COMPLIANCE COMMITTEE

CC/ERT/ARR/2010/39
22 December 2010

Report of the individual review of the annual submission of Australia submitted in 2010

Note by the secretariat

The report of the individual review of the annual submission of Australia submitted in 2010 was published on 22 December 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/2010/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 2010*

* In the symbol for this document, 2010 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

1. This report covers the in-country review of the 2010 annual submission of Australia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 23 to 28 August 2010 in Canberra, Australia, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Helen Plume (New Zealand); energy – Mr. Amit Garg (India); industrial processes – Ms. Karin Kindbom (Sweden); agriculture – Mr. Marcelo Rocha (Brazil); land use, land-use change and forestry (LULUCF) – Mr. Giacomo Grassi (European Union) and Mr. Xiaoquan Zhang (China); and waste – Mr. Seungdo Kim (Republic of Korea). Ms. Plume and Mr. Rocha were the lead reviewers. The review was coordinated by Ms. Astrid Olsson (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.

3. In 2008, the main greenhouse gas (GHG) in Australia was carbon dioxide (CO_2), accounting for 72.9 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent (CO_2 eq), followed by methane (CH_4) (21.1 per cent) and nitrous oxide (N_2O) (4.9 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 75.8 per cent of total GHG emissions, followed by the agriculture sector (15.9 per cent), the industrial processes sector (5.7 per cent), and the waste sector (2.6 per cent). GHG emissions from the solvent and other product use sector are not reported separately but are included in the industrial processes sector for confidentiality reasons. Total GHG emissions amounted to 549,540.29 Gg CO2 eq and increased by 31.4 per cent between the base year[2] and 2008. The trends for each sector are explained in the national inventory report (NIR).

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

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

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

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

Table 1
Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2008[a]

			Gg CO_2 eq								*Change*
		Greenhouse gas	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year –2008 (%)*
Annex A sources		CO_2	277 921.63	277 921.63	303 922.60	349 270.69	381 838.82	386 605.84	393 295.90	400 378.01	44.1
		CH_4	115 910.51	115 910.51	112 950.01	116 963.61	113 084.03	113 912.47	115 412.63	115 687.97	–0.2
		N_2O	18 942.62	18 942.62	21 481.96	26 530.03	26 169.41	26 752.32	26 147.32	26 820.49	41.6
		HFCs	1 126.27	1 126.27	826.46	1 793.62	4 593.34	4 955.16	5 446.80	5 751.67	410.7
		PFCs	3 950.13	3 950.13	1 312.56	1 103.55	1 536.23	589.10	499.60	381.14	–90.4
		SF_6	521.02	521.02	521.02	523.41	521.02	521.02	521.02	521.02	0.0
KP-LULUCF	Article 3.3[b]	CO_2								30 720.30	
		CH_4								1 350.93	
		N_2O								631.52	
	Article 3.4[c]	CO_2	NA							NA	NA
		CH_4	NA							NA	NA
		N_2O	NA							NA	NA

