Advance Version

COMPLIANCE COMMITTEE **CC/ERT/ARR/2012/27**
19 July 2012

Report of the individual review of the annual submission of Australia submitted in 2011

Note by the secretariat

The report of the individual review of the annual submission of Australia submitted in 2011 was published on 18 July 2012. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2011/AUS, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the individual review of the annual submission of Australia submitted in 2011*

* In the symbol for this document, 2011 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2011 annual submission of Australia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 29 August to 3 September 2011 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Paul Duffy (Ireland) and Mr. Dario Gomez (Argentina); energy – Ms. Ana Carolina Avzaradel (Brazil) and Ms. Songli Zhu (China); industrial processes – Ms. Elsa Hatanaka (Japan) and Ms. Deborah Schaefer Ottinger (United States of America); agriculture – Mr. Daniel Bretscher (Switzerland) and Mr. Kohei Sakai (Japan); land use, land-use change and forestry (LULUCF) – Mr. Atsushi Sato (Japan) and Mr. Harry Vreuls (Netherlands); and waste – Mr. Keith Brown (United Kingdom of Great Britain and Northern Ireland) and Mr. Sabin Guendehou (Benin). Mr. Duffy and Mr. Gomez were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Australia, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2009, the main greenhouse gas (GHG) in Australia was carbon dioxide (CO_2), accounting for 73.3 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent (CO_2 eq), followed by methane (CH_4) (20.6 per cent) and nitrous oxide (N_2O) (4.8 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 76.5 per cent of total GHG emissions, followed by the agriculture sector (15.5 per cent), the industrial processes sector (5.4 per cent) and the waste sector (2.6 per cent). Total GHG emissions amounted to 545,858.29 Gg CO_2 eq and increased by 30.4 per cent between the base year[2] and 2009.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector, and also do not include the emissions from deforestation that were included in Australia's initial report under the Kyoto Protocol for the base year and subsequently used for the calculation of the assigned amount.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, by gas, of the Kyoto Protocol, base year to 2009[a]

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Base year–2009 (%)*
Annex A sources		CO_2	278 186.70	278 186.70	304 212.67	349 724.26	382 311.32	394 910.74	401 965.25	400 342.22	43.9
		CH_4	116 046.83	116 046.83	112 906.84	116 867.89	112 851.72	115 092.81	115 921.71	112 701.33	–2.9
		N_2O	18 944.30	18 944.30	21 394.10	26 609.46	26 505.24	26 208.46	26 802.09	26 131.89	37.9
		HFCs	1 126.27	1 126.27	825.82	1 750.58	4 466.86	5 334.08	5 708.92	6 249.63	454.9
		PFCs	3 950.13	3 950.13	1 312.56	1 103.55	1 536.23	499.60	381.14	307.89	–92.2
		SF_6	215.59	215.59	308.71	194.93	178.87	155.15	141.96	125.34	–41.9
KP-LULUCF	Article 3.3[b]	CO_2							33 622.21	24 636.03	
		CH_4							1 443.53	1 167.84	
		N_2O							653.51	538.17	
	Article 3.4[c]	CO_2	NA						NA	NA	NA
		CH_4	NA						NA	NA	NA
		N_2O	NA						NA	NA	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year to 2009

			Gg CO_2 eq								*Change*
		Sector	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Base year–2009 (%)*
Annex A		Energy	289 014.17	289 014.17	313 486.18	360 707.35	395 805.83	409 749.37	417 619.09	417 354.98	44.4
		Industrial processes	24 627.17	24 627.17	24 334.85	26 174.60	29 368.03	31 119.17	31 270.83	29 682.29	20.5
		Solvent and other product use	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	NA
		Agriculture	86 812.06	86 812.06	86 190.35	94 475.98	89 079.58	87 613.59	87 918.76	84 745.63	–2.4
		Waste	18 016.41	18 016.41	16 949.33	14 892.74	13 596.80	13 718.70	14 112.39	14 075.39	–21.9
		LULUCF	NA	43 148.17	104 745.97	–13 504.99	44 836.45	342 467.53	69 487.80	53 970.91	NA
		Total (with LULUCF)	**NA**	**461 671.98**	**545 706.68**	**482 745.67**	**572 686.69**	**884 668.37**	**620 408.87**	**599 829.20**	**NA**
		Total (without LULUCF)	**418 469.81**	**418 469.81**	**440 960.71**	**496 250.66**	**527 850.24**	**542 200.84**	**550 921.07**	**545 858.29**	**30.4**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation & reforestation							–16 757.39	–14 996.40	
		Deforestation							52 476.65	41 338.44	
		Total (3.3)							**35 719.25**	**26 342.03**	
	Article 3.4[d]	Forest management							NA	NA	
		Cropland management	NA						NA	NA	NA
		Grazing land management	NA						NA	NA	NA
		Revegetation	NA						NA	NA	NA
		Total (3.4)	**NA**						**NA**	**NA**	**NA**

Abbreviations: LULUCF = land use, land-use change and forestry; KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, IE = included elsewhere, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for for all gases.

[b] Emissions/removals reported under sector 7 "other" are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[d] Elected activities under Article 3, paragraph 4 of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

5. Table 3 provides information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

Table 3
Information to be included in the compilation and accounting database in t CO_2 eq

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]	*Accounting quantity*[c]
Commitment period reserve	2 661 821 229			2 661 821 229	
Annex A emissions for current inventory year					
CO_2	400 342 220			400 342 220	
CH_4	112 701 330			112 701 330	
N_2O	26 131 888			26 131 888	
HFCs	6 249 627			6 249 627	
PFCs	307 887			307 887	
SF_6	60 074	125 335		125 335	
Total Annex A sources	545 793 026	545 858 288		545 858 288	
Activities under Article 3, paragraph 3, for current inventory year					
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–22 588 836			–22 588 836	–22 588 836
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	7 592 431			7 592 431	7 592 431
3.3 Deforestation for current year of commitment period as reported	41 388 440			41 388 440	41 388 440
Activities under Article 3, paragraph 4, for current inventory year[d]					
3.4 Forest management for current year of commitment period					
3.4 Cropland management for current year of commitment period					
3.4 Cropland management for base year					
3.4 Grazing land management for current year of commitment period					
3.4 Grazing land management for base year					
3.4 Revegetation for current year of commitment period					
3.4 Revegetation in base year					

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2011 annual inventory submission was submitted on 15 April 2011; it contains a complete set of common reporting format (CRF) tables for the period 1990–2009 and a national inventory report (NIR). Australia also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and minimization adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 March 2011. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Australia officially submitted revised emission estimates on 17 October 2011 in response to the list of potential problems and further questions raised by the expert review team (ERT) during the course of the review (see paras. 68–72 below). The values used in this report are based on the values contained in the submission of 17 October 2011.

8. Where necessary, the ERT also used previous years' submissions during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

9. During the review, Australia provided the ERT with additional information and documents which are not part of the annual submission but are in many cases referenced in the NIR. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

10. The Australian inventory is generally complete and covers all the source and sink categories with an exception for the period 1990 to 2009 and is complete in terms of gases and geographical coverage.[4] The ERT notes that there are some categories which are reported as not estimated ("NE") due to lack of data or because the Intergovernmental Panel on Climate Change (IPCC) does not provide a methodology in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) The ERT notes that Australia does not report CH_4 emissions from post-coal mining activities of surface coal mining. The ERT also notes that Australia does not report potential emissions of SF_6 from the subcategory electrical equipment under consumption of halocarbons and SF_6. The ERT encourages Australia to provide such estimates in its future annual submissions when data become available and

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

[4] The information in this report is based on the data as provided by the Party concerned. Any reflection of the data for territories with regard to which any disputes might exist under international law does not constitute a position of the ERT or the UNFCCC with regard to the legal status of such territories.

where methodological guidance is provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to a the 2006 IPCC Guidelines).

2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

11. The ERT concluded that the national system continued to perform its required functions. The ERT found that Australia has improved the timeliness of reporting in its 2011 submission, as recommended by the previous review report. The ERT commends Australia for reporting its 2011 annual submission in a timely manner.

12. Australia described the changes of the national system since the previous annual submission and these changes are discussed in chapter II.G.3 of this report. Australia reported in its NIR that significant changes to the inventory compilation process have been made as a result of using data reported obtained under the National Greenhouse and Energy Reporting System (NGERS). Australia also reported that additional quality assurance/quality control (QA/QC) activities and procedures have been implemented since its 2010 annual submission and the responsibility for approving the inventory for submission has been devolved from the Minister to the Secretary of the Department of Climate Change and Energy Efficiency (DCCEE) (see para. 140 below).

Inventory planning

13. The NIR described the institutional arrangements for the preparation of the inventory. The DCCEE has overall responsibility for the national inventory. Other agencies, government departments and organizations are also involved in the preparation of the inventory as described in figure 1.1 of the NIR.

14. The DCCEE is responsible for all aspects of inventory preparation, including gathering activity data (AD), emissions estimation, quality control, inventory improvement planning, and the preparation of reports and data submissions to the UNFCCC on behalf of the Australian Government. Official consideration of the inventory is overseen by the DCCEE's National Inventory Systems Executive Committee. The draft NIR is also considered by the National Greenhouse Gas Inventory Committee, which has representatives of the Australian state and territory governments, and the Commonwealth Scientific and Industrial Research Organization (CSIRO). Final release of each annual inventory and submission to the UNFCCC is approved by the DCCEE.

15. Australia has elaborated a QA/QC and inventory improvement plan, which was provided to the ERT during the review and which sets out the improvements considered and developed in the period 2011 to 2012. The ERT commends Australia for elaborating and providing such an essential document to the ERT.

Inventory preparation

Key categories

16. Australia has reported a key category tier 1 analysis, both level and trend assessments, as part of its 2011 annual submission. The key category analysis performed by

Australia and that performed by the secretariat[5] produced similar results. Minor differences can be attributed to the finer disaggregation used by the Party. Australia has included the LULUCF sector in its key category analysis, which was performed in accordance with 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). The ERT notes that Australia did not report a key category analysis for 1990 and reiterates the recommendation from the previous review report that Australia provides such an analysis in its next annual submission.

17. Australia has also provided a key category analysis for activities under Article 3, paragraph 3, of the Kyoto Protocol. Australia has identified CO_2 emissions/removals from deforestation and afforestation and reforestation, and CH_4 emissions from deforestation as key categories. Australia has also provided a correlation between activities which are key categories under the Kyoto Protocol with the associated categories under the Convention in table A.1.7 in the NIR.

Uncertainties

18. Australia has reported a tier 1 uncertainty analysis in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines) and the IPCC good practice guidance. The uncertainty assessment has been made by sectoral expert consultants and is independently reviewed by CSIRO. A tier 2 approach has been used for a number of sectors and Australia reports that this approach is still under consideration for the whole inventory for future annual submissions.

