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Technical analysis of the third biennial update report of Singapore submitted on 27 December 2018

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 Singapore, conducted by a team of technical experts in accordance with the modalities and procedures contained in the annex to decision 20/CP.19.

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Contents

Abbreviations and acronyms

AD	activity data
BUR	biennial update report
CGE	Consultative Group of Experts
CH_4	methane
CO	carbon monoxide
COP	Conference of the Parties
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
EF	emission factor
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
ICA	international consultation and analysis
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
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
NA	not applicable
NC	national communication
NE	not estimated
NEA	National Environment Agency
NMVOC	non-methane volatile organic compound
NO	not occurring
non-Annex I Party	Party not included in Annex I to the Convention
NO_X	nitrogen oxides
N_2O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
SF_6	sulfur hexafluoride
SO_2	sulfur dioxide
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"
2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*

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 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. Singapore submitted its second BUR on 16 December 2016, which was analysed by a TTE in the eighth round of technical analysis of BURs from non-Annex I Parties, conducted from 22 to 26 May 2017. After the publication of its summary report, Singapore participated in the fifth workshop for the facilitative sharing of views, convened in Bonn on 4 May 2018.

5. This summary report presents the results of the technical analysis of the third BUR of Singapore, 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, Singapore submitted its third BUR on 27 December 2018 as a summary of parts of its NC4. Singapore submitted its second BUR on 16 December 2016. The submission of its third BUR was made more than two years after the submission of the previous BUR.

7. During the technical analysis, the Party clarified that it had interpreted the two-year timeline as relating to the month of submission and not the specific date of submission.

8. The technical analysis of the BUR took place from 27 to 31 May 2019 in Bonn 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: Carlos Fuller (former member of the CGE from Belize), Maria Ana Gonzales Casartelli (Argentina), Agustín Inthamoussu (Uruguay), Naofumi Kosaka (Japan), Kakhaberi Mdivani (Georgia), Lilian Portillo (former member of the CGE from Paraguay), Renata Patricia Soares Grisoli (Brazil), Christoph Streissler (Austria), Marcelo Theoto Rocha (Brazil) and Silke Christina Wartmann (Germany). Mr. Theoto Rocha and Ms. Wartmann were the co-leads. The technical analysis was coordinated by Sohel Pasha, Nalin Srivastava and Pedro Torres (secretariat).

9. 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 Singapore 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 Singapore's third BUR, the TTE prepared and shared a draft summary report with Singapore on 27 August 2019 for its review and comment. Singapore, in turn, provided its feedback on the draft summary report on 7 October and 23 December 2019.

[1] The consultation was conducted via teleconferencing.

10. The TTE responded to and incorporated Singapore's comments referred to in paragraph 9 above and finalized the summary report in consultation with the Party on 23 December 2019.

II. Technical analysis of the biennial update report

A. Scope of the technical analysis

11. 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 chapter 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 chapter 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 chapter II.D below).

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

B. Extent of the information reported

13. The elements of information referred to in paragraph 11(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 the progress made in their implementation; information on domestic MRV; and information on support needed and received.

14. 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 13 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.

15. The current TTE noted improvements in the reporting in the Party's third BUR compared with that in the second BUR. Information on GHG inventories and mitigation actions and their effects reported in the third BUR demonstrates that the Party has taken into consideration the areas for enhancing transparency 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

16. The technical analysis referred to in paragraph 11(b) above aims to increase the transparency of 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.

17. 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.

18. 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

19. 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 NCs, 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.

20. In its third BUR, the Party provided an update on its national circumstances, including a description of national development priorities, objectives and circumstances, including information on features of geography, climate and economy that might affect its ability to deal with mitigating and adapting to climate change, as well as information regarding national circumstances and constraints on the specific needs and concerns arising from the adverse effects of climate change and/or the impact of the implementation of response measures, as referred to in Article 4, paragraph 8, and, as appropriate, in Article 4, paragraphs 9 and 10, of the Convention.

21. Singapore reported that it currently accounts for about 0.11 per cent of global emissions and that it has taken and will continue to take steps to reduce GHG emissions. However, its small size, dense urban landscape and geographical constraints limit the potential for the development of renewable energy and continue to pose a challenge regarding its emission reduction potential. Singapore also presented a summary of its efforts to manage these challenges and has indicated that it is investing in research and development in the urban solutions and sustainability sector, which includes piloting, test-bedding and accelerating the adoption of new technologies.

22. Singapore transparently described in its BUR the 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, such as roles and responsibilities of the overall coordinating entity, the involvement and roles of other institutions and experts, mechanisms for information and data exchange, and QA/QC procedures for the GHG inventory. In particular, Singapore reported that its MRV Task Force prepares its NCs and BURs for approval by the Inter-Ministerial Committee on Climate Change. The National Climate Change Secretariat, established as a dedicated unit in 2010 under the Prime Minister's Office, serves as the secretariat of the Inter-Ministerial Committee on Climate Change. Singapore reported that positioning the National Climate Change Secretariat under the Prime Minister's Office underscores the importance that the Party places on climate change. During the technical analysis, Singapore clarified that the institutional arrangements have been gradually developed since 2007 and the current arrangement has been in place since 2011.

