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Technical analysis of the second biennial update report of China submitted on 25 June 2019

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 second biennial update report of China, 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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Abbreviations and acronyms

AD	activity data
BUR	biennial update report
CDM	clean development mechanism
CH_4	methane
CNY	yuan
CO	carbon monoxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
EF	emission factor
GDP	gross domestic product
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
LUCF	land-use change and forestry
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
NA	not applicable
NC	national communication
NE	not estimated
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
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
SF_6	sulfur hexafluoride
SO_X	sulfur oxides
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. China submitted its first BUR on 12 January 2017, 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 in Bonn, Germany. After the publication of its summary report, China participated in the sixth workshop for the facilitative sharing of views, convened in Katowice, Poland, on 3 December 2018.

5. This summary report presents the results of the technical analysis of the second BUR of China, 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, China submitted its second BUR on 25 June 2019 as a stand-alone update report. The submission was made within the second calendar year following the submission of the first BUR.

7. The technical analysis of the BUR took place from 2 to 6 September 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: Ahmad Wafiq Aboelnasr (Egypt), Kwame Agyei (Ghana), Rehab Ahmed Hassan (member of the Consultative Group of Experts from Sudan), Nura Al-Otaibi (member of the Consultative Group of Experts from Saudi Arabia), Nicolo Macaluso (Canada), Tahira Munir (Pakistan), Raúl Salas Reyes (Mexico) and Maarten van der Eynden (Norway). Mr. Macaluso and Mr. Salas Reyes were the co-leads. The technical analysis was coordinated by Luca Birigazzi and Alma Jean (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 China 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 China's second BUR, the TTE prepared and shared a draft summary report with the Party on 2 December 2019 for its review and comment. China, in turn, provided its feedback on the draft summary report on 27 February 2020.

9. The TTE responded to and incorporated China's comments referred to in paragraph 8 above and finalized the summary report in consultation with the Party on 17 June 2020.

[1] The consultation was conducted via teleconferencing.

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 China'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 the progress made 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 reporting in the Party's second BUR compared with that in the first BUR. Information on GHG inventories, mitigation actions and their effects, and needs and support reported in the second BUR demonstrates that the Party has taken into consideration some of the areas for enhancing transparency noted by the previous TTE in the summary report on the technical analysis of the Party's first 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 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. The main results (chaps. II.C.1–4 below) cover mainland China, while chapter II.C.5 below reports the results for Hong Kong and Macao, China.

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 second BUR, China provided an update on its national circumstances, including a description of its geography, climate, economy, natural resources, and social and economic development.

20. China 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 the involvement of the National Leading Group on Climate Change, Energy Conservation and Emissions Reduction, the Climate Change Statistics Leadership Group and key institutions at the regional and departmental (industrial) level. The National Leading Group on Climate Change, Energy Conservation and Emissions Reduction is responsible for coordinating comprehensive climate change action in China.

21. The Climate Change Statistics Leadership Group, which was established in 2014, comprises the National Development and Reform Commission, the National Bureau of Statistics, the Ministry of Science and Technology and industry associations. In the BUR, figure 1-2 shows all key departments that are members of the National Leading Group on Climate Change, Energy Conservation and Emissions Reduction. The Government of China has further strengthened the capacity of institutions at the regional and departmental (industrial) level to address climate change. For example, the National Center for Climate Change Strategy and International Cooperation was established in 2012.

22. In its second BUR, China made reference to the information on its domestic MRV arrangements reported in its first BUR (part 5). China's MRV system is designed at the national level and covers three main areas: the BUR preparation process, the GHG inventory system and the preparation of nationally appropriate mitigation actions. During the technical analysis, the Party informed the TTE that the climate change function of the MRV arrangement described in its first BUR had been transferred from the National Development and Reform Commission to the Ministry of Ecology and Environment and indicated that its overall MRV system has not changed and is consistent with the description in the first BUR and NC3.

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

23. As indicated in table 1 in annex I, China 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.

24. China's second BUR has a publication date of December 2018 but was submitted to the secretariat in June 2019, and the GHG inventory reported is for 1994, 2005, 2010, 2012 and 2014, which is more than four years prior to the date of submission. During the technical analysis, China clarified that the late submission was due to a delay in the project funding process of the Global Environment Facility and reform of institutional arrangements in 2018.

25. GHG emissions and removals for the BUR covering the 2014 inventory were estimated using either a tier 1, tier 2 or tier 3 methodology from the Revised 1996 IPCC Guidelines, while in some cases the IPCC good practice guidance (e.g. for industrial process

emissions from selected sectors and wastewater) and the IPCC good practice guidance for LULUCF (e.g. changes in reserves of above-ground biomass, below-ground biomass, litter and deadwood) were applied, as appropriate. China also used the 2006 IPCC Guidelines for selected subcategories of the waste and industrial processes sectors. Table 2.1 of the BUR provides a detailed list of the methodologies used for the 2014 GHG inventory. The TTE commends the Party for using the 2006 IPCC Guidelines and for providing information on the sector-specific and gas-specific methodologies used for the 2014 GHG inventory.

26. With regard to the methodologies used, information was reported transparently on the tier levels and sources of AD used for each category and subcategory. Information was reported on the application of default and country-specific EFs and on AD for the energy, IPPU, agriculture, LULUCF and waste sectors. Information was reported on the source of the EFs but not on the values of country-specific EFs, which could enhance the transparency of the GHG inventory. During the technical analysis, China clarified that it followed the UNFCCC reporting guidelines on BURs and that since reporting values of EFs is not a mandatory reporting requirement, and personnel and funding are limited, calculating the values of country-specific EFs was not prioritized. The TTE noted that the Party providing information on the values of the country-specific EFs used in all sectors in the BUR could facilitate a better understanding of the information reported.

27. Information on the Party's total GHG emissions by gas for 2014 is outlined in table 1 in Mt CO_2 eq. It shows an increase in emissions including LULUCF of 54.3 per cent and in emissions excluding LULUCF of 53.5 per cent since 2005. Information reported on the sources of GHG emissions and removals indicates that the most significant contributions to these emissions are from CO_2, followed by CH_4, N_2O, HFCs, SF_6 and PFCs.

Table 1
Greenhouse gas emissions and removals by gas for China for 2014

Gas	*GHG emissions (Mt CO_2 eq) including LULUCF*	*Change (%) 2005[a]–2014*	*GHG emissions (Mt CO_2 eq) excluding LULUCF*	*Change (%) 2005[a]–2014*
CO_2	9 124	63.6	10 275	61.0
CH_4	1 161	11.0	1 125	11.5
N_2O	610	22.0	610	22.0
HFCs	214	96.3	214	96.3
PFCs	16	166.7	16	166.7
SF_6	61	510.0	61	510.0
Total	**11 186**	**54.3**	**12 301**	**53.5**

[a] 2005 is the earliest reporting year covered by a GHG inventory whose scope and methods are consistent with the 2014 inventory.

