data set provided by the Ministry of Water, Land and Natural Resources. For example, according to the information from the ministry, the inland and plantation forest areas in 2013 amounted to 10,370 and 508 kha, respectively, compared with 10,066 and 629 kha as provided in table 7 and in the data provided during the TA, respectively.

29. Malaysia acknowledged that the area data provided during the TA are correct compared with those included in table 7 of the FRL submission. With regard to any variation identified, Malaysia informed the AT that it is the result of subnational government policy improvement programmes and national initiatives, through which up to 2.2 Mha forest area will be gazetted as TPA by 2025 and which resulted in an increase in the reported managed area. Malaysia also informed the AT that degraded areas undergoing natural regeneration and fulfilling the forest definition thresholds, especially in the Central Forest Spine and Heart of Borneo areas, were gazetted as forest land. For an area to be deforested, it shifts from PRF to SLF and is subsequently converted to another land use. The increase in forest land, especially within TPA and PRF, is from SLF. When a forest is designated to fulfil conservation purposes, SLF or PRF forest areas could be gazetted as TPA. Likewise, SLF forest can also be gazetted as PRF to be managed under sustainable forest management principles. Malaysia explained that the decrease in peat swamp forests does not necessarily equate to deforestation; it could also be due to degazettement (and thus categorized as SLF).

30. The AT commends Malaysia for clarifying the issues identified during the TA in relation to land representation. Nevertheless, the AT notes that, owing to the method used by Malaysia to develop its land-use matrix, and due to the fact that there are significant and constant variations and transitions between the different forest categories and between managed and unmanaged forest land in the FRL submission, the verification of the reported changes in forest land was not possible. The AT notes this as an area for future technical improvement. In particular, the AT encourages Malaysia to develop a land-use matrix based on floristic/vegetation type characteristics, and to further enhance the land-use matrix with information on protection/management characteristics. In addition, taking into account that forest monitoring is already implemented using geospatial and remote sensing techniques as clarified during the TA, the AT encourages Malaysia to upgrade the land representation by using IPCC approach 2. Lastly, the AT notes that a justification of the differences in the official data available from the various data sources used in the construction of the FRL would increase the transparency of the FRL submission.

31. According to table 2 of the FRL submission, the activity “reducing emissions from deforestation” covers forest land conversion to settlements and for “other purposes”. During the TA Malaysia explained that “other purposes” refers to construction such as of roads and rail tracks, and that the difference from the information submitted in the first BUR in 2016, in which deforestation covered forest land conversion to other land, stems from the fact that Malaysia now has more detailed information on the reasons for deforestation. Further, Malaysia acknowledged that deforestation activity covers all conversion of forest land to any other land use (see para. 24 above) and that “other purposes”, as defined by Malaysia, constitutes land use for settlements. The AT commends Malaysia for the information provided during the TA. The AT notes that the inclusion of the clarification would increase the transparency and clarity of the FRL submission. The AT also notes that infrastructure

elements are elements classified as settlements, and that Malaysia can use subcategories under a land use to better reflect the more disaggregated information available.

32. Deforestation AD are available, disaggregated by SLF, peat swamp forests and PRF (see table 9 of the FRL submission). Malaysia used single average biomass stock values for each of the categories for estimating the carbon stock changes due to deforestation. However, as noted in paragraph 30 above, there are significant and constant variations and transitions between the different forest categories and between managed and unmanaged forest land across the time series, and thus a single average value may not be sufficiently representative over time. In response to this observation, Malaysia acknowledged that the accuracy of the estimates may have been affected by the transition of forest land areas between the categories used for the land-use matrix. The AT notes this as an area for future technical improvement, and encourages Malaysia to develop EFs for deforestation that are based on vegetation characteristics rather than using single average values for forest categories that are based on the forest protection regime.

33. The FRL submission does not include post-deforestation carbon stock values. The AT encourages Malaysia to include post-deforestation carbon stocks when estimating emissions from deforestation, in order to increase the accuracy of the FRL submission.