23. Singapore reported on its domestic MRV system. It is designed at the national level and covers three main areas: the NC and BUR preparation process, the GHG inventory system, and monitoring, measuring and documenting the progress of mitigation actions. The system was built on the existing systems, processes and infrastructure, rendering it cost-effective.

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

24. As indicated in table 1 in annex I, Singapore 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. Singapore submitted its third BUR in 2018 and the GHG inventory reported is for 2014, which is consistent with the requirements for the reporting time frame.

26. GHG emissions and removals for the BUR covering the 2014 inventory were estimated using mainly a tier 1 method from the Revised 1996 IPCC Guidelines, while in some cases the IPCC good practice guidance was applied. For the waste sector, CH_4 and N_2O emissions from hazardous waste incineration, CO_2, CH_4 and N_2O emissions from clinical waste incineration and CO_2, CH_4 and N_2O emissions from waste incineration were estimated using the 2006 IPCC Guidelines. Similarly, for the IPPU sector, emissions were estimated using the 2006 IPCC Guidelines. Emissions from the LULUCF sector were estimated using the 2006 IPCC Guidelines and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, as appropriate.

27. With regard to the methodologies used, information was clearly reported, including the specific methodology and the tier levels for energy, IPPU, LULUCF and waste. Sources of AD were also clearly reported in the BUR. Information was reported on the sources and values of EFs, including for the energy sector, estimated mostly using default EFs from the Revised 1996 IPCC Guidelines. The default EFs from the 2006 IPCC Guidelines were used for electronics industry and waste incineration. However, Singapore did not indicate which particular guidelines were used to derive EFs to estimate the emissions from other source categories. During the technical analysis, the Party clarified that CH_4 emissions from wastewater handling were estimated using the default EFs from the 2006 IPCC Guidelines, while the N_2O emission estimate was based on the default EFs from the Revised 1996 IPCC Guidelines. The TTE noted that including information on the sources of EFs for all source categories in the BUR could facilitate a better understanding of the information reported.

28. Information on the Party's total GHG emissions by gas for 2014 is outlined in the table below in Gg CO_2 eq. It shows an increase in emissions of 32.8 per cent since 2000 (by 12,579 Gg CO_2 eq).

Greenhouse gas emissions by gas of Singapore for 2014

Gas	*GHG emissions (Gg CO_2 eq) including LULUCF*
CO_2	48 620.43
CH_4	199.60
N_2O	452.90
HFCs	306.41
PFCs	1 146.83
SF_6	181.96
Total	**50 908.13**

29. Other emissions such as NO_X, CO, NMVOCs and SO_2 were not reported. Singapore reported that the levels of these gases in the air are currently monitored by a network of ambient air quality monitoring stations. NO_X, CO and SO_2 are considered air pollutants and are regulated under the Environmental Protection and Management Act, which stipulates emission standards for these pollutants.

30. Singapore applied notation keys in tables where numerical data were not provided. The use of notation keys was mostly consistent with the UNFCCC guidelines for the preparation of NCs from non-Annex I Parties. Singapore reported that CH_4 emissions from landfill are insignificant as only non-incinerable waste and ash from the incineration process are disposed of at the offshore Semakau landfill. However, information on source categories for waste disposal sites was not provided in the sectoral reporting table for the waste sector using appropriate notation keys. The Party reported information on CO_2, CH_4 and N_2O emissions from waste incineration under the energy sector. However, the 2014 GHG inventory worksheets for the waste sector do not contain appropriate notation keys for energy sector estimation values. During the technical analysis, Singapore indicated that it will provide information on GHG emissions from waste disposal sites and waste incineration for energy purposes in tabular format with the appropriate notation keys in its future BURs. The TTE noted that the inclusion of GHG emission estimates for waste disposal sites and waste

incineration in the energy sector in the BUR with the appropriate notation keys could facilitate a better understanding of the information reported.

31. Singapore 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. However, the Party did not report information that enabled the TTE to understand the GHG emission estimates for individual source categories of the LULUCF sector as described in annex 3A.2 to the IPCC good practice guidance for LULUCF. During the technical analysis, Singapore clarified that it has estimates for all IPCC prescribed land-use categories and for all carbon pools, and explained the breakdown of source and sink categories based on remaining land as well as conversion between land uses for each carbon pool. The Party indicated that it will provide the breakdown estimates in its next BUR. Information was not reported in the sectoral report tables for all the source categories for the energy, IPPU and waste sectors, and gases were not reported in units of mass. During the technical analysis, Singapore clarified that, although the information reported for subcategories does not adhere strictly to the reporting format, the information reported is complete and transparent and complies with the principles of the reporting provisions. The Party stated that it will consider adopting the reporting format at the source category level in the next BUR. The TTE noted that providing GHG emission estimates for individual source categories of the LULUCF sector as described in annex 3A.2 to the IPCC good practice guidance for LULUCF and information for all the source categories for the energy, IPPU and waste sectors with gases in units of mass in the BUR could facilitate a better understanding of the information reported.