19. The reported uncertainty in total GHG emissions in 2009 is ±2.2 per cent (excluding LULUCF) and ±5.7 per cent (including LULUCF). The uncertainty in the trend of total GHG emissions is ±2.0 per cent (excluding LULUCF) and ±8.2 per cent (including LULUCF. The ERT noted that the level of uncertainty is lower than the previous annual submission and the overall annual uncertainty level is determined by the uncertainty in the level of emissions in the LULUCF sector.

Recalculations and time-series consistency

20. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by Australia of the time series 1990–2008 have been undertaken to take into account changes made in all sectors. The magnitude of the impact of recalculations is: a decrease in estimated total GHG emissions in 1990 (0.01 per cent) and a decrease in 2008 (0.24 per cent). The rationale for these recalculations is well documented in chapter 10 of the NIR and in CRF table 8(b).

21. The improvements made in the energy, industrial processes and agriculture sectors had the greatest influence of the recalculations on total GHG emissions. In its 2011 annual submission, Australia revised the energy statistics provided by the Australian Bureau of

[5] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

Agriculture and Resource Economics (ABARE) and reallocated diesel fuel use in mining to road transportation. Significant changes have also taken place in the industrial processes sector due to new data from the Energy-Intensive, Trade-Exposed Industries (EITEIs) programme and the use of NGERS data. Recalculations in the agriculture sector have taken place due to the recalculation of the three-year average of emissions (once the third year of data becomes available), updated milk production and livestock numbers.

22. Recalculations in the energy sector for 2008 increased emissions by 1,015.03 Gg CO_2 eq or 0.2 per cent; in the agriculture sector increased emissions by 542.02 Gg CO_2 eq or 0.6 per cent; and in the waste sector decreased emissions by 292.42 Gg CO_2 eq or 2.0 per cent. The ERT commends Australia for improving its inventory estimates and transparently documenting the rationale for the recalculations in the CRF tables and in the NIR.

Verification and quality assurance/quality control approaches

23. Australia has an elaborated QA/QC plan in accordance with decision 19/CMP.1 and the IPCC good practice guidance. In section 1.6 of the NIR, Australia describes the type of tier 1 and 2 quality checks implemented in the inventory process. For example, Australia implements significant checking of emissions and emission factors (EFs) against international datasets for all other Annex I Parties and the results are discussed in the sectoral chapters of the NIR. QA takes place at a number of levels, including inventory oversight by the National Inventory Systems Executive Committee and a review of the NIR by the National Greenhouse Gas Inventory Committee and CSIRO. The inventory may also be externally audited by the Australian National Audit Office (ANAO). The last such audit took place in 2009.

24. As indicated in the previous review report, Australia's inventory contains a significant amount of confidential data. The NIR does not specifically indicate how this confidential information is quality assured and the ERT therefore reiterates the recommendation of the previous review report that Australia provides additional information on the treatment of confidential information in its QA/QC plan and in the NIR of its next annual submission.

Transparency

25. The ERT notes that the NIR is generally transparent and provides much of the information needed to assess the inventory. However, the ERT found areas that could be improved by providing further information in its NIR. The ERT recommends that Australia provide additional information regarding newly added fuel types in the energy sector (see para. 49 below) and that Australia further improve the methodological description and documentation in its NIR, in particular, relating to categories with confidential information in the industrial processes sector (see paras. 62 and 63 below). The ERT also recommends that Australia improve the transparency of the descriptions of several methodologies in the energy sector (see para. 54 below), agriculture (see para. 80 below) and waste sectors (see para. 111 below) and also improve the reporting of areas of land afforested, reforested and deforested under the KP-LULUCF activities in chapter 11 of the NIR.

Inventory management

26. The ERT reported that the Australia Greenhouse Emissions Information System (AGEIS) is the centralized archiving system, which includes the archiving of disaggregated EFs and AD, documentation on how these factors and data have been generated and aggregated for the preparation of the inventory and emissions estimates from previous submissions. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and

key category identification and planned inventory improvements. The archive is maintained and housed within the DCCEE.

3. Follow-up to previous reviews

27. Australia's NIR contains a detailed annex (annex A.6.3, Volume 3) summarising Australia's responses to the UNFCCC review process as recommended in the previous review report. The ERT commends Australia for including this annex in its NIR and encourages Australia to continue this effort in future annual submissions.

28. Australia has implemented a number of improvements in its 2011 annual submission including:

(a) The improved timeliness of reporting its annual submission (see para. 11 above);

(b) The inclusion of additional checking of carbon balance for fugitive emissions from underground mining activities (see para. 34 below);

(c) The inclusion of the energy utilized by Australian territories in the reference approach (see para. 41 below);

(d) The improvement of the transparency of its reporting in the industrial processes sector relating to ammonia and nitric acid production (see para. 60 below);

(e) The review of the nitrogen (N) excretion rates of horses, mules and asses (see para. 83 below);

(f) The improvements in the estimation of CH_4 emissions from wastewater handling (see para. 114 below);

(g) The changes made to the publicly available information on the registry website (see para. 143 below).

4. Areas for further improvement

Identified by the Party

29. The 2011 NIR identifies several areas for improvement:

(a) Analyse the uncertainty data reported by corporations under NGERS to see how the data can be incorporated into the inventory estimates of uncertainty;

(b) Assess the country-specific EFs for liquid fuels and in relation to the further possibility of reallocating transport emissions from stationary sources;

(c) Further develop EFs for fugitive emissions from coal mines;

(d) Move towards the development of tier 3 methods in the 2012 annual submission, underpinned by site-specific data from individual solid waste disposal sites collected under NGERS, including data from the largest landfills;

(e) Improve the internal consistency of the treatment of wastewater sludge sent to landfill, and develop EFs for other waste treatments, such as composting and anaerobic digestion;

(f) Increase the use of NGERS facility-level data in reporting emissions from industrial wastewater handling from additional industries, and build on research findings, particularly in relation to N_2O emissions from this category;

(g) Reallocate N_2O emissions from sludge applications to agricultural land to the agriculture sector, as requested in the previous review report;

(h) For waste incineration, review the potential inclusion of NGERS facility-level data in future annual submissions.

Identified by the expert review team

30. During the review, the ERT identified cross-cutting issues for improvement. These are listed in paragraph 157 below.

31. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.

B. Energy

1. Sector overview

32. The energy sector is the main sector in the GHG inventory of Australia. In 2009, emissions from the energy sector amounted to 417,354.98 Gg CO_2 eq, or 76.5 per cent of total GHG emissions. Since 1990, emissions have increased substantially, by 44.4 per cent. The key drivers of the increase in emissions were energy industries (increase in emissions by 59.0 per cent), transport (increase in emissions by 34.6 per cent) and manufacturing industries and construction (increase in emissions by 24.9 per cent). Within the sector, 54.6 per cent of emissions were from energy industries, followed by 20.0 per cent from transport, 10.7 per cent from manufacturing industries and construction and 6.9 per cent from fugitive emissions from solid fuels. Other sectors accounted for 4.9 per cent and fugitive emissions from oil and natural gas accounted for 2.6 per cent. The remaining 0.3 per cent was from other.

33. Australia's reporting of emissions is complete in terms of categories, gases, years and geographical coverage,[6] and the emission estimates have been prepared and reported in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Overall, the NIR provides transparent information on the methods and EFs applied. Higher tier methods and a combination of plant-specific, country-specific and default EFs from the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the 2006 IPCC Guidelines have been used to estimate key categories.

34. Fugitive CH_4 emissions from coal post-mining activities of surface coal mining is reported as "NE", citing "no data or IPCC methodology available" as the reason for the use of this notation key. In response to a question raised by the ERT during the review, Australia replied that the emissions might be negligible, and that in its inventory improvement plan Australia has developed a tier 2 method for future reporting of emissions from surface mines which will be comprehensive and will incorporate any potential post-mining emissions within an overall emissions estimate. The ERT acknowledges Australia's effort and recommends that the Party develop a carbon balance approach for surface coal mining activities, using the approach already employed by Australia for underground mining.

35. Recovering/flaring of fugitive CH_4 emissions from underground coal mining activities are reported as "IE", citing "combusted within electricity sector" as the reason for using this notation key. However, there is no clear mention of this in the reporting on power generation in the NIR. In response to a question raised by the ERT during the review, Australia confirmed that the emissions have been included. Further, responding to a question as to whether the CH_4 is flared only (i.e. without energy recovery), Australia

[6] The information in this report is based on the data as provided by the Party concerned. Any reflection of the data for territories with regard to which any disputes might exist under international law does not constitute a position of the ERT or the UNFCCC with regard to the legal status of such territories.

replied that, for the first time, CH_4 flared at coal mines was required to be reported under NGERS, and the facility-level data are currently being analysed. Therefore, the ERT recommends that, to improve the completeness of its reporting, Australia explore the possibility of integrating these data into its next annual submission in case this new emission source is identified, to improve completeness.

36. The NIR contains information on AD, including an Australian Energy Statistics table for 2009 in annex 4 to the NIR. However, the ERT noted that AD provided are not always sufficient to explain some of the variations in the trend (e.g. see para. 52 below). The ERT reiterates the recommendation in the previous review report, namely that Australia provide disaggregated AD in its next annual submission, such as data on the different types of underground mines, in order to clarify the drivers behind the variations in the trends.

37. Australia has implemented a new mandatory system, NGERS, for the collection of data from enterprises based on the National Greenhouse and Energy Reporting Act of 2007. This makes it mandatory for companies with emissions over specified reporting thresholds, such as 25 Gg CO_2 eq emission per year from facilities and 87.5 Gg CO_2 eq emissions per year for corporations, to report their energy-, industrial processes- and waste-related data on an annual basis. In Australia's 2011 annual submission, the data collected by this system for the year 2009 have been intensively used in the energy sector, particularly, in power generation and petroleum refinery. The ERT recognizes this as a positive improvement towards higher-tier methodologies using plant-specific rather than country-specific average data, and this will contribute significantly to the improvement of robustness and accuracy of both AD and EFs. However, the ERT also recognizes that it is a challenge to deal with time-series consistency under this switch of data sources (see paras. 48 and 49 below).

38. Since its last annual submission, Australia has recalculated all subcategories in the energy sector except fugitive emissions from coal mining. Total emissions from the energy sector increased by 1,015.03 Gg CO_2 eq (equivalent to 0.2 per cent of sectoral emissions) in 2008. Australia also presented details of: the revision of AD in the category public electricity and heat production; the reallocation of non-energy use of fuels to the industrial processes sector; the reallocation of fuels among subcategories of the energy sector; and more explanations relating to fuel use in the petroleum refining, manufacture of solid fuels and other energy industries. In particular, emissions in road transportation have changed noticeably since the reallocation of diesel oil from mining to road transportation. The explanations for these recalculations are provided in relevant sections and chapter 10 of the NIR and were found to be sufficiently detailed and satisfactory.