34. The AT could not find information on how Malaysia distinguishes areas of deforestation from temporarily unstocked forest areas. In response to a request for clarification from the AT, Malaysia explained that temporarily unstocked forest is considered forest land that undergoes clear felling, whereas deforestation is considered a change in land use. For plantation forest, replanting is undertaken within one year. Hence, Malaysia considers areas of deforestation and temporarily unstocked forest areas to be separate areas. The AT notes that the inclusion of the information provided during the TA would enhance the transparency of the FRL submission. The AT also notes that, if a disturbed forest land area (e.g. as a result of harvesting or fire) does not regenerate after a period of several years to a level meeting the forest definition thresholds despite management intervention, the approach presented may fail to accurately reflect all deforestation. It is of the view that Malaysia could additionally develop criteria for distinguishing temporary loss of tree cover from deforestation, for example a time period (in years), based on national circumstances, between loss of tree cover below the forest definition threshold and successful regeneration, after which the area is considered deforested.

35. Malaysia reported (in table 6) aggregated net removals from "sustainable management of forests" and "conservation of forest carbon stocks". During the TA, Malaysia clarified that the estimation of carbon stock changes associated with those two activities had been done separately. The AT encourages Malaysia to report separately the net emissions and removals for the activities included in the FRL in order to increase the transparency of the submission.

36. No specific information on the type of biomass losses that were taken into account in estimating the carbon stock changes in forests subject to "conservation of forest carbon stocks" could be found in the FRL submission. During the TA Malaysia clarified that no carbon losses had been taken into account since no logging activities are undertaken in TPA. The AT encourages Malaysia to use information from the NFIs to verify that biomass losses, other than natural mortality, in forest land areas subject to the conservation of carbon stocks do not occur.

37. Malaysia presented AD on deforestation in peat swamp forests but did not report the associated emissions from drained organic soils (CO_2 and N_2O). During the TA Malaysia explained that drainage of peatland was undertaken in the 1950s, 1960s and 1970s and is therefore a legacy issue. The AT notes that it remains unclear how CO_2 and N_2O emissions from drained organic soils were estimated, and encourages Malaysia to include such emissions in its FRL.

38. The FRL submission does not contain information on the methodologies used, including the equations, for estimating CO_2 and direct N_2O emissions associated with the drainage of organic soils, or the equations and EFs used for estimating CO_2 and non-CO_2 emissions from various types of biomass burning. During the TA Malaysia provided the equations used, namely equation 2.26 for CO_2 emissions from drainage of organic soils (volume 4, chapter 4, of the 2006 IPCC Guidelines) and equation 11.1 for N_2O emissions

from drainage of organic soils (volume 4, chapter 11, of the 2006 IPCC Guidelines). For emission from forest fires, Malaysia used equation 2.27 with EFs from table 2.5 applicable to tropical forests (volume 4, chapter 4, of the 2006 IPCC Guidelines). The AT encourages Malaysia to include all the equations and EFs used for estimating CO_2 and non-CO_2 emissions in an effort to increase the transparency of the submission.

39. Malaysia provided in the FRL submission mortality rates for the different forest types (section 3.1.3). However, no information was provided on the source of the values and it was not clear from the submission whether the net annual increment values used in the construction of the FRL include mortality. In response to a question raised by the AT during the TA, Malaysia clarified that the mortality rates are based on national studies and that mortality was taken into account in estimating annual increment (net increment values were used). The AT notes that Malaysia used the same growth rate values (in table 10) as for the previous FRL submission. Taking into account paragraph 15 of TAR 2015 and the fact that the growth rates used by Malaysia are high in comparison with the IPCC default values (see paras. 15 and 20(e) of TAR 2015), the AT reiterates the encouragement for Malaysia to verify the applied growth rates, as well as the biomass net carbon stock changes, against complete data sets taken from the NFIs across the time series. The AT also encourages Malaysia to include the source of the mortality rates used in an effort to increase the transparency of the FRL submission.

