COMPLIANCE COMMITTEE **CC/ERT/ARR/2010/16**
9 March 2010

Report of the individual review of the annual submission of Australia submitted in 2009

Note by the secretariat

The report of the individual review of the annual submission of Australia submitted in 2009 was published on 5 March 2010. 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/2009/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 2009*

* In the symbol for this document, 2009 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of Australia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 21 to 26 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Kristina Saarinen (Finland) and Mr. Marius Ţăranu (Republic of Moldova); energy – Mr. Pascal Bellavance (Canada), Mr. Tomas Gustafsson (Sweden) and Mr. Benon Bibbu Yassin (Malawi); industrial processes – Mr. Afshin Matin (Canada) and Ms. Suvi Monni (European Community); agriculture – Mr. Leonard Brown (New Zealand) and Ms. Hongmin Dong (China); land use, land-use change and forestry (LULUCF) – Ms. Tracy Johns (United States of America) and Mr. Harry Vreuls (Netherlands); and waste – Ms. Maryna Bereznytska (Ukraine) and Mr. Carlos Lopez (Cuba). Mr. Brown and Mr. Ţăranu were the lead reviewers. The review was coordinated by Ms. Sevdalina Todorova and Mr. Matthew Dudley (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 2007, the main greenhouse gas (GHG) in Australia was carbon dioxide (CO_2), accounting for 73.2 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (21.3 per cent) and nitrous oxide (N_2O) (4.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.1 per cent of the overall GHG emissions in Australia. The energy sector accounted for 75.4 per cent of the total GHG emissions, followed by agriculture (16.3 per cent), industrial processes (5.6 per cent) and waste (2.7 per cent). Total GHG emissions amounted to 541,178.73 Gg CO_2 eq and increased by 30.0 per cent between the base year[2] and 2007. The trends for the different gases are reasonable and reflect the emission estimates reviewed.

4. Tables 1 and 2 show total GHG emissions by gas and by sector, respectively. Table 1 includes emissions from Annex A sources only and excludes emissions and removals from the LULUCF sector, including 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.

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[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 includes emissions from Annex A sources only.

Table 1. Total greenhouse gas emissions by gas, 1990–2007[a]

Greenhouse gas	Gg CO_2 eq							Change base year–2007 (%)
	Base year[b]	1990	1995	2000	2005	2006	2007	
CO_2	277 814.89	277 814.89	304 309.76	349 837.35	382 663.05	390 608.52	396 280.22	42.6
CH_4	114 699.27	114 699.27	113 768.06	116 355.64	111.890.55	113 675.72	115 289.97	0.5
N_2O	18 102.36	18 102.36	20 196.44	24 989.61	23 923.36	24 305.61	23 467.76	29.6
HFCs	1 126.27	1 126.27	1 328.91	2 045.23	4 101.26	4770.75	5 117.61	354.4
PFCs	3 950.13	3 950.13	1 312.56	1 103.55	1 536.23	589.10	502.15	–87.3
SF_6	521.02	521.02	521.02	523.41	521.02	521.02	521.02	0.0

[a] "Total greenhouse gas emissions" includes emissions from Annex A sources only (exclude emissions/removals from the LULUCF sector).
[b] "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 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO_2 eq							Change base year–2007 (%)
	Base year[a]	1990	1995	2000	2005	2006	2007	
Energy	286 433.06	286 433.06	312 795.28	358 623.05	392 830.15	400 103.83	408 162.69	42.5
Industrial processes	24 141.44	24 141.44	24 268.94	25 731.17	27 792.74	29 386.59	30 342.89	25.7
Solvent and other product use[b]	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	0.0
Agriculture	86 832.12	86 832.12	86 332.68	94 676.97	89 571.32	90 798.01	88 106.04	1.5
LULUCF	NA	37 579.65	101 010.49	–90 462.68	71 603.29	16 587.76	284 709.69	NA
Waste	18 807.32	18 807.32	18 039.86	15 823.60	14 441.26	14 182.29	14 567.10	–22.6
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	**NA**	**453 793.59**	**542 447.24**	**404.392.10**	**596 238.75**	**551 058.48**	**825 888.42**	**NA**
Total (without LULUCF)	**416 213.94**	**416 213.94**	**441 436.75**	**90 462.68**	**524 635.46**	**534 470.72**	**541 178.73**	**30.0**

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring, IE = included elsewhere.
[a] "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.
[b] In the case of Australia, emissions from the solvent and other product use sector are included in the industrial processes sector for confidentiality reasons.

C. Annual submission and other sources of information

5. The 2009 annual inventory submission was submitted on 26 May 2009; the submission contains a complete set of common reporting format (CRF) tables for the period 1990–2007 and a national inventory report (NIR). Australia also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including: information on changes in the national system and in the national registry. The annual submission was made in accordance with decision 15/CMP.1. Australia indicated that the 2009 submission is also its voluntary submission under the Kyoto Protocol.

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

7. During the review, Australia provided the ERT with additional information. In response to questions raised by the ERT during the review, Australia provided information on the completeness of its annual inventory submission (see para. 9 below). The full list of materials used during the review is provided in the annex to this report.

Completeness of inventory

8. The inventory is complete in terms of gases, years and geographical coverage and is generally complete in terms of categories. Australia did not report emissions from solvent and other product use separately but included them in the industrial processes sector for confidentiality reasons. Australia provided CRF tables for the entire time series, except for CRF table 7 (key category analysis) which is provided only for 2007. The ERT encourages Australia to explore the possibility of reporting CRF table 7 for all years of the time series in its next inventory submission. Australia used the notation key not estimated ("NE") for several categories such as fugitive CH_4 emissions from other leakage in the energy sector and CH_4 emissions from methanol and HFC emissions from aerosols/metered dose inhalers.

9. In response to a question raised by the ERT, Australia stated that it is reviewing the available data and files for the category fugitive CH_4 emissions from other leakage and it intends to enhance the description of this category in its next submission. Regarding CH_4 emissions from methanol, Australia informed the ERT that it hopes that new data will become available following the coming into force of the National Greenhouse and Energy Reporting Act 2007 (NGER). Australia informed the ERT that metered dose inhalers were not covered under the ozone legislation[4] of Australia, but new legislation being considered by the Australian parliament provides for emissions from metered dose inhalers. Australia intends to undertake a voluntary survey of companies and report data in the next annual submission.

10. The ERT recommends that Australia improve the completeness of its next annual submission, especially for those categories that are known to occur within Australia and for which methodologies are available in the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and*

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[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 administrator using procedures agreed in the meetings of 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. The SIAR is not publicly available.

[4] Ozone Protection and Synthetic Greenhouse Gas Management Act 2003.

Uncertainty Management in National Greenhouse Gas Inventories (hereinafter referred to as the IPCC good practice guidance) and the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) to estimate emissions. The ERT encourages Australia to explore approaches available in the scientific literature, to estimate emissions for categories that do not have methodologies prescribed in the Revised 1996 IPCC Guidelines or the IPCC good practice guidance, with a view to enhancing further, to the extent possible, the completeness and accuracy of its inventory The ERT also recommends that Australia, when reporting emissions data for the first time for a given category, ensure that emissions data are provided for the entire inventory time series, and that the choice of methods and emission factors (EFs) is clearly explained in the NIR.

D. Main findings

11. The inventory is generally in line with the Revised 1996 IPCC Guidelines and 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). Australia uses higher tier methods for most key categories and uses the key category and uncertainty analyses as a driving factor for the improvement of the inventory. The ERT considers the 2009 inventory submission to be generally of high quality and welcomes the efforts made by Australia to carry out continuous improvements.

12. The ERT noted that Australia provided sufficient resources for the national system and Australia has an efficient inventory planning and preparation process in place that uses the Australian Greenhouse Emissions Information System (AGEIS) and data from the National Carbon Accounting System (NCAS) of the Department of Climate Change (DCC). The ERT also noted that the use of new data available under the NGER would further improve the accuracy and transparency of the inventory.

13. The submission was complete in terms of years, geographical coverage and gases. However, the ERT found that the completeness of the annual submission could be improved with respect to Australia's reporting of "NE" for a number of minor non-LULUCF categories, especially those categories that are included in either the Revised 1996 IPCC Guidelines or the IPCC good practice guidance, and for which methods are prescribed therein.

14. The ERT concludes that Australia's inventory is generally transparent and the NIR is structured 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). Revised and additional information for the LULUCF sector has significantly improved the transparency of reporting for that sector. The ERT also noted that in some cases data have been aggregated, by that Australia will provide the confidential data to the ERT for the purposes of review (e.g. emissions from ammonia production, nitric acid production, magnesia production, soda ash production and use, acetylene use, the use of N_2O for anaesthesia, and N_2O emissions from aerosol cans have all been aggregated.

