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Technical analysis of the first biennial update report of Thailand submitted on 29 December 2015

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 (non-Annex I Parties), consistent with their capabilities and the level of support provided for reporting, were to submit their first biennial update report (BUR) by December 2014. The least developed country Parties and small island developing States may submit BURs at their discretion. Further, according to paragraph 58(a) of the same decision, the first round of international consultation and analysis (ICA) is to be conducted for non-Annex I Parties commencing within six months of the submission of the Party's first BUR. The process of ICA consists of two steps: the technical analysis of the submitted BUR, followed by a workshop for the facilitative sharing of views under the Subsidiary Body for Implementation. This summary report presents the results of the technical analysis of the first BUR of Thailand 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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I. Introduction and process overview

A. Introduction

1. According to decision 2/CP.17, paragraph 41(a), Parties not included in Annex I to the Convention (non-Annex I Parties), consistent with their capabilities and the level of support provided for reporting, were to submit their first biennial update report (BUR) by December 2014. The least developed country Parties and small island developing States may submit BURs at their discretion. Further, according to paragraph 58(a) of the same decision, the first round of international consultation and analysis (ICA) is to be conducted for non-Annex I Parties commencing within six months of the submission of the Party's first BUR. The process of ICA consists of two steps: the technical analysis of the submitted BUR, resulting in a summary report for each BUR analysed, followed by a workshop for the facilitative sharing of views under the Subsidiary Body for Implementation.

2. This summary report presents the results of the technical analysis of the first BUR of Thailand undertaken by a team of technical experts (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

3. Thailand submitted its first BUR on 29 December 2015. During the technical analysis, Thailand clarified that the delayed submission was attributed to the fact that, in the past, the greenhouse gas (GHG) inventory estimation was performed by a temporary working group. However, in parallel with the preparation of the BUR, and with the aim of improving efficiency and strengthening reporting, the GHG inventory reporting system was established; it was a time consuming process, hence the delay in submission beyond December 2014. In addition, Thailand clarified that it received support from the Global Environment Facility (GEF) for preparing the BUR and its third national communication in March 2014.

4. The technical analysis of the BUR took place from 13 to 17 June 2016 in Bonn, Germany, 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: Mr. Stephen King'uyu (Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) member from Kenya), Mr. Tan Ching Tiong (Malaysia), Mr. Igor Ristovski (the former Yugoslav Republic of Macedonia), Ms. Sekai Ngarize (United Kingdom of Great Britain and Northern Ireland) and Ms. Julia Meisel (CGE member from the United States of America). Mr. King'uyu and Ms. Meisel were the co-leads. The technical analysis was coordinated by Ms. Alma Jean (secretariat).

5. 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 Thailand engaged in consultation via e-mail on the identification of capacity-building needs for the preparation of BURs and participation in the ICA process. Following the technical analysis of the BUR, the TTE prepared and shared a draft summary report with Thailand on 17 August 2016 for its review and comment. Thailand, in turn, provided its feedback on the draft summary report on 31 October 2016.

6. The TTE responded to and incorporated the Party's comments referred to in paragraph 5 above and finalized the summary report in consultation with Thailand on 15 February 2017.

II. Technical analysis of the information reported in the biennial update report

A. Scope of the technical analysis

7. 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 these actions, increase 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 biennial update reporting guidelines for Parties not included in Annex I to the Convention" (hereinafter referred to as the UNFCCC reporting guidelines on BURs) contained in annex III to decision 2/CP.17, 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).

8. The remainder of this chapter presents the results of each of the three parts of the technical analysis of Thailand's BUR outlined in paragraph 7 above.

B. Overview of the elements of information reported

9. The elements of information referred to in paragraph 7(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 measurement, reporting and verification (MRV); and support received.

10. Further, 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 9 above have been included in the BUR of the Party concerned. The results of that analysis are presented in tables 1, 2 and 3 below.

1. National greenhouse gas inventory

11. 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, paragraph 41(g), and paragraphs 3–10 of the UNFCCC reporting guidelines on BURs. 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 "Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention" 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.

12. Table 1 presents the results of the identification of the extent to which the elements of information on GHGs are included in the first BUR of Thailand in accordance with the relevant parts of the UNFCCC reporting guidelines on BURs.

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

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	Yes	
Decision 2/CP.17, annex III, paragraph 5	The updates of the sections on the 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 emission factor may be made in the subsequent full national communication	Yes	
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)	Yes	Information on the GHG inventory is provided but is not presented in exactly the same format as that of table 1
	(b) Table 2 (National greenhouse gas inventory of anthropogenic emissions of HFCs, PFCs and SF6)	No	
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) Tables included in annex 3A.2	No	