40. Malaysia assumed in constructing its FRL that harvesting will continue to be subject to a regulatory framework designed to maintain environmental values and the productive capacity of forests (section 4.4). The current regulatory regime in the country is defined by a cap on the harvest allowed of 85 m^3/ha maximum harvest area. During the TA Malaysia clarified that this cap may change over time and that for estimating the carbon stock change in living biomass the actual annual commercial harvest was taken into account and not the cap. In addition, Malaysia clarified that illegal logs are confiscated and auctioned and then accounted as part of the commercial harvest. Further, Malaysia informed the AT that, with regard to fuelwood, large-scale production of charcoal from fuelwood from mangrove was considered part of the commercial harvest, while other uses of fuelwood do not occur. The AT encourages Malaysia to include in the FRL submission the clarifications provided during the TA providing detailed information on how biomass losses associated with wood and fuelwood removals have been estimated, in order to increase the transparency of the submission.

41. Malaysia included emissions from forest fires in the FRL. The AT commends Malaysia for this improvement, but notes the following:

(a) Malaysia listed the areas affected by fires in the FRL submission (table 3). In response to a question raised by the AT during the TA, Malaysia explained that table 3 includes fire incidents for the whole forest area in Malaysia's territory, which were taken into account in the construction of the FRL. The AT notes that emissions from fires occurring in forest land areas excluded from the activities taken into account in the construction of the FRL should also be excluded from the FRL estimates, and notes this as an area for future technical improvement;

(b) Malaysia assumed that 20 per cent of biomass is destroyed during forest fires (table 10). During the TA Malaysia explained that this assumption is based on expert judgment (field observation). Malaysia also informed the AT that fires usually start from outside forest land and spread into the forest boundaries, not burning the whole forest but only parts of trees. The AT notes that the inclusion of this information would increase the transparency of the FRL submission. The AT also notes that the 20 per cent value is lower than the default values provided in the IPCC good practice guidance for LULUCF (table 3A.1.12) and the 2006 IPCC Guidelines (volume 4, chapter 2, table 2.6) and encourages Malaysia to follow the elicitation protocol contained in the 2006 IPCC Guidelines (volume 1, chapter 2, annex 2A.1) when expert judgment is used and to verify its assumption;

(c) The AT could not reconstruct the estimated values for N_2O emissions from fires reported in table 15 of the FRL submission. In response to the observation made by the AT, Malaysia explained that those values include emissions from drained peatland. The AT notes that the inclusion of disaggregated information on N_2O emissions by source would

enhance the transparency of the FRL submission and facilitate the assessment of the accuracy of the emission estimates;

(d) Malaysia used a single value (140 t dm ha^{-1}) for mass of fuel available for combustion. However, various biomass stocks were reported for the different forest categories (in table 10). During the TA Malaysia explained that the single value for mass of fuel available for combustion was used on the basis that forest fires occur only in SLF. However, as noted in paragraph 30 above, there are significant and constant variations and transitions between the different forest categories and between managed and unmanaged forest land across the time series, and thus a single average value may not be sufficiently representative over time. The AT notes this as an area for future technical improvement, and encourages Malaysia to use representative EFs for mass of fuel available for combustion on the basis of the vegetation characteristics of the land subject to fire.

42. Malaysia provided information (in table 1) on the legal framework with regard to illegal logging and fuelwood gathering, and provided a table presenting the number of logging cases in 2006–2017; however, no information could be found on the amount of wood removed illegally, and if and how fuelwood for energy purposes was treated in the construction of the FRL, taking into account paragraph 20(a) of TAR 2015. During the TA Malaysia explained that information on the amount of wood removed illegally is available for 2014 onward, and presented a brief description of the system for monitoring illegal logging. Malaysia also explained that charcoal from mangroves is the only source of energy considered in the FRL as part of commercial harvesting. Taking into account that the number of illegal logging cases reported for 2006–2014 is identical in tables 1 and 2 of the current and previous FRL submissions, respectively, and that the previous FRL did not include fuelwood harvesting (see para. 20(a) of TAR 2015), whereas the current FRL includes charcoal from mangroves, the AT notes that is unclear why the amount of commercial harvest reported in the current FRL submission (in table 8) is lower than the amount presented in table 15 of the previous FRL submission for the entire reference period.