15. Australia submitted, in part, on a voluntary basis supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with section I of the annex to decision 15/CMP.1. Australia did not report, on a voluntary basis, information on activities under Article 3, paragraphs 3, of the Kyoto Protocol,[5] information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol and information on its accounting of Kyoto Protocol units in the SEF tables. Australia was not eligible to participate in emissions trading until 11 July 2009, which meant that no SEF tables were required for the reporting period.

[5] Australia did not elect to account for land activities under Article 3, paragraph 4, of the Kyoto Protocol.

16. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. 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 decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

17. The ERT encourages Australia to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, that can be found on the UNFCCC website.[6]

18. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the inventory (see para. 37 below). Category-specific recommendations are presented in the sector chapters of this report.

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

1. Overview

19. The ERT concludes that the national system continued to perform its required functions.

20. The NIR adequately describes the national system for the preparation of the inventory. The DCC has overall responsibility for the national inventory. Other agencies, organizations and companies involved are: the Australian Bureau of Statistics (ABS), the Australian Bureau of Agricultural and Resource Economics (ABARE), Coal Services Pty Ltd, the Australian Petroleum Production and Exploration Association, the Department of the Environment, Water, Heritage and the Arts, as well as waste agencies of the state and territory governments. The ERT concludes that the overall organization of the national system is effective and reliable from the point of view of the institutional, procedural and legal arrangements for the estimation of GHG emissions and the timely submission of the inventory. Australia reported in the NIR that no changes have taken place in Australia's national system since the previous annual submission.

21. Australia developed the AGEIS for emission estimates and inventory preparation and management. AGEIS has integrated quality control procedures. The ERT commends Australia for its use of the AGEIS to facilitate inventory preparation and management. Australia developed the NCAS to report emissions from the LULUCF sector and to meet the reporting requirements under Article 3, paragraph 3, of the Kyoto Protocol. The wall-to-wall mapping approach that Australia uses for the representation of land areas facilitates the identification and reporting of activities under Article 3, paragraph 3.

2. Inventory planning

22. The inventory is based on a centralized emission estimation process at the DCC. The data collection process is integrated with other programmes notably the ABS and ABARE and uses a combination of QC tier 1 and tier 2 checks to ensure reliable data flow. Existing legislation supports data collection and new legislation under the NGER will further improve the availability of data.

23. Australia has a functioning quality assurance/quality control (QA/QC) plan with specific responsibilities and objectives in relation to the quality of the inventory. Australia briefly describes its QA/QC plan in the NIR. Further details are contained in the document entitled "National inventory systems: quality assurance-quality control plan 2008–09". The DCC is responsible for the inventory

[6] <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/reporting_requirements/application/pdf/annotated_nir_outline.pdf>.

improvement plan. The key category analysis and uncertainty analysis are used to plan inventory improvements. The ERT commends Australia for its efficient inventory planning and preparation process.

3. Inventory preparation

Key categories

24. Australia reported a key category tier 1 analysis, both level and trend assessment, as part of its 2009 submission. The key category analysis performed by Australia and that performed by the secretariat[7] produced similar results. Australia included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Australia uses higher tier methods for most key categories and uses the key category analysis to prioritize the development and improvement of its inventory. Due to the significant recalculations undertaken in the LULUCF sector, the list of key categories has changed since the last submission; for example, the category grassland remaining grassland was not a key category in the previous submission but it is a top key category in this submission.

Uncertainties

25. Australia prepared an IPCC tier 1 quantitative analysis (including LULUCF) and reported this in the format of table 6.1 as prescribed in the IPCC good practice guidance and in accordance with the UNFCCC reporting guidelines. The ERT noted that Australia intends to implement an IPCC tier 2 uncertainty estimate in future submissions and the ERT encourages Australia to report on the progress made in its next annual submission. The results of the uncertainty analysis are used to prioritize inventory improvements.

26. The ERT found that the overall uncertainty of the inventory (including LULUCF) is estimated at ±2.4 per cent and has changed from ± 4 per cent in the previous submission. The trend uncertainty increased to ±3.0 per cent from ±2.0 per cent in the previous submission. The ERT considers that the uncertainty ranges are generally consistent with the typical uncertainty ranges reported for each sector.

Recalculations and time-series consistency

27. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Australia of the time series 1990–2006 have been undertaken to take into account recommendations made in the previous review report, revisions made to data and EFs and refinements in methodologies. The recalculations resulted in an increase in the emission estimates in 1990 by 58.61 Gg (0.01 per cent) and a decrease in the emission estimates (without LULUCF) in 2006 by 1,594.88 Gg (0.3 per cent). Major recalculations were undertaken in the LULUCF sector where the estimate of total emissions from LULUCF for 1990 decreased by 62,139.45 Gg CO_2 eq (62.3 per cent) and for 2006 increased by 2,801.23 Gg CO_2 eq (20.3 per cent). The estimate of emissions from the waste sector decreased by 14.7 per cent for 2006. The rationale for these recalculations is provided in the NIR and in CRF table 8(b); the recalculations are usually sufficiently justified and documented (with some exceptions in the energy sector and the industrial processes sector) and applied consistently across the time series.

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[7] 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 LULUCF. 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.

Verification and quality assurance/quality control approaches

28. Australia has a functioning QA/QC system that was elaborated in accordance with decision 19/CMP.1 and the IPCC good practice guidance. Australia describes the system in the NIR. Further details are contained in the document entitled "National inventory systems: quality assurance-quality control plan 2008–09". Information on QA/QC procedures is provided in the NIR at the category level and includes the LULUCF sector.

29. The ERT concludes that the quality procedures are implemented in accordance with the IPCC good practice guidance. However, the ERT noted some QC issues regarding the final stages of the preparation of the inventory, including inconsistent use of notation keys in the industrial processes sector, discrepancies between the NIR and CRF tables (e.g. data from land area matrices and summary tables 3 and 10) and minor inconsistencies in the NIR (e.g. documentation of a review of histosols). The ERT recommends that Australia correct these inconsistencies in its next submission and improve QC efforts during the final stages of preparation of the inventory as part of its annual submission.

Transparency

30. The ERT concludes that Australia's inventory is generally transparent. The NIR follows the outline set out in the UNFCCC reporting guidelines. The provision of revised and additional text for the LULUCF sector has significantly improved the transparency of reporting for the sector. However, the ERT notes that in some cases emissions have been aggregated, making it impossible to review certain categories; for example, emissions from ammonia production, nitric acid production, magnesia production, soda ash production and use, acetylene use, use of N_2O for anaesthesia and N_2O emissions from aerosol cans are all reported in aggregated category. Australia recalculated this aggregated category but it is not clear which individual categories have been recalculated. The ERT acknowledges the constraints involved in reporting confidential data but reiterates the strong recommendation made during the previous review that Australia develop and implement an approach for reporting emissions data and information in a manner that supports the expert review of these categories.

31. The ERT noted the wide use of the notation key not applicable ("NA") in the inventory (e.g. in the energy sector and the waste sector). The ERT recommends that Australia revise its use of the notation key "NA" and change it to the appropriate notation keys (e.g. not occurring ("NO") which is the appropriate notation key for activities (also fuels) in a particular category that do not occur within a country).

32. The ERT notes that transparency could be further improved by including additional documentation in the NIR, as indicated in the sector chapters of this document. The additional information could include further information and documentation on the process used to form expert judgement used in the estimates and to ensure that when parameters, EFs and other information from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) are used these are adequately justified and are shown to be appropriate for Australia's national circumstances.

4. Inventory management

33. Australia has a centralized archiving system that is part of the AGEIS. Emissions and removals data obtained from the NCAS are archived in the AGEIS. The AGEIS system archives disaggregated EFs and activity data (AD) and documentation on how these EFs and AD have been generated and aggregated for the preparation of the inventory. 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 ERT commends

Australia for the development and use of the AGEIS system in the preparation and management of the inventory.

F. Follow-up to previous reviews

34. Australia implemented improvements in its inventory including:

(a) Correcting the use of some notation keys in the CRF tables;

(b) Establishing additional QA checks in some areas, such as the carbon balance for the iron and steel sector, and analysing the fluctuations in implied emission factors (IEFs);

(c) Including an explanation of the differences between the reference and sectoral approaches in the energy sector;

(d) Including additional information on the allocation of emissions between the energy and industrial processes sectors;

(e) Including further information to support the use of country-specific methods;

(f) Significantly increasing supporting documentation in the LULUCF sector and addressing issues regarding the representation of land areas and land-use change matrices;

(g) Improving documentation of verification and sensitivity analyses.