32. Singapore reported information on its use of GWP values consistent with those provided by the IPCC in its Second Assessment Report based on the effects over a 100-year time-horizon of GHGs.

33. For the energy sector, Singapore reported CO_2, CH_4 and N_2O emissions of 48,035.60 Gg CO_2, 94.56 Gg CO_2 eq and 302.76 Gg CO_2 eq, respectively. Singapore reported that emission estimates were based on the sectoral approach and calculated using the default conversion and EFs provided in the Revised 1996 IPCC Guidelines. A tier 1 method was used for most emission estimates. A tier 2 method was used in conjunction with vehicle statistics for estimating emissions of CH_4 and N_2O from the combustion of petrol and diesel in road transport. Singapore reported information about various government agencies providing data for the energy sector, including the Energy Market Authority, NEA, the Land Transport Authority, the Maritime and Port Authority of Singapore and the Department of Statistics.

34. Singapore reported emissions for the IPPU sector of 334.67 Gg CO_2 and 77.16 Gg CH_4, 44.95 Gg N_2O, 306.41 Gg HFCs, 1,146.83 Gg PFCs and 181.96 Gg SF_6 in CO_2 eq. The Party reported information on the methodologies used for the estimation of GHG emissions from the IPPU sector based on the 2006 IPCC Guidelines. However, it did not report information on which tier methods and EFs from the 2006 IPCC Guidelines were used for the source categories of petrochemical and carbon black production, metal industry and other product manufacture and use. During the technical analysis, Singapore clarified that for the accounting of IPPU emissions a mix of tier 1, 2 and 3 methods was used, and that, where default EFs were used, they were sourced from the 2006 IPCC Guidelines. Singapore indicated that it will include these details in the GHG inventory worksheet for its next BUR. The Party did not report information on all source categories of the IPPU subsectors in sectoral report tables as in the 2006 IPCC Guidelines. During the technical analysis, Singapore indicated that it will report in line with the reporting format in its next BUR. The TTE noted that providing information on which tier methods and EFs from the 2006 IPCC Guidelines were used for source categories of petrochemical and carbon black production, metal industry and other product manufacture and use in the BUR could facilitate a better understanding of the information reported.

35. Singapore reported that the agriculture sector focuses mainly on produce such as eggs, fish and vegetables for local consumption to supplement the country's imports of these items. In its BUR, the Party used notation keys such as "NO" and "NE" to report emissions with the explanation that, given Singapore's small land size and highly urbanized landscape, GHG

emissions from the agriculture sector are negligible in relation to the small size of carbon stocks and in comparison with those from other economic sectors.

36. For the LULUCF sector, total annual net emissions amounted to 62.03 Gg CO_2 eq, comprising CO_2 and N_2O emissions. Singapore reported a series of enhancements carried out in the LULUCF sector, which had a considerable impact on the emission and removal trends presented in its third BUR for the time series 1990–2014 compared with the results presented in the second BUR. The most significant enhancements were the revision of the tree biomass growth rate for the settlement subcategories on the basis of new measurement data and the analysis of the land use, land-use change and conversion areas on the basis of satellite images for each year of the time series. The TTE commends Singapore for improving the reporting of estimates for the LULUCF sector.

37. For the waste sector, Singapore reported information on the emissions from the source categories of waste incineration, including 194.62 Gg CO_2, 1.83 Gg N_2O and ~0.00 Gg CH_4 in CO_2 eq from hazardous waste incineration and 1.91 Gg CO_2, 0.05 Gg N_2O and ~0.00 Gg CH_4 in CO_2 eq from clinical waste incineration. The Party also reported on wastewater handling, with CH_4 and N_2O emissions of 27.88 and 94.92 Gg CO_2 eq, respectively. However, it did not report disaggregated information on the source categories of domestic wastewater treatment and discharge and industrial wastewater treatment and discharge in sectoral report tables. During the technical analysis, Singapore indicated that it will report in line with the reporting format in its next BUR. The TTE noted that providing disaggregated information on the source categories of domestic wastewater treatment and discharge and industrial wastewater treatment and discharge in sectoral report tables in the BUR could facilitate a better understanding of the information reported.

38. The national inventory report provides an update to all GHG inventories reported in previous NCs and BURs. Singapore reported its national GHG inventory as a chapter of the BUR containing information that provides an update of the NC3 and the second BUR, which addressed anthropogenic emissions and removals for 2000–2014. The annex to the third BUR includes GHG inventory worksheets for 2014 and GHG summary tables for 1994, 2000, 2010 and 2012. Singapore did not report on CO_2, CH_4 and N_2O emissions from the IPPU sector for 1994, 2000, 2010 and 2012; CO_2 emissions from the waste sector for 1994 and 2000 and CH_4 emissions for 1994; or emissions from the LULUCF sector for 1994. During the technical analysis, Singapore clarified that for the IPPU and waste sectors AD are not available for the stated years; however, LULUCF estimates are available for 1994, which will be incorporated in its next BUR. To address the data gap, the Party indicated that it will attempt to apply the methods provided in the 2006 IPCC Guidelines to the extent possible and report the outcome in its next BUR. The TTE noted that providing a consistent time series for all source categories in the BUR could facilitate a better understanding of the information reported.