43. Malaysia acknowledged that an error had been made in the current FRL submission, whereby a double subtraction from plantation forest harvest in the data for commercial harvest had occurred. The AT encourages Malaysia to include the information provided during the TA on the system for monitoring illegal logging, to explain how illegal logging before 2014 was treated in the construction of the FRL and to provide information on the annual amount of wood illegally removed and fuelwood, if available, in an effort to increase the transparency of the FRL submission. The AT encourages Malaysia to recalculate its FRL using the actual amount of wood removed, correcting the error resulting from the double subtraction of harvest from plantations.

44. Malaysia applied a single default BCEF of 1.05 (t dm) m^{-3} for converting merchantable volume to total above-ground biomass. During the TA Malaysia confirmed that the commercial harvest values presented in table 8 are under bark. The AT reiterates the encouragement made by the previous AT (see para. 35(e) of TAR 2015) for Malaysia to use different BCEFs for the different forest types, and to expand the harvested volumes to include over bark, by using appropriate bark percentages or the IPCC default factor of 1.15 contained in the IPCC good practice guidance for LULUCF, before applying BCEF values, in order to increase the accuracy of the estimates.

45. Malaysia applied single values of 0.48 t root dm (t shoot dm)$^{-1}$ from the Wetlands Supplement for mangrove forests and 0.18 t root dm (t shoot dm)$^{-1}$ from Niiyama et al. (2010) for all other forests to estimate below-ground biomass from above-ground biomass. The AT notes that the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.4) and the IPCC good practice guidance for LULUCF (table 3A.1.8) provide different root-to-shoot ratios for the different forest types. The AT notes this as an area for future technical improvement, and encourages Malaysia to consider applying different root-to-shoot ratios for the different forest types in order to improve the accuracy of the estimates.

46. The AT asked Malaysia whether a single CF value was used throughout the construction of the FRL. Malaysia confirmed that a single value of 0.47 from the 2006 IPCC Guidelines (volume 4, chapter 4, table 4.3) was used to convert dry matter into carbon, and explained that the reason for not using more disaggregated CF values was lack of funding.

The AT reiterates the encouragement made by the previous AT (see para. 35(f) of TAR 2015) for Malaysia to use more disaggregated CF values for the different forest types in the construction of the FRL in order to increase the accuracy of the estimates.

Description of relevant policies and plans, as appropriate

47. Malaysia provided a description of the policies and plans relevant to the management of land considered in the FRL submission. The National Policy on Climate Change, the National Biological Diversity Policy, the Revised National Forest Policy (1992), the Tenth Malaysia Plan (2011–2015) and directives from the National Land Council are described in section 6. In accordance with the current regulatory framework as determined in 2004 by the National Forestry Council, the maximum total allowable harvest amount is set at 85 m^3 ha^{-1}.

48. During the TA Malaysia provided information on two initiatives already in place for "connecting" forest land areas in the country. Policy 19 (2005) and Policy 23 (2010) of the National Physical Plan emphasized the importance of establishing the Central Forest Spine, and the Heart of Borneo trilateral initiative between Brunei Darussalam, Indonesia and Malaysia (signed in 2009) was introduced to connect the four major forest complexes in Peninsular Malaysia. The Central Forest Spine Masterplan was approved in 2011 and identified strategies to be implemented for connecting the major forest complexes in 2010–2025. Implementation of those strategies is ongoing. The Heart of Borneo initiative focuses on five major programmes: the creation of an ecologically connected network of protected areas; sustainable management of natural resources; transboundary management initiatives; ecotourism development; and capacity-building.