35. Other improvements identified in previous reviews that have not yet been implemented are in process or have been included in the improvement plan for future submissions (e.g. reconcile the data used to compile the inventory with that provided by ABARE to the International Energy Agency (IEA), review the disaggregation level used for the analysis of key categories, further develop tier 2 uncertainty estimates). The ERT noted the large number of improvements in progress in the LULUCF sector. The ERT encourages Australia to proceed with the implementation of the remaining improvements.

G. Areas for further improvement

1. Identified by the Party

36. The 2009 NIR clearly identifies planned improvements in table 10.4 in the NIR. Australia indicated that it intends to introduce new data collection processes for the energy, industrial processes and waste sectors; conduct field research to improve EFs in the agriculture sector; review methodologies used for fertilizer application; conservation practices; the full incorporation of plantations into the NCAS; and the incorporation of nitrogen (N) cycle capability in the LULUCF sector. The DCC is planning to undertake more extensive tier 2 uncertainty analyses using the Monte Carlo method in its future submissions.

2. Identified by the expert review team

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

(a) Ensuring the inclusion, in its next annual submission, of estimates for categories currently reported as "NE" and for which methods exist in the Revised 1996 IPCC Guidelines and/or the IPCC good practice guidance;

(b) Identifying when the notation key "NA" was used incorrectly in the CRF tables and replacing it with the appropriate notation key;

(c) Exploring the possibility of integrating into its next annual submission GHG and energy data obtained from the first reports of the NGER;[8]

(d) Improving transparency by developing and implementing an approach for reporting emissions data and supporting information from confidential categories in a manner that supports the expert review of these categories;

(e) Improving documentation in the NIR to support the choice of methodologies and EFs (e.g. emissions from off-road machinery, the EF for coke and the EF for waste incineration) and providing information and documentation on the process used to form expert judgements (e.g. in the agriculture sector, the chemical oxygen demand (COD)/biochemical oxygen demand (BOD) ratio for wastewater handling);

(f) Increasing QC in the final stages of inventory preparation and removing discrepancies between the NIR and CRF tables and minor errors in the NIR;

(g) Ensuring that when parameters, EFs and other information from the 2006 IPCC Guidelines are used, these values are adequately justified and shown to be appropriate for Australia's national circumstances;

(h) Progressing the planned improvements in the LULUCF sector in the next annual submission, such as comparisons with the tier 2 model estimates and providing information on the sensitivity analysis, model calibration and accuracy assessment;

(i) Correctly allocating emissions from coal use between the energy and industrial processes sectors (e.g. the use of pulverized coal as a reducing agent in the iron and steel sector should be allocated to the industrial processes sector instead of the energy sector).

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

II. Energy

A. Sector overview

39. The energy sector is the main sector in the GHG inventory of Australia. In 2007, emissions from the energy sector amounted to 408,162.69 CO_2 eq, or 75.4 per cent of total GHG emissions. Since the base year, emissions have increased by 42.5 per cent, mainly due to the rise of emissions in energy industries (+55.0 per cent) and transport (+ 26.9 per cent). Within the sector, 54.4 per cent of the emissions were from energy industries, followed by 19.3 per cent from transport, 11.9 per cent from manufacturing industries and construction and 6.6 per cent from solid fuels (fugitive emissions). Other sectors accounted for 4.8 per cent and oil and natural gas accounted for 2.7 per cent. The remaining 0.4 per cent was from the category other (1.A.5), which included emissions from oxidation of lubricants and military operations. CO_2 is the dominant GHG, contributing 91.2 per cent to total sectoral emissions, while CH_4 and N_2O contributed 8.2 and 0.7 per cent, respectively.

40. Australia's reporting of emissions is generally complete and in line with the Revised 1996 IPCC Guidelines. CO_2 and CH_4 emissions from natural gas and other leakage are reported as "NE". Tier 2 or higher methods and a combination of country-specific, plant-specific and default EFs from the Revised 1996 IPCC Guidelines and the 2006 IPCC Guidelines were applied for key categories. When EFs from

[8] Due on 31 October 2009.

the 2006 IPCC Guidelines are used, the ERT recommends that Australia justify the use of those EFs and show that they are appropriate for Australia's national circumstances.

41. Overall, the NIR provides transparent information on the methods and EFs applied, with a few exceptions (see paras. 46, 51 and 52 below). The notation key "NA" is widely used within the sector instead of the appropriate notation key. The notation key "NA" is with more general use, that is, for activities in a given category that do not result in emissions or removals of a specific gas. The ERT recommends that Australia reconsider its use of the notation key "NA" and consider using the appropriate notation key, such as "NO", for reporting AD and emissions from fuels not used in the country.

42. The NIR contains information on AD for road transportation and there is an energy balance for 2007 provided in the annex 4 to the NIR. However, provided AD are not always sufficient to explain some of the variations in the trend (see para. 53 below). The ERT recommends that Australia include in its next submission disaggregated AD, such as data on the different types of underground mines, in order to clarify the drivers behind the variations in the trends.

43. Australia has recalculated several categories in the energy sector since the last submission due to revisions to energy statistics data, the correction of oxidation factors, different fuel allocation and the correction of transcription errors. Total emissions from the energy sector decreased by 827.35 Gg CO_2 eq (–0.2 per cent of sectoral emissions) in 2006, with the majority of the changes occurring in the categories other (including lubricants and military use of fuels), energy industries and transport. The ERT acknowledges the information provided in the NIR and CRF table 8(b) to support the recalculations, but the ERT found this information to be insufficient in some instances. In response to questions from the ERT, Australia provided further information to support the recalculations. The ERT recommends that Australia improve the transparency of its reporting of recalculations in its next annual submission by providing additional information to support and justify them in line with the IPCC good practice guidance and the UNFCCC reporting guidelines. Australia explained that new data from the NGER would generate higher quality data and therefore improve the accuracy of inventory. The ERT recommends that Australia explore the possibility of integrating these data into its next annual submission.

44. In response to a question from the ERT regarding the progress made on research to develop higher tier measurement methods for emissions from open-cut mines and to improve the country-specific EFs for non-CO_2 emissions from road transportation, Australia responded that these improvements were planned but not implemented due to funding issues. The ERT reiterates the recommendation made during the previous expert review and encourages Australia to conduct research to improve country-specific EFs for non-CO_2 emissions from road transportation, to refine the methods used to estimate fugitive emissions from coal mines and report on the progress made in this research in its next annual submission.

B. Reference and sectoral approaches

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

45. In 2007, Australia reported a difference of –0.2 per cent between CO_2 emissions estimated using the reference and the sectoral approaches. The ERT notes that across the inventory time series the difference in the total CO_2 emissions is lower than 2 per cent and therefore does not require an explanation in CRF table 1.A(c).

46. The ERT notes that the CO_2 EF for coke reported in table 3.2 of the NIR is 108.8 Gg CO_2/PJ. The value differs from the EF used in the reference approach in the CRF (24.02–32.59 t C/TJ or 88.09–119.50 Gg CO_2/PJ). In response to a question from the ERT, Australia explained that the EFs in

the reference approach were not updated along with correction of EFs. The ERT recommends that Australia update the EFs used in the reference approach in its next annual submission and that Australia include relevant checks of information updates in its QA/QC plan.

47. There were several discrepancies between the fuel consumption reported in the CRF tables and that reported to IEA. For example, data on stock changes in liquid and solid fuels differ, with a large discrepancy observed for other bituminous coal in 2000 (+2.9 PJ was reported in the CRF and –209.5 PJ was reported to IEA). In response to a question from the ERT, Australia replied it intends to reconcile the differences between these data. The ERT reiterated the encouragement expressed during the previous review that Australia reconcile the differences in the data reported and that it report on the result in its next annual submission.

2. International bunker fuels

48. Emissions from international bunker fuels are estimated and reported in accordance with the Revised 1996 IPCC Guidelines as a memo item. Data on international and domestic activity are derived from tax information obtained from the customs.

3. Feedstocks and non-energy use of fuels

49. Australia includes detailed information on reporting of feedstocks and non-energy use of fuels in its NIR in line with the Revised 1996 IPCC Guidelines. Data are derived from information obtained from companies and from national statistics.

C. Key categories

1. Stationary combustion: solid fuel – CO_2

50. Australia derives CO_2 emissions from coke in the iron and steel industry from annual carbon mass balances. In the NIR, Australia describes the carbon and energy flow in the integrated iron and steel industry and includes the CO_2 EF for coke for 2007. The underlying data used in the CO_2 EF for coke calculation are confidential in Australia because the sector is highly concentrated with a few main producers. During the course of the review, Australia provided sufficient underlying information on annual carbon balances and calculations of the coke EF.