28. China did not report on any other emissions (e.g. NO_X, CO and NMVOCs), including indirect GHG emissions and emissions from solvents and other product use. During the technical analysis, China clarified that information on other emissions was not reported as a result of high levels of uncertainty in data and expressed its intention to include emissions of indirect GHGs in its next BUR. Moreover, China clarified that since there is no mandatory reporting requirement to report anthropogenic emissions by sources of other GHGs, and personnel and funding are limited, reporting other emissions was not a priority. The TTE noted that providing information on emissions of indirect GHGs in the BUR could facilitate a better understanding of the information reported.

29. China 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.

30. China reported, in table 2-10 of the BUR, 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.

31. The shares of emissions that different sectors contributed to the total GHG emissions excluding LULUCF as reported by the Party, and as calculated by the TTE using information in the BUR, in 2014 are reflected in table 2.

Table 2
Shares of greenhouse gas emissions by sector for China for 2014

Sector	*GHG emissions (Mt CO_2 eq)*	*Share[a] (%)*	*Change (%) 2005–2014*
Energy	9 559	77.7	53.1
Agriculture	830	6.7	5.3
LULUCF	–1 115	NA	45.6
IPPU	1 718	14.0	97.2
Waste	195	1.6	72.6

[a] Share of total emissions without LULUCF.

32. China 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. China also noted that the 100-year time-horizon GWP value for HFC-245fa is from the Fourth Assessment Report of the IPCC.

33. The energy sector is the main source of GHG emissions in China. In 2014, emissions from the energy sector accounted for 77.7 per cent of China's total emissions excluding LULUCF. In 2014, China's total GHG emissions from energy were 9,559 Mt CO_2 eq, of which 95.1 per cent (9,094 Mt CO_2 eq) were from fuel combustion and 4.9 per cent (465 Mt CO_2 eq) from fugitive emissions. In terms of gas composition, CO_2 emissions amounted to 8,925 Mt, all of which were from fossil fuel combustion. CH_4 emissions were 24.8 Mt, of which 10.6 per cent were from fossil fuel combustion and 89.4 per cent were from fugitive emissions, and N_2O emissions were 0.367 Mt, all of which were from fossil fuel combustion.

34. For the IPPU sector, the source categories reported included mineral industry, chemical industry, metal production, production of hydrocarbons and SF_6, and consumption of hydrocarbons and SF_6. In 2014, emissions from the IPPU sector amounted to 1,718 Mt CO_2 eq, with the most significant source being mineral products, accounting for 53.3 per cent (915 Mt CO_2 eq), followed by metal production (16.8 per cent, or 288 Mt CO_2 eq) and chemical industry (13.9 per cent, or 238 Mt CO_2 eq). Emissions from the production of halocarbons and SF_6 accounted for 8.7 per cent, or 150 Mt CO_2 eq, of the total emissions from the IPPU sector, while emissions from the consumption of halocarbons and SF_6 accounted for 7.3 per cent, or 126 Mt CO_2 eq. In terms of gas composition, CO_2 emissions were 1,330 Mt, of which 68.8 per cent were from mineral products, followed by metal production (20.5 per cent) and chemical industry (10.7 per cent).

35. In the IPPU sector the only source of CH_4 stemmed from metal production (6 kt) while the only source of N_2O stemmed from chemical industry (311 kt). Emissions from HFCs were 214 Mt CO_2 eq, of which 70.1 per cent were from the production of halocarbons and SF_6 and 29.9 per cent from the consumption of halocarbons and SF_6. Emissions from PFCs were 16 Mt CO_2 eq, of which 95.6 per cent were from metal production, 0.3 per cent from the production of halocarbons and SF_6, and 4.1 per cent from the consumption of halocarbons and SF_6; SF_6 emissions amounted to 61 Mt CO_2 eq, all of which were from the consumption of halocarbons and SF_6.

36. For the agriculture sector, in 2014 China reported GHG emissions of 830 Mt CO_2 eq. N_2O emissions from agricultural soils were identified as the largest emission source in the sector, accounting for 34.7 per cent, or 288 Mt CO_2 eq, of the total. Enteric fermentation was the next largest source (207 Mt CO_2 eq, or 24.9 per cent of the total) followed by rice cultivation (187 Mt CO_2 eq, or 22.6 per cent) and manure management (138 Mt CO_2 eq, or 16.7 per cent). CH_4 and N_2O emissions from field burning of agricultural residues were also reported. The scope of the 2014 GHG inventory was similar to that of the 2012 GHG inventory.

37. China used the tier 2 method from the Revised 1996 IPCC Guidelines to calculate key source emissions from animal enteric fermentation and manure management. Domestic models were used to calculate emissions from rice fields and agricultural soils, while the tier 1 methodology from the Revised 1996 IPCC Guidelines was used to calculate emissions from the burning of agricultural residues. Information was reported on the number of livestock and amount of fertilizer used.

38. For the LULUCF sector, emissions and removals were estimated using a variety of methodologies. Carbon stock changes for each category of land use and land-use change are calculated, including the five carbon pools of above-ground biomass, below-ground biomass, litter, deadwood and soil organic matter. China reported that data from its sixth to ninth continuous forest resources inventories were used when preparing its LULUCF inventory for 2014. A tier 3 methodology was used for the calculation of changes in reserves of soil organic carbon. Changes in reserves of forestry products were estimated using the production accounting approach. The tier 2 method from the IPCC good practice guidance for LULUCF was used to estimate changes in above-ground biomass, below-ground biomass, litter and deadwood.

39. Wetland CH_4 emissions were estimated using the tier 1 method from the IPCC good practice guidance for LULUCF. Overall, the net removals from the LULUCF sector fluctuated between a minimum of 766 Mt CO_2 eq in 2005 and a maximum of 1,115 Mt CO_2 eq in 2014. While China reported LUCF removals of 407 Mt CO_2 eq for 1994 and LULUCF removals of 576 Mt CO_2 eq for 2012, these estimates were not calculated using the same methodology as that used for the LULUCF inventory for 2014. During the technical analysis, China clarified that because it is not mandatory to recalculate emissions reported in previous NCs, and personnel and funding were limited, recalculation with a methodology consistent with the LULUCF inventory of 2014 was not prioritized. The TTE noted that clarifying information on the methodologies used to estimate net removals from the LULUCF sector in the BUR could facilitate a better understanding of the information reported.