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

49. 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.

50. The pools included in the FRL are above-ground biomass, below-ground biomass and organic soils for the activities "sustainable management of forests" and "conservation of forest carbon stocks". For the activity "reducing emissions from deforestation" only above-ground biomass is included. Litter and deadwood are not included. According to the IPCC tier 1 approach, litter, deadwood and soil carbon stock changes are assumed to be zero for the activities "sustainable management of forests" and "conservation of forest carbon stocks".

51. The AT considers that the exclusion of litter, deadwood and soil organic carbon was adequately justified by Malaysia and commends its intention to obtain better information on the pools in the future with the aim of including them as part of the stepwise approach. The AT concludes that emissions from litter, deadwood and soil organic carbon are likely to be insignificant and their non-inclusion is justified for the activities "sustainable management of forests" and "conservation of forest carbon stocks".

52. For the activity "reducing emissions from deforestation", Malaysia did not include the below-ground biomass, dead organic matter and soil organic matter pools in the FRL, without providing any justification for their exclusion. During the TA Malaysia explained that the dead organic matter and soil organic carbon pools were not considered in the FRL owing to lack of data and lack of funds, noting that an analysis for those pools is under way. The AT notes this as an area for future technical improvement, and also that the 2006 IPCC Guidelines provide appropriate methodologies for the estimation of the pools. For the below-ground biomass pool, the AT is of the view that Malaysia is in a position to estimate the associated carbon stock changes using the root-to-shoot ratios already used for the activities "sustainable management of forests" and "conservation of forest carbon stocks".

53. Malaysia included CO_2 emissions and removals in the FRL, as well as CH_4 and N_2O emissions from biomass burning and CO_2 and N_2O emissions from drainage of organic soils for the activities "sustainable management of forests" and "conservation of forest carbon stocks". Malaysia did not include information on the methodology applied for estimating CO_2 emissions from forest fires. During the TA Malaysia explained that equation 2.14 from the 2006 IPCC Guidelines (volume 4, chapter 2) was applied with the AD and EFs presented in tables 3 and 10 of the FRL submission. The AT considers this to be an area for future

technical improvement, and encourages Malaysia to report on the methodology applied for estimating CO_2 emissions from forest fires, as well as to include a table presenting emissions from forest fires separately, in future FRL submissions.

54. The AT acknowledges that Malaysia included the most significant of the five activities identified in decision 1/CP.16, paragraph 70, in accordance with its national capabilities and circumstances. The AT notes that other activities could also be significant, in particular "reducing emissions from forest degradation", and encourages Malaysia to include, subject to its capabilities and national circumstances, emissions from forest degradation, if any, in its future FRL submissions.

4. Definition of forest

55. Malaysia provided in its submission the definition of forest used in the construction of its FRL. The definition is the same as that used for the national GHG inventory: minimum land area of 0.5 ha; height of 5 m or more; and at least 30 per cent canopy cover. However, this definition differs from that used for the Party's reporting to the Food and Agriculture Organization of the United Nations, which is based on a canopy cover of 10 per cent. In its FRL submission Malaysia explained that some areas of cropland (e.g. rubber plantations) are not considered forest under the National Forestry Act, even though they meet the forest definition thresholds, and thus are not included in the FRL.

III. Conclusions

56. The information used by Malaysia in constructing its FRL for the activities "reducing emissions from deforestation", "sustainable management of forests" and "conservation of forest carbon stocks" is transparent and complete and in overall accordance with the guidelines for submissions of information on reference levels (as contained in the annex to decision 12/CP.17). However, several areas for future technical improvement regarding the transparency, completeness and accuracy of the submission were identified by the AT during the TA. The methodologies applied for estimating GHG emissions and removals are consistent with the IPCC good practice guidance for LULUCF, the 2006 IPCC Guidelines and the Wetlands Supplement. The AT considers that the FRL submission with its annexes, together with the additional information and clarifications provided by Malaysia during the TA, facilitated the understanding of the construction of the FRL and the identification of areas for future technical improvement.