39. The AD uncertainties are unchanged, although the AD have been recalculated. The ERT recommends that Australia reassess the uncertainty of the AD for the energy sector, together with increasing the involvement of NGERS to help reduce uncertainty. In response to the recommendation from the previous review report, Australia stated that the provision of a tier 2 uncertainty analysis will be included in its inventory implementation plan in 2011–2012, subject to resource availability. The ERT encourages Australia to accelerate the process.

40. Australia has provided detailed information on QA/QC procedures and practices using the IPCC tier 1 methods, which are in line with the IPCC good practice guidance requirements. These measures include: running a standard set of tests on AD; checking Australian implied emission factors (IEFs) with those from other countries, secondary data source verification, external review of methodologies used; and establishing a carbon balance for all fuels supplied to and combusted in the Australian economy. In response to recommendations from previous review reports, Australia has also developed a carbon balance for checking fugitive emissions from underground mining activities. The ERT commends Australia for this effort.

2. Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach and international statistics

41. For the year 2009, there is a difference of 0.04 per cent in the CO_2 emission estimates between the reference approach and the sectoral approach. Explanations are provided in the documentation box of CRF table 1.A(c). In response to a recommendation in the previous review report, the energy utilization in Australian offshore territories has been included in the 2011 annual submission. The ERT commends Australia for these efforts.

42. Also reflecting the recommendation from the previous review report, the discrepancies found in the past have been closed between CRF tables 1.C and 1.A(b) regarding jet kerosene (international aviation), residual fuel oil and gas/diesel oil (international marine bunkers) for all the years of the time series.

International bunker fuels

43. Australia collects domestic and international fuel AD as a part of Australian Energy Statistics and had them cross-checked with tax statistics obtained from the customs, in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The previous review report had encouraged Australia to provide a clear statement for the split between domestic and bunker fuel use, in particular to review where a journey is international in accordance with the IPCC good practice guidance, if it is a journey that departs from a port in Australia, stops at another port in Australia and only picks up more passengers or freight, and then finally departs Australia. The 2011 annual submission has therefore introduced, for the first time, a dissection of international and domestic/costal journeys according to the predominant mode of usage by the consumer (page 66 of the NIR).

44. Compared with International Energy Agency (IEA) data for both domestic and international fuel use regarding aviation and navigation, the CRF data are higher by a relatively fairly constant ratio (4–7 per cent) for all years of the time series. In response to a question raised by the ERT during the review, Australia stated that the difference may be caused by the conversion factor from tonnes of fuel to TJ. The ERT recommends that Australia conduct a cross-check between the two data sources to improve consistency.

Feedstocks and non-energy use of fuels

45. Most of AD and emissions associated with non-energy use of fuels are reported under the industrial processes sector and the rest are reported under fugitive emissions from fuel, which is consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. NGERS data has been utilized in the 2011 annual submission to improve the allocation of fuel use between the energy and industrial processes sectors.

46. Australia has identified, using NGERS data, a way to effectively disaggregate a fuel type (BTX) into more detailed fuel types (coal tar and liquefied aromatic hydrocarbons), most of which are used as feedstock. The ERT commends Australia for this good practice improvement.

3. Key categories

Stationary combustion: solid fuels – CO_2

47. Public electricity and heat production was the largest contributor of CO_2 emissions to Australia's GHG inventory in 2009. Australia has applied tier 2 and plant-specific AD and EFs to estimate CO_2 emissions from this category, in line with the IPCC good practice

guidance. In particular, the 2009 data from NGERS cover all coal-fired power stations and all relevant AD and EFs are plant-specific. In addition, some of the oxidation factors were revised instead of using the default value. The ERT commends Australia for applying good practice procedures and recommends that Australia compare the gross plant-specific AD data with ABARE data to ensure data consistency across data sets.

Stationary combustion: liquid fuels – CO_2

48. The ERT noted that the AD for public electricity and heat production over certain thresholds is collected through NGERS, and that the energy use of small power stations is estimated as the difference between the total of reported values under NGERS and the ABARE energy statistics. The ERT reiterates the recommendation in the previous review report that Australia collect these data on a regular basis. Such data collection should be incorporated into the implementation plan for future annual submissions.

49. The ERT also noted that the CO_2 IEF of liquid fuels (71.95 t CO_2/TJ)[7] in 2009 in public electricity and heat production is the lowest among reporting Parties (71.95–83.40 t CO_2/TJ). Similar cases could be found in data for previous years in the time series. During the review, Australia clarified that these IEFs throughout the time series are relatively low because of the high proportion of diesel oil (88.9 per cent in 2009) instead of fuel oil consumed in this category. For the year 2009, refinery gas and liquids were introduced into the fuel mix for the first time, sharing 5 per cent in total liquid fuel combustion. Refinery gas and liquids have a much lower CO_2 EF (54.7 kg CO_2/GJ on a gross calorific value basis) compared with other liquid fuels, which has reduced the overall IEF. To improve the transparency, the ERT recommends that Australia provide explanations on the AD and EFs of newly added fuel types in its NIR to facilitate comparison with other Annex I Parties and previous annual submissions.

50. Similarly, the ERT noted during the review that the CO_2 IEF of liquid fuels used in petroleum refining in 2009 is about 66.87 t CO_2/TJ much lower than data for 1990–2008, which is almost constant at around 72.63 t CO_2/TJ. In response to questions raised during the review, Australia stated that data from facilities, available for the first time under NGERS in 2009, has facilitated a much clearer understanding on the total refinery fuel consumption sourced from refinery feedstock. Australia considers that it is appropriate to analyse several years of NGERS data in order to understand the inter-annual variability of the data before making any decisions regarding time-series recalculations. Therefore, the ERT strongly recommends that Australia review and ensure the time-series consistency of the EFs for its next annual submission.

51. Unlike the EFs for solid and gaseous fuels, country-specific EFs for liquid fuels were used instead of plant-specific data. During the review, Australia informed the ERT that Australia will examine this issue for future updates to the NGERS measurement determination, particularly the carbon content of liquid fuels in Australia, to improve the accuracy and move towards tier 3 methods as recommended in the previous review report.

Road transportation: liquid fuels – N_2O

52. Australia uses a model to estimate non-CO_2 emissions from road transportation. The N_2O IEFs for gasoline for the years 2003, 2005–2009 (8.06–9.78 kg/TJ) are among the highest of reporting Parties (0.1–18.15 kg/TJ) in each year. Australia is now investing in studies to update the disaggregation of vehicle classification and parameters (such as

[7] Australia reported energy data on a gross calorific value (GCV) basis. Hence, reported IEFs are about 5 per cent lower for liquid and solid fuels and biomass, and about 10 per cent lower for gaseous fuels than would have been the case if the data were given on a net calorific value (NCV) basis. This IEFs have been converted into NCV-based values and are not reflecting the reported IEFs.

deterioration rate) used in the non-CO_2 road transport model. The ERT commends Australia for these efforts.

Navigation – CO_2

53. CO_2 emissions from navigation is a key category in Australia's inventory, identified by trend assessment. The ERT noted that the allocation of fuel to military transport has been improved in this annual submission as a result of reporting of fuel consumption by the Department of Defence for 2008 and 2009 and that those emissions from military transport were reported under other (fuel combustion) in accordance with the Revised 1996 IPCC Guidelines. For 1995–2007, these allocations were updated by linearly extrapolating the portions between the previously reported data point (1994) and the later reported data point (2008). The ERT encourages Australia to continue collecting annually the data from the Department of Defence and to report on progress in future annual submissions.

Coal mining and handling – CH_4

54. This is a key category identified both at level and trend assessment. Australia has reported CH_4 emissions from coal mining activities and recovery of a considerable amount of CH_4 from underground mining. The ERT noted that the CH_4 IEF has decreased by 8.6 per cent between 2008 (8.55 kg/t) and 2009 (7.81 kg/t). During the review, Australia clarified this, stating that the fluctuation depends on whether production is from mines with a high CH_4 content versus those with a low CH_4 content. Further, in 2009, production increased sharply from the western coal district, which is characterized by very low CH_4 content. The ERT therefore recommends that Australia provide disaggregated AD in future annual submissions to improve transparency.

4. Non-key categories

Road transportation: liquid fuels – CH_4

55. Although the model parameters have been improved in line with the recommendation in the previous review report, resulting in lower EFs, the IEF for CH_4 from diesel combustion for the period 1990–2009 (7.55–12.50 kg/TJ) is still among the highest of reporting Parties (0.19–12.50 kg/TJ). The ERT acknowledged Australia's efforts for improving its estimates and encourages Australia to provide further analysis and explanation.

C. Industrial processes and solvent and other product use

1. Sector overview

56. In 2009, emissions from the industrial processes sector amounted to 29,682.29 Gg CO_2 eq, or 5.4 per cent of total GHG emissions. Emissions from the solvent and other product use sector were included in the industrial processes sector for confidentiality reasons. Since the base year, emissions have increased by 20.5 per cent in the industrial processes sector. The key driver for the rise in emissions in the industrial processes sector is the growth in the chemical industry and the use of halocarbons. Between 2008 and 2009, emissions from the industrial processes sector declined by 5.1 per cent. This decline reflects decreased production levels across the sector in response to the global economic downturn. Within the industrial processes sector, 33.9 per cent of the emissions were from metal production, followed by 22.1 per cent from the chemical industry, 21.9 per cent from mineral products, 21.5 per cent from the consumption of halocarbons and SF_6. Other production (food and drink) accounted for 0.6 per cent.

57. The Party made recalculations for the industrial processes sector between the 2010 and 2011 submissions following changes in AD in order to update the latest statistical information. The impact of these recalculations on the industrial processes sector is an increase in emissions of 0.4 per cent for 2008. For the solvent and other product use sector, no recalculation was conducted in this submission. The main recalculations took place in the following categories of the industrial processes sector:

(a) Increase in emissions from mineral products of 482.07 Gg CO_2 eq (or 7.4 per cent);

(b) Decrease in emissions from chemical industries of 534.74 Gg CO_2 eq (or 7.4 per cent);

(c) Increase in emissions from metal production of 538.93 Gg CO_2 eq (or 4.9 per cent);

(d) Increase in emissions from other production of 69.69 Gg CO_2 eq (or 68.1 per cent);

(e) Decrease in emissions from consumption of halocarbons and SF_6 of 421.81 Gg CO_2 eq (or 6.7 per cent).