39. Singapore described in its BUR the institutional framework for the preparation of its 2014 GHG inventory. NEA is the governmental body leading the multi-agency effort for the preparation of the national GHG inventory. The GHG inventory preparation process involves the following four stages: data collection as well as QC and QA checks conducted by data owners; QC of the computation of emissions by NEA; QA by an independent team within NEA; and endorsement by the MRV Task Force.

40. Singapore reported that a key category analysis was performed for the level of emissions. The analysis identified 13 key categories, of which 11 related to CO_2 emissions from various categories in the energy sector and 2 related to PFCs and HFCs from the IPPU sector.

41. The BUR provides information on QA/QC measures for all sectors in accordance with the IPCC good practice guidance.

42. Singapore reported information on CO_2 fuel combustion using only the sectoral approach. In its BUR, the Party clarified that, as a global trading hub with a high trade to gross domestic product ratio, the country experiences volatility in trade data as a direct result of its large and volatile trade volumes coupled with the presence of a large refining and petrochemical sector. This gives rise to large discrepancies between emissions calculated using the reference approach and those calculated using the sectoral approach. As such, the

Party indicated that emissions calculated using the sectoral approach would be more accurate than those calculated using the reference approach. Singapore also reported on the plan to undertake a study in 2019 to better understand the reasons for the discrepancies. However, the details of the study were not reported. During the technical analysis, Singapore indicated that it will include details of the study in its future BURs. The TTE noted that providing information on the steps envisaged under the study to identify areas where data may be improved enough to address the reference approach in the BUR could facilitate a better understanding of the information reported.

43. Information was reported on international aviation and marine bunker fuels. In 2014 the GHG emissions from international aviation and marine bunkers amounted to 13,375.47 and 130,570.48 Gg CO_2 eq, respectively.

44. Singapore reported information on the uncertainty assessment (level) of its national GHG inventory. The uncertainty analysis was based on the three levels of confidence as described in the Revised 1996 IPCC Guidelines, namely high, medium and low confidence in estimation, and covers all source categories and all direct GHGs. The results obtained, as reported in the BUR, revealed that 99.6 per cent of GHG data have a confidence level of either medium or high. A large portion of these data relate to emissions from fuel combustion. The categories that were assessed to be of lower confidence accounted for about 0.4 per cent of total emissions.

45. The TTE noted that the transparency of the information reported on GHG inventories could be further enhanced by addressing the areas noted in paragraphs 27, 30, 31, 34, 37, 38 and 42 above.

46. In paragraphs 28, 29, 31, 32, 35, 38 and 39 of the summary report on the technical analysis of Singapore's second BUR, the TTE noted that the transparency of reporting could be enhanced by reporting emissions from land losses to the sea due to construction measures using a separate category (other); including HFC emissions from sources other than uses of refrigeration and air conditioning; including emissions from memo items (international bunkers and CO_2 emissions from biomass); providing information indicating a consistent time series back to the years reported; reporting CO_2 emissions from fuel combustion using both the sectoral and the reference approach; and reporting notation keys for the agriculture sector. The TTE noted that Singapore took into consideration these areas for improvement, except estimating HFC emissions from sources other than refrigeration and air conditioning and applying the reference approach for estimating CO_2 emissions from fuel combustion, in the chapters of its third BUR entitled "Land Use, Land-Use Change and Forestry" (pp.74–75) and "Singapore's Emissions for 2014" (pp.66–67). The TTE commends the Party for enhancing the transparency of the information reported.

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

47. As indicated in table 2 in annex I, Singapore 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.

48. The information reported provides a clear and comprehensive overview of the Party's mitigation actions and their effects. In its BUR, which includes information on national context, Singapore framed its national mitigation planning and actions in the context of the national GHG emission reduction targets by 2020 and 2030. Singapore reported that it has committed to a target under the Copenhagen Accord of reducing GHG emissions by 16 per cent below the 'business as usual' level by 2020. The Party also reported that it has formalized its pledge under the Paris Agreement to reduce the intensity of its GHG emissions by 36 per cent from the 2005 level by 2030 and to stabilize its emissions with the aim of them peaking in around 2030. Most of the mitigation actions are in the energy sector. Singapore reported that it is almost completely reliant on the import of oil and gas for its energy supply, making energy a strategic resource. It therefore prices fuel and electricity according to supply and demand and does not subsidize energy cost. This policy, as well as Singapore's limited options for alternative energy sources, are incentives for efficient energy use, thus

contributing to the control of GHG emissions. Singapore reported that it is on track to meeting its 2020 pledge.