Decision	*Provision of the reporting guidelines*	*Yes/ Partly/No/NA*	*Comments on the extent of the information provided*
	to chapter 3 of the IPCC good practice guidance for LULUCF		
	(b) The sectoral report tables annexed to the Revised 1996 IPCC Guidelines	No	
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 the previous national communications	Yes	The time series from 2000 to 2011 are reported in figures 13 and 14;
Decision 2/CP.17, annex III, paragraph 8	Non-Annex I Parties that have previously reported on their national GHG inventories contained in their national communications are encouraged to submit summary information tables of inventories for previous submission years (e.g. for 1994 and 2000)	Partly	National and sectoral emission levels for 2000 are reported in figures 13 and 14
Decision 2/CP.17, annex III, paragraph 10	Additional or supporting information, including sector-specific information, may be supplied in a technical annex	NA	
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	The institutional arrangements for the preparation of the GHG inventory are reported in figures 10 and 11 of the BUR
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 the following gases by sources and removals by sinks:		
	(a) CO2	Yes	
	(b) CH4	Yes	
	(c) N2O	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 HFCs, PFCs and SF6	No	

Decision	*Provision of the reporting guidelines*	*Yes/ Partly/No/NA*	*Comments on the extent of the information provided*
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	No	
	(b) Marine bunker fuels	No	
Decision 17/CP.8, annex, paragraph 16	Non-Annex I Parties are encouraged, as appropriate, to report on anthropogenic emission by sources of other GHGs, such as:		
	(a) CO	Yes	
	(b) NOx	Yes	
	(c) NMVOCs	Yes	
Decision 17/CP.8, annex, paragraph 17	Other gases not controlled by the Montreal Protocol, such as SOx, included in the Revised 1996 IPCC Guidelines may be included at the discretion of the Parties	Yes	
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 approaches, and to explain any large differences between the two approaches	No	
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 emission factors and activity data. 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, emission factors and activity data used in their estimation of emissions, as		

Decision	*Provision of the reporting guidelines*	*Yes/ Partly/No/NA*	*Comments on the extent of the information provided*
	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	
	(b) Explanation of the sources of emission factors	Yes	Default values from the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines were used
	(c) Explanation of the sources of activity data	Yes	Activity data were obtained from statistical reports of relevant agencies
	(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:	No	All estimations were prepared using the Revised 1996 IPCC Guidelines
	(i) Source and/or sink categories		
	(ii) Methodologies		
	(iii) Emission factors		
	(iv) Activity data		
	(e) Parties are encouraged to identify areas where data may be further improved in future communications through capacity-building	No	
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	No	

Decision	*Provision of the reporting guidelines*	*Yes/ Partly/No/NA*	*Comments on the extent of the information provided*
	(b) Underlying assumptions	No	
	(c) Methodologies used, if any, for estimating these uncertainties	No	

Abbreviations: BUR = biennial update report, GHG = greenhouse gas, 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*, NA = not applicable, NMVOC = non-methane volatile organic compound, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

2. Mitigation actions and their effects

13. The parts of the UNFCCC reporting guidelines on BURs on the reporting of information on mitigation actions in BURs are contained in paragraphs 11–13 of the UNFCCC reporting guidelines on BURs.

14. Thailand reported on mitigation actions in its first BUR. The information on mitigation actions reported is provided in tabular format.

15. Table 2 presents the results of the identification of the extent to which the elements of information on mitigation actions are included in the first BUR of Thailand in accordance with the relevant parts of the UNFCCC reporting guidelines on BURs.

Table 2
Identification of the extent to which the elements of information on mitigation actions are included in the first biennial update report of Thailand

Decision	*Provision of the reporting guidelines*	*Yes/ Partly/No*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III, paragraph 12	For each mitigation action or groups 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	Partly	Information on the methodology is not reported for the 13 additional mitigation actions reported in appendix 1
	(ii) Assumptions	No	
	(c) Information on:		

Decision	*Provision of the reporting guidelines*	*Yes/ Partly/No*	*Comments on the extent of the information provided*
	(i) Objectives of the action	Partly	The broad objective of the National Climate Change Master Plan is reported on page 44. The specific objectives for the individual actions are not reported in table 14
	(ii) Steps taken or envisaged to achieve that action	Yes	
	(d) Information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged, and the results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible:		
	(i) Progress of implementation of the mitigation actions	Yes	
	(ii) Progress of implementation of the underlying steps taken or envisaged	Yes	
	(iii) Results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible	Yes	
	(e) Information on international market mechanisms	Yes	
Decision 2/CP.17, annex III, paragraph 13	Parties should provide information on the description of domestic measurement, reporting and verification arrangements	Yes	

3. Finance, technology and capacity-building needs and support received

16. 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 paragraphs 14–16 of the UNFCCC reporting guidelines on BURs.

17. Table 3 presents the results of the identification of the extent to which the elements of information on finance, technology and capacity-building needs and support received are included in the BUR of Thailand in accordance with the relevant parts of the UNFCCC reporting guidelines on BURs.

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 first biennial update report of Thailand

Decision	*Provision of the reporting requirements*	*Yes/ Partly/No*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III,	Non-Annex I Parties should provide updated		

Decision	*Provision of the reporting requirements*	*Yes/ Partly/No*	*Comments on the extent of the information provided*
paragraph 14	information on constraints and gaps, and related financial, technical and capacity-building needs:		
	(a) Constraints and gaps	Yes	
	(b) Related financial, technical and capacity-building needs	Yes	
Decision 2/CP.17, annex III, paragraph 15	Non-Annex I Parties should provide updated information on financial resources, technology transfer, capacity-building and technical support received from the Global Environment Facility, Annex II Parties 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 biennial update report	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) Technology needs, which must be nationally determined	Yes	
	(b) Technology support received	Yes	

C. Technical analysis of the information reported

18. The technical analysis referred to in paragraph 7(b) above aims to increase the transparency of mitigation actions and their effects, without engaging in discussion on the appropriateness of those actions. Accordingly, the technical analysis focused on the transparency of the information reported in the BUR.