58. The ERT considers the inventory of the sector to be of high quality and, subsequent to the submission of revised estimates of SF_6 emissions for the electrical equipment category, in response to the list of potential problems and further questions and potential problems raised by the ERT during the review (see para. 69 below), complete and in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Australia is striving to continuously improve its inventory and generally uses higher-tier methods and country- or plant-specific EFs, except for the category consumption of halocarbons and SF_6, where most EFs are default factors taken from the 2006 IPCC Guidelines. The 2009 inventory incorporates extensive facility-specific AD and EFs recently obtained through NGERS. This has resulted in significant recalculations. The NIR includes several helpful tables detailing the impact of the recalculations on the estimates for each affected category in both absolute and percentage terms. Australia has made significant efforts to maintain time-series consistency, such as engaging the external consultant previously used to collect AD and EF information to undertake a QC assessment of the full time series. In many cases, the methods used to ensure time-series consistency are clearly explained (e.g. soda ash production and use, ammonia and nitric acid production), but in others they are not (e.g. lime production).

59. As part of its QA/QC efforts, Australia recently completed a comparison between the national HFC, PFC, and SF_6 emissions implied by atmospheric measurements and those in the inventory. In response to questions raised by the ERT during the review, Australia provided a report describing this comparison, "Australian PFC, HFC, and SF_6 Emissions, Final Report" prepared for DCCEE by the Light Metals Flagship CSIRO Marine and Atmospheric Research, May 2011[8]. This comparison showed good agreement for overall HFC emissions (weighted by their global warming potential), although the agreement was not as good for some HFC species. The NIR did not include the results of the comparison for SF_6, but in response to a question from the ERT during the review, Australia stated that the SF_6 emissions implied by the atmospheric measurements were higher than those included in the 2011 annual inventory submission. The ERT commends Australia for its efforts to improve and quality-assure its industrial processes inventory.

[8] The CSIRO report concluded: "Based on Cape Grim data, it is highly unlikely that Australian SF_6 emissions are as low as about 2-3 tonnes/yr as now reported in the NGGI (DCCEE, 2011); the atmospheric data indicate emissions of ~30 tonnes/year in recent years."

60. Australia has taken the recommendations from the previous review report into consideration and has implemented many of them in its 2011 annual submission. Specifically, Australia has significantly increased the transparency of its reporting by noting that ammonia production accounts for two thirds of the CO_2 emissions from the chemical industry, by providing the ranges of IEFs for ammonia and nitric acid production in the NIR and by better distinguishing between reductant and energy uses of hydrocarbons (e.g. in ammonia production and ferroalloys production) and accounting for the former in the industrial processes sector. In addition, Australia has updated the SF_6 equipment bank using NGERS data. However, Australia continues to report emissions from the use of pulverized coal as a reductant during iron and steel production in the energy sector. Moreover, aggregated reporting of emissions from the chemical industry continues to impede transparency.

61. Australia has improved the completeness of the industrial processes sector by including in the inventory SF_6 from various applications other than electrical equipment. It did this by applying a per capita emission estimate based on the inventory of New Zealand. While the ERT commends Australia's efforts to quantify emissions from these sources, the ERT notes that this approach could result in an overestimation because magnesium casting, which is typically a significant source of SF_6 in countries where this activity occurs, does not occur in Australia. Australia also verified the completeness of its estimate of halocarbon emissions from use of fire extinguishers by confirming that PFCs are rarely, if ever, used in this application in Australia.

2. Key categories

Chemical industry – CO_2 and N_2O

62. Data from the chemical industry are confidential and reported in an aggregated manner to preserve confidentiality. Reported CO_2 emissions include ammonia production, acetylene use and synthetic rutile and titanium dioxide (TiO_2) production. Reported N_2O emissions include nitric acid production and other N_2O use for anaesthesia and in aerosols (that should be reported under the solvent and other product use sector). The methods used by Australia to estimate emissions from the confidential categories are consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

63. Although Australia has taken some steps to increase the transparency of its estimates of emissions from this category, aggregation of emissions continues to impede transparency. In the NIR, Australia notes that it plans to explore ways of disaggregating ammonia data while still protecting other confidential chemical industry data aggregated with ammonia. In response to a question raised by the ERT, Australia further noted that it had commissioned an independent review by CSIRO of the handling of confidential data in the inventory. The ERT strongly recommends that Australia continue to increase the transparency of the chemical industry inventory by disaggregating data further.

Iron and steel production – CO_2

64. The NIR states that a tier 1b method is used to estimate CO_2 emissions and a tier 2 method for non-CO_2 emissions in its inventory. The use of coke and natural gas as reducing agents is reported in the industrial processes sector, while the use of pulverized coal as a reducing agent is allocated to the energy sector. The ERT reiterates the recommendation of previous review reports that Australia reallocate the coal used as a reducing agent to the industrial processes sector. The ERT encourages Australia to determine whether new data collected via NGERS could facilitate this reallocation, as it did for ferroalloys.

Consumption of halocarbons and SF_6 – HFCs

65. The methods used by Australia to estimate emissions from this category are consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, but subject to considerable uncertainty due to their reliance on default EFs. To estimate emissions from this category, Australia uses data on HFC imports in bulk and in equipment, data on HFCs destroyed, data on equipment stocks for some types of equipment (domestic refrigerators and air conditioning and mobile air conditioning), and default EFs and lifetimes from the 2006 IPCC Guidelines. Australia estimates the stocks of equipment for which it lacks data (commercial refrigeration and air conditioning and transport refrigeration) based on historical and current refrigerant import data and broad end-use shares reported by refrigerant importers, assuming that any refrigerant which is not used to refill existing equipment (which has leaked at the default rates) is used to fill new equipment. The ERT considers that the use of default EFs introduces considerable uncertainty into the emission estimates, despite Australia's sophisticated model and its good data on the gas supply and on the stocks of some types of equipment.[9]

66. In the planned improvements section of its NIR, Australia notes that it expects that NGERS will provide country-specific information on annual leakage rates from commercial and industrial refrigeration and air-conditioning applications. The ERT encourages Australia to make use of this information, as well as any available information on commercial and industrial refrigeration equipment stocks, to develop more accurate and precise estimates of emissions across the air-conditioning and refrigeration end use.

67. Australia's description of its methods for estimating HFC emissions are detailed and generally transparent, with a few exceptions. The explanation in the NIR of how stocks of commercial refrigerators and air conditioners are estimated is somewhat insufficiently transparent. Tables 4.25 through to 4.33 of the NIR provide detailed information on the stocks of equipment (where available) and on the banks of refrigerant. However, it is not always clear which chemicals are contained in the stocks and banks. For example, the stocks of split systems and packaged air-conditioning equipment in tables 4.26 and 4.27 of the NIR are shown to be quite large in the mid-1990s, implying that these include hydrochlorofluorocarbons (HCFCs) systems as well as HFC systems. In response to a question raised by the ERT during the review, Australia confirmed that the tables include systems using non-HFC refrigerants. The ERT recommends that Australia, in its next annual submission, provide only the equipment stocks using HFCs, or at least clarify through a title or footnote that the equipment stocks also include HCFCs. Also, CRF table 2(II).F provides neither emissions nor EFs for air-conditioning and refrigeration equipment, and it presents no information at all for other ozone depleting substances substitute applications or for SF_6 in electrical equipment, although this information appears likely to be available based on the description of the model included in the NIR. The ERT, therefore, recommends that Australia report banks, emissions and IEFs for all ozone depleting substances substitute applications and electrical equipment in table 2(II).F in its next annual submission.

[9] Australia has performed an analysis of the sensitivity of the model's results to various assumptions regarding the end uses to which gas is allocated and the frequency of equipment servicing. The results were found to be relatively insensitive to these assumptions. However, the analysis did not examine the results' sensitivity to assumed emission rates from equipment, which is likely to be higher.

3. Non-key categories

Lime production – CO_2

68. The issue of the fluctuation over time of the CO_2 IEF for lime production was raised in the previous review report, and Australia was encouraged to include more information on this in the NIR of its 2011 annual submission. Accordingly, Australia has expanded its discussion of the EFs used for lime production, attempting to account for EFs estimated under the EITEIs programme for 2007–2009 as well as for EFs used in previous years. The explanation, however, remains unclear. For example, the NIR states that "time-series consistency is maintained through the use of a weighted average EF of 0.751 t CO_2/t lime produced for the years when individual facility data are not available (1990–2007)". This implies that the IEFs for these years are constant, whereas in fact they vary between 0.749 t/t and 0.751 t/t. In addition, 0.751 t/t is higher than the country-specific EFs cited earlier in the NIR discussion (0.675 t CO_2/t for commercial lime and 0.730 t CO_2/t for non-commercial lime). This discrepancy is not explained in the NIR. In response to a question raised by the ERT during the review, Australia explained that the fluctuations are a result of the relative proportions of commercial and in-house lime produced, each with its own respective fractional purities. The ERT recommends that Australia clarify in the NIR of its next annual submission exactly how the country-specific EFs of 0.675 t/t, 0.730 t/t and 0.751 t/t are developed, how they are related and how they are applied to estimate emissions throughout the time series (i.e. to individual facilities or to the industry as a whole).

Electrical equipment – SF_6

69. The ERT identified two potential problems with Australia's estimates of SF_6 emissions from electrical equipment, both of which are likely to lead to an underestimation of emissions from this category. First, Australia estimated emissions from this category based on an EF for losses of 0.5 per cent from the total charge in the equipment. This EF falls below the default EFs provided for electrical equipment in the IPCC good practice guidance and the Revised IPCC 1996 Guidelines (2 per cent and 1 per cent, respectively). Australia did not provide any information on country-specific research supporting its use of the 0.5 per cent value in either the NIR or subsequent correspondence with the ERT during the review week. Australia did not account for emissions resulting from the disposal of electrical equipment, although clearly electrical equipment has been in use in Australia for at least the default lifetime provided in the IPCC 1996 Guidelines and IPCC good practice guidance (30 years).

70. In response to the list of potential problems and further questions raised by the ERT, Australia submitted revised estimates of SF_6 emissions for electrical equipment use and new estimates for the manufacture of electrical equipment, on. Australia also supplied the ERT with detailed explanations of the revised and new estimates, including spreadsheets and references. In its revised estimates, Australia makes use of extensive country-specific data on equipment stocks and emission rates collected under its NGERs programme for 2008 and 2009. Under Australia's NGERS programme, all operators of electric power systems with total GHG emissions above 50,000 tonnes of CO_2 eq per year must report the nameplate capacity and emissions from the electrical equipment containing SF_6. Australia believes that all of its electric power systems are reported under the programme. Operators of systems representing 43 per cent of Australia's total nameplate capacity estimate the SF_6 equipment's emissions using a tier 3 method; the remainder operators report using a default EF (2 per cent). To estimate emissions in 2008 and 2009, Australia applied the average emission rate reported for the systems using the tier 3 method to the remainder of the country's systems. To estimate emissions for 1990–2007, Australia used default EFs from the IPCC good practice guidance for 1990–1995 and 2000, interpolating between these

values and the EFs reported under NGERS. Australia assumes that the national stock of electrical equipment has followed the same growth trajectory as the electrical equipment installed at the major network in Australia's largest state, New South Wales. In communications with the ERT, Australia stated that this utility was typical of Australia's utilities in terms of the age of its equipment. The ERT notes that both the NGERS and IPCC good practice guidance default EFs account for disposal emissions. The ERT concluded that the revised estimations address the concerns raised by the ERT and considerably improve the transparency, accuracy, completeness, comparability and consistency of Australia's inventory of SF_6 from electrical equipment and agreed with the revised estimates. The revised estimate for SF_6 emissions was 125.34 Gg CO_2 eq, which is an increase of 108.6 per cent from the original estimate (60.07 Gg CO_2 eq).