49. The Party reported a summary of its mitigation actions in tabular format in accordance with decision 2/CP.17, annex III, paragraph 11. Fifteen mitigation actions in six groups were listed in tables 1–6 of the BUR. Information on the plan to implement a carbon tax from 2019 was provided (p.96); however, this measure was not listed in the tables containing information on mitigation actions. During the technical analysis, Singapore clarified that the carbon tax that came into effect on 1 January 2019 was still at the development phase at the time of the preparation and publication of the third BUR. Therefore, limited information was available to report in tabular format. The Party indicated that it will report on the carbon tax in tabular format in the next BUR. The TTE noted that including information on the carbon tax in tabular format in the BUR could facilitate a better understanding of the information reported.

50. Consistently with decision 2/CP.17, annex III, paragraph 12(a), Singapore reported the names and descriptions of mitigation actions or groups of actions, including information on the nature of the actions, coverage (sector and gases), quantitative goals and progress indicators in tables 1–6 of the BUR.

51. The information reported for the energy sector includes 13 mitigation actions in five groups: (1) "Shifting to cleaner energy sources", (2) "Improving industry energy efficiency and promoting use of cleaner fuels", (3) "Greening buildings", (4) "Shifting travel demand to low-emission modes and reducing vehicular emissions" and (5) "Improving energy performance standards of household appliances and promoting energy efficiency to households". Consistently with decision 2/CP.17, annex III, paragraph 12(b) and (c), Singapore reported information on methodologies and assumptions, as well as the objectives of the mitigation actions and the steps taken or envisaged to achieve the actions. For "Manufacturing energy efficiency", an action under group 2, abatement is assumed to be 1 per cent above the 'business as usual' level for a period of three years for 90 per cent of the manufacturing sector. However, the basis for this assumption was not reported. During the technical analysis, Singapore clarified that the assumed 1 per cent increase in energy efficiency above the 'business as usual' level was based on a consultancy study on energy efficiency potential for Singapore's industry sector as well as internal projections; the Party indicated that it will provide details of these assumptions when explaining methodologies in the next BUR. The TTE noted that including details of these assumptions in the BUR could facilitate a better understanding of the information reported.

52. Consistently with decision 2/CP.17, annex III, paragraph 12(d), information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged and the results achieved was also reported for all groups of actions in the energy sector. Two of the actions were reported as "completed" and the other 11 as "ongoing". The mitigation actions providing the greatest contribution to emission reductions are the fuel switch for power generation from fuel oil to natural gas, which in 2016 delivered an emission reduction of 4.0 Mt CO_2 eq, and the "Green Mark" buildings programme for improving the energy efficiency of new and existing buildings, which in 2016 delivered an emission reduction of 0.846 Mt CO_2 eq. In 2020, these two actions are expected to deliver mitigation effects of 4.0 Mt CO_2 eq and up to 1.55 Mt CO_2 eq, respectively, relative to 'business as usual' emission levels. Next in line, in terms of abatement achieved in 2016, are four actions that delivered similar contributions to emission reduction: the incentives for the promotion of co-generation plants (0.614 Mt CO_2 eq), the actions to increase the share of public transport (0.59 Mt CO_2 eq), the incentives to promote energy efficiency in the manufacturing sector (0.586 Mt CO_2 eq) and the measures to improve energy performance standards of household appliances (0.57 Mt CO_2 eq).

53. Two mitigation actions were reported for the waste sector under a sixth group, namely wastewater sludge disposal by incineration and actions to increase the overall recycling rate. Consistently with decision 2/CP.17, annex III, paragraph 12(b) and (c), Singapore reported information on methodologies and assumptions, the objectives of the actions and steps taken or envisaged to achieve the actions. Consistently with decision 2/CP.17, annex III, paragraph 12(d), information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged and the results achieved was also reported. Both actions

were reported as “ongoing”. The estimated emission reductions achieved by the two actions in 2016 amounted to 0.09 and 0.03 Mt CO_2 eq, respectively. In 2020, wastewater sludge incineration is expected to provide an emission reduction of 0.1 Mt CO_2 eq, and actions to increase the overall recycling rate to provide an emission reduction of 0.05 Mt CO_2 eq.

54. Apart from the mitigation actions listed in tables 1–6 of the BUR, Singapore reported on its plan to implement a carbon tax from 2019. The tax will cover around 80 per cent of the national emissions and will be applied uniformly to entities with annual emissions of 25 kt CO_2 eq and above across all sectors, complementing the existing mitigation efforts to meet Singapore’s pledge under the Paris Agreement.

55. Singapore provided information on its involvement in international market mechanisms as a Party to the Kyoto Protocol. As at September 2018, Singapore had six registered clean development mechanism activities. For information on these activities, Singapore referred to its NC3 and its first BUR, where the estimated emission reductions from the activities were reported as approximately 473 kt CO_2 eq annually and where the activities were reported to have been registered between November 2008 and July 2014.