2. Stationary combustion: liquid fuel – CO_2

51. The ERT notes that the NIR does not describe in a transparent manner how emissions from off-road vehicles and other machinery are estimated and reported under manufacturing industries and construction. In the NIR, Australia stated that AD for off-road vehicles and other machinery in CRF tables 1.A(a)s2 and 1.A(a)s4 are reported according to the corresponding Australia New Zealand Standard Industrial Classification. However, it is not clear how the AD or emissions are derived. As emissions from off-road vehicles and other machinery are aggregated with emissions from stationary combustion under manufacturing industries and construction, the extent of the emissions from off-road vehicles and other machinery cannot be assessed. The ERT recommends that Australia report these emissions separately in its next annual submission.

3. Road transportation: liquid fuel – CO_2 and N_2O

52. Australia uses a country-specific bottom-up approach to estimate emissions from road transportation in line with the IPCC good practice guidance. The ERT noted that the NIR provides information on vehicle stock age distribution and average fuel consumption rates for 2007. The statistics for 1991 and 2001 differ from the data from subsequent years for several vehicle types and fuels, but Australia does not provide underlying information in the NIR on vehicle engine types to clarify and

explain these differences. In response to a question from the ERT, Australia responded that the data are consistent with the ABS Motor Vehicle Census and that it is likely that the variation is due to reduced car sales as a result of the economic recession affecting Australia at that time. The ERT recommends that Australia include an explanation for the variations in its next annual submission.

4. Coal mining: solid fuel – CH_4

53. The ERT noted that for underground mines the trend in the CH_4 IEF decreased by 17.3 per cent between 1990 and 2007, with large variations between 2005 and 2006 (14.5 per cent) and between 2006 and 2007 (5.5 per cent). Australia explained that the trend in the CH_4 IEF is partly due to a shift in the proportion of non-gassy underground mines. The ERT reiterates the recommendation made during the previous expert review that Australia include in its next submission disaggregated AD, such as data on the different types of underground mines, in order to clarify the drivers behind the variations in the trends.

5. Oil and natural gas: liquid, gaseous fuel – CO_2 and CH_4

54. The ERT commends Australia for its detailed reporting of fugitive emissions from oil and natural gas and well-documented estimates. However, Australia reports CO_2 and CH_4 emissions from other leakage from natural gas as "NE" due to the lack of available data. In response to a question from the ERT, Australia explained that emissions from this subcategory are considered negligible. The ERT encourages Australia to estimate and report CH_4 emissions in accordance with the Revised 1996 IPCC Guidelines in its next submission.

III. Industrial processes and solvent and other product use

A. Sector overview

55. In 2007, emissions from the industrial process and solvent and other product use sectors amounted to 30,342.89 Gg CO_2 eq, or 5.6 per cent of total GHG emissions. Australia included direct GHG emissions from solvent and other product use in the industrial processes sector. Since 1990, emissions have increased by 25.7 per cent, mainly due to an increase in the consumption of halocarbons by 982.2 per cent since the base year and an increase in emissions from the category other (2.G) (confidential emissions expressed in CO_2 eq) by 238.8 per cent since the base year. Within the industrial processes sector, 36.7 per cent of the emissions were from metal production, followed by 21.1 per cent from the category other (2.G), 19.3 per cent from mineral products and 18.6 per cent from consumption of halocarbons and SF_6. The remaining 4.4 per cent were from chemical industries. CO_2 was the dominant GHG, contributing 79.5 per cent to total sectoral emissions, while HFCs accounted for 16.9 per cent and PFCs and SF_6 each accounting for 1.7 per cent. CH_4 and N_2O contributed 0.2 and 0.1 per cent, respectively. N_2O emissions from solvent and other product use are reported under the category other (2.G) in the industrial processes sector.

56. The ERT concluded that the industrial processes sector is generally complete in terms of categories, years and geographical coverage. The ERT also concluded that emission estimates were prepared and reported in accordance with the IPCC good practice guidance and are time-series consistent. As indicated in the previous review, there are minor completeness issues in the industrial processes sector. Australia does not estimate CO_2 emissions from food and drink production; emissions from production of dichloroethylene, methanol; potential and actual emissions of HFCs from aerosols/metered dose inhalers; or potential SF_6 emissions from electrical equipment. Australia indicated that dichloroethylene production does not occur in Australia and therefore the ERT recommends that the relevant notation key ("NO") be used. Australia stated that it intends to report emissions from methanol and food and drink production in its next annual submission. The ERT recommends that Australia

continue its efforts to improve completeness by developing estimates for the categories reported as "NE", particularly for the categories for which emissions are known to occur in the country and for which methods exist in the Revised 1996 IPCC Guidelines and/or the IPCC good practice guidance, and if emissions for a given category cannot be estimated then Australia is to provide sufficient explanation in the NIR as to why they cannot be estimated.

57. Australia used higher tier methods and country-specific EFs to estimate emissions from key categories using the Revised IPCC 1996 Guidelines, the IPCC good practice guidance and methodologies included in the World Business Council for Sustainable Development (WBCSD) guidance[9] (for CO_2 emissions from the categories cement, and iron and steel production). The ERT concluded that the methods used are in line with the IPCC good practice guidance.

58. The methods and sources of AD used in the inventory are sufficiently documented in the NIR, and appropriate QA/QC procedures were applied. However, Australia includes emissions from ammonia production, nitric acid production, magnesia production, soda ash production and use, acetylene use, use of N_2O for anaesthesia and N_2O emissions from aerosol cans under the category other (2.G), and reports these emissions in CO_2 eq. This approach prevents Australia reporting in a transparent manner. In the previous review, the ERT strongly recommended that Australia develop and implement an approach for reporting emissions data in a transparent manner that supports the review of the inventory. The ERT reiterates this recommendation. Emissions of HFCs other than HFC-134a are also aggregated under the category consumption of halocarbons and SF_6. The ERT recommends that Australia disaggregate emissions of HFCs by reporting each separate gas which would increase the transparency of reporting in this category.

59. The 2009 submission includes recalculations made following a revision to the CO_2 EF for coke used as a reductant in iron and steel production and the PFC EFs (both for CF_4 and C_2F_6) in aluminium production, and revisions to the AD for the categories other (2.G) and consumption of halocarbons and SF_6. As a result of these recalculations, emissions for 2006 increased by 3.5 per cent. The ERT recommends that Australia include information on all recalculations in the NIR (e.g. recalculations of estimates of HFC emissions for 2006 and earlier years that are not mentioned in the NIR).

B. Key categories

1. Ammonia production – CO_2

60. Australia uses plant-specific EFs for this category. In the NIR, Australia explains that the emissions reported under the industrial processes sector include process emissions and emissions from the energy use of natural gas because there is a lack of data available to allow Australia to differentiate between the two uses. However, the ERT recommends that only emissions related to use of natural gas as a feedstock be included under industrial processes and the emissions from natural gas used for energy be allocated to the energy sector. The ERT encourages Australia to further explore the possibility for appropriate allocation of emissions between the energy and industrial processes sectors.

2. Iron and steel production – CO_2

61. Australia used the IPCC tier 2 method to estimate CO_2 emissions from iron and steel production. Emissions from the use of coke and natural gas as reducing agents are reported under this category, whereas emissions from coal used as a reducing agent are reported in the energy sector. The ERT recommends that Australia reallocate emissions from coal used as a reducing agent to the industrial processes sector. Emissions from coke use are determined from a mass balance, using plant-specific AD,

[9] WBCSD 2005, Cement Sustainability Initiative, Climate Protection Task Force, "The Cement CO_2 Protocol, CO_2 accounting and Reporting Standard for the Cement Industry", Protocol Guidance. Document Version 2.0.

IPCC default factors and a country-specific value for the carbon content of the steel produced (0.2 per cent). Australia stated that it recalculated the CO_2 emission estimates for iron and steel production for 2005 and 2006 following a revision to the calculations in the carbon balance for iron and steel, which resulted in an increase in CO_2 emission estimates in 2006 by 1.3 per cent. There was no change in the estimates for the period 1990–2005. The ERT noted that the revision improved the accuracy of the emission estimates.

3. ODS substitutes – HFCs

62. In the subcategory refrigeration and air conditioning, Australia reported potential emissions that are lower than actual emissions. In response to a question from the ERT, Australia acknowledged that it omitted emissions from pre-charged equipment in its estimate of potential emissions for this category. The ERT recommends that Australia correct this in its next annual submission.

