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Technical analysis of the third biennial update report of Malaysia submitted on 31 December 2020

Summary report by the team of technical experts

Summary

According to decision 2/CP.17, paragraph 41(a), Parties not included in Annex I to the Convention, consistently with their capabilities and the level of support provided for reporting, were to submit their first biennial update report by December 2014. Further, paragraph 41(f) of that decision states that Parties not included in Annex I to the Convention shall submit a biennial update report every two years, either as a summary of parts of their national communication in the year in which the national communication is submitted or as a stand-alone update report. As mandated, the least developed country Parties and small island developing States may submit biennial update reports at their discretion. This summary report presents the results of the technical analysis of the third biennial update report of Malaysia, conducted by a team of technical experts in accordance with the modalities and procedures contained in the annex to decision 20/CP.19.

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
AFOLU	agriculture, forestry and other land use
AR	Assessment Report of the Intergovernmental Panel on Climate Change
BUR	biennial update report
CDM	clean development mechanism
CGE	Consultative Group of Experts
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COVID-19	coronavirus disease 2019
EF	emission factor
GEF	Global Environment Facility
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
HWP	harvested wood products
ICA	international consultation and analysis
IE	included elsewhere
IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance	*Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*
IPCC good practice guidance for LULUCF	*Good Practice Guidance for Land Use, Land-Use Change and Forestry*
IPPU	industrial processes and product use
KASA	Ministry of Environment and Water
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
N_2O	nitrous oxide
NA	not applicable
NC	national communication
NE	not estimated
NF_3	nitrogen trifluoride
non-Annex I Party	Party not included in Annex I to the Convention
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
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)
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
SF_6	sulfur hexafluoride
SOC	soil organic carbon
TTE	team of technical experts
UNFCCC guidelines for the preparation of NCs from non-Annex I Parties	"Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention"
UNFCCC reporting guidelines on BURs	"UNFCCC biennial update reporting guidelines for Parties not included in Annex I to the Convention"

I. Introduction and process overview

A. Introduction

1. The process of ICA consists of two steps: a technical analysis of the submitted BUR and a facilitative sharing of views under the Subsidiary Body for Implementation, resulting in a summary report and a record, respectively.

2. According to decision 2/CP.17, paragraph 41(a), non-Annex I Parties, consistently with their capabilities and the level of support provided for reporting, were to submit their first BUR by December 2014. In addition, paragraph 41(f) of that decision states that non-Annex I Parties shall submit a BUR every two years, either as a summary of parts of their NC in the year in which the NC is submitted or as a stand-alone update report.

3. Further, according to paragraph 58(a) of the same decision, the first round of ICA is to commence for non-Annex I Parties within six months of the submission of the Parties' first BUR. The frequency of developing country Parties' participation in subsequent rounds of ICA, depending on their respective capabilities and national circumstances, and the special flexibility for small island developing States and the least developed country Parties, will be determined by the frequency of the submission of BURs.

4. Malaysia submitted its second BUR on 27 September 2018, which was analysed by a TTE in the twelfth round of technical analysis of BURs from non-Annex I Parties, conducted from 25 February to 1 March 2019. After the publication of its summary report, Malaysia participated in the eighth workshop for the facilitative sharing of views, convened in Madrid on 9 December 2019.

5. This summary report presents the results of the technical analysis of the third BUR of Malaysia, undertaken by a TTE in accordance with the provisions on the composition, modalities and procedures of the TTE under ICA contained in the annex to decision 20/CP.19.

B. Process overview

6. In accordance with the mandate referred to in paragraph 2 above, Malaysia submitted its third BUR on 31 December 2020 as a stand-alone update report. The submission was made within two years and three months from the submission of the second BUR.

7. A desk analysis of Malaysia's BUR was conducted remotely from 8 to 12 March 2021 and was undertaken by the following TTE, drawn from the UNFCCC roster of experts on the basis of the criteria defined in decision 20/CP.19, annex, paragraphs 2–6: Amr Osama Abdel-Aziz (Egypt), Ana-Maria Danila (former member of the CGE from the European Union), Toghrul Feyziyev (Azerbaijan), Olia Glade (New Zealand), Zammath Khaleel (member of the CGE from Maldives), Mwangi James Kinyanjui (Kenya), Juan Luis Martin Ortega (El Salvador), Naoki Matsuo (Japan), Anne Nyatichi Omambia (former member of the CGE from Kenya), Anand Sookun (Mauritius), Chisa Umemiya (Japan) and Vicente Paolo Yu (Philippines). Mr. Abdel-Aziz and Ms. Umemiya were the co-leads. The technical analysis was coordinated by Marion Vieweg-Mersmann and Hiroaki Odawara (secretariat).

8. During the technical analysis, in addition to the written exchange, through the secretariat, to provide technical clarifications on the information reported in the BUR, the TTE and Malaysia engaged in consultation[1] on the identification of capacity-building needs for the preparation of BURs and participation in the ICA process. Following the technical analysis of Malaysia's third BUR, the TTE prepared and shared a draft summary report with Malaysia on 31 May 2021 for its review and comment. Malaysia, in turn, provided its feedback on the draft summary report on 23 July 2021.

[1] The consultation was conducted via videoconferencing.

9. The TTE responded to and incorporated Malaysia's comments referred to in paragraph 8 above and finalized the summary report in consultation with the Party on 13 October 2021.

II. Technical analysis of the biennial update report

A. Scope of the technical analysis

10. The scope of the technical analysis is outlined in decision 20/CP.19, annex, paragraph 15, according to which the technical analysis aims to, without engaging in a discussion on the appropriateness of the actions, increase the transparency of mitigation actions and their effects and shall entail the following:

(a) The identification of the extent to which the elements of information listed in paragraph 3(a) of the ICA modalities and guidelines (decision 2/CP.17, annex IV) have been included in the BUR of the Party concerned (see chap. II.B below);

(b) A technical analysis of the information reported in the BUR, specified in the UNFCCC reporting guidelines on BURs (decision 2/CP.17, annex III), and any additional technical information provided by the Party concerned (see chap. II.C below);

(c) The identification, in consultation with the Party concerned, of capacity-building needs related to the facilitation of reporting in accordance with the UNFCCC reporting guidelines on BURs and to participation in ICA in accordance with the ICA modalities and guidelines, taking into account Article 4, paragraph 3, of the Convention (see chap. II.D below).

11. The remainder of this chapter presents the results of each of the three parts of the technical analysis of Malaysia's BUR outlined in paragraph 10 above.

B. Extent of the information reported

12. The elements of information referred to in paragraph 10(a) above include the national GHG inventory report; information on mitigation actions, including a description of such actions, an analysis of their impacts and the associated methodologies and assumptions, and information on progress in their implementation; information on domestic MRV; and information on support needed and received.

13. According to decision 20/CP.19, annex, paragraph 15(a), in undertaking the technical analysis of the submitted BUR, the TTE is to identify the extent to which the elements of information listed in paragraph 12 above have been included in the BUR of the Party concerned. The TTE considers that the reported information is mostly consistent with the UNFCCC reporting guidelines on BURs. Specific details on the extent of the information reported for each of the required elements are provided in annex I.

14. The current TTE noted improvements in the reporting in the Party's third BUR compared with that in its second BUR. Information on the GHG inventory reported in the Party's third BUR demonstrates that it has taken into consideration the areas for enhancing the transparency of the information reported noted by the previous TTE in the summary report on the technical analysis of the Party's second BUR.

C. Technical analysis of the information reported

15. The technical analysis referred to in paragraph 10(b) above aims to increase the transparency of information reported by the Parties on mitigation actions and their effects, without engaging in a discussion on the appropriateness of those actions. Accordingly, the focus of the technical analysis was on the transparency of the information reported in the BUR.

16. For information reported on national GHG inventories, the technical analysis also focused on the consistency of the methods used for preparing those inventories with the appropriate methods developed by the IPCC and referred to in the UNFCCC reporting guidelines on BURs.

17. The results of the technical analysis are presented in the remainder of this chapter.

1. Information on national circumstances and institutional arrangements relevant to the preparation of national communications on a continuous basis

18. As per the scope defined in paragraph 2 of the UNFCCC reporting guidelines on BURs, the BUR should provide an update to the information contained in the most recently submitted NC, including information on national circumstances and institutional arrangements relevant to the preparation of NCs on a continuous basis. In their NCs, non-Annex I Parties report on their national circumstances following the reporting guidance contained in decision 17/CP.8, annex, paragraphs 3–5, and they could report similar information in their BUR, which is an update of their most recently submitted NC.