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

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

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

Table 2
Greenhouse gas emissions by sector and activity, base year to 2008

			Gg CO_2 eq							*Change*
		Sector	*Base year*[a]	*1990*	*1995*	*2000*	*2005*	*2006*	*2007*	*2008*	*Base year –2008 (%)*
Annex A		Energy	289 272.38	289 272.38	313 656.23	360 826.57	396 047.32	399 595.88	408 436.83	416 604.06	44.0
		Industrial processes	24 378.71	24 378.71	24 072.90	25 835.33	28 813.01	29 967.15	31 314.68	31 136.68	27.7
		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	IE, NA, NO	NA
		Agriculture	86 812.06	86 812.06	86 190.35	94 475.98	89 079.58	90 274.35	87 586.24	87 394.74	0.7
		Waste	17 909.03	17 909.03	17 095.13	15 047.04	13 802.95	13 498.53	13 985.52	14 404.81	–19.6
		Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
		LULUCF	NA	46 124.32	108 390.56	–2 505.70	42 150.55	47 284.87	339 537.78	68 518.15	NA
		Total (with LULUCF)	**NA**	**464 496.50**	**549 405.17**	**493 679.21**	**569 893.40**	**580 620.78**	**880 861.04**	**618 058.44**	**NA**
		Total (without LULUCF)	**418 372.18**	**418 372.18**	**441 014.61**	**496 184.91**	**527 742.85**	**533 335.91**	**541 323.27**	**549 540.29**	**31.4**
KP-LULUCF	Article 3.3[c]	Afforestation & reforestation								–16 947.78	
		Deforestation								49 650.53	
		Total (3.3)								32 702.75	
	Article 3.4[d]	Forest management								NA	NA
		Cropland management	NA							NA	NA
		Grazing land management	NA							NA	NA
		Revegetation	NA							NA	NA
		Total (3.4)	NA							NA	NA

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

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

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

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

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

	As reported	*Adjustment*[a]	*Final*[b]	*Accounting quantity*[c]
Commitment period reserve	2 661 821 229		2 661 821 229	
Annex A emissions for current inventory year				
CO_2	400 378 012		400 378 012	
CH_4	115 687 968		115 687 968	
N_2O	26 820 489		26 820 489	
HFCs	5 751 667		5 751 667	
PFCs	381 136		381 136	
SF_6	521 020		521 020	
Total Annex A sources	**549 540 291**		**549 540 291**	
Activities under Article 3, paragraph 3, for current inventory year				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	–23 032 901		–23 032 901	–23 032 901
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	6 085 120		6 085 120	0
3.3 Deforestation for current year of commitment period as reported	49 650 531		49 650 531	49 650 531
Activities under Article 3, paragraph 4, for current inventory year[d]				
3.4 Forest management for current year of commitment period				
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

[a] "Adjustment" is relevant only for Parties for which the ERT has calculated a or several adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.
[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

6. The GHG inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The expert review team (ERT) noted that in some cases where country-specific methods and emission factors (EFs) are used, transparency could be improved by providing clearer or more detailed explanation in the NIR.

7. The 2010 inventory submission is generally of high quality and continues to show improvement from year to year. The ERT noted, in particular, Australia's commitment to the continuous improvement of its inventory, and the role that the National Greenhouse and Energy Reporting System (NGERS) will play in the future. Although the inventory submission covers all sectors and categories, the ERT identified a need for further improvements, particularly in the areas of timeliness of reporting and transparency (see para. 16 below).

8. Australia has submitted supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with chapter I of the annex to decision 15/CMP.1.

9. Australia has chosen to account for activities under Article 3, paragraph 3, of the Kyoto Protocol annually. The Party has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. Australia has reported information on activities under Article 3, paragraph 3, of the Kyoto Protocol in accordance with decisions 15/CMP.1, 16/CMP.1 and 6/CMP.3.

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

11. In general, the national system continues to perform its required functions as set out in the annex to decision 19/CMP.1; however, the ERT identified problems regarding the timeliness of the 2010 annual submission of the NIR and common reporting format (CRF) tables that will need to be addressed by Australia. The 2010 annual submission was submitted within six weeks of the deadline for annual submissions of 15 April 2010, after which the consequences of late submission apply under decision 15/CMP.1.

12. 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).