40. The inventory for the waste sector covers the categories of GHG emissions from solid waste disposal sites and from wastewater handling. China reported emissions of 195 Mt CO_2 eq, with CH_4 emissions from solid waste disposal and CH_4 emissions from wastewater handling being the largest emissions sources in this sector, accounting for 53.2 and 46.8 per cent of the total emissions, respectively.

41. The national inventory report provides an update to the GHG inventories for 1994, 2005, 2010 and 2012 reported in China's first, second and third NCs and first BUR. Information on previous inventories is reported in table 2-13 (1994), table 2-14 (2005), table 2-15 (2010) and table 2-16 (2012) of the BUR. China reported that an update to the emission level was carried out for 2005 and 2010 using the methodologies applied to the 2014 GHG inventory. Owing to issues with differing methods and scopes, the national inventories for 1994 and 2012 were not updated. During the technical analysis, China clarified that because it is not mandatory to recalculate emissions reported in previous NCs or to report a consistent time series, and personnel and funding are limited, this information was not prioritized.

42. China further clarified that, given the importance of 2005 (the base year of China's CO_2 emission reduction target per unit of GDP), it recalculated and reported the information provided in the 2005 national inventory in the BUR. The TTE noted that the Party reporting a consistent time series in the BUR could facilitate a better understanding of China's anthropogenic emissions and removals.

43. China described in its BUR the institutional framework for the preparation of its 2014 GHG inventory, including the key agencies involved. The Party reported that it has established a national system for GHG inventory development and a stable team for the preparation of GHG inventories. The Ministry of Ecology and Environment is the governmental body responsible for climate change policies and coordinates the preparation of China's GHG inventory, which is prepared with the support of a number of other organizations.

44. With respect to AD, the National Bureau of Statistics established a sector-specific statistical reporting system for addressing climate change, which increased the types of energy statistics used and allowed the AD required for the preparation of the GHG inventory

to be incorporated into the statistical reporting system. Given the importance of coal combustion, an analysis was undertaken on the net calorific value of coal consumed in key sectors by type and use. In terms of EFs, the National Bureau of Statistics initially established a statistical survey system on relevant parameters and conducted research into specific sectors. Each of the organizations mentioned above has specific roles for the sectors included in the GHG inventory, as reported in table 1-5 of the BUR.

45. China reported that, for the 2010 national inventory, a key category analysis was performed for the level of emissions and 40 categories were identified as key, including 19 sources of CO_2 emissions from the energy sector (e.g. public electricity and heat production), 6 from the IPPU sector (e.g. cement, iron and steel production) and 6 from the agriculture sector (e.g. livestock enteric fermentation and CH_4 emissions from rice cultivation); 2 sources of CH_4 emissions from solid waste disposal and wastewater treatment; and 7 sinks of forestry biomass, forest dead organic matter, soil carbon from agricultural land and grassland soil carbon. China reported that, for the 2014 inventory, emissions from these key categories were calculated using higher-tier methods and country-specific EFs.

46. The BUR provides information on quality assurance/quality control measures for all sectors. Regarding inventory management, China ensured that materials supporting the preparation of the inventory were archived in a timely manner and that a database system for the national and sectoral GHG inventories was established. A number of technical seminars for academic exchanges and discussions with other domestic research institutions and experts were also held, as well as an independent analysis and review of the inventory's methodologies and results. The TTE commends China for providing information on quality assurance/quality control procedures in accordance with the IPCC good practice guidance.

47. China reported information on CO_2 fuel combustion using both the sectoral and the reference approach. CO_2 emissions were calculated using a tier 2 method and China's domestic EF parameters and the level of emissions were verified using the reference approach. China reported that the difference between the results of the sectoral and reference approaches is lower than 5 per cent. In addition, CH_4 and N_2O emissions from fossil fuel combustion were calculated using the sectoral approach. During the technical analysis, China informed the TTE that the different data sources used were the main reason for the differing calculation results. Furthermore, China clarified that for the sectoral approach the AD were from consumption, while for the reference approach the AD were from production. The TTE noted that the Party clarifying this information in the BUR could facilitate a better understanding of the information reported.

48. Information was clearly reported on international aviation and marine bunker fuels, in the form of a memo item in accordance with decision 17/CP.8 annex, table 1.

49. China reported information on the uncertainty assessment level of its national GHG inventory. The uncertainty analysis was based on the error propagation approach from the IPCC good practice guidance and covers emissions from the energy, IPPU, agriculture, LULUCF and waste sectors. In the BUR, the Party indicated that the overall level uncertainty for emissions in 2014 is between –5.2 and 5.3 per cent. Table 2-12 of the BUR specifies the uncertainty analysis for individual sectors as follows: energy (–5.2 to 5.3 per cent); IPPU (–3.9 to 3.9 per cent); agriculture (–19.2 to 20.4 per cent); LULUCF (–21.1 to 21.2 per cent); and waste (–23.2 to 23.2 per cent).

50. While China's BUR included information on the methodology used for the uncertainty analysis, information on the uncertainty levels of AD and EFs, in particular country-specific EFs, used for the analysis, was not reported. During the technical analysis, China clarified that the uncertainty of AD and EFs for different emissions sources varied according to data source and that the overall uncertainty is based on the IPCC good practice guidance. The TTE noted that the Party providing underlying assumptions for estimating uncertainty levels in the BUR could facilitate a better understanding of the information reported.

51. The TTE noted that the transparency of the information reported on GHG inventories could be further enhanced by addressing the areas noted in paragraphs 26, 28, 39, 42, 47 and 50 above.

52. In paragraphs 24–42 of the summary report on the technical analysis of China's first BUR, the TTE noted where the transparency of reporting could be further enhanced. The TTE noted that China took into consideration several areas for improvement (e.g. providing information on which IPCC guidelines were applied to different parts of the GHG inventory and providing information on AD for the LUCF sector) and commends the Party for enhancing the transparency of the information reported. Other areas for improvement identified by the TTE in China's first BUR remain relevant to its second BUR.

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

53. As indicated in table 2 in annex I, China 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.

54. The information reported provides a comprehensive overview of the Party's mitigation actions and their effects in the three chapters covering policies and targets for GHG emission control; mitigation actions and their progress; and the results of major mitigation actions. China frames its national mitigation planning and actions in the context of its 13th Five-Year Plan for National Economic and Social Development established in 2016 and other related development schemes in the energy sector. The 13th Five-Year Plan is aimed at enhancing guidance through strategic goals and policies for areas related to mitigation, as outlined in the BUR.

55. Regarding its policies and targets, China reported that it had established the following indicators for 2020 for its nationally appropriate mitigation actions: reducing its CO_2 emissions per unit of GDP (also referred to as carbon intensity) by 40–45 per cent below the 2005 level; increasing its share of non-fossil fuel energy in primary energy consumption to about 15 per cent; and increasing forest areas by 40 million ha and forest stock volume by 1.3 billion m^3 above the 2005 level. China reported on the progress achieved in reducing CO_2 emissions per unit of GDP by 6.1 per cent compared with the 2015 level by 2016.