56. Singapore reported information on its domestic MRV arrangements in accordance with decision 2/CP.17, annex III, paragraph 13. The information reported indicates that Singapore has in place a domestic MRV system for mitigation actions. Each government agency is responsible for monitoring, measuring and documenting the progress of the mitigation actions under its purview. The information collected from official sources and verified by lead agencies is then consolidated annually by the Long-Term Emissions and Mitigation Working Group secretariat, which assesses the effects of measures and tracks progress towards meeting mitigation pledges and objectives.

57. The TTE noted that the transparency of the information reported on mitigation actions and their effects could be further enhanced by addressing the areas noted in paragraphs 49 and 51 above.

58. In paragraph 45 of the summary report on the technical analysis of Singapore’s second BUR, the previous TTE noted that the transparency of reporting could be further enhanced by indicating clearly the references for the goals of the mitigation actions. The current TTE noted that Singapore took into consideration this area for improvement in the tables describing the groups of mitigation actions in its third BUR and clearly stated in the third BUR that the results achieved by the actions in question were calculated against the ‘business as usual’ projections. The TTE commends the Party for enhancing the transparency of the information reported.

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

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

60. Singapore reported information on constraints and gaps, but it did not report on related financial, technical and capacity-building needs in accordance with decision 2/CP.17, annex III, paragraph 14. In its BUR Singapore identified its small size and lack of access to alternative energy as constraints. For example, biomass is currently not viable as a significant energy resource for Singapore owing to lack of domestic biomass sources and available land to produce biomass. During the technical analysis, Singapore clarified that it did not rely on external funding for addressing its financial, technical and capacity-building needs. So far, its investment in innovation and bottom-up adjustment by companies to government policies have enabled Singapore to address its climate challenges despite disruptive changes in technology. Singapore further clarified that it regularly participates actively in various climate change capacity-building activities in order to learn from the experience of other countries. The TTE noted that providing the reasons why information on financial, technical and capacity-building needs was not included in the BUR could facilitate a better understanding of the information reported.

61. Singapore reported information on financial resources but did not report information on technology transfer, capacity-building and technical support received in accordance with decision 2/CP.17, annex III, paragraph 15. In its BUR Singapore reported that it had not received any financial resources. The Party did not report whether it received any form of technology transfer, capacity-building and technical support. During the technical analysis, Singapore confirmed that it had not received any form of such support. The Party explained that it hosts joint capacity-building programmes for fellow non-Annex I Parties in conjunction with external partners, including Parties included in Annex I to the Convention, United Nations agencies and relevant international organizations, as part of the Singapore Cooperation Programme, its flagship technical assistance programme. Singapore also offers capacity-building assistance through the provision of expertise from local trainers. The TTE noted that providing the reasons why information on technology transfer, capacity-building and technical support received in accordance with decision 2/CP.17, annex III, paragraph 15, was not included in the BUR could facilitate a better understanding of the information reported.

62. Singapore did not report 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. During the technical analysis, Singapore clarified that its technology needs and priorities were highlighted in the chapter of its BUR entitled "National Circumstances" (pp.50–57), specifying an ongoing focus on research, development, demonstration and deployment of technology for improving efficiency across multiple sectors (pp.52–57), adopting carbon capture and storage and utilization options (p.55) and facilitating solar deployment (p.56). Singapore explained that the technology requirements were assessed as a domestic process and were nationally determined. The results were published in the form of seven technology road maps, which remain unchanged since the second BUR. Singapore considers these road maps equivalent to a technology needs assessment, as they identify and prioritize the technologies and actions required to address its energy and climate change challenges. The TTE noted that providing the reasons why 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, was not included in the BUR could facilitate a better understanding of the information reported.

63. The TTE noted that the transparency of the information reported on needs and support received could be further enhanced by addressing the areas noted in paragraphs 60–62 above.

64. In paragraphs 58 and 59 of the summary report on the technical analysis of Singapore's second BUR, the previous TTE noted that the transparency of the reporting on constraints and gaps and related financial, technical and capacity-building needs could be further enhanced. The current TTE noted that Singapore clearly reported that no financial support was received. The TTE commends the Party for enhancing the transparency of the information reported.

65. Singapore reported information on various international technical cooperation programmes for fellow developing countries in collaboration with international organizations and developed country partners such as the United Nations Environment Programme and Australia, including a regional capacity-building workshop on transparency under the Convention, which aimed to build and sustain the capacity of regional countries in preparing their BURs and in undergoing the ICA process. The TTE commends Singapore for its activities.

5. Any other information

66. Singapore reported some information on its awareness-raising activity for households and businesses to be more energy conscious and make adjustments to their daily activities, choices and processes. Singapore introduced the mandatory energy labelling scheme for appliances in 2008 to raise consumer awareness of the energy consumption of various household appliances. The Party reported that it will continue to raise awareness and build capabilities to improve energy efficiency across sectors.

D. Identification of capacity-building needs

67. In consultation with Singapore, the TTE identified no capacity-building needs related to the facilitation of the preparation of subsequent BURs and participation in ICA.