19. 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 Intergovernmental Panel on Climate Change (IPCC) and referred to in the UNFCCC reporting guidelines on BURs.

20. 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

21. 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 national communication, including, among other things, information on national circumstances and institutional arrangements relevant to the preparation of national communications on a continuous basis. For their national communications, non-Annex I Parties report on their national circumstances following the reporting guidance contained in decision 17/CP.8, annex, paragraphs 3–5.

22. In accordance with decision 17/CP.8, annex, paragraph 3, Thailand, in its BUR, reported the following information on its national circumstances: information on features of its geography, climate and economy that may affect its ability to deal with mitigating climate change.

23. Thailand reported that, to promote inclusive growth, it needs to pay attention to raising the productivity of the manufacturing, agriculture and services sectors and to encourage higher levels of education and skills as well as creativity, innovation and competition. Population growth and the birth rate have been declining and the World Bank classified Thailand as an upper-middle income economy in 2015. The urban population has grown substantially over the past decade, and primary energy consumption has been increasing.

24. Thailand reported information on its institutional arrangements relevant to the preparation of its national communications and BURs on a continuous basis. The description covers key aspects of the institutional arrangements, such as the identification of the overall coordinating entity and of other institutions and experts.

25. As a demonstration of the high priority placed on addressing climate change, the Royal Thai Government has included this area on its national agenda, and in 2007 it established the National Committee on Climate Change Policy (NCCC), which is chaired by the Prime Minister. The primary responsibilities of the NCCC are: to formulate overall climate change policy and strategy; to determine national positions with regard to the international negotiations under the Convention and any relevant international agreements; and monitoring and evaluating implementation results of government agencies as stated in the national policy and strategy. The structure of the NCCC is also reported in the BUR and includes the establishment of three subcommittees: the Integrated Policy and Plan Sub-Committee; the Technical and GHG Database Sub-Committee; and the Coordination and Negotiation Sub-Committee. The Technical and GHG Database Sub-Committee coordinates the preparation of national communications and BURs. Five sectoral working groups have also been established to review activity data and their relevant emission factors used to calculate sectoral GHG emissions and removals, as well as to provide recommendations on the MRV system best suited to the country. Thailand has also reported in its BUR on the institutional arrangements specific to the preparation of GHG inventories, including identifying the agencies and their respective sectors of involvement; however, their specific roles have not been identified. The TTE noted that the transparency of this information would be improved, if Thailand reports this information in its BUR.

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

26. As indicated in table 1 above, Thailand reported in its BUR, in accordance with paragraphs 3–10 of the UNFCCC reporting guidelines on BURs and paragraphs 8–24 of the "Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention" contained in the annex to decision 17/CP.8.

27. Thailand reported information on its national GHG inventory covering GHG emissions and removals for 2011 using the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). In accordance with decision 17/CP.8, annex, paragraph 20, the global warming potential values were consistent with those provided by the IPCC in its Second Assessment Report.

28. Thailand described the institutional arrangements in figures 10 and 11 of the BUR, including the responsibility for compiling and verifying the data and the repository for the GHG database. The TTE commends Thailand for establishing these institutional arrangements.

29. In 2011, the total GHG emissions of Thailand were reported as 305.52 million tonnes of carbon dioxide equivalent (Mt CO_2 eq) excluding the land use, land-use change and forestry (LULUCF) sector and 234.58 Mt CO_2 eq including the LULUCF sector. Carbon dioxide (CO_2) accounted for 75 per cent of all GHG emissions, while methane (CH_4) and nitrous oxide (N_2O) accounted for 19 per cent and 6 per cent, respectively. Excluding the LULUCF sector, the energy sector is the highest GHG emitting source (72.97 per cent), followed by the agriculture sector (17.32 per cent), industrial processes (5.97 per cent) and waste (3.74 per cent).

30. As encouraged by decision 2/CP.17, annex III, paragraph 7, Thailand also reported a time series for the period 2000–2011, reflecting an increase in GHG emissions, including the LULUCF sector, from 2000 to 2004, with a decline in 2005 and then a gradual decrease thereafter. However, no reason for the decline in 2005 was reported. During the technical analysis, Thailand clarified that the decline was attributable to the exclusion of GHG emissions from rubber plantations in the recalculation of the LULUCF sector for 2000 to 2004. During the period 2000–2011, the GHG emissions from the energy and industrial processes sectors increased by an average of 3.32 per cent and 2.67 per cent, respectively; however, the TTE noted that the drivers for the increase in emissions for these two sectors are not provided. However, during the technical analysis, Thailand clarified its intention to include the information related to the drivers of the two increasing emission sectors in its next BUR, which the TE notes could enhance the transparency of the information reported.