56. China also reported on its workplan on GHG emission control as part of its 12th Five-Year Plan from 2011, which reflected targets to drastically reduce carbon intensity, such as achieving a 17 per cent reduction by 2015 compared with the 2010 level, and to achieve progress in controlling emissions from non-energy-related activities and other GHGs. It forms the basis for the 13th Five-Year Plan, in which China reports its mitigation actions and targets, the main change compared with the previous plan being to effectively control carbon emissions and decrease intensity by 18 per cent below the 2015 level by 2020.

57. In its BUR, China reported information on progress in the following seven main groups of mitigation actions in a narrative format: (1) intensifying guidance and target control; (2) economic and industrial structural adjustment; (3) optimizing energy structures; (4) promoting energy conservation and boosting efficiency; (5) controlling non-CO_2 GHG emissions; (6) increasing carbon sinks; and (7) promoting mechanisms for implementing and strengthening mitigation actions. From this comprehensive list, the Party selected three major groups of actions and reported them in tabular format, as outlined in paragraph 58 below.

58. China reported an analysis of the results of its major mitigation actions in tabular format in accordance with decision 2/CP.17, annex III, paragraph 11. These mitigation actions are grouped into three clusters, the first of which concerns the nationwide emission target described in paragraphs 55–56 above. The other two clusters relate to optimizing energy structures, and conserving energy and improving energy efficiency. China refers to its NC3 to provide additional details on its policies and actions for climate change mitigation, relating to both CO_2 and non-CO_2 GHG emissions.

59. Consistently with decision 2/CP.17, annex III, paragraph 12(a), China reported in table 3-6 and chapter 2 of the BUR information on the names and descriptions of mitigation actions, including information on the nature of the action, coverage (i.e. sector and gases), time horizons, supervision departments, quantitative goals and progress indicators. The Party reported that most of its mitigation actions pertain to CO_2. Information about the other types of GHGs covered by each mitigation action is not reported in a disaggregated manner.

60. A description of mitigation actions, as well as information on quantitative goals, was clearly reported in the BUR. The Party reported in most cases information on the nature of the actions, which were described as either "compulsive" or "government"; however, these terms were not defined in detail in the report. During the technical analysis, China clarified that many actions reported in the BUR are in relation to reducing specific GHG emissions and it had difficulties defining the specific types of GHG emissions covered by each mitigation action. The TTE noted that the Party clarifying the information about the nature and the coverage of each mitigation action in the BUR could facilitate a better understanding of the information reported.

61. In the BUR, the Party described seven mitigation actions relating to energy structure optimization. Information on methodologies, assumptions, objectives, steps taken or envisaged and results achieved was reported for all actions, as well as the estimated emission reductions. According to the information reported for this group of actions in table 3-6, the development of non-fossil fuel energy achieved the highest reduction in GHG emissions, amounting to 110 Mt CO_2 in 2016. China reported that the policies and measures adopted in 2016 resulted in a reduction in coal consumption from 63.7 to 62 per cent in relation to the total energy consumption, a rise in natural gas consumption from 5.9 to 6.2 per cent, and an increase in non-fossil fuel energy consumption (including hydropower, wind, solar, biomass, geothermal and nuclear) from 12.1 to 13.3 per cent.

62. Three mitigation actions were reported relating to energy conservation and improving energy efficiency. The Party reported information on the methodologies and assumptions used for all three mitigation actions. However, it reported the mitigation action energy management contracting extension project as "/". The TTE was not able to understand the meaning of this notation key. During the technical analysis, the Party clarified that the notation key was used to indicate the unavailability of information. Information on the objectives, status and progress of implementation was reported for all actions. While the nationwide energy conservation action has been completed, the actions energy management contracting extension project and energy conservation in industry are ongoing.

63. The Party also reported information on the results achieved in terms of GHG emission reductions, with the highest GHG emission reduction of all reported mitigation actions coming from energy conservation measures and amounting to 490 Mt CO_2 in 2016. In addition, China provided a reference to a 2017 report on energy conservation service industry development, which contains the methodologies and assumptions used. The TTE noted that reporting the above-mentioned methodologies and assumptions in the BUR could facilitate a better understanding of the information reported.

64. As indicated in paragraph 57 above, China reported information on the progress of some mitigation actions that were reported in narrative format but were not included in tabular format. These include mitigation actions linked to economic and industrial structural adjustment, control of non-CO_2 GHG emissions and an increase in carbon sinks.

65. The information reported on the progress of mitigation actions linked to economic and industrial structural adjustment indicates that the Party promoted a shift in manufacturing from a production-oriented sector to a production- and service-oriented sector. China reported that, in 2016, it reduced capacity in the steel sector by over 65 Mt, shut down approximately 1,500 coal mines with capacities below 0.3 Mt and eliminated outdated industrial production capacity (see table 3-1 of the BUR). The mitigation actions linked to controlling non-CO_2 GHG emissions are in three areas: industrial processes, agriculture and waste disposal. China reported that the Party has been promoting 'green' manufacturing processes and cleaner production techniques, such as controlling N_2O emissions from nitric acid production.

66. The Party also reported that it was continuing to monitor the treatment of HFCs and provide subsidies to companies that destroy HFC-23 during waste treatment. In 2016 a total of 13,300 t HFC-23 was destroyed. With regard to agriculture, China reported that, in 2016, the mitigation actions implemented helped to achieve emission reductions of around 50 Mt CO_2 eq. Regarding waste disposal, China reported that, by 2016, the mitigation actions implemented assisted in treating 44.88 billion m^3 wastewater.

67. The Party reported on mitigation actions linked to increasing carbon sinks, indicating that it was continuing to implement a number of forestry ecology protection and restoration projects, increase grassland sinks and develop marine blue carbon sinks. China reported that, in 2016, a total area of 6.788 million ha was afforested and 8.5004 million ha forests were tended. The Party reported on a mitigation action to proactively increase grassland carbon sinks, which resulted in grassland fences increasing by 2.993 million ha. Furthermore, China reported information on the development of marine blue carbon sinks, for which the Party implemented a variety of programmes, such as the South Mangrove and North Willow wetland restoration programme, which helped to improve the management of marine carbon sinks. The TTE noted that the information provided in the Party's second BUR is an update of the information provided in the first BUR.