63. In the NIR, Australia reported that it did not undertake recalculations for this category. However, the actual emissions of HFCs vary considerably for the years 1995–2006 when compared to the previous inventory submission. In the NIR, the emission estimates are 13.0 per cent lower for 1995 and 2.6 per cent higher for 2006 than in the previous submission. In addition, there are also differences in the estimates of potential emissions for the years 1994–2005. The ERT recommends that Australia explain this inconsistency in its next annual submission and report all recalculations in the future submissions.

4. Other (2.G) – CO_2

64. As mentioned in paragraphs 30 and 58 above, emissions from confidential categories are reported as a sum in CO_2 eq in this category. The NIR states that emissions for this category were recalculated for 2006 due to the availability of updated production data for industry. However, the emissions reported in this inventory submission for the years 1991–2005 are on average lower than those in the previous inventory submission (ranging from –1.1 to –18.9 per cent). The emission estimates for 2006 are 14.6 per cent higher than those reported in the previous inventory submission. The ERT recommends that Australia provide more details in the NIR to explain and support the recalculations and that Australia state in which categories emission estimates have been recalculated in its next annual submission. The ERT reiterates the strong recommendation made during the previous review that Australia develop and implement an approach for reporting emissions data and information in a manner that supports the expert review of those categories regarding the accuracy of and trends in emission estimates.

C. Non-key categories

1. Ferroalloys production – CO_2

65. The NIR states that one company in Australia produces ferroalloys, but the emissions are reported as "NA" in the CRF tables and the AD are reported as "NO". Australia stated in the NIR that emissions from this category are included under manufacturing industries and construction and limestone and dolomite use. The ERT recommends that Australia reallocate the emissions from fuel used as a reducing agent to the industrial processes sector and that Australia use the appropriate notation keys.

2. Electrical equipment – SF_6

66. Australia uses a constant value of charge in electrical equipment, based on the assumption that no changes have occurred in the stock, and a constant leakage factor is used. The ERT noted that the charge in equipment below 220 kV is not taken into consideration. The ERT acknowledges that new data available under the NGER should further improve the accuracy and transparency of reporting in this

category and recommends that Australia report these new data in the next annual submission along with a description of the methodology used by facilities to estimate emissions. The ERT recommends that Australia consider including reporting emissions from charge of SF_6 in electrical transmission equipment with operating voltages less than 220 kV.

IV. Agriculture

A. Sector overview

67. In 2007, emissions from the agriculture sector amounted to 88,106.04 Gg CO_2 eq, or 16.3 per cent of total GHG emissions. Since 1990, emissions have increased by 1.5 per cent; however emissions have been decreasing since 2001. The key driver for the decrease in emissions since 2002 is the reduction in the size of livestock populations and productivity as a result of drought in southern and eastern Australia. Within the sector, 65.3 per cent of emissions were from enteric fermentation, followed by 17.0 per cent from agricultural soils, 13.1 per cent from prescribed burning of savannas and 3.9 per cent from manure management. The remaining 0.6 per cent was from rice cultivation and field burning of agricultural residues. The 13.1 per cent contribution from prescribed burning of savannas is unique among Annex I Parties.

68. The reporting of the agriculture sector is complete and covers all sources of emissions. AD for many categories in the agriculture sector are derived using data from the five-year census and annual surveys conducted by the ABS. The inventory is compiled on a state-by-state basis to reflect the different physical circumstances and management practices in each state. The ERT believes that this approach increases the accuracy of the inventory. The ERT commends Australia for its efforts to provide detailed methodological information and statistics, comparisons with tier 1 factors and contextual background information in the NIR. The ERT encourages Australia to include a brief contextual description of the different physical circumstances and management practices in each state that determine the different emission parameters.

69. The ERT observed that many EFs and parameters used in the agriculture section of the inventory are supported by expert judgement; for example, the use of scaling factors for N excretion in some animal species, assumptions in savanna burning and probability distributions in the uncertainty analysis. The ERT noted that the NIR contains little information to support the values based on expert judgement, the process followed and what information was considered by the experts to form the expert judgement. To increase the transparency of the inventory, the ERT recommends that Australia include information[10] to support the values based on expert judgement in the NIR.

70. Many of the specific recommendations made by the previous ERT to increase the transparency of reporting within the sector, such as providing an explanation for differences between animal numbers and data from the Food and Agriculture Organization of the United Nations, have been addressed. However, the ERT noted that some recommendations regarding the provision of additional information had not been addressed in the 2009 submission. For example, the age at which calves are removed and information on burning efficiencies in savannas. The ERT encourages Australia to implement the recommendations made during previous reviews.

71. Emission estimates for the most recent year (2006) and the previous year (2005) were recalculated due to the use of three-year averaging in the agriculture sector, updated census information and minor corrections to some AD for 2006, such as areas where savanna burning occurs. Australia has not made changes to the methodologies or EFs used since the 2008 submission. The ERT concludes that the recalculations improve the accuracy of the inventory and that they have been prepared in accordance

[10] See section 6.2.5 of the IPCC good practice guidance.

with IPCC good practice guidance and are justified. The impact of the recalculations was an increase in the emission estimate for the agriculture sector in 2006 by 0.8 per cent (686.32 Gg CO_2 eq). The recalculations did not affect the emission estimate for 1990.

B. Key categories

1. Enteric fermentation – CH_4

72. The major sources of emissions from enteric fermentation are non-dairy cattle and sheep, accounting for 63.8 per cent and 21.4 per cent of emissions, respectively. Australia applied an enhanced livestock classification and tier 2 methods for dairy cattle, beef cattle, sheep and swine. Emissions from feedlot cattle are reported separately in order to estimate emissions more accurately, as a different management regime is used for these cattle. The ERT believes that the methodology used for this category is of good quality and the transparency of reporting is sufficient. The ERT noted that Australia has not followed the recommendation from the previous review to include information on the age at which calves are removed from the herd. The ERT recommends that this information be included in the next annual submission.

73. Australia reported in the NIR that the uncertainty for enteric fermentation was estimated to be 5.5 per cent. The ERT noted that this value was one of the lowest of reporting Parties (5–50 per cent). During the review, Australia provided additional information on how the uncertainty is derived using the Monte Carlo method. The ERT noted that the probability distributions are often based on expert judgement and there were limited data to support the distributions. The ERT also noted that the uncertainty analysis was reviewed in 2005 by the Atmospheric Research Division of the Australian Commonwealth Scientific and Industrial Research Organisation. The ERT encourages Australia to update its uncertainty analysis using data from the latest research in EFs for the agriculture sector and to provide additional information to support the expert opinions.

2. Agricultural soils – N_2O

74. The major sources of emissions from agricultural soils are indirect emissions (41.3 per cent), emissions from pasture range and paddock (26.1 per cent) and emissions from synthetic fertilizer use (19.1 per cent). In the 2007 inventory, Australia used updated data for the fraction of N fertilizer applied to different production systems and land area for 2006 (data obtained from ABS). The ERT noted that in some cases, the new data was significantly different from the data obtained from the census in 2001. For example, the percentage of fertilizer applied to irrigated pasture in New South Wales increased by 100 per cent. In response to a question raised by the ERT, Australia explained that the census in 2006 did not include all production categories and data and therefore in some cases Australia decided to use the data from 2001. The ERT encourages Australia to further investigate the differences between the data from ABS and those obtained from the census. The ERT also encourages Australia to include further information on the process and differences between data from the 2001 and 2006 census in the next annual submission.

75. During the 2007 in-country review, the ERT identified that the N excretion rates used for horses (39.5 kg N/head/year) and mules/asses (13.2 kg N/head/year) differed from the IPCC default value of 25 kg N/head/year and this was not adequately justified in the NIR. Australia stated in the NIR that the N excretion rates for horses and mules/asses were assumed to be a scaled value of the N excretion rates for sheep or beef cattle. The ERT acknowledges that using a scaled value from the tier 2 approach for Australian beef cattle and sheep would provide a more accurate estimate of emissions than the tier 1 EFs but notes that country-specific values should be adequately supported and documented so that they are consistent with the IPCC good practice guidance. The ERT reiterates the recommendation made during the previous review that Australia include further information to support the scaling factors applied.

3. Prescribed burning of savannas – N_2O and CH_4

76. Australia uses a tier 2 methodology using AD derived from a combination of state data and satellite data and a stratification of savanna into woodland and grassland derived from version 4.1 of the Interim Biogeographic Regionalisation for Australia, fuel loads and burning efficiencies. The ERT considers the methodology used by Australia to estimate emissions from savanna burning to be appropriate. The ERT noted that all savannas in Queensland were treated as grassland. The ERT noted that data exist in version 6.1 of the Interim Biogeographic Regionalisation for Australia that may allow Australia to stratify savanna in Queensland. The ERT also noted that fuel loads for woodland in Western Australia and the Northern Territory were typically four times higher than those for grassland. Australia informed the ERT that according to expert judgement, woodlands in Queensland were expected to have significantly lower fuel loads than in Western Australia and the Northern Territory because of grazing pressure. The ERT recommends that Australia include information in the NIR to support the expert judgement that all savannas in Queensland can be treated as grassland. The ERT reiterated the recommendation made during the previous review that Australia improve its documentation of burning efficiencies. The ERT noted that Australia intends to review burning efficiencies in the 2010 submission.