71. In its revised estimates, Australia included in its inventory emissions from the manufacture of electrical equipment. Previously, emissions from this source were not quantified. The ERT commends Australia for improving the completeness of its inventory by estimating emissions from this category, but the ERT has identified a possible mistake in Australia's method. To estimate the nameplate capacity of new equipment, Australia adds the observed (i.e. the net) increase in the total equipment nameplate capacity to the losses from the stock due to emissions. However, the nameplate capacity of new equipment is actually equal to the net increase in the total equipment nameplate capacity plus the nameplate capacity of decommissioned equipment (this follows from the definition of the "Net increase in nameplate capacity" in equation 3.15 of the IPCC good practice guidance). For the time series through to 2009, the ERT considers that Australia's method for estimating the nameplate capacity of new equipment results in an overestimate of this nameplate capacity and therefore of emissions, because Australia's estimated losses from the stock due to emissions are greater than the nameplate capacity of decommissioned equipment. However, using Australia's methods for projecting total and retiring equipment stocks, the ERT concluded that the nameplate capacity of decommissioned equipment will exceed emissions from equipment stocks around 2014, and possibly earlier. When this occurs, Australia's method will result in an underestimate of emissions, albeit a small one.

72. The ERT commends Australia for the considerable improvement in its inventory of SF_6 emissions from electrical equipment, and for its continuing efforts to check and improve its estimates for this category. The ERT recommends that Australia report SF_6 emissions from this category using the revised method, correcting the mistake identified in the previous paragraph in its next annual submission and provide, in the NIR, the information which was provided to the ERT in the course of the review in order to ensure the transparency of the reporting.

73. One area where Australia could further improve the transparency of its inventory is regarding the treatment of sealed-pressure electrical equipment in its NGERS programme and inventory. Because sealed-pressure equipment is rarely serviced during its lifetime, the mass balance methods used by utilities reporting under Australia's NGERS programme will not capture emissions from this source. Instead, the 2006 IPCC Guidelines recommend that appropriate EFs be applied to the data for the total nameplate capacity of sealed-pressure equipment reported in the country. The ERT, therefore, encourages Australia to more clearly discuss the fraction of reported nameplate capacity that consists of sealed-pressure equipment and the methods that Australia uses to estimate emissions from this equipment. The ERT notes that reporting by equipment importers, which Australia indicated could occur under proposed legislation, could be quite helpful in developing or checking estimates of the nameplate capacity of sealed-pressure equipment.

D. Agriculture

1. Sector overview

74. In 2009, emissions from the agriculture sector amounted to 84,745.63 Gg CO_2 eq, or 15.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 2.4 per cent. The key driver for the fall in emissions is a 14.4 per cent (9,182.4 Gg CO_2 eq) decrease from enteric fermentation. Within the sector, 64.6 per cent of the emissions were from enteric fermentation, followed by 16.7 per cent from agricultural soils, 14.3 per cent from the prescribed burning of savannas and 3.9 per cent from manure management. The remaining 0.4 per cent were from field burning of agriculture residues and 0.1 per cent from rice cultivation.

75. AD are derived using data from different organizations, both governmental (e.g. Australian Bureau of Statistics) and private (e.g. industrial associations). The agriculture sector inventory is complete and covers all categories of emissions and gases for all years of the time series, having been compiled on a state-by-state basis to better reflect the large physical, climate and management differences between states and territories.

76. Most of the EFs and parameters used in the agriculture sector inventory are country-specific, based on studies conducted within both Australia and the offshore territories and expert judgement. In the previous review report, the ERT noted that many of the studies were relatively old (over 10 years) and strongly recommended that Australia explain in its next annual submission how it plans to update such studies. In accordance with the recommendation in the previous review report, Australia provided its 2011–2012 national inventory improvement plan during the review. The ERT welcomes Australia's efforts and recommends that Australia report progress along the improvement plan in the NIR of its next annual submission.

77. Australia provided information on uncertainty analysis in the "Uncertainties and Time-series Consistency" section for each category and in annex 7 of the NIR. However, the description reported of the uncertainty analysis is unclear. For example, the disaggregated uncertainty values and distributions used in the tier 2 uncertainty analysis are not described in the NIR. The ERT recommends that Australia provide a transparent description of its uncertainty analysis, including source information of the applied values, in future annual submissions.

78. The ERT noted that there were no significant recalculations in the 2011 annual submission due to changes in methodologies and/or EFs. The ERT concluded that the recalculations improve the accuracy of the inventory of the sector and that Australia has prepared it in accordance with the IPCC good practice guidance. The impact of the recalculations was an increase in the sectoral emission estimates in 2008 by 0.6 per cent (524.02 Gg CO_2 eq), but emissions in 1990 were not recalculated. Recalculations were made due to:

(a) Changes in the AD (e.g. recalculations of the three-year average of emissions once the third year becomes available);

(b) Updates to preliminary milk production estimates for 2008;

(c) Revision of the allocation of feedlot cattle into different export classes for 2007–2008, based on information reported by the industry;

(d) A number of improvements and corrections to the AD and input data for agricultural soils.

2. Key categories

Enteric fermentation – CH_4

79. In 2009, this category emitted 54,736.47 Gg CO_2 eq (10.0 per cent of total GHG emissions). Australia uses a tier 2 method with country-specific EFs to estimate the emissions from dairy cattle, free-range beef cattle, feedlot cattle, sheep and swine. Emissions from the rest of the livestock population were estimated using the tier 1 method and IPCC default EFs. The ERT considered this approach adequate to Australian conditions and in line with the IPCC good practice guidance. However, as indicated in the previous review report, some of the studies used to support such an approach are relatively old. During the review, Australia provided its improvement plan indicating that the in-country peer review of tier 2 parameters for enteric fermentation is in progress. The ERT encourages Australia to finalize these studies and to apply the results for the preparation of the inventory as soon as the study has been finalized.

80. The ERT noted that the cattle population in 2009 reported in the CRF tables is 6.8 per cent lower than the Food and Agriculture Organization (FAO) data (CRF tables report 26,129 thousands of heads, whereas the FAO data show 27,907). For this issue, Australia reported in the documentation box of the CRF table 4.A that non-dairy cattle are disaggregated into free-range and feedlot cattle. This is important because the characteristics of the animals, their feed and manure handling differ significantly. For transparency, these two categories are reported separately; however, due to the limitations of the CRF table, it is necessary to report the feedlot cattle under other livestock. The ERT agrees with Australia's explanation that feedlot cattle were subtracted from cattle in the CRF tables. However, this is not described in the NIR. The ERT, therefore, recommends that, in its next annual submission, Australia also include information in the NIR to explain that feedlot cattle are reported under other (enteric fermentation) in the CRF tables.

Manure management – CH_4 and N_2O

81. In 2009, GHG emissions from this category were 3,315.92 Gg CO_2 eq (0.6 per cent of total GHG emissions). For N_2O estimation, Australia uses the methodology based on the Revised 1996 IPCC Guidelines to estimate emissions and default EFs, whereas for the estimation of N excreted, Australia uses a country-specific method.

82. With regard to the effects on emissions of implementing the pre-weaning feeding regimes, in the previous review report, the ERT had recommended that Australia implement the appropriate recommendations made in previous review reports or, at the least, indicate the progress made in its NIR of the 2011 annual submission. In the follow up to this recommendation, Australia described the new method to be implemented in the 2012 annual submission. The ERT recommends that Australia apply this new method for the inventory preparation and report the results in its next annual submission.

83. In the follow up to the recommendation in the previous review report, Australia conducted a review of the N excretion rates for horse and mules/asses. In the NIR, Australia stated that livestock weights and N excretion rates for horses and donkeys in Australia are consistent with the default values in the 2006 IPCC Guidelines or that these values are estimated using information from the 2006 IPCC Guidelines. Finally, Australia concluded that no change in the N excretion rate was required. The ERT commends this follow up by Australia and concludes that the Party's decision is reasonable.

Agricultural soils – N_2O

84. In 2009, GHG emissions from this category were 14,191.19 Gg CO_2 eq (2.6 per cent of total GHG emissions). The estimates of direct soil emissions (synthetic fertilizers and

animal manure applied to soils) and animal production emissions were estimated using a tier 2 method with country-specific EFs. Indirect soil emissions (nitrogen leaching and runoff) were estimated using a country-specific method and country-specific EFs. A tier 1 method with IPCC default EFs was used to estimate the remaining categories: direct soil emissions (N-fixing crops, crop residues and cultivation of histosols); and indirect soil emissions (atmospheric deposition).

85. In the previous review report, it is indicated that Australia stated that the $Frac_{GASM}$ used in agricultural soils should have been reported as 0.21 not '0' for all years of the time series. In its 2011 annual submission, Australia corrected this parameter for all the years from 1990 to 2007 in its CRF tables; however, the ERT noted that for 2008 and 2009 this parameter still is reported as '0' which is an error. The ERT recommends that Australia correct the values of $Frac_{GASM}$ as '0.21' for whole time series in its next annual submission and enhance its QC procedures.

Prescribed burning of savannas – N_2O and CH_4

86. In 2009, this category emitted 12,146.64 Gg CO_2 eq (2.2 per cent of total GHG emissions). The methodology used is country-specific, with different fuel loads and burning efficiencies for different types of savanna.

87. In the previous review report, it has been recommended that Australia update the burning efficiency, including Queensland fuel loads and vegetation classifications, in the 2011 annual submission. In the NIR of its 2011 annual submission, Australia stated that a new method will be implemented in the 2012 annual submission. In addition, the ERT noted that the 2011–2012 national inventory improvement plan provided by Australia includes the introduction of an in-country peer review of the current estimation methodology for savanna burning. The ERT welcomes this effort and recommends that Australia apply the new method and report the emissions in its next annual submission.

3. Non-key categories

Rice cultivation – CH_4

88. Australia's rice cultivation area decreased by approximately 90 per cent from 1990 to 2009. Australia explained that all rice cultivation in Australia is flood irrigated and that this industry has been severely affected by the ongoing drought. In addition, the ERT also confirmed that the ongoing drought damaged Australian agriculture sector in the periods 2002 to 2003 and 2006 to 2007.