19. In its third BUR, Malaysia provided an update on its national circumstances, including a description of the country's geography, climate, forests, biodiversity, water resources and economy, as well as relevant information regarding the national circumstances related to the energy, agriculture and solid waste sectors. Malaysia reported that it had observed a trend towards an increase in temperature and slight changes in rainfall patterns in its regions between 1952 and 2016. It also highlighted the importance of forests, which cover 55.2 per cent of the country's land area, in relation to both the climate and biodiversity. In 2010, Malaysia launched the Economic Transformation Programme for 2010–2020. In Malaysia, gross domestic product (at 2010 constant prices) grew from 659.6 billion Malaysian ringgit in 2005 to 1,108.9 billion Malaysian ringgit in 2016. The main sectors contributing to gross domestic product were services (55.0 per cent), manufacturing (23.3 per cent), mining and quarrying (8.9 per cent), agriculture, livestock, forestry and fishing (8.2 per cent) and construction (4.6 per cent).

20. In addition, Malaysia provided a summary of relevant information regarding its national circumstances in tabular and graphical format.

21. Malaysia transparently reported in its third BUR an update on its existing institutional arrangements relevant to the preparation of its NCs and BURs on a continuous basis. The description covers key aspects of the institutional arrangements. KASA is the newly appointed focal point to the UNFCCC following a restructuring of the Government between 2018 and 2020. Its secretary-general chairs the National Steering Committee on Climate Change, under which the National Steering Committee on National Communications and Biennial Update Reports coordinates the preparation of NCs and BURs, with the Climate Change Division of KASA serving as the secretariat.

22. Malaysia has established six technical working groups under the National Steering Committee on National Communications and Biennial Update Reports to carry out technical work related to preparing NCs and BURs, namely in the areas of the GHG inventory; mitigation; adaptation; technology; financial, technical and capacity-building needs; research and systematic observation; and MRV. Malaysia provided information on coordinating ministries and the associated ministries and agencies responsible for specific areas of the GHG inventory and for reporting on mitigation and adaptation action. For example, KASA is the overall coordinating ministry for the GHG inventory, while nine associated organizations are responsible for preparing the GHG inventory for the energy, LULUCF, waste, agriculture and IPPU sectors. Malaysia has also established the National Steering Committee on REDD+, the Technical Working Committee on REDD+ and the National Committee on Clean Development Mechanism.

23. Malaysia reported in its third BUR an update on its domestic MRV arrangements. The description covers key aspects of the institutional arrangements. The MRV arrangements are designed at the national level and cover two main areas: the GHG inventory and mitigation actions. Detailed sectoral information on the MRV process for both areas is outlined in the respective sections of the BUR. During the technical analysis, Malaysia provided additional information, clarifying that the technical working group on

mitigation actions is responsible for first-level QC of reported data, while the technical working group on MRV is responsible for second-level verification and endorsement of reported information.

2. National greenhouse gas emissions by sources and removals by sinks

24. As indicated in table I.1, Malaysia reported information on its GHG inventory in its BUR mostly in accordance with paragraphs 3–10 of the UNFCCC reporting guidelines on BURs and paragraphs 8–24 of the UNFCCC guidelines for the preparation of NCs from non-Annex I Parties, contained in the annex to decision 17/CP.8.

25. Malaysia submitted its third BUR in 2020 and the GHG inventory reported is for 2016. The GHG inventory is consistent with the requirements for the reporting time frame. Malaysia also submitted a technical annex with additional information on the national GHG inventory, comprising sectoral background tables and summary tables of emission and removal estimates for the 1990–2016 time series, in conjunction with its third BUR. The TTE commends the Party's efforts to improve the completeness of the information provided in the BUR.

26. GHG emissions and removals for the BUR covering the 2016 inventory and 1990–2016 time series were estimated using mainly IPCC tier 1 methodologies and IPCC default EFs. Tier 2 methodologies were used for categories where country-specific EFs were available. All significant sources and removals of direct GHGs outlined in the 2006 IPCC Guidelines and associated with activities occurring in Malaysia were covered in the inventory. Malaysia applied the IPCC good practice guidance to improve the transparency, accuracy, consistency, comparability and completeness of the inventory.

27. Information on AD and EFs used was clearly reported in the BUR, including country-specific data and IPCC default EFs. Table A3 of the technical annex to the BUR lists the key types of AD, the data sources for each AD type and the main data providers for all inventory sectors. Malaysia applied country-specific EFs to estimate emissions from cement production and glass production in the IPPU sector; enteric fermentation and manure management in the agriculture sector; forest remaining forest land, cropland remaining cropland, and settlements remaining settlements in the LULUCF sector; and palm oil mill effluent (CH_4) from industrial wastewater in the waste sector.

28. Information on the sources of the country-specific EFs was not clearly explained in Malaysia's BUR, but the EFs used were reported in table A2 of the technical annex. Table A1 of the technical annex shows whether the EFs for the latest reporting year (2016) are country-specific or default but does not provide any further information. During the technical analysis, the Party clarified the sources of country-specific EFs for the IPPU and forestry sectors (see paras. 43 and 46 below) and that information on the sources of country-specific EFs was not provided in the BUR owing to constraints arising from the COVID-19 pandemic.

29. Malaysia also reported information on categories 3.A (livestock), 3.B (land), 3.C (aggregate sources and non-CO_2 emissions sources on land) and 3.D (HWP and other emissions) as provided in the 2006 IPCC Guidelines.

30. Information on the Party's total GHG emissions by gas for 2016 is outlined in table 1 in Gg CO_2 eq.

Table 1
Greenhouse gas emissions by gas of Malaysia for 2016

Gas	*GHG emissions (Gg CO_2 eq) including LULUCF*[a]	*GHG emissions (Gg CO_2 eq) excluding LULUCF*[a]
CO_2	4 430.46	245 823.28
CH_4	57 210.99	57 182.06
N_2O	7 714.73	7 695.60
HFCs	757.00	757.00
PFCs	4 976.27	4 976.27
SF_6	348.17	348.17

Gas	*GHG emissions (Gg CO_2 eq) including LULUCF*[a]	*GHG emissions (Gg CO_2 eq) excluding LULUCF*[a]
Other	50.85	50.85
Total (Gg CO_2 eq)	**75 488.48**	**316 833.23**

[a] 2006 IPCC Guidelines AFOLU categories 3.B (land), 3.C.1.a (biomass burning on forest land) and, if reported, 3.D (HWP (3.D.1) and other emissions (3.D.2)).

31. Information on other emissions was clearly reported in the technical annex to the third BUR (table B1), including 1,012.52 Gg nitrogen oxides, 4,956.69 Gg carbon monoxide, 902.68 Gg non-methane volatile organic compounds and 697.33 Gg sulfur dioxide. Malaysia also reported emissions of NF_3 (50.85 Gg CO_2 eq) in its inventory for the IPPU sector. The TTE commends the Party for including information on emissions of NF_3 in its BUR.

32. Information on GHG emissions by gas and sector in Gg CO_2 eq was clearly reported in table 2.4 of the BUR and in Gg for CO_2, CH_4 and N_2O and in Gg CO_2 eq for HFCs, PFCs, SF_6 and NF_3 in tables B12–B18 of the technical annex to the BUR. However, the TTE noted that there is a difference of 0.27 Gg CO_2 eq and 9.03 Gg CO_2 eq between the results reported in table 2.4 and those in the annex tables in the total GHG emissions including and excluding land, biomass burning on forest land and HWP and other emissions, respectively, and the reason for the difference was not clear to the TTE. During the technical analysis, the Party clarified that the emissions from biomass burning under category 3.C consist of biomass burning in agriculture and biomass burning in forest, and these emissions need to be assigned to the respective agriculture and LULUCF sector total calculations. The Party also clarified that remaining differences are due to rounding errors, as the annex tables only display two decimal places.

33. Malaysia applied notation keys in tables where numerical data were not provided. The use of notation keys was consistent with the UNFCCC guidelines for the preparation of NCs from non-Annex I Parties.