31. Thailand did not report information on the description, methodology, emission factors and activity data used in the estimation of GHG emissions for country-specific sources; however, during the technical analysis, Thailand provided the information used for estimating GHG emissions in the five sectors reported in the BUR. In addition, Thailand further clarified that the information regarding GHG emissions sources/sinks which were estimated by applying country specific emission factors will be clarified in the next BUR or the third national communication.

32. . Thailand reported GHG emissions and removals of CO_2, CH_4 and N_2O in its national GHG inventory. The TTE commended Thailand for reporting of other gases, including carbon monoxide, nitrogen oxides, non-methane volatile organic compounds and Sulphur oxides. However, the TTE notes that the emissions by sources of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6) are

not reported in the BUR. During the technical analysis, Thailand informed the challenges in data collection for HFCs, PFCs and SF_6, and that information would be included in the future BUR submission. The TTE notes that including this information in the BUR would enhance the transparency of the information reported by Thailand.

33. Thailand provided a summary table of total national emissions and removals of CO_2, CH_4 and N_2O covering the sectors reported. In addition, sectoral tables are also reported, on a gas-by-gas basis and in units of mass, for each sector. The information is consistent with that contained in table 1 in the annex to decision 17/CP.8, although it is not presented in exactly the same format. During the technical analysis, Thailand clarified that sector-specific information was reported in the Thai version of the full report and that this information would be included as a technical annex to the next BUR submission. The TTE notes that including this information would enhance the transparency of information reported by Thailand.

34. Thailand reported information on the recalculated emissions and removals of GHGs in 2000. However, the inventory of the previous submission year 1994 is not included in the BUR. During the technical analysis, Thailand clarified that the challenges encountered in carrying out the recalculation for 1994 were the result of lack of information collected in the preparation of the initial national communication. The TTE notes that including this information in the BUR would enhance the transparency of information reported by Thailand.

35. Information on an uncertainty analysis of the GHG inventory was not reported in the BUR, including level of uncertainty associated to data, underlying assumptions and methodologies. During the technical analysis, the Party provided this information for the energy, agriculture and waste sectors. Thailand clarified that the analysis was done by applying the concept of uncertainty assessment and default values from the IPCC good practice guidance and the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). Thailand referred to some challenges faced in carrying out the uncertainty analysis for these three sectors, and a description of the challenges and the details of the uncertainty analysis are reported in the full version of the national inventory report in the local language. The Party further clarified that the information on uncertainty analysis on of the underlying assumptions and methodologies will be included in the next BUR or the third national communication. The TTE notes that the inclusion of this information in the BUR would enhance the transparency of information reported by Thailand.

36. Thailand did not include information on a key category analysis in the BUR; however, during the technical analysis, the Party provided additional information on the identified key categories for the energy, industrial processes and agriculture sectors, and indicated that the LULUCF and waste sectors are not key categories. Thailand further indicated that tier 1 level and trend assessments were conducted in accordance with the IPCC good practice guidance and that 42 and 11 categories were covered in the level assessment and the trend assessment, respectively. The TTE notes that reporting this information in the BUR would enhance the transparency of information reported by Thailand.

37. Thailand reported GHG emissions for the energy sector on a gas-by-gas basis for 2011 in its BUR and identified the sector as a net source of 222.9 Mt CO_2 eq. The energy sector accounted for 72.97 per cent of total GHG emissions excluding LULUCF. The emissions in this sector are dominated by fuel combustion (1.A) and by the subcategory public electricity and heat production (1.A.1), which contributed approximately 86.87 Mt CO_2 eq, or 39 per cent of the total emissions for this sector. GHG emissions from transport (1.A.3) were 61.11 Mt CO_2 eq, or 27 per cent, and for manufacturing and construction

(1.A.2) were 44.52 Mt CO_2 eq, or 20 per cent, respectively. Fugitive emissions were 9.29 Mt CO_2 eq, or just over 4 per cent.

38. Thailand reported CO_2 emissions from fuel combustion using the sectoral approach, but did not report information using the reference approach which, consequently, does not allow the TTE to analyse the difference between CO_2 emissions using the reference and sectoral approaches.

39. During the technical analysis, Thailand clarified its decision in choosing the sectoral approach for estimating the emissions for the first BUR. In addition, Thailand also clarified that it will report the emissions estimated using both approaches and explain the differences between the two approaches in the next BUR or the third national communication. The TTE notes that this would further enhance the transparency of the information reported by Thailand.

40. Information on emissions from international aviation and marine bunker fuels was not reported, as encouraged by decision 17/CP.8, annex, paragraph 19. During the technical analysis, Thailand clarified that these emissions will be reported in future BURs, provided that disaggregated data are available. The TTE notes that doing so in future reports would increase the transparency of the information reported by Thailand.

41. Thailand reported emissions from the industrial processes sector for the 2011 inventory; the sector is a net source at 18.23 Mt CO_2 eq, or 5.97 per cent of total GHG emissions excluding LULUCF. GHG emissions from mineral products (2.A) accounted for 17.94 Mt CO_2 eq (98 per cent) of the total emissions for this sector, while chemical industry (2.B) and metal production (2.C) contributed less than 2 per cent, respectively.