E. Land use, land-use change and forestry

1. Sector overview

89. In 2009, net emissions from the LULUCF sector amounted to 53,970.91 Gg CO_2 eq. In this year, the LULUCF sector offset 9.9 per cent of the total GHG emissions in Australia. Since 1990, net emissions have increased by 25.1 per cent. The key driver for the rise in emissions is grassland. In addition, net emissions by sources and removals by sinks show high inter-annual variability and shifted between being a net sink and a net source throughout the time series. This trend is influenced by, among other things, the inter-annual climate variability and natural disturbances such as fire and drought. Within the sector, net emissions of 137,157.97 Gg CO_2 eq were from grassland. These emissions were offset by net removals of 55,155.51 Gg CO_2 eq from forest land and 25,264.99 Gg CO_2 eq from cropland. The category other was a net sink of 2,765.55 Gg CO_2 eq, and includes harvested

wood products, agricultural lime application and N_2O from disturbance associated with land converted to grassland.

90. Australia has reported emissions and removals for forest land, cropland and grassland. Australia does not estimate emissions and removals for wetlands and settlements, while those for other land are reported as "not occurring" ("NO"). Australia reports conversions between cropland and grassland as IE and NO, but reports land which is managed under a crop-pasture rotation under forest land. Australia reports forest land converted to wetlands and settlements separately as IE, but includes these estimates under the forest land converted to grassland category. Australia is still planning to improve its inventory by separating forest land converted to settlements from forest land converted to grassland. The ERT recommends that Australia reports the results of the implementation of this planned improvement in future submission.

91. The emissions and removals in all land conversion categories were estimated using a tier 3 approach, in which an ecosystem mass balance model including all carbon pools (the Full Carbon Accounting Model (FullCAM)) is fully integrated with a spatially explicit land representation. A combination of tier 2 and tier 3 methodological approcahes was used for lands remaining in the same category. Australia continues to improve the documentation relating to the tier 3 approach it used and the comparison of the results from the tier 3 model with a tier 2 approach for the conversion categories. The ERT noted that in its 2011 annual submission, Australia has improved the documentation on the tier 2 method applied. The ERT acknowledges the efforts made by Australia to improve the transparency of its reporting.

92. Australia chose 50 years as the transition period for land-use conversion but this was not fully applied in its disaggregation of land uses into the land-use remaining and land-use conversion subcategories, which is inconsistent with the IPCC good practice guidance for LULUCF. The ERT noted that Australia's 2011 annual submission includes information on an improved disaggregation of the land use in its improvement plan steaming from a recommendation of the previous review report. The ERT recommends that Australia implement this planned improvement in its next annual submission, as it is needed so that the report is consistent with the IPCC good practice guidance for LULUCF.

2. Key categories

Forest land remaining forest land – CO_2

93. The subcategory forest land remaining forest land is subdivided into "harvested native forest", "pre-1990 plantations", "other native forests" and "fuelwood" (which includes emissions from across the three other subdivisions). Australia has elected to move lands from the conversion subcategory to the remaining category after 50 years but also use subcategories to separate recent land conversions from older land conversions; these hold a time period of 0 to 20 years and 21 to 50 years. However, as noticed in the previous review report, this is not applied consistently across all land-use categories. Australia reports that it is working to apply this consistently across all land-use categories in future submissions. As Australia's current reporting is not consistent with the IPCC good practice guidance for LULUCF, which requires that any change in area of forest land should correspond to a change in land use, the ERT reiterates the recommendation of the previous review report that Australia apply this method consistently in its next annual submission.

94. As indicated in the previous review report, Australia explained that changes in forest area under the subdivision "other native forests" do not always correspond to real changes in land use. Changes in forest cover due to climate variation in areas where tree crown cover is close to the threshold selected (20 per cent) are reported as changes in forest area. In its 2011 annual submission, Australia reports that it plans to implement a research

project to improve the reporting on these changes in land use and that the project will take the recommendation from the previous review report into consideration. The ERT welcomes this action, reiterates the recommendation from the previous review report and looks forward to the results being reported in Australia's next annual submission.

95. Australia assumes that there is no change in the soil carbon stock in the category forest land remaining forest land, which is estimated following the tier 1 approach of the IPCC good practice guidance for LULUCF. Australia reports that research is ongoing to implement higher tier modelling of soil carbon in all forest land remaining forest land subcategories. The ERT welcomes these activities and looks forward to the results of higher-tier modelling being implemented and reported in its next annual submission.

Land converted to forest land – CO_2

96. Australia reports land converted to forest land as land-use change from grassland to plantations and the reporting is restricted to conversions since 1990. The area converted to forest land was in 2009 1,122.10 kha and the associated removals were 15,011.72 Gg CO_2. The method used to estimate emissions and removals is a combination of tier 3 emissions estimation and approach 3 land representations. The model covers all carbon pools: living biomass, dead organic matter and soil.

Cropland remaining cropland – CO_2

97. Australia reports under cropland remaining cropland only those lands that were used for cropping prior to 1972 and remain as cropland. The CO_2 emissions and removals were estimated using the tier 3 approach (FullCAM), which includes estimates of emissions and removals in living biomass, dead organic matter and mineral soil associated with land management practices and annual climate variability. Australia reported the CO_2 emissions and removals from this land category as an aggregated value for an area of 21,691.76 kha. The ERT reiterates the recommendation of the previous review report that Australia document in a transparent manner in the NIR the method used to estimate CO_2 emissions and removals due to transition among crop types and provide these data disaggregated by crop type in CRF table 5.B and or the NIR.

Grassland remaining grassland – CO_2

98. CO_2 emissions and removals from grassland remaining grassland have significantly influenced the total emissions trend in the LULUCF sector and show a decrease since 2007. In 2009, grassland remaining grassland amounted to a net source of 92,585.81 Gg CO_2 eq; in 2008 this category was a net source of 137,823.85 Gg CO_2 eq; and in 2007, it was a net source of 252,471.11 Gg CO_2 eq. Emissions from the grassland remaining grassland category are estimated using interim methods. The tier 3 approach (FullCAM) is used to estimate emissions and removals by all pools for the grass-only areas and a tier 2 method is used to estimate emissions and removals for the shrubland (subforest) areas for living biomass and dead organic matter. A new grass growth model is being developed for integration with the existing inventory methods and Australia is also completing a full national time series of change in sparse woody (shrub) vegetation cover from 1988 onwards using the National Carbon Accounting System (NCAS) Landsat data. However, at the moment, Australia reported the CO_2 emissions and removals from this category as an aggregated number. The ERT recommends that Australia report the results of these improvements in its next annual submission and reiterates the recommendation of the previous review report that Australia also present the information in CRF table 5.C, grassland remaining grassland disaggregated by grassland type, including grass and shrub transitions.

Forest land converted to cropland and forest land converted to grassland – CO_2

99. Australia reports continuously cyclic forest regrowth and reclearing of woody regrowth in grasslands under forest land converted to grassland. Forest growth in the category forest land converted to grassland is modelled using a tier 3 method – the fully spatial, hybrid process-empirical method – which is also used for forest land remaining forest land and for land converted to forest lands. This ensures that there is consistency in the method to estimate changes in carbon stock. The lands which are managed under a crop–pasture rotation are reported under forest land converted to cropland. The conversion categories include only forest land converted to cropland or to grassland after 1972, leading to a variable land conversion period (from 18 years for 1990 to 37 years for 2009) which is inconsistent with the IPCC good practice guidance for LULUCF. As precise information on the conversion of land prior to 1972 is not available, it is not possible to have the information for the 50 year period that Australia uses. The ERT reiterates the recommendation of the previous review report that Australia improve the consistency of reporting and provide estimates for the full chosen period (50 years) in its next annual submission.

100. The lands which are managed under a crop–pasture rotation are reported under forest land converted to cropland. For some years, Australia has reported an increase in carbon stock in mineral soil for forest land converted to cropland due to a high input of dead organic matter in this conversion category. Although appendix 7F of the NIR provides information on the method, it does not provide clear documentation for this increase for some years. The ERT reiterates the recommendation of the previous review report that Australia provide additional documentation to justify this pattern in the NIR of its next annual submission.

3. Non-key categories

Biomass burning – CO_2, CH_4 and N_2O

101. In CRF table 5(V), Australia does not report all emissions from biomass burning, but only a part of the annual emission estimates from non-CO_2 gases. CO_2 emissions and removals are included in other CRF tables as follows: CO_2 emissions and removals associated with the burning and subsequent regrowth of forest lands are reported under forest land remaining forest land "other native forest"; those associated with slash burning in harvested native forests are reported under forest land remaining forest land "harvested native forests"; those associated with the burning and subsequent regrowth of savannas and temperate grasslands are reported under "grassland remaining grassland". Non-CO_2 emissions of prescribed burning of savannas are reported in the agriculture sector. All data and methodologies are currently under review and development. Australia foresees that in the 2012 annual submission the country-specific methodology for prescribed burning of savannas will be updated. The review of the EFs for CH_4 from biomass burning is ongoing and it is envisaged that the results from this project will be used for the 2014 annual submission. The ERT commends Australia for these ongoing improvement projects and recommends that Australia report the results in future annual submissions.

F. Waste

1. Sector overview

102. In 2009, emissions from the waste sector amounted to 14,075.39 Gg CO_2 eq, or 2.6 per cent of total GHG emissions. Since 1990, emissions from the waste sector have decreased by 21.9 per cent. The key driver for the fall in emissions is the steady increase in the recovery rate of CH_4 from landfills. Within the sector, 78.3 per cent of the emissions in

2009 were from solid waste disposal on land, followed by 21.5 per cent from wastewater handling, and 0.2 per cent from waste incineration. Over the period 1990 to 2008, emissions from solid waste disposal on land and wastewater handling decreased by 22.4 per cent and 18.6 per cent, respectively.

103. All categories in the waste sector were reported consistently over the whole time series in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

104. The 2010 ERT observed that GHG emissions from biological recycling processes (e.g. composting) of solid waste were not reported. Although the 2011 annual submission does not quantify emissions from these sources, which it reported in the NIR to be insignificant at present, it notes that these may increase in the future, and so may be included in future inventories. The ERT encourages Australia to explore ways of estimating the GHG emissions from the biological treatment of solid waste using country-specific and/or other available methodologies and to report emissions from this category in its next annual submission.

105. Australia has made recalculations for the waste sector between the 2010 and 2011 submissions following changes in AD taking into account wood and paper disposal in landfill site, applying facility level data for wastewater handling, and AD taking into account clinical waste incineration. The impact of these recalculations on the waste sector is a decrease in emissions of 2.0 per cent for 2008.