34. The TTE noted that Malaysia reported emissions for some categories as "IE" or "NE" but did not explain in the BUR the reasons for doing so. For example, CO_2, CH_4 and N_2O emissions from paraffin wax use (2.D.2) and ferroalloys production (2.C.2); CO_2 emissions from lubricant use (2.D.1); CO_2 and CH_4 emissions from pulp and paper (2.H.1) and food and beverages industry (2.H.2); and HFC and PFC emissions from foam blowing agents (2.F.2), fire protection (2.F.3), aerosols (2.F.4) and solvents (2.F.5) were all reported as "NE", while emissions from mining and quarrying (1.A.2.i) and construction (1.A.2.k) were reported as "IE", and no further explanation for the use of the notation keys was provided in the BUR. During the technical analysis, the Party clarified that emissions from construction, and mining and quarrying were assumed to be included in the category non-specified industry under manufacturing industries and construction (1.A.2) owing to the lack of available disaggregated data. Malaysia also explained that it reported the above-mentioned categories as "NE" owing to the lack of available data for the corresponding sectors at the time of compiling the inventory.

35. Malaysia reported comparable information addressing the tables included in annex 3A.2 to the IPCC good practice guidance for LULUCF and the sectoral reporting tables annexed to the Revised 1996 IPCC Guidelines. The Party provided a clear allocation of emissions between agriculture and LULUCF under the AFOLU sector in table 2.4 of the BUR, mapping against the subcategories provided in the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines. The TTE commends Malaysia for its efforts to maintain the transparency of the inventory.

36. The shares of emissions that different sectors contributed to the Party's total GHG emissions excluding LULUCF for 2016, as calculated by the TTE using information provided in table 2.4 of the third BUR, are reflected in table 2.

Table 2
Shares of greenhouse gas emissions by sector of Malaysia for 2016

Sector	*GHG emissions (Gg CO_2 eq)*	*% share*[a]
Energy	251 695.02	79.4
IPPU	27 348.83	8.6
AFOLU	–230 717.03	NA
Livestock (category 3.A) and aggregate sources and non-CO_2 emissions sources on land (category 3.C), excluding biomass burning on forest land (category 3.C.1.a)	10 627.72	3.4
Land (category 3.B) and biomass burning on forest land (category 3.C.1.a)	–241 344.75	NA
Waste	27 162.66	8.6

[a] Share of total emissions without LULUCF.

37. Malaysia reported information on its use of GWP values consistent with those provided by the IPCC in its AR4 based on the effects over a 100-year time-horizon of GHGs. As the inventory was calculated on the basis of the 2006 IPCC Guidelines, comparable information based on those Guidelines was included in table 2.4 of the BUR, within the reporting format of table 1 referred to in decision 17/CP.8, annex, chapter III (based on the sectoral composition in the Revised 1996 IPCC Guidelines).

38. For the energy sector, information was clearly reported on GHG emissions, methodological tier levels, AD and their sources, EF types (default or country-specific) and values, and key categories. The energy sector accounted for 79.4 per cent of the Party's total GHG emissions excluding LULUCF in 2016. CO_2 emissions from energy industries (solid fuels), energy industries (gaseous fuels) and road transportation were reported as the three highest-emitting sources in Malaysia, contributing 21.5, 17.4 and 16.4 per cent, respectively, of Malaysia's total GHG emissions (excluding LULUCF) in 2016.

39. The Party also reported energy industries as the category with the highest average annual growth rate of emissions, of 6.4 per cent, between 1990 and 2016, while the average annual growth rate of emissions for the entire energy sector was 5.4 per cent. Malaysia further reported that growth in GHG emissions has slowed over the past few years. The decrease in emissions from manufacturing industries and construction from 2008 onward is due to the sector's shift from coal fuel to electricity consumption and increased energy efficiency. Fugitive emissions from the oil and gas industries also grew at an average rate of 5.1 per cent per year from 1990 to 2016 but have slowed over the past few years. With regard to the planned improvement of the estimates, Malaysia stated in the third BUR (section 2.11) that efforts are ongoing to improve the EFs and the collection and disaggregation of AD to enable higher-tier calculations for the energy industries, road transportation and domestic waterborne transport categories. Additionally, the Party reported that efforts will be made to improve the completeness of the AD and EFs for fugitive emissions from oil and gas.

40. For the industrial processes sector, information was clearly reported on GHG emissions, methodological tier levels, AD and their sources, EFs, key categories, notation keys used and other information specific to the sector for most categories. Malaysia included in its third BUR information on the following categories: HFC emissions from refrigeration and air conditioning (2.F.1); PFC emissions from aluminium production (2.C.3); SF_6 emissions from electrical equipment (2.G.1); and HFC, PFC, SF_6 and NF_3 emissions from integrated circuit or semiconductor (2.E.1). The Party developed a country-specific EF and applied a tier 2 methodology to estimate emissions from cement production and applied a tier 2 methodology for estimating CO_2 emissions from the categories glass production (2.A.3), ammonia production (2.B.1) and HFC-134a emissions from mobile air conditioning (category 2.F.1.b). The TTE commends Malaysia for this substantial improvement in the completeness and accuracy of the inventory.

41. The Party reported that GHG emissions from the IPPU sector grew at an average rate of 7.6 per cent per year from 1990 to 2016. Throughout the time series, mineral industry contributed the highest emissions, followed by chemical industry, metal industry and electronics industry, growing at an average rate of 5.9, 15.8, 11.4 and 11.0 per cent per year, respectively. The main source of GHG emissions from mineral industry was cement production (category 2.A.1), accounting for 2.9 per cent of total national emissions excluding LULUCF.

42. In the IPPU sector, CO_2 emissions from mineral industry increased by 49.3 per cent and CH_4 emissions from chemical industry increased by 20.3 per cent between 2015 and 2016, and the reason for these significant increases was not clear to the TTE. During the technical analysis, the Party clarified that significant growth in emissions was reported for mineral industry between 2015 and 2016 because of data-reporting issues concerning other process uses of carbonates (particularly limestone and dolomite) (category 2.A.4), which caused large variations in the emission estimates owing to the use of unreported production data for 2015 that were subsequently reported for 2016.

43. Information on the sources of the country-specific EFs used for the IPPU sector was not clearly reported in Malaysia's BUR. During the technical analysis, the Party clarified that for cement production (category 2.A.1) and glass production (category 2.A.3) the country-specific EFs were obtained from the respective stakeholders and based on the national clinker ratio for cement and the national annual cullet[2] ratio for glass.

44. Malaysia reported the agriculture and LULUCF sectors separately using categories 3.A, 3.B, 3.C and 3.D from the 2006 IPCC Guidelines. For the agriculture sector, relating to categories 3.A and 3.C under the AFOLU sector in the 2006 IPCC Guidelines, agricultural soils (N_2O) and enteric fermentation (CH_4) were identified as key categories and the most relevant emissions sources in the sector. The average growth rate in GHG emissions for the agriculture sector was 1.8 per cent, with significant inter-annual fluctuations in parallel with the use of fertilizers in the sector, particularly by oil palm plantations. N_2O emissions from managed agricultural soils was the largest source throughout the time series, accounting for an average of 43.8 per cent of sectoral emissions from 1990 to 2016. For calculating emissions for the agriculture sector, Malaysia used default EFs from the 2006 IPCC Guidelines and the IPCC good practice guidance.

45. For the LULUCF sector, Malaysia reported annual trends in CO_2 emissions and removals for 1990–2016 in table B12 of the technical annex. Overall, net removals from LULUCF fluctuated between a minimum of 74,321.11 Gg CO_2 in 1994 and a maximum of 263,847.86 Gg CO_2 in 2014. Information on data sources for the forestry sector was collected from the Ministry of Energy and Natural Resources and annual publications of the relevant forestry departments, including national forest inventories and literature. EFs for cropland were derived from commodity statistics published by the Ministry of Plantation Industries and Commodities, while AD were obtained from gazettes and issued commodity licences. During the technical analysis, the Party explained that it experienced challenges in estimating emissions from the SOC pool and identified this as a capacity-building need to enhance the completeness of future reporting.