68. China provided information on its involvement in international market mechanisms under the Kyoto Protocol and documented that, by 2016, a total of 5,074 CDM projects had been approved by the National Development and Reform Commission. The CDM projects reportedly contributed to annual emission reductions of around 782 Mt CO_2 eq. The Party also reported that, by 23 August 2016, 1,557 projects had been granted certified emission reductions under the CDM, with annual emission reductions of around 358 Mt CO_2 eq. The TTE noted that no additional information was provided on how many of the CDM projects reported in the second BUR were included in the first BUR. During the technical analysis, China provided additional information clarifying that, of the 5,074 CDM projects reported in its second BUR, 2,226 were reported in its first BUR and that information on new projects approved after 23 August 2016 is not available.

69. China provided information on its regional and national emissions trading scheme, which saw transactions of 64 Mt carbon emission allowances (i.e. auctioning of allowances and free allocation of allowances) made in pilot carbon markets in seven provinces and cities. The Party also stated its intention to develop a unified national carbon emissions trading scheme and to implement MRV for carbon and allowance systems for key emitters as outlined in the 13th Five-Year Plan. China reported further progress in developing its carbon emissions trading scheme, under which the scheme for the construction of the national carbon emissions trading market (for the power generation industry) was implemented. The Party also provided information on the progress made in the pilot low-carbon projects and related work, which promote climate investment and financing, as well as carbon capture and storage testing. China launched the third group of 45 pilot low-carbon cities in 2017, since which time 87 pilot low-carbon provinces have been reached.

70. China reported information on its domestic MRV arrangements in accordance with decision 2/CP.17, annex III, paragraph 13, and provided a reference to its first BUR. The first BUR provided information in accordance with the voluntary general guidelines for domestic MRV contained in decision 21/CP.19. China reported that it has established a domestic MRV system for mitigation actions and outlined the steps for its proposed further enhancement, including establishing institutional arrangements; defining mitigation accounting standards, monitoring and data collection responsibilities; defining reporting obligations; and defining verification approaches and roles. An institutional arrangement for tracking high-level indicators related to climate change actions is documented in table 5-3 of China's first BUR. During the technical analysis, China stated that it had included in its first BUR a capacity-building need to support its domestic MRV arrangements; however, no international support has yet been received.

71. The TTE noted that the transparency of the information reported on mitigation actions and their effects could be enhanced by addressing the areas noted in paragraphs 60 and 63 above.

72. In paragraphs 47–51 of the summary report on the technical analysis of China's first BUR, the previous TTE noted where the transparency of reporting on methodologies and assumptions, descriptions of steps taken or envisaged, involvement in international market mechanisms and domestic MRV arrangements could be enhanced. The current TTE noted that China took into consideration these areas for improvement and 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

73. As indicated in table 3 in annex I, China 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.

74. China 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 China identified two main constraints related to finance: insufficient financial support from developed countries and international financial support received mainly for mitigation actions. China reported that, during 2016–2030, it will require, on average, CNY 1.3 trillion per year on top of the amount already provided by domestic public and private sectors, whereas since 2010 it has received only around USD 5.2 billion in grants and concessional loans.

75. The Party reported that the support received so far for adaptation has only been sufficient for a few small-scale projects. During the technical analysis, China clarified that, as a result of limited project information, more than 95 per cent of the international financial support it receives is estimated to have been allocated to mitigation, meaning that less than 5 per cent is allocated to adaptation and cross-cutting areas. Furthermore, the Party informed the TTE of the challenges encountered in collecting and reporting data on international support received but stated that the MRV arrangements for mitigation are facilitating such activities across different departments. The Party also informed the TTE that its capacity to address all the reporting requirements was constrained, given its limited personnel and funding, and that adequate support would be required to fully address the reporting requirements.

76. China reported that its financial, technical and capacity-building needs are related to the implementation of its strategic goals of addressing climate change and nationally determined contributions. However, detailed information on the methodology, uncertainties and additional details of sectoral financial needs related to nationally determined contributions is not reported in the BUR. During the technical analysis, China clarified that these details were not provided owing to limited space in this chapter. During the technical analysis, China also clarified that, according to a preliminary estimation, it will require financial support for fulfilling its nationally determined contribution goals totalling around CNY 56 trillion during 2016–2030, of which CNY 32 trillion would be for mitigation and CNY 24 trillion for adaptation.

77. On the basis of reasonable projections of future financial resources, China expects a gap of around CNY 0.5 trillion for mitigation and CNY 0.8 trillion for adaptation per year. During the technical analysis, China also clarified that it had encountered challenges in adapting to climate change and therefore had already published a set of capacity-building needs related to adaptation in the 2013 National Strategy for Climate Change Adaptation, Part V. During the technical analysis, China reported that it is in the process of identifying priority adaptation options on different scales in different sectors.

78. China reported information on financial resources, technology transfer, capacity-building and technical support received in accordance with decision 2/CP.17, annex III, paragraph 15. In its BUR China reported that, between 2010 and 2016, it received financial support of USD 132 million from the Global Environment Facility (table 4-1), USD 18.15 million from the Asian Development Bank and USD 8 million from the European Investment Bank (table 4-2). An additional USD 4.08 billion was in the form of concessional loans from the World Bank and the Asian Development Bank (table 4-3).

79. The information also indicates that China received USD 997 million through bilateral channels (table 4-4). In addition, China received capacity-building support for its project on preparing its NC3 and BUR and for upgrading small hydroelectricity projects in the country. China also reported that it received capacity-building support from multilateral institutions and bilateral cooperation programmes, such as the EU–China cooperation project on emissions trading and the Sino–German cooperation project Capacity Building for Key Actors in the Building Energy Efficiency Sector. The Party reported that the capacity-

building support received is still limited and does not meet its demands, therefore limiting the implementation of policies and actions.

80. China 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 its BUR, the Party reported in tabular format its prioritized mitigation technology needs (table 4-5) for the energy, renewable energy and transportation sectors; the iron and steel, construction material, waste disposal and chemical industries; residential and commercial building; and industry. China also identified its prioritized technology needs for climate change adaptation relating to agricultural forest and ecological environment, urban adaptation, and disaster warning and weather monitoring (table 4-6). The Party reported that it had conducted many rounds of technology needs assessments.

81. China did not provide detailed information on technology support received. During the technical analysis, the Party clarified that this was because few related cases had been reported domestically. Furthermore, it has not received technology transfer support under the Convention; it is unable to access most of the mitigation technologies, owing to some countries blocking the export and transfer of advanced technologies and implementing export licensing measures to limit the classification of export controls. Even with consent from technology suppliers to sell relevant technologies, the Party reported difficulties in having these technologies pass through customs owing to policy restrictions set by the host country. In addition, most mitigation technologies are not economical and their large-scale application requires financial support which has not been obtained in China. The TTE noted that providing a description of the challenges faced in receiving technical and technology support in the BUR could facilitate a better understanding of the information reported.

82. 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 paragraph 81 above.