2. Key categories

Solid waste disposal on land – CH_4

106. Australia has continued to apply the IPCC tier 2 methodology in line with the IPCC good practice guidance, using country-specific degradable organic carbon fraction (DOC_f) values and the IPCC default parameter values for degradable organic carbon (DOC) and methane generation rate constant (k). Australia's time series of AD extends back to 1940, which is consistent with the IPCC good practice guidance, and its approach to the calculation of waste landfilled and its composition in the period 1940–1990 (before quantitative data were available) is reasonable. A delay of 0.5 years between the disposal of waste and the start of CH_4 formation is used (the IPCC default value for delay), but this is incorrectly recorded as a delay of 50.00 years in the CRF tables. The ERT recommends that Australia correct this figure in the CRF tables in its next annual submission.

107. In the previous annual review report, Australia was encouraged to develop country-specific DOC and k values. As indicated in paragraph 107 above in its 2011 annual submission Australia still uses default values for DOC and k. The ERT reiterates the encouragement of the previous review report to adopt country-specific values for these parameters, but notes that this matter will be addressed in Australia's plan to use facility-specific parameter values from NGERS in future annual submissions.

108. In addition, Australia was encouraged to verify the methane correction factor (MCF) values for the years prior to 1990 by the previous ERT, as it is probable that unmanaged landfill practices were carried out during those years. Australia has addressed this issue in its 2011 annual submission, reporting survey evidence obtained in 2007 which showed that about 95 per cent of the country's solid waste to be disposed of to landfills meeting the criteria of "well-managed landfills" are characterized with an MCF=1.00, and stating that no comprehensive data are available to characterize changes to management practices over time.

109. In its 2011 annual submission, Australia has reported a small recalculation of emissions from this category affecting the period 2004–2008. This is the result of decreases

of 0.2 per cent (in 2007 and 2008) and 0.1 per cent (in 2004–2006) in the landfill disposal of wood and paper in harvested wood products for these years, and a concomitant increase in the use of aerobic treatment for these wastes.

110. Australia has used facility-specific data from NGERS and from industry surveys to estimate the amount of CH_4 recovered from landfills. Whilst commending Australia for its use of facility-specific data, the ERT recommends that Australia improve the transparency of its NIR by detailing how these data were obtained (for example, whether from measurements or estimates), the uses of the gas (e.g. flaring, power generation and so on) and the level of uncertainty.

111. The ERT noted that Australia has not specifically stated in its NIR where emissions of CO_2 from power generation from landfill CH_4 are accounted for in its inventory. The ERT recommends that Australia report the CO_2 emissions as a memo item as biomass combustion and non-CO_2 emissions as a non-memo item under the energy sector.

Wastewater handling – CH_4

112. Australia has developed country-specific biochemical degradable carbon loadings and MCF values to produce accurate estimates of CH_4 generation from the wastewater handling category. Australia's estimates of CH_4 emissions from domestic and commercial wastewater and industrial wastewater handling are in line with the IPCC good practice guidance method.

113. The ERT commends Australia for the improvements it has introduced in its 2011 annual submission. Recalculations have been performed for the whole time series in wastewater handling as a result of the availability of facility-level data under NGERS. Facility-level AD and model parameters have been back-cast to 1990 by facility to provide time-series consistency. Emissions are based on chemical oxygen demand (COD), not biological oxygen demand (BOD), but as BOD is referenced in the CRF tables in relation to domestic and commercial wastewater, the ERT recommends that Australia also state the conversion ratio.

114. The effects of these recalculations on CH_4 emissions estimates from domestic and commercial wastewater handling (including from unsewered wastewater treatment) is an increase CH_4 emissions in 1990 by 7.6 per cent in the 2011 annual submission, compared with the 2010 annual submission, from 1,378.44 Gg CO_2 eq to 1,483.65 Gg CO_2 eq. In subsequent years of the time series, the difference between the two submissions decreased and changed sign, so that by the year 2008, the value reported in the 2011 annual submission was 15.9 per cent less than the 2010 annual submission, showing a decrease from 1,943.55 Gg CO_2 eq to 1,652.07 Gg CO_2 eq.

115. For industrial wastewater handling, the impacts of the recalculation are generally smaller, with the 2011 annual submission showing CH_4 emissions to be 0.1 per cent higher in 1990 and 1.7 per cent higher in 2008, compared with the 2010 annual submission. Where facility-specific information is lacking under NGERS, estimates have been based on country-specific wastewater and COD generation rates. In addition, facility-specific data on MCF obtained through NGERS for the sugar, pulp and paper and beer industries have been provided for the first time in the 2011 annual submission. The ERT commends Australia for its improvements in the reporting of emissions from this category and encourages Australia to extend the use of facility-specific data in future annual submissions.

116. However, it is apparent that Australia still has not completely overcome the QA/QC concerns stated in the previous review report and a number of trivial errors have been noted. For example, the values of COD generation for some industries reported in the NIR do not agree completely with the corresponding data in the CRF tables. It would also facilitate comparison if the data in the NIR and CRF tables were reported to the same

number of significant figures. The ERT therefore reiterates the recommendation of the previous review report that Australia improve its QA/QC procedures to eliminate such mistakes in its future annual submissions.

3. Non-key categories

Wastewater handling – N_2O

117. Australia has developed a country-specific methodology and parameter values (e.g. N loadings and N amounts in effluents) to estimate N_2O emissions from human sewage in order to enhance the accuracy of N_2O emission estimates in this category. The approach is based on the IPCC good practice guidance methodology and comprises estimates of emissions from sewage treatment at wastewater treatment plants, emissions from effluent discharged into the aquatic environment and from disposal of treated sludge on land. Facility-specific data on total N entering wastewater treatment plants and being discharged in effluent have been obtained, partly through NGERS, representing 108 facilities. Australia used the IPCC default EF for emissions from wastewater treatment plants, effluent and treated sludge applied to agricultural land. In addition the per capita protein consumption values have been revised for the years 1994–2008 due to the availability of updated data. The ERT commends Australia for its use of facility-specific data and considers that Australia has adopted a reasonable methodology for calculating N inputs from the portion of the population not covered by these facilities.

118. In previous review reports it has been recommended that Australia reallocate emissions from sludge application to agricultural land to the agriculture sector of the inventory. This has not been done in the 2011 annual submission. However, the ERT notes that the current NIR anticipates that this will be done in the next annual submission and the ERT, therefore, reiterates the recommendation of the previous review report.

Waste incineration – CO_2 and N_2O

119. Australia reported emission estimates of CO_2 from the incineration of solvents and clinical waste as well as emission estimates of CO_2 and N_2O from the incineration of municipal solid waste (MSW) (which ceased in 1996) for the period 1990 to 1996. The 2011 annual submission has addressed concerns stated in the previous review report over the transparency of AD and EFs for CO_2 emissions derived from fossil fuel.

120. However, the CRF tables incorrectly report N_2O and CH_4 emissions from the incineration of waste (clinical waste and solvents) as "NA". Since these emissions are likely occurring, the ERT recommends that Australia quantify the emissions of N_2O from this category. If no data on EFs are available, the ERT recommends that Australia report those emissions as "NE", rather than "NA".

121. The ERT notes that a minor recalculation for CO_2 emissions from clinical waste incineration has been undertaken for the years 2006–2008, following the availability of NGERS data on per capita incineration rates for 2009.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

122. Australia has provided complete information in the NIR with respect to the requirements outlined in paragraphs 5 to 9 of the annex to decision 15/CMP.1 and further described by the IPCC good practice guidance for LULUCF. Australia has not elected any activity under Article 3, paragraph 4, of the Kyoto Protocol. Australia has chosen annual accounting for activities under Article 3, paragraph 3, of the Kyoto Protocol.

123. Australia has made recalculations for the KP-LULUCF activities between the 2010 and 2011 annual submissions following changes in AD because the NCAS Landsat data have been updated to include the most recent available satellite data. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows:

(a) Decrease in removals by afforestation and reforestation of 190.39 Gg CO_2 eq (or 1.1 per cent);

(b) Increase in emissions from deforestation of 2,826.12 Gg CO_2 eq (or 5.7 per cent).

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

124. For afforestation and reforestation Australia applies a full tier 3, approach 3 system to estimate emissions and removals under Article 3, paragraph 3. These are the same methods as used to report under the Convention, but use additional data and policy rule settings to meet the particular requirements of the Kyoto Protocol and chapter 4 of the IPCC good practice guidance for LULUCF. The NCAS Landsat data have been updated to include the most recent available satellite data. This resulted in a reduction of the area of lands under afforestation and reforestation activities at the beginning of 2008 by 2.14 kha and a reduction in removals in 2008 of 190.39 Gg CO_2 eq.

125. During the review, Australia informed the ERT that the annual change in land use categories, as depicted by the matrix in table 7.5, volume 2 of the NIR, is not equal to the data reported under the Convention or activities under Article 3, paragraph 3 of the Kyoto Protocol (human-induced land-use change) because that matrix incorporates both human-induced and natural causes for change in forest cover. From the area reported in table 7.5, Australia then subtracts the area that result in non-human induced change, namely natural regrowth after previous clearing, abandonment of lands and areas of natural crown cover change due to climate and fire. The annual area of afforestation and reforestation is the same as the area of post-1990 plantation (grassland converted to forest land under the Convention) which is reported in table 7.D5 of the NIR. The data in this table are consistent with the data reported in CRF table NIR-2. To improve transparency the ERT recommends that Australia present the annual area of afforestation and reforestation in chapter 11 of the NIR in its next annual submission.

126. For the year 2008, Australia reports 48.499 kha of land harvested since the beginning of the commitment period and for 2009, Australia reports 96.521 kha. In the NIR volume 2, appendix 7D regarding post-1990 plantations, Australia provides detailed information on the tier 3 model used for estimates. In this model, the age and magnitude of maximum current annual biomass increment (max. IB) varies with species, site productivity

and management. The ERT notes that some areas, as presented in the CRF table 5 (KP-1)A1.2, include annual harvesting of plantations, but from the information presented in chapter 11 of the NIR it is not clear whether this annual harvesting is using the same values as the CRF table or uses different values over years to estimate the changes in carbon stock. To improve transparency the ERT recommends that Australia provide in its next annual submission more information on the estimation of the carbon stock change in the units of land harvested.

Deforestation – CO_2

127. In its NIR, Australia reported only generic qualitative information on the size and geographical location of forest areas that have lost forest cover but which are not yet classified as deforested. In the NIR volume 2, appendix 7E, Australia provides figure 7.E2 showing the net change in forest cover that is not attributed to human-induced actions. Australia has included a review of the assessment of non-human induced forest cover change in its inventory improvement plan. The ERT welcomes this announced review, but reiterates the encouragement of the previous review report that Australia provide in its next annual submission, but certainly no later than the 2014 annual submission, a quantitative assessment of forest areas that have lost forest cover but which are not yet classified as deforested.