46. Information on how AD and EFs for the forestry sector were generated was not reported. The Party explained that, for the forestry sector, EFs were derived from the national forest inventory, while EFs for cropland were derived from literature. Malaysia further explained that the gain–loss method was used for forest land remaining forest land, while the stock-change method was used for forest land converted to non-forest land (deforestation). The Party explained that all calculations for the LULUCF sector were performed using IPCC software. Emissions from HWP were not estimated and were appropriately reported as "NE". During the technical analysis, the Party clarified that providing information on HWP was not considered to be a reporting requirement for developing countries and work on data collection is ongoing.

47. For the waste sector, information was clearly reported on GHG emissions, methodological tier levels, AD and their sources, EFs, key categories, notation keys used

[2] Cullet is broken glass or glass from refuse used in glass production.

and other information specific to the sector. GHG emissions from the waste sector grew at an average rate of 3.6 per cent per year from 1990 to 2016. CH_4 emissions from wastewater treatment and discharge was the largest source throughout the time series and accounted for an average of 68.7 per cent of total sectoral emissions. Malaysia developed country-specific EFs for industrial wastewater (category 4.D.2) and applied a tier 2 methodology to calculate emissions for that category and category 4.C.1 (waste incineration). The TTE commends Malaysia for this improvement. For solid waste disposal sites (category 4.A), Malaysia used a tier 1 methodology, even though this is a key category and accounts for 3.5 per cent of total GHG emissions excluding LULUCF. During the technical analysis, Malaysia explained that it is currently working to improve the AD and EFs for the waste sector, especially for the municipal solid waste and industrial wastewater categories, which contribute the majority of GHG emissions in the waste sector. The Party highlighted that further technical capacity is required to apply the first-order decay model for estimating GHG emissions from solid waste disposal.

48. In the waste sector, CH_4 emissions from wastewater treatment and discharge decreased by 12.0 per cent between 2015 and 2016, and CO_2 emissions from waste incineration decreased by 19.2 per cent during the same period, but the reasons for these significant changes were not clear to the TTE. During the technical analysis, the Party clarified that the emission trend for industrial wastewater is mainly influenced by market demand for industrial products because the level of GHG emissions is proportionate to the level of industrial production.

49. The BUR provides an update to all GHG inventories reported in the Party's previous NCs and BURs. The information reported provides an update of the Party's second BUR and NC3, which addressed anthropogenic emissions and removals for 1990–2014. The update was carried out for 1990–2014 using the methodologies contained in the 2006 IPCC Guidelines, thus generating a consistent 27-year time series up to 2016. The Party reported that it recalculated emissions and removals for the entire time series to allow for the use of updated AD and EFs and the inclusion of additional subcategories in accordance with the 2006 IPCC Guidelines. The Party also reported a general explanation of the changes in emissions between 1990 and 2016.

50. Information on the differences between the recalculated emissions and the previously reported emission calculations and explanations for the significant changes in some sectors between the two most recent years of the inventory (2015–2016) was not reported. However, after comparing the emissions for all sectors reported in the second and third BURs for 1990–2014, the TTE was able to identify the changes in emissions for the agriculture and waste sectors for 1994, 2000, 2005, 2011 and 2014 and the changes in emissions for the LULUCF sector for 2011. Overall, the recalculations resulted in the decrease of total estimated GHG emissions excluding LULUCF by 0.1 per cent for 2014 and the increase of total estimated GHG emissions including LULUCF by 2.5 per cent for 2014.

51. Malaysia clearly reported that a key category analysis was performed for the level of emissions and the trend in emissions for 2005–2016 including and excluding LULUCF. An approach 1 assessment was applied in both cases. According to the level assessment excluding LULUCF, CO_2 emissions from fuel use in energy industries (solid and gaseous fuels) and road transportation, together with CH_4 emissions from fugitive emissions (natural gas), represented a share of 63.1 per cent of total GHG emissions in 2016. Including LULUCF, removals from forest land remaining forest land was the largest key category contributor for the level assessment, amounting to 41.1 per cent of total GHG emissions and removals in 2016.

52. The BUR provides information on QA/QC measures for all sectors. Malaysia reported that QA/QC procedures were implemented by the sectoral inventory coordinators and experts, and QA activities were carried out by the GHG Inventory and Reporting Unit under KASA during the merging of the sectoral GHG inventory reports into the national GHG inventory report and technical annex to the BUR. Malaysia included information on its inventory improvement plan, providing a general description of the enhancements planned by sector. The TTE commends Malaysia for providing information in accordance with the IPCC good practice guidance.

53. Malaysia clearly reported information on CO_2 fuel combustion using both the sectoral and the reference approach. The information reported indicates that the combustion emissions estimated under the sectoral and reference approach are 222,510.48 and 235,881.97 Gg CO_2 eq, respectively. The difference between the estimates calculated using the two approaches was reported as 5.7 per cent.

54. Information on the reasons for differences between the sectoral and the reference approach by fuel was not clearly reported in Malaysia's BUR. During the technical analysis, the Party provided information on the differences by fuel (11.8 per cent for liquid fuels, 25.6 per cent for gaseous fuels and 0.5 per cent for solid fuels) and clarified that the estimates under the sectoral approach were based on actual consumption of fuels. For gaseous fuels, emissions were overestimated under the reference approach owing to natural gas distribution losses and transformation. In the case of liquid fuels, the treatment of transfers caused a difference in the estimates under the sectoral approach compared with those under the reference approach.

55. Information was clearly reported on GHG emissions from international aviation and marine bunker fuels in the technical annex to the BUR. According to the emission data by gas, emissions from international aviation and international waterborne navigation amounted to 8,302.44 and 7,624.91 Gg CO_2 eq, respectively, for 2016.

56. Information on the data sources used for estimating emissions from international bunkers was not clearly reported in Malaysia's BUR. During the technical analysis, the Party clarified that, for international waterborne navigation, the fuel consumption percentages were derived following consultations with the Marine Department of Malaysia and applied to the primary fuel data in the national energy balance. For international aviation, Malaysia obtained the relevant fuel consumption figures by subtracting the fuel consumed by domestic civil and non-specified aviation from the total amount of fuel consumed by aviation. The Party explained that the AD for total aviation turbine fuel and aviation gasoline were obtained from the national energy balance; the AD for total domestic aviation fuel consumption were obtained from a survey conducted among major commercial, general and sports aviation companies; and the AD for total aviation fuel consumption for the non-specified category were obtained from a survey conducted among those involved in domestic aviation operations. Additionally, information on the data sources for the energy sector including international bunkers was reported in table A3 of the third BUR.

57. Malaysia reported information on the uncertainty assessment (level) of its national GHG inventory. The uncertainty analysis was based on the tier 1 approach and covers all source categories and all direct GHGs. The results obtained, as reported in the BUR, reveal that the level uncertainty for emissions is 66.2 per cent (7.3 per cent excluding LULUCF) and the trend uncertainty is 119.7 per cent (7.6 per cent excluding LULUCF). The TTE commends Malaysia for providing in its BUR detailed information on the selected uncertainty values for AD and EFs and the reasons for their selection.

58. The TTE noted that the transparency of the information reported on GHG inventories could be further enhanced by addressing the areas noted in paragraphs 28, 32, 34, 39, 43, 46, 48, 50, 54 and 56 above, which could facilitate a better understanding of the information reported on GHG inventories.

59. In paragraph 48 of the summary report on the technical analysis of the Party's second BUR, the previous TTE noted areas where the transparency of the reporting on ozone-depleting substances for some categories in the IPPU sector could be further enhanced. The current TTE noted the improvements referred to in paragraph 40 above and commends the Party for enhancing the transparency of its reporting.

3. Mitigation actions and their effects, including associated methodologies and assumptions

60. As indicated in table I.2, Malaysia reported in its BUR, mostly in accordance with paragraphs 11–13 of the UNFCCC reporting guidelines on BURs, information on mitigation actions and their effects, to the extent possible.

61. The information reported provides a clear and comprehensive overview of the Party's mitigation actions and their effects. The Party reported that KASA and the Ministry of Energy and Natural Resources are the key ministries responsible for climate change related matters. For climate policymaking, the Malaysian Climate Change Action Council, chaired by the Prime Minister with several key ministers as members, sets the direction of climate change policy. Decisions taken by the Council and other bodies are subject to the approval of the Cabinet. The Economic Planning Unit under the Prime Minister's Department coordinates overall development planning for Malaysia and implementation through five-year development plans. The Eleventh Malaysia Plan (2016–2020) includes climate change mitigation and adaptation actions and programmes. In addition, the BUR lists the coordinating ministries and their respective implementing agencies for the key climate mitigation actions, grouped by sector.