42. GHG emissions from the waste sector were reported as 11.43 Mt CO_2 eq, or 3.74 per cent of total GHG emissions excluding LULUCF. Wastewater treatment (6.B) accounted for 6.42 Mt CO_2 eq, or 56 per cent of total emissions for this sector, followed by solid waste disposal (6.A) and waste incineration (6.C), accounting for 4.93 Mt CO_2 eq, or 43.10 per cent, and 0.09 Mt CO_2 eq, or 0.83 per cent, respectively, of the total emissions for this sector.

43. In 2011, total GHG emissions from the agriculture sector were reported as 52.92 Mt CO_2 eq, or 17.32 per cent of total GHG emissions excluding LULUCF. Among the subsectors covered in 2011, rice cultivation was the largest source of GHG emissions (27.19 Mt CO_2 eq), followed by agricultural soils (11.82 Mt CO_2 eq), enteric fermentation (8.30 Mt CO_2 eq), manure management (3.85 Mt CO_2 eq) and field burning of crop residues (1.76 Mt CO_2 eq). Although the methodology was not reported in the BUR, during the technical analysis Thailand provided further clarification. The TTE commends Thailand for using the tier 2 approach in most subsectors. Although a summary of the sources of activity data and emission factors is given for each subsector, Thailand also indicated [during the technical analysis that detailed information is available in the full version of the national GHG inventory report in the local language. The TTE notes that the transparency of the information reported would be further enhanced if Thailand includes the relevant information from the GHG inventory report in its BUR.

44. Thailand reported the GHG emissions and removals from the LULUCF sector for 2011, which were prepared using the Revised 1996 IPCC Guidelines. However, the tables that Parties are encouraged to include by decision 2/CP.17, annex III, paragraph 6, were not reported in the BUR. During the technical analysis, Thailand clarified that it did not use the tables included in annex 3A.2 to the IPCC good practice guidance for LULUCF because of the lack of image processing remote sensing data for the GHG inventory and the financial resources required for these processes. Thailand also clarified that the sectoral reporting tables annexed to the Revised 1996 IPCC Guidelines were prepared and reported in the Thai version of its BUR; however, this information was not reported in the English version,

because of time constraints. The Party further clarified its intention to include this information in its next BUR, and the TTE notes that this would enhance the transparency of the Party's reporting in the LULUCF sector.

45. In 2011, the LULUCF sector was a net sink of 70.94 Mt CO_2 eq, comprising emissions of 42.70 Mt CO_2 eq and removals of 114.13 Mt CO_2 eq. The information reported in the BUR indicates that a significant amount of removals from this sector in 2011 can be attributed to the inclusion of rubber plantations and other permanent tree species in the subsector changes in forest and other woody biomass stocks. The information reported also acknowledged the importance of forest conservation, plantations and better management of land resources.

46. Thailand reported that improvements in data collection and research have led to the recalculation of GHG emissions and removals for the year 2000, to facilitate comparison with the data in 2011. As reflected in figure 14 of the BUR, between 2000 and 2011, the Party's net removals of CO_2 increased from 12.00 Mt CO_2 eq to 70.94 Mt CO_2 eq. During the technical analysis, Thailand indicated that a recalculation was undertaken for 2000 to 2004. Thailand also clarified that the higher removal rates during 2005 to 2011 compared with 2000 to 2004 can be attributed to the exclusion of rubber plantations in the latter period, because of a lack of data. Additional information on the methodology was also provided during the technical clarification. In addition to clarifying that the tier 2 approach was adopted in all subsectors, Thailand also summarized the sources of the activity data and emission factors and stated that detailed information is available in the country's full version of the national inventory report in the local language. The TTE notes that the transparency of the information reported by Thailand would be further enhanced by including the relevant information from the GHG inventory report in the BUR.

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

47. As indicated in table 2 above, Thailand reported in its BUR, in accordance with paragraphs 11–13 of the UNFCCC reporting guidelines on BURs, information on mitigation actions and their effects.

48. Thailand reported that, since the submission of its second national communication, submitted on 24 March 2011, several climate change policies and measures have been put in place at the national level. This is aimed at fulfilling Thailand's goal towards sustainable development, including a low-carbon resilient society, as stated in its Eleventh National Economic and Social Development Plan 2012–2016. Thailand also reported on its National Climate Change Master Plan (2015–2050), which was endorsed by the Royal Thai Government on 14 July 2015. The information reported includes the vision, mission and targets that are categorized as short term (by 2016), medium term (up to 2020) and long term (up to 2050).

49. Within the context of its Master Plan and nationally appropriate mitigation actions (NAMAs), Thailand reported its potential to reduce GHG emissions by 7 per cent compared with the "business as usual" (BAU) scenario by 2020 (figure 20, BUR, page 46). Thailand reported that the emissions could be further reduced by 20 per cent below BAU in the same period, with sufficient international support. It reported information on the details of the NAMA road map and achievements for the energy and transport sectors in table 14 of the BUR, where the following five mitigation actions are summarized with a total GHG emission reduction of 14.34 Mt CO_2 eq by 2013:

(a) Electricity generation from natural renewable energy (solar, win, and small hydropower) to substitute for fossil fuels;

(b) Electricity generation from biorenewable energy (biomass and biogas) to substitute for fossil fuels;

(c) Biodiesel generation to substitute for diesel in the transport sector;

(d) Ethanol generation to substitute for gasoline in the transport sector;

(e) Energy efficiency for existing EGAT power plants by improving efficiency of specific energy consumption.