68. The TTE noted that, although capacity-building needs were not identified during the technical analysis, the Party reported in its BUR the following ongoing efforts to enhance its capacity:

(a) Singapore is pursuing continuous learning to fine-tune its technical expertise on a wide range of issues from reporting processes to enhancing its climate change activities. The Party also actively collaborates with international partners to identify and promulgate best practices in these areas. It has learned a lot from sharing knowledge and experience through different channels, including by collaborating with experts and participating in technical workshops;

(b) Singapore is continuing its institutional strengthening and capacity-building efforts to improve future work on the national GHG inventory, in particular training new and existing officers involved in the preparation of the national GHG inventory.

69. No capacity-building needs for the technical analysis of Singapore's third BUR were identified by the TTE, in consultation with Singapore, in the summary report on the technical analysis of its second BUR.

III. Conclusions

70. The TTE conducted a technical analysis of the information reported in the third BUR of Singapore in accordance with the UNFCCC reporting guidelines on BURs. The TTE concludes that the reported information is mostly consistent with the UNFCCC reporting guidelines on BURs and 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 removal by sinks of all GHGs not controlled by the Montreal Protocol; mitigation actions and their effects, including associated methodologies and assumptions; constraints and gaps; financial resources; domestic MRV; and other information relevant to the achievement of the objective of the Convention. During the technical analysis, additional information was provided by Singapore clarifying aspects of its GHG inventory; clarifying assumptions, progress and results achieved from its mitigation actions; and clarifying technical and capacity-building needs. The TTE concluded that the information analysed is mostly transparent.

71. Singapore reported information on the institutional arrangements relevant to the preparation of its BURs. In 2011 it established sufficient institutional arrangements that allow for the sustainable preparation of its BURs and it has maintained them so far. The TTE commends Singapore for the continuous effort.

72. In its third BUR, submitted in 2018, Singapore reported information on its national GHG inventory for 2014. This included GHG emissions and removals of CO_2, CH_4, N_2O and fluorinated gases for the relevant sources and sinks, excluding the precursor gases. Estimates based on the reference approach for CO_2 fuel combustion, estimates at the level of source categories for the IPPU sector and estimates for solid waste disposal were not provided. The inventory was developed on the basis of the combination of the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines, although in some cases the IPCC good practice guidance or the IPCC good practice guidance for LULUCF, and specific EF values from the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines, were applied for individual key categories. The total GHG emissions for Singapore for 2014 were reported as 50,908.13 Gg CO_2 eq, including the LULUCF sector. Thirteen key categories were identified, with CO_2, HFCs and PFCs and the energy and IPPU sectors identified as the main gases and sectors, respectively.

73. Singapore reported information on mitigation actions and their effects, including the results achieved in 2016 and quantitative goals to be achieved in 2020. The Party frames its mitigation efforts in the context of its almost complete reliance on the import of oil and gas

for its energy supply and of its mitigation commitment for 2020 and its 2030 pledge. Singapore reported on 15 mitigation actions. Most of these actions occur in the energy sector (13 actions in five energy-related fields of action); the other two actions concern the waste sector. In addition to these actions, which are completed or ongoing, Singapore reported on the planned introduction of a carbon tax to be implemented from 2019, which will cover around 80 per cent of the national emissions. Singapore reported that it is well on track to meeting its 2020 pledge. The mitigation actions with the highest contribution to emission reductions are the fuel switch for power generation from fuel oil to natural gas, which in 2016 delivered an emission reduction of 4.0 Mt CO_2 eq, and the "Green Mark" buildings programme for improving the energy efficiency of new and existing buildings, which in 2016 delivered an emission reduction of 0.846 Mt CO_2 eq. In 2020, these two actions are expected to deliver mitigation effects of 4.0 Mt CO_2 eq and up to 1.55 Mt CO_2 eq, respectively, relative to 'business as usual' emission levels.

74. Singapore reported information on key constraints and gaps but did not report on related needs. Singapore reported in the BUR that it had not received any financial resources. The Party did not report on technology transfer, capacity-building or technical support received. During the technical analysis, it confirmed that no such support had been received. Information on technology needs assessment and technology needed and received was not reported in the BUR. During the technical analysis, Singapore clarified that its seven technology road maps are equivalent to a technology needs assessment.

75. The TTE, in consultation with Singapore, identified no 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 TTE noted that, although capacity-building needs were not identified during the technical analysis, Singapore reported on the ongoing efforts to enhance its capacity.

Annex I

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

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

Decision	*Provision of the reporting guidelines*	*Yes/partly/no/NA*	*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	Singapore submitted its third BUR in December 2018; the GHG inventory reported is for 2014.
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 COP or those determined by any future decision of the COP on this matter.	Yes	Singapore used a combination of the Revised 1996 IPCC Guidelines and 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;	Partly	GHG emission estimates for individual source categories of the LULUCF sector were not reported. However, comparable information was reported.
	(b) The sectoral report tables annexed to the Revised 1996 IPCC Guidelines.	Partly	Information reported did not cover all source categories and was not in units of mass.
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.	Partly	In its NC1 Singapore provided data for 1994, which was included in its third BUR together with a continuous time series for 2000–2014. However, the time series was not consistent for all source categories.
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	Yes	This information was reported for 1994, 2000, 2010 and 2012.