62. The TTE noted that the Government of Malaysia was restructured between 2018 and 2020. In addition, Malaysia is currently revising its nationally determined contribution and is therefore in a transitional phase with regard to its climate policy from both an administrative and political perspective. Owing to the impact of the COVID-19 pandemic, the Party was not in a position to provide specific information on future targets, projections and the overarching climate policy strategy in the current BUR. However, Malaysia clarified during the technical analysis that it intends to provide such information in its next BUR.

63. Most of the mitigation actions are in the energy sector, although measures in the forestry sector contribute most to emission reductions. Malaysia reported on measures in the industrial processes and agriculture sectors but stated that it was not possible to estimate emission reductions for these sectors owing to the limited availability of data. All mitigation actions were reported as implemented. The implemented mitigation actions contributed to estimated emission reductions of 35,889.40 Gg CO_2 eq in 2016, with forestry being the main source of emission reductions, representing 56.6 per cent of total emission reductions, followed by sources such as renewable power (mainly hydropower) (18.3 per cent), paper recycling (11.0 per cent), biogas recovery from palm oil mill effluent (6.6 per cent) and palm-based biodiesel for transport (3.1 per cent). Contributions from sources of renewable energy other than hydropower and from energy efficiency actions were small since these initiatives are still in the initial stages.

64. Malaysia reported a summary of its sectoral mitigation actions in tabular format in accordance with decision 2/CP.17, annex III, paragraph 11. The Party also reported information on its mitigation actions in narrative format.

65. Consistently with decision 2/CP.17, annex III, paragraph 12(a), Malaysia clearly reported the names of mitigation actions or groups of actions, descriptions, progress indicators and coverage (sector and gases) for key mitigation actions or groups of actions, as well as the nature of the actions and the key implementing agency for most actions, in tables 3.4–3.15 of the BUR.

66. Information on quantitative goals was not reported in Malaysia's BUR for the reasons stated in paragraph 62 above, as clarified during the technical analysis. For some measures, the Party did not report the nature of the mitigation action, such as how stakeholders would be incentivized. Further, tables 3.4–3.15 of the BUR encompass key mitigation actions or groups of actions or measures in the energy, transport, waste and forestry sectors but do not include actions in the IPPU and agriculture sectors. The TTE noted that some measures are not included in the tables in the BUR owing to their small contribution to total GHG emissions, a lack of data and/or difficulties in estimating the results of mitigation actions. The main text of the BUR provides information on some additional measures, such as those in industry sectors not covered by the tables.

67. Malaysia clearly reported information on methodologies used for estimating emission reductions, assumptions, the objectives of the actions, results achieved and the steps taken to achieve those actions for most of the actions reported.

68. The mitigation actions in the energy supply sector are focused mainly on programmes promoting renewable power, driven by the National Renewable Energy Policy and Action Plan (2010), the Renewable Energy Act 2011 and the Sustainable

Energy Development Authority Act 2011. The long-term Power Sector Development Plan (2020–2038) for Peninsular Malaysia sets targets for renewable power capacity, including the goal of achieving a 31 per cent share (1,178 MW) of total installed capacity by 2025 and 40 per cent (2,414 MW) by 2035. The Plan also caps the capacity of coal-fired power plants, which accounted for 68 per cent of total GHG emissions (68.2 Mt CO_2 eq) from electricity generation in 2016. The capping is projected to result in a 35 per cent capacity reduction between 2020 and 2039.

69. The summary table on emission reductions achieved by mitigation actions (table 3.1 of the BUR) shows that the energy supply sector, in particular renewable power, not including the cap on the capacity of coal-fired power plants, accounted for 20.2 per cent of total estimated emission reductions in 2016. Among renewable power sources, the contribution of large-scale hydropower dominates the mix; its share in total power generation increased from 5.35 to 12.83 per cent between 2010 and 2016. A competitive bidding process is applied for large hydropower, and a large-scale solar programme, also using a competitive bidding process, has recently been introduced. In addition, several measures have been put in place to promote small-scale renewable power sources. A feed-in tariff and public/private licences are two key incentive measures for photovoltaic, biomass, small-scale hydro and biogas power generation.

70. The National Energy Efficiency Action Plan was introduced in 2016, targeting energy demand in the residential, commercial and industrial sectors. It consists of several initiatives, including five-star rating and minimum energy performance standards for key electrical appliances; energy auditing and management for buildings and industries using incentives and financing schemes for energy service companies; promoting cogeneration in industries and commercial buildings by reducing barriers; and promoting energy efficiency for new buildings through labelling. Other programmes such as the Green Building Rating Scheme, which encourages the private sector to obtain green building certificates, support energy efficiency improvements additional to those included in the National Energy Efficiency Action Plan. Although there is a wide range of initiatives, the aggregated GHG emission reduction effect of the National Energy Efficiency Action Plan was small in 2016 since the initiative was in its initial stages.

71. For transportation, measures to support a modal shift to rail-based public transport were introduced under the National Land Public Transport Master Plan, with the aim of public transport accounting for 40 per cent of journeys in urban areas by 2030. The National Automotive Policy 2014 has strategically situated Malaysia as a regional hub for manufacturing and assembling energy-efficient vehicles by setting technical specifications and introducing incentives for manufacturers that produce certified energy-efficient vehicles. In addition, measures were introduced to promote the blending of biofuels. The transportation sector accounted for 4.3 per cent of the total estimated GHG emission reductions in 2016.

72. The palm oil based biodiesel programme has been strengthened by gradually increasing the blending ratio of palm oil based biodiesel to petroleum diesel from 5 to 7 per cent and, most recently, to 10 per cent in 2018 and by specifying mandatory technical standards for these fuels. The programme promoting use of natural gas in vehicles targets buses and taxis using several fuel price and tax incentives such as import duties, sales tax and road tax. Several agencies are responsible for these initiatives (the Ministry of Transport for the modal shift; the Ministry of International Trade and Industry for energy-efficient vehicles; the Ministry of Plantation Industries and Commodities for biodiesel; and the Economic Planning Unit under the Prime Minister's Department for natural gas use in vehicles), highlighting the cross-cutting nature of the Party's mitigation actions and demonstrating effective collaboration across government agencies.

73. Information reported on the waste sector includes the revised National Solid Waste Management Policy 2016, which set the target of a 40 per cent reduction in waste disposed to solid waste disposal sites by 2020, consisting of a 22 per cent reduction through recycling and 18 per cent through waste management. The information reported in the BUR focuses on actions to promote recycling of paper and biogas recovery from palm oil mill effluent. The latter is a mandatory measure for new and existing palm mills. The

electricity sold to the grid generates a financial incentive through the feed-in tariff programme for renewable power promotion.

74. The forestry sector is a net sink and the greatest contributor to the Party's mitigation actions, attributable to the activities reducing deforestation, sustainable management of forests and conservation of forest carbon stocks (activities identified from the national REDD+ programme). Key measures are the forest certification scheme and the cap on annual allowable felling (85 m^3/ha) for the harvesting of commercial timber in permanent reserved forests. The coverage of the protected area network, which aims to achieve a coverage of at least 20 per cent of the total land area of Malaysia by 2025, was increased by 15 per cent between 2014 and 2016. Measures to improve the CO_2 sequestration capacity of degraded forests and connectivity between forests are supported by forest enrichment programmes.

75. The Party reported information on cross-sectoral measures, including the Green Technology Financing Scheme to facilitate green technology projects by providing government guarantees for a percentage of the financed amount. The duration of the scheme was extended in March 2019 and eligibility extended to energy service companies. Further measures include the Green Investment Tax Allowance, the Green Income Tax Exemption and a green recognition scheme for certified products meeting environmental standards. The Low Carbon Cities Framework was established in 2011 as a national framework to guide local government in the transformation to low-carbon cities. In addition, the central government introduced the Government Green Procurement initiative to procure products and services that take into account certain environmental criteria and standards. The emission reductions resulting from these measures are included in the contributions of each sector to total emission reductions.