50. Thailand also reported that its intended nationally determined contribution, which was submitted to the secretariat on 1 October 2015, indicated that Thailand's GHG emissions would be reduced by 20 per cent below the BAU level by 2030 and up to 25 per cent if supported by international organizations.

51. Thailand reported a further 13 mitigation actions categorized as additional implemented projects to support mitigation in appendix 1 (BUR pp. 63–70), covering six sectors, namely, agriculture and forestry (4 mitigation actions each), energy and waste (3 actions combined) and industrial processes and product use, and transport (1 action each).

52. Consistent with decision 2/CP.17, annex III, paragraphs 11 and 12, Thailand reported information on the names and descriptions of each mitigation action, including information on the nature of the action, coverage (sectors and gases), time frame, quantitative goals and progress indicators for all five mitigation actions reported in table 14 and the additional 13 actions reported in appendix 1.

53. Thailand also reported information on the description of the methodologies used to calculate the GHG reductions for all five of the mitigation actions in table 14. Thailand, however, did not report information on the underlying assumptions for the actions reported in the BUR. In addition, information on the methodologies and the underlying assumptions for the 13 mitigation actions reported in appendix 1, was not reported. The TTE notes that the transparency of reporting would be further enhanced if Thailand included in its BUR information on the description of the methodologies and underlying assumptions.

54. Consistent with decision 2/CP.17, annex III, paragraph 12(c) and (d), Thailand reported information on the objectives, steps taken or envisaged, progress of implementation and results achieved (such as estimated outcomes) for all the mitigation actions reported in table 14 and appendix 1. The objectives of the reported mitigation actions are mainly within the context of GHG emission reductions and co-benefits. Thailand reported further information on the steps taken to achieve the mitigation actions through the various mitigation policies, which facilitated the outcomes and reduction in GHG emissions under the subtitle "Additional domestic mitigation measures" on pages 51–56 of the BUR.

55. On the progress of implementation, Thailand reported that six mitigation actions are completed, six are ongoing and one is planned. With respect to the results achieved, Thailand reported a total estimated GHG emission reduction of 14.34 Mt CO_2 eq by 2013. It further reported that the already realized GHG emission reduction of 14.34 Mt CO_2 eq is equivalent to a 4 per cent emission reduction, an indication that the Party is well on its way to meet its 2020 GHG emission reduction target of 7 per cent. The TTE notes that the transparency of the reporting would be further enhanced if Thailand reported this information its BUR.

56. In accordance with decision 2/CP.17, annex III, paragraph 12(e), Thailand reported information on international market mechanisms (BUR, pp. 57–58). In this respect, Thailand reported that it has been actively participating in the clean development mechanism (CDM), where the Thailand Greenhouse Gas Management Organization serves as the designated national authority (DNA). Further, Thailand reported that so far the DNA

has issued letters of approval to 222 projects (consisting of 212 single and bundled CDM projects, 7 CDM programmes of activities and 3 transboundary projects. The 222 projects are estimated to have total expected certified emission reductions (CERs) of 12.71 Mt CO_2 eq per year. In addition, out of these 222 projects, 153, mainly focusing on the utilization of renewable energy, have already been registered with the CDM Executive Board, with total expected CERs of 7.41 Mt CO_2 eq per year. Another 54 registered projects have been issued with a total of 9,136,639 CERs. Thailand also reported that it is working with international development partners to explore future international and domestic market mechanisms to encourage further investment in mitigation activities such as the Partnership for Market Readiness and the Forest Carbon Partnership Facility.

57. In addition to reporting information on international market mechanisms, Thailand reported information on its voluntary domestic crediting scheme and carbon footprint reduction label. With regard to the domestic crediting scheme, Thailand Greenhouse Gas Management Organization has developed the Thailand Voluntary Emission Reduction Program (T-VER), using a baseline and credit approach to calculate GHG emission reductions from appropriate projects. This scheme encourages both the public and the private sector to reduce GHG emissions while enhancing sustainable development, and covers the energy, waste and forestry sectors. Further, Thailand reported that 20 projects were registered under the T-VER as at October 2015, with expected total annual GHG emission reductions of 704,413 t CO_2 eq. The TTE notes that this information is beyond the reporting obligations for non-Annex I Parties. In this regard, the TTE commends Thailand for reporting on this additional information in its BUR.

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

58. As indicated in table 3 above, Thailand reported in its BUR, in accordance with paragraphs 14–16 of the UNFCCC reporting guidelines on BURs, information on finance, technology and capacity-building needs and support received, as follows:

(a) Thailand reported on constraints and gaps, and related financial, technical and capacity-building needs. It noted that some key barriers for the energy sector include limitation of grid connection owing to the inadequate capacity of transmission lines, lack of support by financial institutions for energy efficiency and renewable energy investments, lack of domestic technological and technical resources and negative public perception, particularly against waste-to-energy and biomass power plants. Thailand also noted that efforts are needed to inform the public, through lessons learned and sharing the experience of other countries, as well as showcasing success stories from pilot or demonstration projects. Thailand reported that it is having discussions with international development partners on preparing a strategic plan to access global funds such as the Green Climate Fund;