13. Australia has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1, in its NIR.

14. In the course of the review, the ERT formulated a number of recommendations relating to transparency (e.g. the use of confidential information in the industrial processes sector (see para. 71), the allocation of some emissions within and between the energy and the industrial processes sectors (see paras. 75 and 77), the rationale for the choice of emission parameters in the agriculture sector (see para. 91), a clearer description of the tier 2 methods applied for comparison purposes in the LULUCF sector (see para. 106), the inconsistencies with the IPCC good practice guidance for LULUCF (see para. 107), a

clearer explanation of its recalculations in the LULUCF sector (see para. 108), and further information on activities under Article 3, paragraph 3, of the Kyoto Protocol to assist with the review process (see para. 143)); and improving accuracy both in the estimation of transport emissions in the energy sector (see para. 58) and in the utilization of data obtained from the NGERS (see paras. 64 and 72) in the energy and industrial processes sectors.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

15. The 2010 annual inventory submission was submitted on 26 May 2010; it contains a complete set of CRF tables for the period 1990–2008 and an NIR. Australia has also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The SEF tables were submitted on 26 May 2010. The annual submission was submitted in accordance with decision 15/CMP.1.

16. However, the ERT noted that since 2004, Australia has not submitted its annual submission by the deadline of 15 April. Although, under decision 15/CMP.1, there is a six-week period before any consequences resulting from a late submission come into effect, the ERT recommends that Australia submit its next inventory by 15 April 2011. Further, the ERT recommends that Australia review the elements of its national system that would enable the timely submission of its annual inventory.

17. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

18. During the review, Australia provided the ERT with additional information and documents which are not part of the annual submission but are in many cases referenced in the NIR. Where necessary, the ERT also used previous years' submissions during the review. The full list of materials used during the review is provided in annex I to this report.

Completeness of inventory

19. The inventory is largely complete. It covers all source and sink categories for the period 1990 to 2008 and is complete in terms of years and geographical coverage. However, there remain a number of categories which Australia believes to be minor and which are reported as not estimated ("NE") either because of a lack of data or because the Revised 1996 IPCC Guidelines do not provide a methodology. Where data becomes available and where there is methodological guidance provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006

[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 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.

IPCC Guidelines), the ERT encourages Australia to provide estimates of these emissions in its future annual submissions.

20. In addition, the ERT notes that the NGERS is already starting to deliver data that can be used to improve further the completeness and accuracy of the GHG inventory, and the ERT commends Australia for this development.

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

Overview

21. The ERT concluded that the national system generally continued to perform its required functions. However, improvements could be made regarding the timeliness of reporting and the ERT recommends that Australia take this issue into account in its inventory planning and preparation processes.

22. Australia described the changes to the national system since its previous annual submission and these changes are discussed in chapter II.G.3 (para. 150 below) of this report. In the course of the review, the ERT learned that the inventory and National Carbon Accounting System (NCAS) teams are now in the same division of the Department of Climate Change and Energy Efficiency (DCCEE), which the ERT regards as a positive development.

Inventory planning

23. During the in-country visit, Australia explained the national system for the preparation of the inventory. The DCCEE has overall responsibility for the national inventory. Other agencies, organizations and consultants are also involved in the preparation of the inventory.

24. The DCCEE is responsible for all aspects of activity data (AD) coordination, emissions estimation, quality control, improvement planning, preparation of the reports and submission to the UNFCCC on behalf of the Australian Government. Within the DCCEE, the National Inventory Systems Executive Committee provides oversight of all aspects of the inventory process; this is a particular strength of the national system. The National Greenhouse Gas Inventory Committee, which comprises representatives of the Australian state and territory governments and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) has been in place since the early 1990s. It provides a formal external review of the NIR prior to its release as well as having a key role in the revision of EFs and methodologies.

Inventory preparation

Key categories

25. Australia has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2010 submission. The key category analysis performed by the

Party and that performed by the secretariat[4] produced similar results. Differences can be explained by the finer level of disaggregation used by Australia. The Party has included a key category analysis both with and without the LULUCF sector. These analyses were performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT noted that Australia did not provide a key category analysis for 1990 (as required by the UNFCCC reporting guidelines) and recommends that Australia include this analysis in its next annual submission.