76. Malaysia provided information on its involvement in international market mechanisms as a Party to the Kyoto Protocol. The Party clearly documented its involvement in the CDM and voluntary carbon market. Its domestic administrative arrangements include the establishment of a national CDM committee and three technical committees in 2002. As at December 2018, Malaysia had registered 143 CDM project activities and five programmes of activities, with 12.3 Mt CO_2 eq certified emission reductions issued for 2006–2018. Palm oil related projects accounted for 78.3 per cent of the CDM pipeline and 63.2 per cent of the Party's total potential emission reductions under the CDM. In addition, Malaysia reported 12 voluntary carbon market projects under the Verified Carbon Standard. Malaysia does not count projects under international market mechanisms as part of its national mitigation actions.

77. Malaysia clearly reported information on its domestic MRV arrangements in accordance with decision 2/CP.17, annex III, paragraph 13. The information reported indicates that Malaysia has in place a domestic MRV system for mitigation actions. Malaysia reported that, whereas the MRV scheme is coordinated by KASA, the data-collection process and related QA/QC procedures are initiated by data owners, the information is then transmitted to sectoral working groups and is checked at the final stage by the MRV technical working group to assess its reliability. During the technical analysis, the Party explained that it has been integrating its MRV scheme in 'plan-do-check-act' cycles, which the Party is planning to enhance in order to track progress in achieving the target under its nationally determined contribution.

78. The TTE noted that the transparency of the information reported on mitigation actions could be further enhanced by addressing the areas noted in paragraph 66 above, which could facilitate a better understanding of the information reported on mitigation actions.

79. In paragraph 59 of the summary report on the technical analysis of Malaysia's second BUR, the previous TTE noted areas where the transparency of the reporting on mitigation actions could be enhanced. The current TTE noted that these remain areas for improvement of future reporting, as indicated in paragraph 63 above.

4. Constraints and gaps, and related technology, financial, technical and capacity-building needs, including a description of support needed and received

80. As indicated in table I.3, Malaysia reported in its BUR, mostly in accordance with paragraphs 14–16 of the UNFCCC reporting guidelines on BURs, information on finance, technology and capacity-building needs and support received.

81. Malaysia clearly reported information on constraints and gaps, and related financial, technical and capacity-building needs in accordance with decision 2/CP.17, annex III, paragraph 14. In its BUR, Malaysia identified the lack of sufficient technical and technological capacity to carry out climate change initiatives as a common constraint faced by government agencies. Table 4.3 of the BUR summarizes Malaysia's support needs at the activity level for the energy, IPPU, waste, agriculture, LULUCF, cross-cutting, climate modelling, disaster risk management, water and public health sectors, providing information for each listed activity on lead agencies, the status of the activities, the amount of finance required, where relevant, and the nature of support needed. A total of 18 activities are listed in the BUR as requiring support.

82. Malaysia reported information on financial resources, capacity-building and technical support received in accordance with decision 2/CP.17, annex III, paragraph 15. In its BUR, Malaysia reported that it received and used USD 32,265,249 from the GEF between 2006 and 2018. It also received financial resources from bilateral funding sources, namely Germany and the United Kingdom of Great Britain and Northern Ireland.

83. The information reported in table 4.2 of the BUR indicates that the financial resources received were used for delivering capacity-building and technical support. Among others, the United Nations Development Programme provided technical and capacity-building support for green technology application, and the United Nations Industrial Development Organization provided support for energy efficiency projects and the implementation of solar thermal systems. Malaysia also reported other capacity-building support received, including for the preparation of the GHG inventory, MRV of emission data, adaptation planning and climate negotiations, as well as financial support.

84. Information on support received for the preparation of the third BUR was not reported in Malaysia's BUR. During the technical analysis, the Party clarified that USD 352,000 had been approved by the GEF for preparing the third BUR and it was awaiting disbursement.

85. Malaysia reported information on nationally determined technology needs with regard to the development and transfer of technology in accordance with decision 2/CP.17, annex III, paragraph 16. In table 4.3 of its BUR, Malaysia provided information on technology needs for the energy, IPPU, waste, agriculture, climate modelling, water and public health sectors, including high-efficiency motors, hydro technology, heat exchange biotechnology, crop models, and advanced data coding and modelling.

86. Information on how those technology needs were identified was not reported in Malaysia's BUR, including whether the needs were nationally determined. During the technical analysis, the Party clarified that it requires adequate financial resources and expertise to update its technology needs assessment for future reporting.

87. Information on technology support received was not reported in the BUR. During the technical analysis, the Party clarified that it received the UNFCCC and IPCC GHG inventory software as technology support.

88. The TTE noted that the transparency of the information reported on needs and support received could be enhanced by addressing the areas noted in paragraphs 84, 86 and 87 above, which could facilitate a better understanding of the information reported on needs and support received.

89. In paragraph 68 of the summary report on the technical analysis of the Party's second BUR, the previous TTE noted areas where the transparency of the reporting on how technology needs were identified, including whether the needs were nationally determined, could be enhanced. The current TTE noted that these remain areas for improvement of future reporting, as indicated in paragraph 86 above.

D. Identification of capacity-building needs

90. In consultation with Malaysia, the TTE identified the following needs for capacity-building that could facilitate the preparation of subsequent BURs and participation in ICA:

(a) Developing country-specific EFs to enable application of the tier 2 methodology for the largest emissions sources in the energy sector;

(b) Developing methodologies and collecting data for estimating GHG emission reductions for non-quantified initiatives, especially for reducing fugitive emissions by oil/gas operators, substituting material in the cement and iron and steel industries, and recycling non-paper materials;

(c) Developing country-specific EFs and improving AD to enable application of the first-order decay model for the waste sector;

(d) Long-term modelling, especially for the AFOLU sector; modelling mitigation assessment scenarios for the waste and IPPU sectors; and sector-specific factor and decomposition analysis;

(e) Enhancing the national capacity to conduct the technology needs assessment, when required, by improving access to adequate financial resources and technical support from international sources;

(f) Enhancing the national capacity to estimate emissions from soils and use models, such as the Yasso model.

91. In consultation with Malaysia, the TTE identified a need for capacity-building that could facilitate the Party's transition to the enhanced transparency framework under the Paris Agreement, namely enhancing the national capacity for future scenario analysis, including factor analysis and decomposition analysis at the sectoral level.

92. The TTE noted that, in addition to those identified during the technical analysis, Malaysia reported several capacity-building needs in table 4.3 of the BUR covering the following areas:

(a) Energy storage and efficiency;

(b) Life cycle inventory databases for major industries;

(c) Resource recovery for anaerobic digestion;

(d) Impact assessment of crop productivity;

(e) SOC models;

(f) National adaptation plans and adaptation assessment;

(g) Flood forecasting and warning programmes;

(h) Public health vulnerability assessments.

93. In paragraphs 71 and 79 of the summary report on the technical analysis of Malaysia's second BUR, the previous TTE, in consultation with Malaysia, identified and prioritized capacity-building needs. In its third BUR, Malaysia reflected that some of those capacity-building needs have been addressed. The TTE noted that some capacity-building needs remain, including developing country-specific EFs for the energy and waste sectors, estimating SOC emissions and enhancing the national capacity to conduct a more detailed technology needs assessment.

III. Conclusions

94. The TTE conducted a technical analysis of the information reported in the third BUR of Malaysia in accordance with the UNFCCC reporting guidelines on BURs and concludes that the information reported is mostly consistent. It provides an overview of

national circumstances and institutional arrangements relevant to the preparation of NCs on a continuous basis; the national inventory of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol; mitigation actions and their effects, including associated methodologies and assumptions; constraints and gaps, and related financial, technical and capacity-building needs, including a description of support needed and received; and domestic MRV. During the technical analysis, additional information was provided by Malaysia on its capacity-building needs. The TTE concluded that the information analysed is mostly transparent.

95. Malaysia reported an update on the institutional arrangements relevant to the preparation of its BURs. KASA is the newly appointed focal point to the UNFCCC, and its secretary-general chairs the National Steering Committee on Climate Change, under which the National Steering Committee on National Communications and Biennial Update Reports coordinates the preparation of NCs and BURs, with six technical working groups preparing the NCs and BURs. Malaysia's MRV arrangements cover the GHG inventory and mitigation actions. Malaysia has taken significant steps to establish institutional arrangements that allow for the sustainable preparation of its BURs. These include making organizational improvements.