(b) Thailand reported that a technology needs assessment for climate change mitigation/adaptation was completed in 2012. The report concluded that mitigation technology was needed for energy efficiency and the renewable energy sector, while adaptation technology was needed for the agriculture, water resources management and modelling sectors;

(c) In relation to technology needs, Thailand noted that incentives are needed for technology developers to cooperate and share technology knowledge to enable technology transfer on a larger scale. Thailand reported that it has prioritized five technology options for mitigation in the energy sector: (i) smart grid; (ii) waste-to-energy; (iii) advanced biofuels; (iv) high-efficiency boilers; and (v) carbon dioxide capture and storage. It has further prioritized adaptation technology needs in three sectors: agriculture, water resource management and modelling. Thailand did not report on technology support received. The

TTE notes that the transparency of reporting would be further enhanced if Thailand provides this information in its BUR;

(d) The BUR also includes information on Thailand's work with the Asian Development Bank and the World Bank Group to access the Clean Technology Fund to support low-carbon investment by the private sector;

(e) Information on the support received, mostly for capacity-building of both mitigation and adaptation, including financial support, is reported in appendix 2 to the BUR. Thailand also reported that, with the United Nations Partnership Framework 2012–2016 and others, low-carbon and green economy projects cover three main pillars, namely: climate change adaptation and disaster risk reduction; low-carbon and green economy projects; and coordination and knowledge management;

(f) Thailand reported that it received numerous instances of international and bilateral support from development partners, mostly for capacity-building for mitigation and adaptation. These included capacity-building and technology assessment projects that received funding from the GEF, the United Nations Development Programme (UNDP), the United Nations Environment Programme, the Food and Agriculture Organization of the United Nations and from bilateral sources;

(g) Thailand reported that in 2014 it received a grant from the GEF through its implementing agency, the UNDP, to prepare its third national communication and its first BUR. Counterpart support was provided by the Royal Thai Government through in-kind and in-cash contributions, to fulfil its reporting obligations under the Convention.

5. Domestic measurement, reporting and verification

59. As indicated in table 2 above, Thailand reported in its BUR, in accordance with paragraph 13 of the UNFCCC reporting guidelines on BURs, information on the description of domestic MRV arrangements, as follows:

(a) Thailand reported that its domestic MRV system was developed to monitor the progress made in the implementation of mitigation actions for the sectors included in its NAMA road map. The activities involve: measuring by the responsible installations according to a specific GHG emission reduction methodology; reporting activity data by the responsible installations to the corresponding authority; and verification by authorized agencies such as the Department of Alternative Energy Development and Efficiency. Thailand further provided an illustration of the GHG emission reduction monitoring structure according to the NAMA road map, in figure 23 of its BUR;

(b) In addition, Thailand reported information on the description of institutions, entities, arrangements and systems involved in the domestic MRV of NAMAs (BUR p. 58). It also reported information on the description of how domestically supported NAMAs are measured, including the collection and management of relevant and available information. In this respect, the measuring of activity data is carried out according to a specific GHG emission reduction methodology by the responsible installations (e.g. power plants and liquid fuel production plants), with reporting being carried out by the responsible installations to the corresponding authority (e.g. Energy Regulatory Commission, Department of Energy Business, EGAT). Thailand further reported that verification is undertaken by the authorized agencies such as the Department of Alternative Energy Development and Efficiency. Given that all the agencies involved in the MRV process are domestic, it can be inferred that the work is carried out by domestic experts, thereby enhancing the cost-effectiveness of the verification process.

60. Thailand, however, did not report information on the description of domestic MRV arrangements for other mitigation actions that may fall outside the scope of the NAMA

road map, such as the additional implemented actions reported in appendix 1 to its BUR. The TTE notes that provision of information on the domestic MRV arrangements of other mitigation actions that may fall outside the scope of the NAMA road map could further enhance the transparency of the reporting.

6. Any other information

61. Thailand reported on the following technology needs relating to climate change adaptation:

(a) Agriculture: forecasting and early warning systems; crop improvement for climate resilience; and precision farming technologies;

(b) Water resource management: networking and management of infrastructure; seasonal climate prediction as a part of weather and hydrological modelling; and sensor networking as a part of early warning;

(c) Modelling: national data centre; national data collection, transfer and management process; and integrated modelling.

D. Identification of capacity-building needs

62. In consultation with Thailand, the TTE identified the following capacity-building needs related to the facilitation of the preparation of subsequent BURs and participation in ICA.

63. Needs with regard to the GHG inventory are:

(a) Reporting emissions on marine and aviation bunkers, which was previously hindered by the lack of disaggregated data;

(b) Establishing and operating a national GHG inventory database scheme;

(c) Reporting of CO_2 emissions from fuel combustion using the reference and sectoral approaches;

(d) Further investigation of country-specific activity data and emission factors in the agriculture sector, in particular on livestock and agricultural soils;

(e) Developing country-specific emission factors for biomass burning;

(f) Preparing and transferring a data collection system to the estimations by using the 2006 IPCC Guidelines;

(g) Collecting activity data on private planting area and wood utilization;

(h) Improving consistency between forest areas and the conversion of forest areas;

(i) Investigation of the emission factors of biomass under different conditions, including biomass of degraded forest, biomass change in the conversion of forest land to cropland or other land, biomass under the agroforestry system;

(j) Reporting of an uncertainty analysis;

(k) Reporting of a key category analysis;

(l) Reporting of the tables included in annex 3A.2 to chapter 3 of the IPCC good practice guidance for LULUCF.