26. Australia uses the key category analysis for prioritizing the inventory development process and for choosing good practice estimation methods for emissions and removals due to activities under Article 3, paragraph 3, of the Kyoto Protocol. Australia has identified both deforestation and afforestation/reforestation as key categories for activities under Article 3, paragraph 3, of the Kyoto Protocol. The Party has also provided a table in the NIR that gives a summary overview of key categories for LULUCF activities under the Kyoto Protocol together with the corresponding LULUCF key category analysis under the Convention. Key categories identified by Australia are: land converted to forest land, land converted to cropland, and land converted to grassland.

Uncertainties

27. Australia has conducted uncertainty analyses across the energy, industrial processes, agriculture, LULUCF and waste sectors in line with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF and has reported this information in the format of table 6.1 as prescribed in the IPCC good practice guidance. Australia has mostly applied a tier 1 approach, but has used a tier 2 analysis for some categories. Sectoral uncertainty estimates have been prepared by external consultants and subjected to an independent review by CSIRO.

28. The ERT found that the overall uncertainty of the inventory (including LULUCF) is estimated at ±8.3 per cent with the corresponding trend uncertainty estimated at ±10.8 per cent. Much of the uncertainty derives from the LULUCF sector; when this sector is excluded, the estimates are ±2.3 per cent and ±2.1 per cent for the overall inventory and trend, respectively. The uncertainties (including LULUCF) reported in the 2009 NIR were ±2.4 per cent and ±3.0 per cent. The ERT learned during the course of the review that the much lower estimates in the 2009 NIR were because the grassland remaining grassland and cropland remaining cropland categories had been mistakenly omitted.

29. The ERT noted that for the last two years Australia has mentioned in its NIR that it is planning to undertake a more extensive tier 2 uncertainty analysis. The ERT encourages Australia to include this more explicitly in its inventory improvement plan and to report on the progress made in its next NIR.

Recalculations and time-series consistency

30. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time series 1990 to 2007 have been undertaken to take into account revisions or improvements to AD (e.g. stationary energy and transport; cropland remaining cropland), the inclusion of

[4] 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.

additional sources of data (e.g. CO_2 from underground coal mines via the NGERS) and refinements to methodologies (e.g. emissions from soda ash production); and to fill in gaps and respond to recommendations made by the ERT (e.g. HFC emissions from metered dose inhalers). The major changes, and the magnitude of the impact, include: an increase in estimated total GHG emissions in 1990 (0.5 per cent) and an increase in 2007 (0.1 per cent). When LULUCF is included, the total effect is an increase of 2.4 per cent for 1990 and an increase of 6.7 per cent for 2007. The rationale for these recalculations is provided in the NIR and in CRF table 8(b).

Verification and quality assurance/quality control approaches

31. Australia has elaborated a quality assurance/quality control (QA/QC) plan in accordance with decision 19/CMP.1 and the IPCC good practice guidance. External review is part of the QA/QC and verification process, including an audit by the Australian National Audit Office (ANAO), a peer review of key methods and data, and public consultation on emission-related factors provided under the NGERS. The Party's QA/QC plan is in line with the IPCC good practice guidance but does not explicitly mention the handling of confidential information (although it can be derived from the QA/QC plan that external consultants operate a QC protocol). Given that Australia's inventory contains a relatively high level of confidential data, additional information on how this confidential information is quality-assured would further enhance and improve the transparency of the inventory. The ERT therefore recommends that Australia explicitly cover the treatment of confidential information in its QA/QC plan.

Transparency

32. The NIR provides much of the information necessary to assess the inventory. However, in cases where country-specific methods and EFs are used, transparency could be improved with clearer or more detailed explanation in the NIR. The ERT noted that this improved transparency would facilitate future reviews, particularly centralized and desk reviews. Specific details concerning improvements to the transparency of reporting are provided in the sector chapters below, but the ERT notes in particular that improvements are needed in relation to confidential data and to the LULUCF sector.