96. In its third BUR, submitted in 2020, Malaysia reported information on its national GHG inventory for 1990–2016. This included GHG emissions and removals of CO_2, CH_4 and N_2O for all relevant sources and sinks, as well as the precursor gases. The Party also reported GHG emissions of HFCs, PFCs, SF_6 and NF_3. The inventory was developed on the basis of the 2006 IPCC Guidelines. Total GHG emissions for 2016 were reported as 75,488.48 Gg CO_2 eq (including LULUCF) and 316,833.23 Gg CO_2 eq (excluding LULUCF). In the key category analysis including the LULUCF sector, the five key categories identified were forest land remaining forest land, land converted to settlements, energy industries – gaseous fuels, energy industries – solid fuels, and manufacturing industries and construction – liquid fuels. These key categories contributed 79.3 per cent of the total GHG emissions. Information on the reason for reporting emissions for some categories as "NE" and "IE" was provided during the technical analysis and the Party clarified that information on the sources of country-specific EFs was not provided in the BUR owing to constraints arising from the COVID-19 pandemic.

97. Malaysia reported information on mitigation actions and their effects in both tabular and narrative format. Malaysia reported implemented actions in the energy supply and demand, transportation, waste and forestry sectors. The mitigation actions focus on the forestry, energy supply and waste sectors and the amount of emissions avoided. Malaysia has also introduced many measures and initiatives related to energy efficiency and the transport sector. The Party reported on the progress of implementation of its mitigation actions and the results achieved, including emission reductions. Malaysia also reported information on its involvement in international market mechanisms and MRV arrangements. Estimates of emission reductions for some actions were not provided owing to methodological difficulties, as clarified by Malaysia in the BUR and during the technical analysis.

98. Malaysia reported information on key constraints, gaps and related needs, including a list of needs summarized at the activity level across sectors and thematic areas in table 4.3 of the BUR. Information was reported on the technical and capacity-building support received, including for the application of green technology, energy efficiency initiatives and the implementation of solar thermal systems, including in table 4.2 of the BUR. The Party also reported that it received financial support from both multilateral and bilateral funding sources. Information on financial resources received for preparing the third BUR was not provided by the Party in its BUR. During the technical analysis, the Party clarified that USD 352,000 has been approved by the GEF for preparing the third BUR and Malaysia is awaiting disbursement. The Party also clarified that it received support related to the transfer of technology, including GHG inventory software. Information on how technology needs were nationally determined was not reported owing to difficulties in accessing adequate financial resources and expertise, as clarified by the Party during the technical analysis.

99. The current TTE noted improvements in the reporting in the Party's third BUR compared with that in its second BUR. The information reported demonstrates that the Party has taken into consideration the areas for enhancing the transparency of the information reported, as noted by the TTE in the summary report on the technical analysis of the second BUR. However, improvements are ongoing, and the Party has taken note of outstanding areas for future improvement.

100. The TTE, in consultation with Malaysia, identified the six capacity-building needs listed in chapter II.D above and needs for capacity-building that aim to facilitate reporting in accordance with the UNFCCC reporting guidelines on BURs and participation in ICA in accordance with the ICA modalities and guidelines, taking into account Article 4, paragraph 3, of the Convention. The Party, in consultation with the TTE, also identified the need for capacity-building to facilitate transition to the enhanced transparency framework referred to in paragraph 93 above. Malaysia identified the following as priority capacity-building needs:

(a) Developing country-specific EFs to enable application of the tier 2 methodology for the largest emissions sources in the energy sector;

(b) Developing methodologies and collecting data for estimating GHG emission reductions for non-quantified initiatives, especially for reducing fugitive emissions by oil/gas operators, substituting material in the cement and iron and steel industries, and recycling non-paper materials;

(c) Developing country-specific EFs and improving AD to enable application of the first-order decay model for the waste sector;

(d) Enhancing the national capacity to conduct the technology needs assessment, when required, by improving access to adequate financial resources and technical support from international sources;

(e) Enhancing the national capacity to estimate emissions from soils and use models, such as the Yasso model.

(a)

Annex I

Extent of the information reported by Malaysia in its third biennial update report

Table I.1
Identification of the extent to which the elements of information on greenhouse gases are included in the third biennial update report of Malaysia

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 2/CP.17, paragraph 41(g)	The first BUR shall cover, at a minimum, the inventory for the calendar year no more than four years prior to the date of the submission, or more recent years if information is available, and subsequent BURs shall cover a calendar year that does not precede the submission date by more than four years.	Yes	Malaysia submitted its third BUR in December 2020; the GHG inventory reported is for 2016.
Decision 2/CP.17, annex III, paragraph 4	Non-Annex I Parties should use the methodologies established in the latest UNFCCC guidelines for the preparation of NCs from non-Annex I Parties approved by the Conference of the Parties or those determined by any future decision of the Conference of the Parties on this matter.	Yes	Malaysia used the 2006 IPCC Guidelines.
Decision 2/CP.17, annex III, paragraph 5	The updates of the section on national inventories of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol should contain updated data on activity levels based on the best information available using the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF; any change to the EF may be made in the subsequent full NC.	Yes	
Decision 2/CP.17, annex III, paragraph 6	Non-Annex I Parties are encouraged to include, as appropriate and to the extent that capacities permit, in the inventory section of the BUR:		
	(a) The tables included in annex 3A.2 to the IPCC good practice guidance for LULUCF;	Yes	Comparable information was reported in tables B5 and B9 of the BUR.
	(b) The sectoral report tables annexed to the Revised 1996 IPCC Guidelines.	Yes	Comparable information was reported in the technical annex to the BUR.
Decision 2/CP.17, annex III, paragraph 7	Each non-Annex I Party is encouraged to provide a consistent time series back to the years reported in its previous NCs.	Yes	The time series reported in the BUR was 1990–2016.
Decision 2/CP.17, annex III, paragraph 8	Non-Annex I Parties that have previously reported on their national GHG inventories contained in their NCs are encouraged to submit summary information tables of inventories for previous submission years (e.g. for 1994 and 2000).	Yes	This information was reported for 1990–2016.
	The inventory section of the BUR should consist of a national inventory report as a summary or as an update of the information contained in decision		

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III, paragraph 9	17/CP.8, annex, chapter III (National greenhouse gas inventories), including:		
	(a) Table 1 (National greenhouse gas inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol and greenhouse gas precursors);	Yes	Comparable information was reported in table 2.4 of the BUR.
	(b) Table 2 (National greenhouse gas inventory of anthropogenic emissions of HFCs, PFCs and SF_6).	Yes	Comparable information was reported in table 2.4 of the BUR.
Decision 2/CP.17, annex III, paragraph 10	Additional or supporting information, including sector-specific information, may be supplied in a technical annex.	Yes	The Party submitted additional information on the GHG inventory as an annex to its BUR.
Decision 17/CP.8, annex, paragraph 12	Non-Annex I Parties are also encouraged, to the extent possible, to undertake any key source analysis as indicated in the IPCC good practice guidance to assist in developing inventories that better reflect their national circumstances.	Yes	
Decision 17/CP.8, annex, paragraph 13	Non-Annex I Parties are encouraged to describe procedures and arrangements undertaken to collect and archive data for the preparation of national GHG inventories, as well as efforts to make this a continuous process, including information on the role of the institutions involved.	Yes	
Decision 17/CP.8, annex, paragraph 14	Each non-Annex I Party shall, as appropriate and to the extent possible, provide in its national inventory, on a gas-by-gas basis and in units of mass, estimates of anthropogenic emissions of:		
	(a) CO_2;	Partly	Some subsectors were reported using notation key “NE”.
	(b) CH_4;	Partly	Some subsectors were reported using notation key “NE”.
	(c) N_2O.	Partly	Some subsectors were reported using notation key “NE”.
Decision 17/CP.8, annex, paragraph 15	Non-Annex I Parties are encouraged, as appropriate, to provide information on anthropogenic emissions by sources of:		
	(a) HFCs;	Yes	
	(b) PFCs;	Yes	
	(c) SF_6.	Yes	
Decision 17/CP.8, annex, paragraph 16	Non-Annex I Parties are encouraged, as appropriate, to report on anthropogenic emissions by sources of other GHGs, such as:		
	(a) Carbon monoxide;	Yes	
	(b) Nitrogen oxides;	Yes	
	(c) Non-methane volatile organic compounds.	Yes	
Decision 17/CP.8, annex, paragraph 17	Other gases not controlled by the Montreal Protocol, such as sulfur oxides, and included in the Revised 1996 IPCC Guidelines may be included at the discretion of Parties.	Yes	The Party reported on other gases, such NF_3.