5. Technical analysis of the information reported for Hong Kong and Macao

83. In addition, as encouraged by decision 17/CP.8, annex, paragraph 4, China provided a summary of relevant information regarding its national circumstances in tabular format for Hong Kong and Macao. China described in its first BUR the existing institutional arrangements relevant to the preparation of its NCs and BURs on a continuous basis for both Hong Kong and Macao.

(a) Hong Kong

84. Hong Kong is described as a vibrant city with a mild climate, limited natural resources, high population density and a highly developed service industry. It is also a renowned international financial, trading and shipping hub.

85. The information reported in the BUR on the GHG inventory for Hong Kong uses a combination of methodologies from the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines, using EFs based on the circumstances of Hong Kong to the extent possible.

86. For Hong Kong, the BUR indicated that total GHG emissions (excluding LUCF) was 44,999 kt CO_2 eq in 2014. The share of emissions contributed by different sectors to the total GHG emissions in 2014 was 90.65 per cent for the energy sector (40,794 kt CO_2 eq); 3.65 per cent for the IPPU sector (1,641 kt CO_2 eq); 0.07 per cent for the agriculture sector (31 kt CO_2 eq); and 5.63 per cent for the waste sector (2,534 kt CO_2 eq).

87. Notation keys were used in some sectors; for example, CH_4 and N_2O emissions from industrial processes were reported as "NE". The notation keys are explained, thereby enhancing the transparency of the reporting.

88. The GHG inventories for Hong Kong for other years (1994, 2005, 2010 and 2012) were not included in the BUR. In its NC3, the Party reported a GHG inventory for Hong Kong covering 1994, 2005 and 2010.

89. Emissions from international bunker fuels (marine and aviation) were reported as memo items in table 5-2 of the BUR. In addition, table 5-2 includes special regional aviation

and marine emissions as memo items; the BUR states that these emissions were included in the GHG inventory for mainland China as emissions from domestic aviation and navigation.

90. The uncertainty analysis of the Hong Kong inventory was undertaken in accordance with the 2006 IPCC Guidelines. The uncertainty was estimated at 4.34 per cent using the error propagation method in the IPCC good practice guidance. The Party also noted in the BUR that emissions from coal-fired power generation were the main cause of the uncertainty, which is mainly due to limited statistics on the type and quantity of coal consumption at power plants.

91. In its BUR, China reported that a quantitative GHG emission reduction target to reduce carbon intensity by 50–60 per cent below the 2005 level by 2020 was first set in Hong Kong's Climate Change Strategy and Action Agenda published in 2014. Furthermore, China reported that Hong Kong's Climate Action Plan 2030+ was published in January 2017, setting out a further target to reduce carbon intensity by 65–70 per cent below the 2005 level by 2030, which is equivalent to a reduction of between 3.3 and 3.8 t CO_2 per capita.

92. China reported that, in order to achieve these targets, a series of policies and measures have been adopted across a variety of sectors, such as energy, transport, industry and waste, including phasing out coal-fired electricity generation; promoting renewable energy developments and introducing feed-in tariffs to incentivize the private sector; selling renewable energy certificates; promulgating and implementing a building energy-efficiency ordinance; setting energy-saving targets for government buildings; implementing the Mandatory Energy Efficiency Labeling Scheme and carbon audits for buildings; and waiving the First Registration Tax on electric vehicles. Furthermore, China reported in its BUR that, in 2016, Hong Kong reduced CO_2 emissions per unit of GDP by 29 per cent while GHG emissions per capita remained at 5.7 t CO_2 eq.

93. The Party provided a summary of its mitigation actions in tabular format. Consistently with decision 2/CP. 17, annex III, paragraph 12(a), China reported the names and descriptions of the mitigation actions, including information on the nature of the action, coverage (sector gases), quantitative/qualitative goals and progress indicators for Hong Kong in table 5-4 and chapter 2 of part V of China's second BUR.

94. Nine mitigation actions were reported for Hong Kong in table 5-4, of which most were in the energy sector. A number of other mitigation actions were reported in chapter 2 of part V of the BUR, but not listed in table 5-4. Consistently with decision 2/CP.17, annex III, paragraph 12(b–d), China provided information on methodologies, objectives of the actions, steps taken or envisaged to achieve those actions and the progress of implementation of the mitigation actions relevant to Hong Kong. The TTE noted that information on assumptions for the mitigation actions listed in table 5-4 was not provided. Information on the estimated emission reduction effects was provided for most of the mitigation actions listed in table 5-4, with the exception of the mitigation action relating to Hong Kong's Climate Action Plan 2030+, which was reported as "/". The TTE noted that estimated emission reduction effects are provided under the targets or major components columns.

95. China did not report information on international market mechanisms for Hong Kong in its second BUR. During the technical analysis, the Party clarified that there are currently no projects under international market mechanisms for Hong Kong.

96. China did not report information on domestic MRV arrangements for Hong Kong. However, the TTE noted that information was provided on the departments responsible for each mitigation action listed in table 5-4.

(b) Macao

97. Macao is a special administrative region of China. It is a city with a mild climate, limited natural resources, high population density and a well-developed gaming industry. It is also a world-famous hub for tourism and leisure activities.

98. The information reported in the BUR for the GHG inventory of Macao indicates that a combination of methodologies from the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines was used, using EFs based on the circumstances of Macao to the extent possible.

99. For Macao, it was indicated in the BUR that the total GHG emissions (excluding and including LUCF) were 1,095 kt CO_2 eq in 2014. Emissions from LUCF were reported as "NE"/"NO", which means that there is no distinction between GHG emissions excluding and those including LUCF. The different sectors that contributed to the total GHG emissions in 2014 are energy (1,071 kt CO_2 eq, or 97.8 per cent) and waste (24 kt CO_2 eq, or 2.2 per cent). Owing to special social and geographical characteristics, as well as the availability of relevant data, Macao's GHG inventory covers only GHG emissions from energy-related activities and waste disposal.

100. Notation keys were used in some sectors; for example, CO_2, CH_4, N_2O, PFC and SF_6 emissions from industrial processes and CH_4 emissions from LUCF were reported as "NO", while HFC emissions from industrial processes and CO_2 and N_2O emissions from LUCF were reported as "NE". The notation keys are explained, thereby enhancing the transparency of the reporting.

101. In 2014, N_2O emissions were 37 kt CO_2 eq (3.4 per cent), while CH_4 emissions were 4 kt CO_2 eq (0.4 per cent). It was indicated in in the BUR that emissions from HFCs, PFCs and SF_6 were excluded from Macao's GHG inventory owing to a lack of data.

102. The GHG inventories for Macao for other years (1994, 2005, 2010 and 2012) were not included in the BUR. In its NC3, the Party reported a GHG inventory for Macao covering 2005 and 2010.