57. The FRL presented in the submission, for the reference period 2000–2014, corresponds to –213,053,000 t CO_2 eq/year and is Malaysia's second FRL. The previous FRL was submitted on 8 December 2014 and was subject to a TA in 2015. The previous FRL covered the activity "sustainable management of forests" and was based on historical average CO_2 emissions and removals from production forests within PRF only.

58. The AT acknowledges that Malaysia included in the FRL the most significant activities, the most important biomes and the most significant pools in terms of emissions and removals from forests. In doing so, the AT considers that Malaysia followed decision 1/CP.16, paragraph 70, on activities undertaken and decision 12/CP.17, paragraph 10, on implementing a stepwise approach. The AT commends Malaysia for the improvements implemented in its second FRL submission. The AT notes that unmanaged forest land and forest plantations are included for the activity "reducing emissions from deforestation" only. Taking into account that management practices and human interventions in these areas may be associated with the displacement of emissions from forest areas included in REDD-plus activities, the AT encourages Malaysia to consider their inclusion in its future FRL submissions.

59. The AT notes that differences were identified between the FRL submission and the GHG inventory included in Malaysia's first BUR[18] in terms of sources of EFs (see para. 20 above).

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

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

(a) Include information on the technical specification of the maps used for the land representation, the classification protocol followed, the quality control procedures followed, and the assessment of the accuracy of the map production (see para. 23 above);

(b) Include explicit definitions of the activities included in the FRL and on the different forest strata; how land is classified as managed or unmanaged; and how consistency in the application of those definitions and classifications is ensured over time (see paras. 24 and 27 above);

(c) Include explicit information on the type of forest areas included in and excluded from the FRL, and the type of forest areas covered by each activity (see para. 27 above);

(d) Refine the land-use matrix using floristic/vegetation type characteristics and upgrade the land representation by using IPCC approach 2 (see para. 30 above);

(e) Provide transparent documentation of the reasons for differences between the data sets used in the construction of the FRL (see para. 30 above);

(f) Develop EFs for deforestation using vegetation characteristics rather than single average values for forest categories on the basis of the forest protection regime (see para. 32 above);

(g) Include explicit information on the EFs used for estimating associated emissions from deforestation (see para. 33 above);

(h) Develop criteria for distinguishing temporary loss of tree cover from deforestation (see para. 34 above);

(i) Report separately net emissions and removals for each of the activities included in the FRL (see para. 35 above);

(j) Verify that biomass losses in forest land areas subject to the conservation of carbon stocks do not occur, using complete data sets from the NFIs (see para. 36 above);

(k) Include estimates of CO_2 and N_2O emissions from drained organic soils subject to deforestation (see para. 37 above);

(l) Include information on all equations and EFs used for estimating CO_2 and non-CO_2 emissions (see para. 38 above);

(m) Verify the applied growth rates, as well as the biomass net carbon stock changes, against complete data sets taken from the NFIs across the time series and include the source of the mortality rates used (see para. 39 above);

(n) Provide detailed information on the estimation of biomass losses associated with wood and fuelwood removals (see para. 40 above);

(o) Exclude emissions from fires occurring in forest land areas excluded from the FRL (see para. 41(a) above);

(p) Follow the elicitation protocol from the 2006 IPCC Guidelines when expert judgment is used and verify the expert judgment (see para. 41(b) above);

(q) Use representative EFs for mass of fuel available for combustion on the basis of the vegetation characteristics of the land subject to fire (see para. 41(d) above);

(r) Include information on the system for monitoring illegal logging and on the treatment of illegal logging before 2014 in the FRL, provide information on the annual amount of wood illegally removed and fuelwood, if available, and recalculate the FRL using the actual amount of wood removed (see para. 43 above);

(s) Use different BCEFs for the different forest types and ensure that they are applied to over-bark harvested volumes (see para. 44 above);

(t) Apply different root-to-shoot ratios for the different forest types (see para. 45 above);

(u) Use more disaggregated CF values for the different forest types (see para. 46 above).