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 17/CP.8, annex, paragraph 18	Non-Annex I Parties are encouraged, to the extent possible, and if disaggregated data are available, to estimate and report CO_2 fuel combustion emissions using both the sectoral and the reference approach and to explain any large differences between the two approaches.	Partly	The Party reported CO_2 emissions from fuel combustion using both the sectoral and reference approach, but the differences between the approaches were not clearly explained.
Decision 17/CP.8, annex, paragraph 19	Non-Annex I Parties should, to the extent possible, and if disaggregated data are available, report emissions from international aviation and marine bunker fuels separately in their inventories:		
	(a) International aviation;	Yes	
	(b) Marine bunker fuels.	Yes	
Decision 17/CP.8, annex, paragraph 20	Non-Annex I Parties wishing to report on aggregated GHG emissions and removals expressed in CO_2 eq should use the GWP provided by the IPCC in its AR2 based on the effects of GHGs over a 100-year time-horizon.	NA	The Party used the GWP values provided in the AR4.
Decision 17/CP.8, annex, paragraph 21	Non-Annex I Parties are encouraged to provide information on methodologies used in the estimation of anthropogenic emissions by sources and removals by sinks of GHGs not controlled by the Montreal Protocol, including a brief explanation of the sources of EFs and AD. If non-Annex I Parties estimate anthropogenic emissions and removals from country-specific sources and/or sinks that are not part of the Revised 1996 IPCC Guidelines, they should explicitly describe the source and/or sink categories, methodologies, EFs and AD used in their estimation of emissions, as appropriate. Parties are encouraged to identify areas where data may be further improved in future communications through capacity-building:		
	(a) Information on methodologies used in the estimation of anthropogenic emissions by sources and removals by sinks of GHGs not controlled by the Montreal Protocol;	Yes	Malaysia used the 2006 IPCC Guidelines. Tier 1 methodologies were used for most sectors and categories. Tier 2 methodologies were used where country-specific EFs were available.
	(b) Explanation of the sources of EFs;	Partly	Malaysia used the 2006 IPCC Guidelines and provided an overview of the country-specific EFs but did not report their sources.
	(c) Explanation of the sources of AD;	Yes	
	(d) If non-Annex I Parties estimate anthropogenic emissions and removals from country-specific sources and/or sinks that are not part of the Revised 1996 IPCC Guidelines, they should explicitly describe:	NA	
	(i) Source and/or sink categories;		
	(ii) Methodologies;		
	(iii) EFs;		
	(iv) AD;		

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
	(e) Parties are encouraged to identify areas where data may be further improved in future communications through capacity-building.	Yes	
Decision 17/CP.8, annex, paragraph 22	Each non-Annex I Party is encouraged to use tables 1–2 of the guidelines annexed to decision 17/CP.8 in reporting its national GHG inventory, taking into account the provisions established in paragraphs 14–17. In preparing those tables, Parties should strive to present information that is as complete as possible. Where numerical data are not provided, Parties should use the notation keys as indicated.	Yes	
Decision 17/CP.8, annex, paragraph 24	Non-Annex I Parties are encouraged to provide information on the level of uncertainty associated with inventory data and their underlying assumptions, and to describe the methodologies used, if any, for estimating these uncertainties:		
	(a) Level of uncertainty associated with inventory data;	Yes	
	(b) Underlying assumptions;	Yes	
	(c) Methodologies used, if any, for estimating these uncertainties.	Yes	

Note: The parts of the UNFCCC reporting guidelines on BURs on reporting information on GHG emissions by sources and removals by sinks in BURs are contained in decision 2/CP.17, paras. 3–10 and 41(g). Further, as per para. 3 of those guidelines, non-Annex I Parties are to submit updates of their national GHG inventories in accordance with paras. 8–24 of the UNFCCC guidelines for the preparation of NCs from non-Annex I Parties, contained in the annex to decision 17/CP.8. The scope of such updates should be consistent with the non-Annex I Party's capacity and time constraints and the availability of its data, as well as the level of support provided by developed country Parties for biennial update reporting.

Table I.2
Identification of the extent to which the elements of information on mitigation actions are included in the third biennial update report of Malaysia

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III, paragraph 11	Non-Annex I Parties should provide information, in tabular format, on actions to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol.	Yes	Tables 3.1 (summary of mitigation actions and their results) and 3.4–3.15 (detailed information on each action) of the BUR provide details of the Party's key mitigation actions, in addition to the textual descriptions in section 3 of the BUR.
Decision 2/CP.17, annex III, paragraph 12	For each mitigation action or group of mitigation actions, including, as appropriate, those listed in document FCCC/AWGLCA/2011/INF.1, developing country Parties shall provide the following information, to the extent possible:		
	(a) Name and description of the mitigation action, including information on the nature of the action, coverage (i.e. sectors and gases), quantitative goals and progress indicators;	Partly	Information on quantitative goals and sector coverage for some of the mitigation actions was not reported.
	(b) Information on:		

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
	(i) Methodologies;	Yes	The methodologies used for each action were clearly described in tables 3.4–3.15 of the BUR.
	(ii) Assumptions;	Yes	Relevant data used for the assumptions were reported for each action.
	(c) Information on:		
	(i) Objectives of the action;	Yes	
	(ii) Steps taken or envisaged to achieve that action;	Yes	
	(d) Information on:		
	(i) Progress of implementation of the mitigation actions;	Yes	
	(ii) Progress of implementation of the underlying steps taken or envisaged;	Yes	
	(iii) Results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible;	Yes	
	(e) Information on international market mechanisms.	Yes	Transparent information on international market mechanisms was provided for the CDM and Verified Carbon Standard.
Decision 2/CP.17, annex III, paragraph 13	Parties should provide information on domestic MRV arrangements.	Yes	Domestic MRV arrangements were clearly described using a diagram showing the steps undertaken.

Note: The parts of the UNFCCC reporting guidelines on BURs on the reporting of information on mitigation actions in BURs are contained in decision 2/CP.17, annex III, paras. 11–13.

Table I.3
Identification of the extent to which the elements of information on finance, technology and capacity-building needs and support received are included in the third biennial update report of Malaysia

Decision	*Provision of the reporting requirements*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III, paragraph 14	Non-Annex I Parties should provide updated information on:		
	(a) Constraints and gaps;	Yes	
	(b) Related financial, technical and capacity-building needs.	Yes	
Decision 2/CP.17, annex III, paragraph 15	Non-Annex I Parties should provide:		
	(a) Information on financial resources received, technology transfer and capacity-building received;	Yes	
	(b) Information on technical support received from the GEF, Parties included in Annex II to the Convention and other developed country Parties, the Green Climate Fund and multilateral institutions for	Partly	Information on support received was provided, including on financial support received from various sources (BUR tables 4.1–4.2). However, information was not reported on

Decision	*Provision of the reporting requirements*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
	activities relating to climate change, including for the preparation of the current BUR.		support received for the preparation of the third BUR.
Decision 2/CP.17, annex III, paragraph 16	With regard to the development and transfer of technology, non-Annex I Parties should provide information on:		
	(a) Nationally determined technology needs;	Partly	Information on how technology needs were nationally determined was not reported.
	(b) Technology support received.	No	

Note: The parts of the UNFCCC reporting guidelines on BURs on the reporting of information on finance, technology and capacity-building needs and support received in BURs are contained in decision 2/CP.17, annex III, paras. 14–16.

Annex II

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 1997. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. JL Houghton, LG Meira Filho, B Lim, et al. (eds.). Paris: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency. Available at https://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html.

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. J Penman, D Kruger, I Galbally, et al. (eds.). Hayama, Japan: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency/Institute for Global Environmental Strategies.
Available at http://www.ipcc-nggip.iges.or.jp/public/gp/english/.

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies.
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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.

B. UNFCCC documents

NC3 of Malaysia. Available at https://unfccc.int/non-annex-I-NCs.

Summary report on the technical analysis of the second BUR of Malaysia. Available at https://unfccc.int/ICA-reports.

Third BUR of Malaysia. Available at https://unfccc.int/BURs.