103. Emissions from international bunker fuels (marine and aviation) were reported as memo items in table 6-2 of the BUR. In addition, table 6-2 includes special regional aviation and marine emissions as memo items and the BUR states that these emissions were included in the GHG inventory for mainland China as emissions from domestic aviation and navigation.

104. The uncertainty analysis of Macao's inventory was undertaken in accordance with the 2006 IPCC Guidelines. The uncertainty of Macao's inventory was estimated as 3.2 per cent using the error propagation method in the IPCC good practice guidance. The level of uncertainty is 3.2 per cent for the energy sector and 17.4 per cent for the waste sector.

105. In its BUR, China reported that Macao drew up its Environmental Protection Planning (2010–2020) in 2010 and Five-Year Development Plan in 2016. The Party reported that Macao set the objective of reducing its GHG emissions per regional GDP by 40–45 per cent below the 2005 level by 2020. To achieve this objective, a series of mitigation actions have been adopted for various sectors, including the energy and transport sectors. Some of the mitigation actions for Macao were reported in narrative format and include increasing the proportion of natural gas power generation; adopting renewable energy sources such as photovoltaics; reducing the consumption of heavy oil to improve its energy consumption structure in a way that reduces GHG emissions; and implementing a Green Hotel Award to promote low-carbon development in the hotel and tourism sector. China further reported that, in 2014, Macao reduced GHG emissions per capita by 21.9 per cent below the 2010 level and reduced GHG emissions per unit of regional GDP by 37.1 per cent below the 2010 level.

106. The Party provided a summary of its mitigation actions in both tabular and narrative format. Consistently with decision 2/CP. 17, annex III, paragraph 12(a), China reported the names and descriptions of the mitigation actions, including information on the nature of the action, coverage (sector gases), quantitative/qualitative goals and progress indicators for Macao in table 6-4 of the BUR.

107. Five mitigation actions were reported for Macao in table 6-4, most of which were in the energy sector. These include gradually increasing the share of natural gas power generation, implementing an energy-efficiency and energy-saving plan for public sectors and institutions, and introducing public outdoor light-emitting diode lighting applications. Consistently with decision 2/CP.17, annex III, paragraph 12(b–d), China provided information on methodologies and assumptions, objectives of the actions, and the steps taken or envisaged to achieve those actions for all mitigation actions listed in table 6-4 relevant to Macao. China provided information relevant to Macao on the progress of implementation of the mitigation actions for two of the mitigation actions listed in table 6-4.

108. China did not report information on international market mechanisms for Macao. During the technical analysis, the Party clarified that there are currently no projects under international market mechanisms for Macao.

109. China did not report information on domestic MRV arrangements for Macao. However, the TTE noted that information was provided on the departments responsible for each mitigation action listed in table 6-4.

D. Identification of capacity-building needs

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

(a) Strengthening the institutional framework for the preparation of the GHG inventory, including:

(i) Preparing national inventories on an institutionalized basis rather than on a project basis;

(ii) Collecting inventory data and coordinating data from various sectors;

(b) Enhancing national capacity associated with the estimation of indirect GHGs (e.g. CO, NMVOCs and NO_X);

(c) Enhancing national capacity to quantitatively calculate the emission reduction effect of overlaps between different mitigation actions;

(d) Enhancing national capacity to identify, quantify and report on financial support needed and received, in particular to provide more data or information sources on financial support received;

(e) Enhancing national capacity to develop guidelines and methodologies for estimating future mitigation and adaptation support needs, including a periodically updated database on technology that could be transferred and information on capacity-building events or workshops for BUR compilers.

111. The TTE noted that, in addition to those identified during the technical analysis, China reported the following capacity-building needs in its BUR:

(a) Strengthening national capacity to prepare the GHG inventory and the inventory report for the purpose of the BUR, including establishing an institutionalized system for the preparation of GHG inventories, including local GHG inventories;

(b) Strengthening capacity to conduct statistics work and MRV, including strengthening research into local EFs and improving the technology skills and competence of the inventory compilers;

(c) Strengthening national capacity to address areas related to climate change adaptation;

(d) Strengthening national capacity related to finance, personnel and intergovernmental coordination;

(e) Strengthening national capacity to improve education and training in addressing climate change and raising public awareness.

112. China confirmed that the capacity-building needs identified for mainland China's BUR are also relevant to Hong Kong and Macao.

113. In paragraphs 92 to 94 of the summary report on the technical analysis of China's first BUR, the previous TTE, in consultation with China, identified capacity-building needs. In its second BUR, China reflected that some of those capacity-building needs have been addressed.

III. Conclusions

114. The TTE conducted a technical analysis of the information reported in the second BUR of China 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, including a national inventory report; 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; the level of support received to enable the preparation and submission of BURs; and domestic MRV reported in the NC3 and first BUR. The TTE concluded that the information analysed is mostly transparent.

115. China reported information on the institutional arrangements relevant to the preparation of its BURs. The National Leading Group on Climate Change, Energy Conservation and Emissions Reduction is responsible for comprehensively coordinating climate change action in China. The Climate Change Statistics Leadership Group, which was established in 2014, comprises the National Development and Reform Commission, the National Bureau of Statistics, the Ministry of Science and Technology and industry associations. In the BUR, figure 1-2 shows all key departments that are members of the National Leading Group on Climate Change, Energy Conservation and Emissions Reduction. In 2018, in accordance with the arrangements for the institutional reform of the Government of China , the functions of addressing climate change were allocated from the National Development and Reform Commission to the newly established Ministry of Ecology and Environment.

116. The Government has further strengthened the capacity of institutions at the regional and departmental (industrial) level to address climate change. For example, the National Center for Climate Change Strategy and International Cooperation was established in 2012. China has taken significant steps to create institutional arrangements that allow for the sustainable preparation of its BURs. These include organizational improvements and knowledge-sharing procedures to facilitate sectoral information transfer. The TTE commends China for the progress made and noted that the planned improvements to the overall MRV system of GHG emissions and reductions, as outlined in the first BUR and NC3, would increase the sustainability of reporting of information to the secretariat.

117. In its second BUR, submitted in 2019, China reported information on its national GHG inventory for multiple years (1994, 2005, 2010, 2012 and 2014). This included GHG emissions and removals of CO_2, CH_4 and N_2O for all relevant sources and sinks. Estimates of fluorinated gases were provided. The inventory was developed on the basis of a combination of the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the 2006 IPCC Guidelines. China used both country-specific and IPCC default EFs. The total GHG emissions for 2014 were reported as 12,301 Mt CO_2 eq (excluding LULUCF) and 11,186 Mt CO_2 eq (including LULUCF). Overall, 40 key categories were identified, with CO_2 and the energy sector identified as the main gas and key category, respectively.