64. The TTE notes that, in addition to the capacity-building needs identified during the technical analysis, Thailand reported the following list of capacity-building needs in its BUR:

(a) Enhancing grid technology and transmission;

(b) Enhancing financial institution support for energy efficiency and renewable energy investments;

(c) Procuring technical and technological resources for waste-to-energy and biomass power plants;

(d) Establishing efforts to inform the public about waste-to-energy and biomass power plants;

(e) Establishing incentives for technology developers to cooperate and share technology to enable large-scale technology transfer;

(f) Enhancing national capacity to develop assumptions for all mitigation actions.

III. Conclusions

65. The TTE concludes that:

(a) Most of the elements of information listed in paragraph 3(a) of the ICA modalities and guidelines have been included in the first BUR of Thailand;

(b) Thailand reported on its national circumstances, providing context about its strategy to promote inclusive growth and on institutional arrangements. The TTE notes that the transparency of the reporting on institutional arrangements could have been improved if Thailand had described the respective roles of these entities, the mechanisms for information and data exchange, quality assurance/quality control procedures, provisions for public consultation and other forms of stakeholder engagement and future improvement plans;

(c) Thailand reported on its national GHG inventory covering GHG emissions and removals for 2011 using the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Thailand provided information on the recalculated emissions and removals of GHGs in 2000 but not 1994 owing to the unavailability of information collected in the preparation of its initial national communication. With regard to completeness, the BUR does not include information on differences in the CO_2 emissions from fuel combustion using the sectoral and reference approaches for the 2011 inventory or on emissions from international aviation and marine bunker fuels. Additional information on the methodology used, activity data and emission factors was provided for all sectors. During the technical analysis, Thailand highlighted the need to continuously improve the transparency, consistency, comparability, completeness and accuracy of reporting in its national GHG inventories;

(d) During the technical analysis, Thailand provided clarification and additional information on the GHG inventory, including explaining the challenges encountered in estimating the fluorinated gases and recalculation of GHG emissions and removals for 1994. Thailand also provided additional information on several aspects, including the methods, activity data and emission factors used for estimating GHG emissions and conducting an uncertainty analysis and a key category analysis;

(e) Thailand reported information on the description of mitigation actions, including: the sectors and gases covered, time period, goals and indicators for each mitigation measure; associated methodologies; objectives and the steps taken or envisaged;

progress of implementation of the mitigation actions and the underlying steps taken or envisaged, and the results achieved, including the estimated outcomes; and domestic MRV arrangements and international market mechanisms within the framework of the NAMA road map. The TTE notes that Thailand provided additional relevant information on its domestic crediting mechanisms, and commends the Party for this extra effort;

(f) Information on the underlying assumptions, description of domestic MRV arrangements for mitigation actions outside the scope of the NAMA road map and objectives of the additional implemented projects to support mitigation, was not reported. The TTE notes that the transparency of the reporting could be enhanced by including the information not reported. Thailand reported that enhancing national capacity in the development of assumptions for all mitigation actions was a priority capacity-building need;

(g) Thailand reported on constraints and gaps, and related financial, technical and capacity-building needs, including identifying priority technology needs for mitigation and adaptation. It reported transparently on support received for a variety of projects. The TTE notes that the transparency of the reporting could have been further enhanced if Thailand had provided information on the technology support received.

66. The TTE, in consultation with Thailand, identified 12 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. Thailand further identified the following as the priority capacity-building needs:

(a) Establishing and operating a national GHG inventory database scheme;

(b) Preparing and transferring a data collection system to the estimations by using the 2006 IPCC Guidelines;

(c) Investigation of the emission factors of biomass production under different conditions, including biomass of degraded forests, biomass changes in the conversion of forest land to cropland or other lands, and biomass under agroforestry systems;

(d) Reporting of the tables included in annex 3A.2 to chapter 3 of the IPCC good practice guidance for LULUCF;

(e) Establishing incentives for technology developers to cooperate and share technology to enable large-scale technology transfer.

Annex

Documents and information used during the technical analysis

Reference documents

"Composition, modalities and procedures of the team of technical experts for undertaking the technical analysis of biennial update reports from Parties not included in Annex I to the Convention". Annex to decision 20/CP.19. Available at <http://unfccc.int/resource/docs/2013/cop19/eng/10a02.pdf#page=12>.

"Modalities and guidelines for international consultation and analysis". Annex IV to decision 2/CP.17. Available at <http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf>.

"UNFCCC biennial update reporting guidelines for Parties not included in Annex I to the Convention". Annex III to decision 2/CP.17. Available at <http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf>.

"Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention". Annex to decision 17/CP.8. Available at <http://unfccc.int/resource/docs/cop8/07a02.pdf#page=2>.

First biennial update report of Thailand. Available at <http://unfccc.int/8722.php>.

Second national communication of Thailand. Available at <http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php>.