V. Land use, land-use change and forestry

A. Sector overview

77. In 2007, net emissions from the LULUCF sector amounted to 284,709.69 Gg CO_2 eq. Since the base year, net emissions have increased by 657.6 per cent. The key drivers for the rise in emissions are changes in cropland in the land-use category, which changed from a sink (–250.63 Gg CO_2 eq) in 1990 to a source (23,565.20 Gg CO_2 eq) in 2007, and a 217.3 per cent increase in emissions from grassland.

78. During the initial review, Australia conducted major recalculations in the LULUCF sector and resubmitted its CRF tables. These recalculated data were not available during the 2008 annual review. In the 2009 submission, this improvement is reported as recalculations of the 2006 data because in the previous submission, the estimates from the initial report were included. These recalculations include new estimates for forest land remaining forest land for the carbon stock changes in living biomass occurring in other native forest, including the forest balancing term. These new estimates increased estimated removals from forest land in 1990 by 34.2 per cent. Australia provided revised estimates in the 2009 submission for cropland remaining cropland following changes in management practices. The revised data for living biomass, dead organic matter and soil organic matter pools decreased emission estimates from cropland in 1990 by 138.2 per cent. Australia provided revised data for these three pools for grassland to reflect a change to more intensively managed pastures over time. In 2006, CO_2 removals from forest land increased from –49,571.97 to –107,295.00 Gg CO_2 eq, CO_2 emissions from grassland increased from 57,157.28 to 101,597.08 Gg CO_2 eq and CO_2 emissions from cropland increased from 3,154.13 to 19,559.38 Gg CO_2 eq. The recalculations reported in the 2009 submission decreased the total emission estimate from LULUCF in 1990 by 62,139.45 Gg CO_2 eq (62.3 per cent) and increased the LULUCF emission estimate reported for 2006 by 2,801.23 Gg CO_2 eq (20.3 per cent). The LULUCF sector shows high inter-annual variations. For example, the sector was a source of emissions in 2002 (283,885.46 Gg CO_2 eq) and a sink in 2004 (–193,623.41 Gg CO_2 eq).

79. Australia reports emissions and removals for forest land, cropland and grassland. The NIR explains why estimates are not provided for wetlands, settlements and other land. Emissions from harvested wood products are reported under the category other. Australia does not report forest land converted to settlements, but includes these estimates under conversion to grassland. A tier 3 approach was used to estimate the emissions and removals associated with the conversion from forest land to grassland. The ERT encourages Australia to increase the transparency of the reporting of the

conversions by reporting the conversion of forest land to settlements in line with IPCC good practice guidance for LULUCF under the category settlements and not including them under the category grassland.

80. The principal method of representing land areas is through a time-series obtained from a national remote sensing programme. Reconciliations are carried out for each land unit to ensure that there are no gaps or overlaps which could lead to an omission or double counting of areas of land. Areas of forest land and forest land converted to grassland and cropland are determined using data from the remote sensing programme. Land areas in the cropland remaining cropland and grassland remaining grassland categories are obtained from the land-use mapping programme of the Bureau of Rural Sciences. Australia improved the transparency of the reporting of this method in the NIR and included land-use matrices for all years, together with an example of climate effects on emissions from cropland. The ERT welcomes the improvements made in the transparency of reporting. However, the ERT noted that the annual land area matrices provided in the NIR and the land areas reported in the CRF tables were not consistent and recommends that Australia ensure consistency in its next annual submission.

81. The ERT noted that Australia had not selected a period after which land reported under a land-use conversion subcategory is moved to a land-use remaining subcategory. In the NIR, Australia stated that it plans to use the method contained in the 2006 IPCC Guidelines, subdividing the land remaining category into a strata of land to identify and report on lands in different stages of transition. In response to a question from the ERT, Australia informed the ERT that it intends to report on two periods (0–20 and 21–50 years) in the next annual submission. The ERT recommends that Australia also include documentation to support the selection of these periods.

82. To assess changes in land cover, Australia used groups of three pixels to identify the extent of forest cover. The previous ERT believed that this approach may result in an underestimation of forest areas and recommended that Australia check the impact of this approach. In response to a question from the ERT, Australia clarified the approach used, explaining that it is used to ascertain whether the land has at least 20 per cent crown cover and whether the modelled estimate of biomass is applied only to those pixels above the threshold. The ERT welcomes this clarification and encourages Australia to include this rationale in its next annual submission.

83. The emission and removal estimates in the LULUCF sector are largely derived from the FullCAM model developed under the NCAS. The FullCAM model integrates field measurements, modelling and remote sensing. Australia informed the ERT that some of the methods used in the 2009 submission (e.g. the methods for harvested native forests, plantations and other native forests non-CO_2 emissions, the grassland and shrubland subcategories in grassland) are interim methods, which Australia intends to improve in the next submission. The ERT welcomes Australia's planned improvements.

84. The ERT commends Australia for the transparency of reporting (including technical reports, the public release of the tools used for inventory compilation and publications in peer-reviewed literature) of the NCAS. The ERT welcomes the additional information provided in the 2009 submission, especially the description of the FullCAM model. In response to a question during the review, Australia informed the ERT that a tier 2 model has been developed for comparison purposes and that it intends to compare and present its results with the FullCAM model in the next submission. Australia also intends to include additional information on sensitivity analysis, model calibration and accuracy assessment in its next submission. Given the difficulty of reviewing a complex model such as FullCAM, the ERT commends Australia for its plans to include this information. In addition, the ERT welcomes the progress reported by Australia to improve the flexibility of the FullCAM software, which was carried out in response to recommendations made during the previous review.

85. The majority of the recommendations from previous reviews have been implemented in the 2009 submission or are indicated to be dealt with in future submissions. All forest is now included in the area of managed land, but the time period that land stays in a conversion category still has to be decided. Several improvements are ongoing and Australia stated that there are further improvements to be made regarding the models in the NCAS; for example, verifying the results of the modelling of soil carbon change for afforestation and reforestation, replacing the interim methods for these land conversions with a tier 3 process-based modelling method, as well as replacing estimates based on interim methods for grassland pools.

B. Key categories

1. Forest land remaining forest land – CO_2 and CH_4

86. The 2009 submission includes estimates of CO_2 emissions and removals from other native forests under the forest land sector. This improvement increased the estimated sink by 14,212.71 Gg (42.8 per cent) in 1990 and 57,721.83 Gg (215.5 per cent) in 2006. Australia undertook additional recalculations for harvested native forest following a revision to the ABARE wood removal data for the years 2001–2006. The ERT encourages Australia to provide an explanation as to why the ABARE data were revised.

87. In the NIR, Australia stated that it included all forests in its area of managed land and stated that it no longer uses a balancing term. Previously, Australia reported the natural changes in forest area as a forest balancing term and not under forest land. The ERT welcomes these improvements.

88. Controlled burning and wildfires in forests result in CH_4 emissions that vary across the time series. Australia uses country-specific EFs to derive emission estimates, but this is currently under review. The ERT noted that the use of a three-year moving average is not inconsistent with the IPCC good practice guidance. However, the ERT encourages Australia to reconsider its use of the three-year moving average and to consider using annual emission estimates to increase transparency.

2. Land converted to forest land – CO_2

89. In Australia, land converted to forest land is almost always formerly grassland. Therefore, all emissions are reported as grassland converted to forest land. The soil carbon is presumed to be in equilibrium and carbon stock change in soils is reported in the CRF tables as "NO". During the review, Australia informed the ERT that it is in the process of verifying the results of the modelling of soil carbon change for afforestation and reforestation and that it intends to report soil carbon for land converted to forest land in the 2010 inventory submission. The ERT welcomes this improvement.

90. Australia reports areas of grassland converted to forest land in two places in the NIR and in CRF table 5.A. The data in CRF table 5.A are consistent with the data in table 7.C4 in the NIR, but are not consistent with the data presented in the land area matrices in table 7.5 of the NIR. In response to a question by the ERT, Australia stated that the land area matrices in table 7.5 included all natural and human-induced changes between forest land and grass land and/or cropland, but table 7.C4 in the NIR is only for human-induced activities. However, the ERT noted that the values in table 7.C4 are higher than those in table 7.5. The ERT recommends that Australia ensure consistency between the land area matrix and the land-use change data in CRF table 5.A.