128. For the same reasons as for afforestation and reforestation activities, the land cover transitions in table 7.5 of the NIR do not match the deforestation areas for the activities under Article 3, paragraph 3, of the Kyoto Protocol. In the CRF table NIR-2 Australia reports the deforested areas for 2008 and 2009. During the review, Australia provided the ERT with a preliminary estimate of the annual area of land subject to deforestation under the Kyoto Protocol. To improve transparency the ERT encourages Australia to also present the annual deforested area since 1990 in the NIR of its next annual submission.

129. Recalculations of the 2008 emissions from deforestation have resulted in an increase of emissions by 2,826.12 Gg CO_2 and are the result of the use of improved data, in particular for: management data for the relative frequency of cropland and grassland management in Northern New South Wales; and the attribution of forest cover change where fire had also occurred. During the review, Australia informed the ERT that it assumes there is no systematic effect of confirming uncertainties in subsequent years, as the uncertainty in forest cover change can reflect a range of factors. The ERT welcomes this information that there is no indication for a systematic underestimation in the first year of estimating the carbon stock changes for deforestation.

130. In its 2011 annual submission, Australia provided in the NIR more information on model verification activities and an explanation of the tier 2 comparison models and indicated that it will continue to improve this information in the NIR of future annual submissions. The ERT welcomes these improvements, but suggests that Australia give priority to those elements that are important in the calculation of the carbon stock changes for deforestation under the Kyoto Protocol.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

131. Australia has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note

of the findings included in the SIAR on the SEF tables and the SEF comparison report.[10] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

132. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraph 88(a–j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol

133. Australia has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

134. Table 4 shows the accounting quantities for KP-LULUCF as reported by Australia and the final values after the review.

Table 4
Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2011 submission[a]			*2010 submission*[b]	*"Net" accounting quantity*[c]
	As reported	*Revised estimates*	*Final*	*Final*	
Afforestation and reforestation	–46 294 933		–46 294 933	–23 032 901	–23 262 032
Deforestation	93 815 088		93 815 088	49 650 531	44 164 557
Forest management	NA		NA	NA	NA
Article 3.3 offset[d]	NA		NA	NA	NA
Forest management cap[e]	NA		NA	NA	NA
Cropland management	NA		NA	NA	NA
Grazing land management	NA		NA	NA	NA
Revegetation	NA		NA	NA	NA

[a] The values included under the 2011 submission are the cumulative accounting values for 2008 and 2009 as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2009.

[b] The values included under the 2010 submission are the final accounting values as a result of the 2010 review and are included in table 6 of the 2010 annual review report (FCCC/ARR/2010/AUS, page 32).

[10] The SEF comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

[c] The "net" accounting quantity is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2011 submission and where the quantities issued or cancelled based on the 2010 review have been subtracted ("net" accounting quantity = final 2011-final 2010).

[d] Article 3.3 offset: For the first commitment period, a Party included in Annex I that incurs a net source of emissions under the provisions of Article 3, paragraph 3, may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[e] In accordance with paragraph 11 of the annex to decision 16/CMP.1, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, after the application of paragraph 10 of the annex to decision 16/CMP.1 and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

135. Based on the information provided in table 4 for the activity afforestation/reforestation, Australia shall issue 23,262,032 removal units in its national registry.

136. Based on the information provided in table 4 for the activity deforestation, Australia shall cancel 44,164,557 assigned amount units, emission reduction units and/or certified emission reduction units in its national registry.

National registry

137. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

Calculation of the commitment period reserve

138. Australia has reported its commitment period reserve in its 2011 annual submission. Australia reported that its commitment period reserve has not changed since the initial report review (2,661,821,229 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

139. Australia reported that there are changes in its national system since the previous annual submission. Australia reported in its NIR that significant changes to the inventory compilation process has taken place as a result of using data obtained under NGERS. Australia also reported that additional QA/QC activities and procedures have been implemented since its 2010 annual submission and the responsibility for approving the inventory for submission has been devolved from the Minister for Climate Change, Energy Efficiency and Waste to the Secretary of the DCCEE. The ERT concluded that Australia's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

140. Australia reported that there are changes in its national registry since the previous annual submission. In response to a recommendation in the previous review report Australia made a change to the list of publicly available information and now provides information on the registry website on legal entities and account holdings. The ERT commends Australia for changes made to its registry website. The ERT concluded that Australia's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

141. Australia has reported that there are changes in its reporting of the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol, in accordance with chapter I.H of the annex to decision 15/CMP.1, in its 2011 annual submission.

142. In response to a recommendation in the previous review report, Australia has reported updated and additional information relating to the actions and activities in which Australia is engaged to implement its commitments mentioned in Article 3, paragraph 1, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties. The ERT commends Australia for reporting specific areas and initiatives in which it is engaged in its NIR. The ERT concluded that, taking into account the confirmed changes in the reporting, the reported information is complete and transparent.

143. In its NIR, Australia reported that it has established a multi-party climate change committee to consider the costs and benefits of introducing a carbon price in its domestic economy. All Australian states and territories have agreed to phase out retail price regulation for electricity and natural gas where effective competition is agreed.

144. Australia also reports how it has committed resources to improve access to clean and affordable energy in countries of the Pacific. Australia has worked closely with Tonga to develop an Energy Road Map (2010–2020) which will reduce fossil fuel dependence and expand access to reliable energy services. The Energy Road Map will also have the effect of reducing the impact on Tonga of any increase in the price of carbon-intensive energy sources.

III. Conclusions and recommendations

145. Australia made its annual submission on 15 April 2011. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

146. The ERT concludes that the inventory submission of Australia has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and Australia has submitted a complete set of CRF tables for the years 1990–2009 and an NIR; generally complete and covers all the source and sink

categories with an exception for the period 1990 to 2009 and is complete in terms of gases and geographical coverage.[11]

147. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

148. Australia's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF, except for the issues raised in paragraph 158 below. The ERT commends Australia for the substantial improvements made since its previous submission.

149. Australia performed recalculations for the inventory between the 2010 and 2011 annual submissions following changes in methods and AD. The impact of these recalculations on the GHG total emissions is an increase by 0.3 per cent for 2008 and by 0.02 per cent for 1990. The main recalculations took place in the following sectors/categories:

(a) Energy sector (increase of emissions by 0.2 per cent in 2008);

(b) Agriculture sector (increase of emissions by 0.6 per cent in 2008);

(c) Waste sector (decrease of emissions by 2.0 per cent in 2008).

The ERT commends Australia for improving its inventory estimates and transparently documenting the rationale for the recalculations in the CRF tables and in the NIR.

150. Australia has estimated and reported GHG removals by sinks and emissions by sources from afforestation, reforestation and deforestation activities in the CRF tables for the years 2008 and 2009. Australia provided in the NIR complete information with respect to the requirements outlined in paragraphs 5 to 9 of the annex to decision 15/CMP.1. Australia has not elected any activities under Article 3, paragraph 4.

151. Australia has performed recalculations for the KP-LULUCF activities between the 2010 and 2011 annual submissions following changes in AD to include the most recent available satellite data. The impact of these recalculations on each KP-LULUCF activity for 2008 is as follows:

(a) Decrease in removals by afforestation and reforestion activities of 190.39 Gg CO_2 eq (or 1.1 per cent);

(b) Increase in emissions from deforestation of 2,826.12 Gg CO_2 eq (or 5.7 per cent).

152. Australia has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

153. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

154. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

155. Australia has reported the information requested in chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3,

[11] The information in this report is based on the data as provided by the Party concerned. Any reflection of the data for territories with regard to which any disputes might exist under international law does not constitute a position of the ERT or the UNFCCC with regard to the legal status of such territories.

paragraph 14", as part of its 2011 annual submission. Australia has reported updated and additional information relating to the actions and activities in which Australia is engaged to implement its commitments mentioned in Article 3, paragraph 1, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, in response to the previous review report. The ERT concluded that the reported information is complete and transparent.

156. The ERT identifies the following cross-cutting issues for improvement:

(a) Report a key category analysis for 1990 in its next annual submission (para. 16 above);

(b) Describe in the QA/QC plan or in the NIR how Australia treats confidential data (para. 24 above);

(c) Reassess the uncertainties used in the energy sector since the introduction and use of NGERs data (para. 39 above).

157. In the course of the review, the ERT formulated a number of recommendations relating to the transparency and consistency of the information presented in Australia's annual submission in the energy, industrial processes, agriculture, LULUCF and waste sectors and KP-LULUCF activities. The key recommendations are that Australia:

(a) Provide a carbon balance approach for CH_4 emissions from surface coal mining, provide an analysis of NGERs data relating to CH_4 flared from coal mining activities and improve the transparency of the information for the coal mining and handling category (paras. 34, 35 and 54 above);

(b) Continue to increase the transparency of reporting in the chemical industry of the industrial processes sector by providing additional disaggregation of emissions in the industrial processes sector, for which emissions are currently reported as confidential (para. 63 above);

(c) Improve the reporting of SF_6 from electrical equipment in line with the IPCC good practice guidance (paras. 69–72 above);

(d) Separate the reporting of forest land converted to settlements from forest land converted to grassland (para. 91 above);

(e) Implement the changes to the reporting of land uses consistently across all land-use categories (para. 94 above);

(f) Improve the consistency of the reporting in the forest land converted to cropland and grassland categories for the full 50 year period (para. 100 above);

(g) Improve the transparency of the reporting on how CH_4 recovered from landfills is estimated (para. 111 above);

(h) Improve the transparency of the reporting of annual areas of afforestation and reforestation in chapter 11 of the NIR (para. 126 above).

IV. Questions of implementation

158. No questions of implementation were identified by the ERT during the review.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Australia 2011. Available at <http://unfccc.int/resource/docs/2011/asr/aus.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2011. Available at <http://unfccc.int/resource/webdocs/sai/2011.pdf>.

FCCC/ARR/2010/AUS. Report of the individual review of the greenhouse gas inventory of Australia submitted in 2010. Available at <http://unfccc.int/resource/docs/2010/arr/aus2.pdf>.

UNFCCC. *Standard Independent Assessment Report*, Parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Robert Sturgiss (DCCEE), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Australia:

Australia's National Greenhouse Accounts, National Inventory Systems Inventory Improvement Plan 2011-2012.

[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AAU	assigned amount unit
AD	activity data
BOD	biological oxygen demand
CER	certified emission reduction unit
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
CRF	common reporting format
DOC	degradable organic carbon
DOC_f	degradable organic carbon fraction
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
FAO	Food and Agriculture Organization
GCV	gross calorific value
Gg	gigagram (1 Gg = 1,000 tonnes = 10^9 grams)
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
GJ	gigajoule (1 GJ = 10^9 joule)
HCFCs	hydrochlorofluorocarbons
HFCs	hydrofluorocarbons
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
k	methane generation rate constant
KP-LULUCF	Land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kg	kilogram (1 kg = 1,000 grams)
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
N_2O	nitrous oxide
NO	not occurring
NIR	national inventory report
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
t	tonne
TiO_2	titanium dioxide
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change