118. China reported information on mitigation actions and their effects, including information on China's national context, and framed its national mitigation planning and actions in the context of its 13th Five-Year Plan (2016–2020). China reported information on its mitigation actions in three chapters, providing an overview of its overall national goals and targets, information on progress made in its mitigation actions, and an analysis and the results of its major mitigation actions. China reported actions that are both ongoing and completed, which occur within several sectors, including energy, industry and waste. Information on methodologies and assumptions was reported for most of its mitigation actions listed in table 3-6 of the BUR. The key mitigation actions are China's nationwide mitigation action, the objective of which is to reduce CO_2 emissions per unit of GDP by 40–45 per cent below the 2005 level by 2020, and the nationwide energy conservation action, for which China reported an estimated effect of a reduction in emissions of 490 Mt CO_2 in 2016.

119. China reported information on key constraints, gaps and related needs, including financial, technology and technical needs related to mitigation and adaptation in different sectors. Information on support received and needed was reported. China also reported the challenge of establishing a standardized and sustainable system for the preparation of national GHG inventories. Information on technology needs and technology needed and received was also reported in the BUR. During the technical analysis, China provided additional information on its financial and capacity needs.

120. The TTE, in consultation with China, identified the five capacity-building needs listed in chapter II.D above 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.

Annex I

Extent of the information reported by China in its second biennial update report

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

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.	No	China submitted its second BUR in June 2019; the GHG inventories reported are for 1994, 2005, 2010, 2012 and 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 Conference of the Parties or those determined by any future decision of the Conference of the Parties on this matter.	Yes	China used a combination of the Revised 1996 IPCC Guidelines, the IPCC good practice guidance, the IPCC good practice guidance for LULUCF 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	China submitted updates of its 2005 and 2010 GHG inventories using a combination of the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines. The national inventories for 1994 and 2012 were not updated.
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.
	(b) The sectoral report tables annexed to the Revised 1996 IPCC Guidelines.	Yes	Comparable information was reported.
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	The BUR reported GHG inventories for 1994, 2005, 2010, 2012 and 2014. The time series reported in the BUR did not include the years 1995–2004, 2006–2009, 2011 and 2014. The inventories for 1994 and 2005 are not consistent with the 2014 inventory.
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 1994, 2005, 2010 and 2012, as reported in China's previous NCs and first BUR.
	The inventory section of the BUR should consist of a national inventory report as a summary or as		

Decision	*Provision of the reporting guidelines*	*Yes/partly/no/NA*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III, paragraph 9	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);	Yes	Tables 2-7, 2-10 and 2-11 of the BUR report comparable information on anthropogenic emissions by sources and removals by sinks. Emissions from solvents and other product use are not reported.
	(b) Table 2 (National greenhouse gas inventory of anthropogenic emissions of HFCs, PFCs and SF_6).	Yes	Comparable information was reported in table 2-11.
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 the GHG inventory for Hong Kong and Macao 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	Information on procedures and arrangements undertaken to collect and archive data for the preparation of national GHG inventories was reported.
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;	Yes	
	(c) N_2O.	Yes	
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	Information on HFCs was reported.
	(b) PFCs;	Yes	Information on PFCs was reported.
	(c) SF_6.	Yes	Information on SF_6 was reported.
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) CO;	No	Information on CO was not reported.
	(b) NO_X;	No	Information on NO_X was not reported.
	(c) NMVOCs.	No	Information on NMVOCs was not reported.
Decision 17/CP.8, annex, paragraph 17	Other gases not controlled by the Montreal Protocol, such as SO_X, and included in the Revised 1996 IPCC Guidelines may be included at the discretion of Parties.	No	The Party did not report on other gases, such as SO_X.

Decision	*Provision of the reporting guidelines*	*Yes/partly/no/NA*	*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.	Yes	
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	China used the GWP provided in the IPCC Second Assessment Report for all GHGs except HFC-245fa, for which the GWP provided in the IPCC Fourth Assessment Report is used.
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	China used a combination of the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the 2006 IPCC Guidelines.
	(b) Explanation of the sources of EFs;	Yes	China used a combination of IPCC default EFs and country-specific EFs where available. The country-specific EFs were not reported.
	(c) Explanation of the sources of AD;	Yes	Party reported the sources of AD collected by national organizations.
	(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:	Yes	
	(i) Source and/or sink categories;		
	(ii) Methodologies;		
	(iii) EFs;		
	(iv) AD;		

Decision	*Provision of the reporting guidelines*	*Yes/partly/no/NA*	*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 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	
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;	No	
	(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 second biennial update report of China

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.	Yes	
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	The Party provided information on methodologies for all mitigation actions. Information on methodologies for the mitigation action energy management

Decision	*Provision of the reporting guidelines*	*Yes/partly /no*	*Comments on the extent of the information provided*
			contracting extension project listed in table 3-6 of the BUR was reported as "/". This notation key indicates the unavailability of information.
	(ii) Assumptions;	Yes	The Party provided information on assumptions for all mitigation actions. Information on assumptions the mitigation action energy management contracting extension project listed in table 3-6 of the BUR was reported as "/".
	(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	Information on the status of implementation of the mitigation actions is provided in narrative format in section 2, part III, of the BUR.
	(ii) Progress of implementation of the underlying steps taken or envisaged;	Yes	Information on the status of implementation of the mitigation actions is provided in narrative format in section 2, part III, of the BUR.
	(iii) Results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible;	Yes	The Party provided information on results achieved for all mitigation actions. Information on the mitigation action nationwide mitigation action listed in table 3-6 of the BUR was reported as "/".
	(e) Information on international market mechanisms.	Yes	
Decision 2/CP.17, annex III, paragraph 13	Parties should provide information on domestic MRV arrangements.	Yes	The Party provided a reference to its first BUR for more details on MRV arrangements.

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 second biennial update report of China

Decision	*Provision of the reporting requirements*	*Yes/partly/no*	
Decision 2/CP.17, annex III, paragraph 14	Non-Annex I Parties should provide updated information on:		
	(a) Constraints and gaps;	Yes	Information on constraint and gaps was provided in chapter 1.2.4, part IV, of the BUR.
	(b) Related financial, technical and capacity-building needs.	Yes	Information on financial, technical and capacity-building needs was provided.
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	China provided information on financial support received in table 4-2 of the BUR.

Decision	*Provision of the reporting requirements*	*Yes/partly/no*	
	(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.	Yes	
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;	Yes	China provided a list of prioritized adaptation technology needs in table 4-6 of the BUR.
	(b) Technology support received.	Yes	

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 BUR of China. 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.

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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.

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

Third NC of China. Available at http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php.