3. Cropland remaining cropland – CO_2

91. In the previous submission emissions from this category were estimated using tier 1 methods, assuming that emissions and removals were in equilibrium. The CO_2 emissions and removals from cropland remaining cropland are now estimated using the tier 3 FullCAM model which includes

estimates of emissions and removals in living biomass, dead organic matter and soil associated with land management practice and annual climate variability. The recalculation increased the estimated sink by 24,503.14 Gg in 1990 and increased the emission estimate by 8,424.94 Gg in 2006. In response to a question from the ERT, Australia stated that a new crop growth model is under development and will be available for the 2011 inventory submission.

4. Land converted to cropland – CO_2

92. Australia reports a significant increase in carbon stock in the soil pool (with large variations from year to year) when forest land is converted to cropland. In some cases, these increases in the soil pool almost compensate for the loss of carbon in the above-ground biomass pool. The ERT recommends that Australia include documentation in the NIR to justify this pattern.

93. The category forest land converted to cropland includes land converted to cropland as well as lands which are managed using a crop-pasture rotation. The ERT welcomes the additional documentation and justification for parameters, the inclusion of a sensitivity analysis, and clarification on the definition of mature biomass used in the model.

5. Grassland remaining grassland – CO_2

94. Australia estimates emissions and removals from grassland in the 2009 submission using tier 2 and 3 methods, while in previous submissions Australia assumed that these emissions and removals were in equilibrium. The recalculation increased the estimated sink by 18,263.48 Gg in 1990 and increased the emission estimate by 31,709.75 Gg in 2006. The ERT welcomes this improvement.

95. Grassland remaining grassland estimates involve three elements: the grassland component, the shrubland component and the CO_2 emissions and post-fire removals associated with savanna burning. Grasslands and shrublands are estimated using interim methods that Australia intends to replace in future submissions. In response to a question from the ERT, Australia stated that it is in the process of completing a national map of sparse woody (non-forest) vegetation for the 2010 inventory submission and Australia hopes that a time series of changes in sparse woody vegetation will be available for the 2011 inventory submission. The ERT noted that a new grass growth model is under development and Australia intends to use this model for the 2011 submission. The ERT welcomes the ongoing improvements.

6. Land converted to grassland – CO_2 and CH_4

96. CH_4 emissions from on-site burning associated with land conversion are based on the mass of carbon burnt annually. However, for land converted to grassland Australia reports included elsewhere ("IE") for AD and emissions from biomass burning in CRF table 5(V) (biomass burning). The ERT recommends that Australia report the areas or biomass burned in its next annual submission.

VI. Waste

A. Sector overview

97. In 2007, emissions from the waste sector amounted to 14,567.10 Gg CO_2 eq, or 2.7 per cent of total GHG emissions. Since the base year, emissions have decreased by 22.6 per cent. The key driver for the fall in emissions is increased methane recovery. The increased recovery offset increases in emissions as a result of a growing population and increased industrial production. Within the sector, 76.2 per cent of the emissions were from solid waste disposal on land, followed by 23.6 per cent from wastewater handling and 0.2 per cent from waste incineration. In 2007, CH_4 accounted for 95.7 per cent of the total GHG emissions in the waste sector, and N_2O and CO_2 accounted for 4.1 per cent and

0.2 per cent, respectively. Over the period 1990–2007, the CH_4 emissions from municipal solid waste (MSW) disposal decreased by 25.5 per cent, CH_4 emissions from wastewater handling decreased by 14.7 per cent and CO_2 emissions from waste incineration decreased by 60.6 per cent.

98. Emissions were estimated for all categories except N_2O emissions from industrial wastewater due to a lack of data and CH_4 and N_2O emissions from clinical waste incineration due to a lack of EFs. The ERT recommends that Australia change the notation key used in industrial wastewater and waste incineration from "NA" to "NE".

99. The section of the inventory on the waste sector is generally transparent. The ERT recommends that Australia provide more detailed information for the industrial wastewater and waste incineration categories. The reporting of the waste sector is consistent, since the same methodologies are used for the base year and subsequent years and recalculations are made in accordance with the IPCC good practice guidance.

100. The NIR does not include information on QA/QC procedures for the waste sector, although the general QA/QC procedures implemented also apply to the waste sector. The methodology used for solid waste was subject to external independent review. The independent review was commissioned to address recommendations made by the ERT in the initial review report. A tier 1 uncertainty assessment was applied for the waste sector. The ERT encourages Australia to provide a tier 2 uncertainty analysis in future submissions.

101. Australia included several improvements to the waste sector in the 2009 submission. The improvements addressed suggestions and recommendations made by the ERT in previous reviews, including changes that led to recalculations and other changes mentioned in the relevant chapters of the NIR. The recalculations resulted in a minor increase of 0.2 per cent in the emission estimate for the sector in 1990 and a decrease of 14.7 per cent for 2006.

B. Key categories

1. Solid waste disposal on land – CH_4

102. The methodology used by Australia to estimate emissions from solid waste disposal on land is consistent with the tier 2 first order decay (FOD) method contained in the 2006 IPCC Guidelines. The FOD methodology used includes the option to apply individual decay profiles to each component of the waste stream, such as food or paper, taking into account the half-life of that component. Following recommendations in the initial review report, Australia validated the key parameters in the harvested wood product (HWP) model that affect the amount of waste paper and wood sent to landfills. The half-lives and associated k values used for each component of the waste stream are the defaults provided in the 2006 IPCC Guidelines and take into account the conditions at the solid waste disposal sites (SWDS). In response to a question raised by the ERT during the review, Australia explained that waste stream shares were held constant from 1940 to 1990 due to a lack of data. The ERT recommends that changes in waste management practices be taken into account when compiling historical data and recommends that Australia improve the data on waste stream shares used prior to 1990.

103. In response to recommendations made by the ERT in the initial review report, CH_4 emissions from solid waste disposal on land were recalculated using revised estimates of paper and of waste from the production of HWPs disposed of in landfills and other changes in the waste composition. According to the NIR, the amount of paper sent to landfills decreased sharply between the 2008 and 2009 submissions. The recalculations for the category solid waste disposal on land resulted in a minor increase of 0.35 per cent in the CH_4 emission estimate for the base year and a decrease of 17.3 per cent for 2006. The impact on total emissions was an increase of 0.01 per cent for 1990 and a decrease of 0.43 per cent for 2006. The ERT recommends that Australia provide additional information in the NIR

on the key drivers for the decrease in CH_4 emissions from solid waste disposal on land and the amount of paper sent to landfills between the submission of the 2008 and 2009 inventories.

104. In the initial review, the ERT recommended that Australia use data from landfill sites when available. In response to a question from the ERT, Australia explained that a work programme is in place to incorporate facility-level information into the National Greenhouse Accounts compilation process. Australia plans to include the facility-level information in the 2011 inventory submission.

105. All solid waste disposal on land is assumed to be disposed of in anaerobic landfills or managed landfills that are covered and not in open dumps or unmanaged sites. A methane conversion factor (MCF) of 1 is used for every year. In response to a question from the ERT, Australia explained that the assumption is used because of a lack of data. The ERT recommended that changes in waste management practices be taken into account when compiling historical data and recommends that Australia verify the classification used for the SWDS and the MCF values for the years prior to 1990.

106. In the NIR, the percentage of sludge in MSW is reported as 0.0 per cent and the sludge from commercial and industrial wastewater is reported as 1.6 per cent for 2007. A share of the industrial sludge is disposed of in landfills. However, the calculation uses the default degradable organic carbon value for domestic sludge. In response to a question from the ERT, Australia explained that the current data on disposal of biosolids are not disaggregated by source. Australia informed the ERT that it is currently undertaking a reconciliation of sludge treatment in the wastewater and disposal of sludge to landfill and it intends to report on this reconciliation in future submissions. The ERT recommends that Australia include improved information on emissions from sludge, the allocation of emission estimates to categories and the emission parameters applied in the next annual submission.

2. Wastewater handling – CH_4

107. Australia estimated emissions of CH_4 from industrial wastewater and domestic/commercial wastewater handling using the IPCC good practice guidance default methods and default values for COD, BOD and wastewater generation rates. The default values are supplemented by country-specific data when these data are available. For domestic wastewater, country-specific COD/BOD ratios were used, but these ratios are not transparently documented in the NIR. In response to a question from the ERT, Australia provided an explanation on the approach used. The ERT recommends that Australia include the information supporting the COD/BOD ratios in the next annual submission.

108. CH_4 emissions from industrial wastewater were recalculated using data on the use of raw sugar instead of data on cane crushing. These recalculations resulted in a decrease in the CH_4 emission estimate in 1990 and 2006 (–0.18 and –5.62 per cent, respectively) and had a negligible impact on total emissions.