Decision	*Provision of the reporting guidelines*	*Yes/partly/no/NA*	*Comments on the extent of the information provided*
	inventories for previous submission years (e.g. for 1994 and 2000).		
Decision 2/CP.17, annex III, paragraph 9	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 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);	Partly	Information did not cover all source categories of the IPPU, agriculture, LULUCF and waste sectors.
	(b) Table 2 (National greenhouse gas inventory of anthropogenic emissions of HFCs, PFCs and SF_6).	Partly	Information did not cover all source categories of the IPPU sector.
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 GHG inventory worksheets for 2014 and GHG summary tables for 2012, 2010, 2000 and 1994 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;	Yes	
	(b) CH_4;	Partly	Information was provided in CO_2 eq but not in units of mass.
	(c) N_2O.	Partly	Information was provided in CO_2 eq but not in units of mass.
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:		

Decision	*Provision of the reporting guidelines*	*Yes/partly/no/NA*	*Comments on the extent of the information provided*
	(a) CO;	No	The Party did not report the emissions but reported the reason for not reporting them.
	(b) NO_X;	No	The Party did not report the emissions but reported the reason for not reporting them.
	(c) NMVOCs.	No	The Party did not report the emissions but reported the reason for not reporting them.
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.	No	The Party did not report the emissions but reported the reason for not reporting them.
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.	No	GHG emission estimates based on the reference approach were not reported. Information on inaccuracy and improvement measures in relation to estimation using the reference approach was provided in the BUR.
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 Second Assessment Report based on the effects of GHGs over a 100-year time-horizon.	Yes	The Party used the GWP provided in the IPCC Second Assessment Report.
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	Singapore used a combination of the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines. Different tier methodologies were used for specific sectors.
	(b) Explanation of the sources of EFs;	Partly	The emissions from the energy sector were mostly estimated using the default EFs from the Revised

Decision	*Provision of the reporting guidelines*	*Yes/partly/no/NA*	*Comments on the extent of the information provided*
			1996 IPCC Guidelines. The default EFs from the 2006 IPCC Guidelines were used for electronics industry and waste incineration. The Party did not specify the guidelines used for the EFs to estimate the emissions from other source categories.
	(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:		Singapore estimated and reported emissions from welding gas under the category other for the IPPU sector.
	(i) Source and/or sink categories;	No	Information was not reported to explain the emission estimate.
	(ii) Methodologies;	No	Information was not reported to explain the emission estimate.
	(iii) EFs;	No	Information was not reported to explain the emission estimate.
	(iv) AD;	No	Information was not reported to explain the emission estimate.
	(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 and 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	Notation keys were used.
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, paragraphs 3–10 and 41(g). Further, as per paragraph 3 of those guidelines, non-Annex I Parties are to submit updates of their national GHG inventories in accordance with 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. 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 2
Identification of the extent to which the elements of information on mitigation actions are included in the third biennial update report of Singapore

Decision	*Provision of the reporting guidelines*	*Yes/partly/no*	*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.	Partly	Singapore reported on its plan to implement a carbon tax from 2019 (on p.97 of its BUR) but this measure was not listed in the tables containing information on mitigation actions.
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;	Yes	
	(b) Information on:		
	(i) Methodologies;	Yes	
	(ii) Assumptions;	Yes	
	(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	In the tabular format, Singapore listed mitigation actions as “ongoing” or “completed”.
	(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	For all mitigation actions listed in tables 1–6 of the BUR, the estimated abatement for 2016 was provided.
	(e) Information on international market mechanisms.	Yes	The information was provided by referring to the Party’s NC3 and first BUR.
Decision 2/CP.17, annex III, paragraph 13	Parties should provide information on domestic MRV arrangements.	Yes	

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, paragraphs 11–13.

Table 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 Singapore

Decision	*Provision of the reporting requirements*	*Yes/partly/no*	*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.	No	
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;	Partly	The Party reported that no financial support had been received. However, no information on technology transfer or capacity-building received was reported.
	(b) Information on technical support received from the Global Environment Facility, Parties included in Annex II to the Convention and other developed country Parties, the Green Climate Fund and multilateral institutions for activities relating to climate change, including for the preparation of the current BUR.	No	
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;	No	
	(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, paragraphs 14–16.

Annex II

Documents and information used during the technical analysis

Reference documents

First, second and third BURs of Singapore. Available at http://unfccc.int/8722.php.

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. Available at http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

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.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/.

NC1, NC2, NC3 and NC4 of Singapore. Available at http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php.

Summary report on the technical analysis of the first BUR of Singapore. Available at http://unfccc.int/national_reports/non-annex_i_parties/ica/technical_analysis_of_burs/items/10054.php.

Summary report on the technical analysis of the second BUR of Singapore. Available at https://unfccc.int/ICA-cycle2.