61. 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) Obtain information on the litter, deadwood and soil organic carbon pools for land subject to "sustainable management of forests" and "conservation of forest carbon stocks" (see para. 51 above);

(b) Include the below-ground, litter, deadwood and soil organic carbon pools for land subject to deforestation (see para. 52 above);

(c) Include information on the methodology applied for estimating CO_2 emissions from forest fires and report emissions from forest fires separately (see para. 53 above).

62. The AT acknowledges and welcomes the intention expressed by Malaysia to undertake the following improvements, while noting the Party's stated capacity needs and lack of funding:

(a) Include the litter, deadwood and soil organic carbon pools in its FRL;

(b) Explore the possibility of soil modelling with the aim of reporting the results in its next BUR;

(c) Fully assess forest data in regions where accessibility is a problem;

(d) Upgrade the uncertainty assessment of the emission and removal estimates.

63. Malaysia's Government changed in May 2018, resulting in the restructuring of ministries and interministerial transfer of functions and jurisdictions. Therefore, Malaysia will submit a new FRL in the next submission cycle.

64. In conclusion, the AT commends Malaysia 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 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 adequate and predictable support.[19] The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Malaysia.

65. The table contained in the annex summarizes the main characteristics of Malaysia's proposed FRL.

[19] 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 Malaysia

Main features of the FRL		*Remarks*
Proposed FRL (in t CO_2 eq/year)	−213 053 000 (for 2016−2025)	See paragraph 6 of this document
Type and duration of FRL	FRL = average annual historical net CO_2 eq removals in 2000–2014	See paragraph 6 of this document
Adjustment for national circumstances	No	
National/subnational	National	See paragraph 6 of this document
Activities included	Reducing emissions from deforestation; sustainable management of forests; and conservation of forest carbon stocks	The FRL includes gross emissions from deforestation resulting from the conversion of forests and excludes any subsequent emissions and removals from the deforested areas. For sustainable management of forests and conservation of forest carbon stocks, the FRL includes net removals (see para. 8 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 dead organic matter and soil carbon pools were assumed to be in equilibrium using the IPCC tier 1 methodology for sustainable management of forests and conservation of forest carbon stocks. For reducing emissions from deforestation there was a lack of data and funds. However, for below-ground biomass the AT is of the view that Malaysia is in a position to estimate associated carbon stock changes (see paras. 9, 50, 51 and 52 of this document)
Gases included	CO_2, N_2O and CH_4	Non-CO_2 emissions from fires and drained organic soils were reported (see paras. 9 and 53 of this document)
Forest definition	Included	Minimum tree crown cover of 30 per cent; minimum land area of 0.5 ha; minimum tree height of 5 m. Rubber plantations are not included (see para. 55 of this document)
Relationship with latest GHG inventory	The methods used for the FRL are not consistent with the first BUR published in 2015	Malaysia used the 2006 IPCC Guidelines for its FRL, but used the IPCC good practice guidance for LULUCF for its first BUR. Other inconsistencies were identified during the technical assessment (see para. 20 of this document)
Description of relevant policies and plans	Included	See paragraph 47 of this document

Main features of the FRL		*Remarks*
Description of assumptions on future changes in policies	Not applicable	
Description of changes to previous FRL	Not included	A specific description of changes from the previous FRL was not included. The necessary information can be found across different sections of the FRL submission (see para. 15 of this document)
Future improvements identified	Yes	Several areas for future technical improvement were identified (see paras. 19, 22, 23, 60 and 61 of this document)

Abbreviations: 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, BUR = biennial update report, FRL = forest reference level, GHG = greenhouse gas, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance for LULUCF = *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry*.