109. Previous ERTs recommended that Australia include detailed information on the country-specific data and parameters used to estimate emissions from wastewater handling. Australia identified the underlying assumptions used in the municipal wastewater methodology as an area for further improvement. In response to a question from the ERT, Australia explained that a study of wastewater handling systems in Australia is being carried out by the wastewater industry and Australia hoped that facility-specific information on wastewater treatment would soon be available. The ERT recommends that Australia include improved information on this issue in its next annual submission.

110. Previous ERTs encouraged Australia to improve the information provided on sludge from wastewater handling, such as providing information on the quantity of sludge from wastewater handling and its allocation to sectors. The ERT welcomes the reconciliation undertaken of sludge treatment in wastewater and disposal of sludge to landfills (see para. 106 above) and recommends that Australia include this information in its next annual submission.

111. In areas of Australia without a sewer system, on-site treatment systems such as septic tanks are used. The NIR does not contain information on the MCF values for the handling systems used or how these values are obtained. In response to a question from the ERT, Australia explained that the amount of BOD in areas without a sewer system that settles out as solids and undergoes anaerobic decomposition is assumed to be 15 per cent. The ERT recommends that Australia include information to support this assumption in its next annual submission.

C. Non-key categories

Waste incineration – CO_2 and N_2O

112. Australia reports emissions of CO_2 from the incineration of solvents and clinical waste, as well as emissions of CO_2 and N_2O from the incineration of MSW for the period 1990–1996. The incineration of MSW ceased in 1996. Following a recommendation made in the initial review report, Australia has included revised estimates for waste incineration. Australia calculated CO_2 emission estimates from the incineration of solvents by converting the volume of solvents incinerated to the mass of solvent, deriving the energy content and using a CO_2 EF per petajoule of solvent. The ERT noted that the information provided in the NIR on waste incineration is very limited. The NIR includes the source of data on incinerated clinical waste, but there is no information on or references for the carbon content of the waste and the proportion of waste that is of fossil origin. The ERT recommends that Australia improve the transparency of its reporting of the category by including more background information (e.g. the calculation and value of the CO_2 EF for solvents) in its next submission.

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

A. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

113. Australia has not 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. This is because Australia was not eligible to trade these units until 11 July 2009. Parties are required to start reporting SEF tables, in accordance with decisions 14/CMP.1 and 15/CMP.1, for the first calendar year in which they transferred or acquired emission reduction units (ERUs), certified emission reductions (CERs), assigned amount units (AAUs) or removal units (RMUs); therefore Australia was not required to report SEF tables for the reporting period.

2. National registry

114. 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 findings 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. Australia has adequate security, data safeguard and disaster recovery measures in place. The ERT recommends that Australia further enhance the user interface of its registry by providing the public information referred to in paragraphs 45–48 of the annex to decision 13/CMP.1 and report, in its next annual submission, on any changes made to that public information.

3. Calculation of commitment period reserve

115. Australia reported its commitment period reserve in its 2009 annual submission. The commitment period reserve for Australia has not changed since the initial report review and amounts to 2,661,821,229 t CO_2 eq, calculated as 90 per cent of Australia's assigned amount. The ERT agrees with this figure.

B. Changes to the national system

116. Australia reported no change in its national system since the previous annual submission. 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.

C. Changes to the national registry

117. Australia's registry went live with the international transaction log on 19 December 2008. Australia reported no significant change in its national registry since the previous annual submission apart from the appointment of a new system administrator. 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.

VIII. Conclusions and recommendations

118. Australia made its annual submission on 26 May 2009. Australia indicated that the 2009 annual submission is also a voluntary submission under the Kyoto Protocol. 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 the changes to the national system and the national registry). This is in line with decision 15/CMP.1.

119. The ERT concludes that the inventory submission of Australia was prepared and reported in accordance with the UNFCCC reporting guidelines. Australia submitted a set of CRF tables and an NIR; these are complete in terms of geographical coverage, years and gases, as well as generally complete in terms of categories. Australia provided CRF tables for the time series 1990–2007, except for table 7 which is provided just for 2007. Australia reported some categories such as fugitive CH_4 emissions from other leakage in the energy sector and CH_4 emissions from methanol and HFC emissions from aerosols/metered dose inhalers as "NE".

120. Australia's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT commends Australia on the significant improvements made in the LULUCF sector, notably on the major recalculations implemented following the recommendations made during previous reviews, the revised and additional text provided for the LULUCF sector and the ongoing improvements planned for this sector.

121. The information submitted on a voluntary basis required under Article 7, paragraph 1, of the Kyoto Protocol was prepared and reported in accordance with decision 15/CMP.1. Australia did not report on a voluntary basis information under Article 3, paragraph 3, of the Kyoto Protocol, information on Kyoto Protocol units, and information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

122. Australia did not report information on its accounting of Kyoto Protocol units and SEF tables. Parties are required to start reporting SEF tables, in accordance with decisions 14/CMP.1 and 15/CMP.1,

for the first calendar year in which they transferred or acquired ERUs, CERs, AAUs or RMUs. Australia was not eligible to trade these units until 11 July 2009 therefore it was not required to report SEF tables for the reporting period.

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

124. 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. However, the ERT recommends that Australia further enhance the user interface of its registry by providing the public information referred to in paragraphs 45–48 of the annex to decision 13/CMP.1 and report on any changes made in its next annual submission.

125. In the course of the review, the ERT formulated a number of recommendations[11] relating to the completeness and transparency of the annual submission. The key recommendations are that Australia:

(a) Improve the completeness of the inventory by including emission estimates, especially for those categories for which methods to estimate emissions are available in either the Revised 1996 IPCC Guidelines or the IPCC good practice guidance;

(b) Identify instances when the notation key "NA" was used incorrectly in the CRF and replace it with appropriate notation key;

(c) Explore the possibility of integrating into its next annual submission GHG emissions and energy data obtained from the first reports of the NGER due on 31 October 2009;

(d) Improve transparency by developing and implementing an approach for reporting emissions data and supporting information from confidential categories in a manner that supports the expert review of those categories;

(e) Improve documentation in the NIR to support methodologies and EFs (e.g. for emissions from off-road machinery, the EF for coke and the EF for waste incineration) and provide information and documentation on the process used to form expert judgements (e.g. in the agriculture sector and the COD/BOD ratio for wastewater handling);

(f) Increase QC in the final stages of preparation of the inventory submission and remove discrepancies between the NIR and CRF tables and minor errors in the NIR;

(g) Ensure when parameters, EFs and other information from the 2006 IPCC Guidelines are used, that these values are adequately justified and shown to be appropriate for Australia's national circumstances;

(h) Progress the planned improvements in the LULUCF sector for the next annual submission, such as carrying out comparisons with the tier 2 model estimates, and provide information on sensitivity analysis, model calibration and accuracy assessment;

(i) Correctly allocating emissions from coal use between the energy and industrial processes sectors (e.g. the use of pulverized coal as a reducing agent in the iron and steel sector should be allocated to the industrial processes sector instead of the energy sector).

[11] For a complete list of recommendations, the relevant chapters of this report should be consulted.

IX. Questions of implementation

126. 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. *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 2009. Available at <http://unfccc.int/resource/docs/2009/asr/aus.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2009. Available at <http://unfccc.int/resource/webdocs/sai/2009.pdf>.

FCCC/IRR/2007/AUS. Report of the review of the initial report of Australia. Available at <http://unfccc.int/resource/docs/2009/irr/aus.pdf>.

FCCC/ARR/2008/AUS. Report of the individual review of the greenhouse gas inventory of Australia submitted in 2007 and 2008. Available at <http://unfccc.int/resource/docs/2009/arr/aus.pdf>.

UNFCCC. Standard independent assessment report. Unpublished document.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Robert Sturgiss (Department of Climate Change), including additional material on the methodology and assumptions used.

Annex II

Acronyms and abbreviation

AAU	assigned amount unit
AD	activity data
BOD	biochemical oxygen demand
CER	certified emission reduction
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
CRF	common reporting format
EF	emission factor
ERT	expert review team
FOD	first order decay
Gg	gigagram
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)
HFCs	hydrofluorocarbons
HFC-134a	1, 1, 1, 2-Tetrafluoroethane
HWP	harvested wood product
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1 thousand grams)
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NE	not estimated
NIR	national inventory report
NO	not occurring
N_2O	nitrous oxide
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SWDS	solid waste disposal site
TJ	terajoule (1 TJ = 10^{12} joule)
WBCSD	World Business Council for Sustainable Development
UNFCCC	United Nations Framework Convention on Climate Change

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