Inventory management

33. The Australian Greenhouse Emissions Information System (AGEIS) provides a centralized archiving system which includes the archiving of: emission estimates of past submissions; past AD, EFs and other parameters and models; and data source descriptions, methodology descriptions and source reference material. AGEIS provides QC functions, including an implied emission factor (IEF) tool, reconciliation reports (state/territory totals compared to national totals) and a carbon balance. The systems provided by AGEIS give inventory staff ready access to all related materials that underpin the emission estimates and provide the means for the replication of emission estimates from past submissions. In addition, the NCAS has its own system for archiving technical reports and other documentation that are not cited in the NIR. AGEIS is housed within the DCCEE and its data is regularly backed up, with tapes stored off-site. The functionality of AGEIS was demonstrated to the ERT during the review.

3. Follow-up to previous reviews

34. Australia demonstrated a high level of responsiveness to recommendations made during the expert review process. The NIR contains very useful tables that provide summaries of responses to ERT recommendations. In particular, the ERT noted:

(a) In the energy sector the use of notation keys has improved and detailed explanations have been provided for discrepancies between the fuel consumption reported in the CRF tables and that reported to the International Energy Agency (IEA);

(b) In the industrial processes sector there have been improvements regarding transparency and the use of confidential data as well as a decrease in the use of the notation key "NE" as new sources have been are reported;

(c) In the agriculture sector there has been an improvement in the allocation of fertilizer to production systems and extra information has been provided on burning efficiencies for savannas;

(d) In the LULUCF sector there has been an improvement in the documentation of the tier 3 approach and, for the first time, a comparison has been provided of the results from the tier 3 model with a tier 2 approach for the conversion categories;

(e) In the waste sector, transparency issues regarding references for data sources and proportions of waste of fossil fuel origin have been resolved.

35. However, there are a number of pending issues from previous reviews, including:

(a) The recurring issue of low transparency due to the use of confidential data in the industrial processes sector (see para. 71);

(b) The allocation of the use of natural gas as a feedstock to the industrial processes sector and energy use to the energy sector (see para. 75);

(c) The reallocation of the coal used as a reducing agent to the industrial processes sector (see para. 77);

(d) The development of a tropical cattle EF (see para. 95);

(e) Additional information on the emissions from manure management once the results of the ongoing review have been implemented (see para. 100);

(f) Additional documentation in the NIR to justify the increase in carbon stock in mineral soil for forest land converted to cropland (see para. 117).

4. Areas for further improvement

Identified by the Party

36. The 2010 NIR identified several areas for improvement, which were further elaborated on during the review week and include:

(a) Enhancing the response to all ERT recommendations as part of the overall inventory development process as resources allow;

(b) The transition to tier 3 methods using the NGERS. This will include use of improved data for the energy, industrial processes and waste sectors;

(c) The continued enhancement of QC tools, in particular the integration of new QC tools within AGEIS. This will include the completion of the systematic carbon balance assessments, automated comparability tests with the inventories of other Parties and the development of tier 2 proxy methods where tier 3 methods have been implemented;

(d) Investment in research into new measurement techniques, in particular in the coal mining and waste sectors;

(e) Given the integration of the NGERS facility and inventory estimation methods, a review of the NGERS measurement tools in 2010–11 could enhance the quality of inventory estimates;

(f) Further developments in the agriculture sector, inter alia, enteric fermentation (tropical feeds), nitrogen (N) excretion rates, and savanna burning;

(g) Further developments in the LULUCF sector, including completing the use of the tier 3 approach for forest land remaining forest land, and developing and using new crop growth and grass growth models.

Identified by the expert review team

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

(a) The provision of a tier 2 uncertainty analysis;

(b) The provision of more precise descriptions of methodologies that differ from those of the IPCC;

(c) Strengthening of the elements of the national system relating to timeliness of reporting;

(d) In the transition to the use of data from the NGERS (in the energy, industrial processes and waste sectors), ensuring that steps are taken to preserve continuity (including vital knowledge and experience) and ensuring time-series consistency;

(e) The provision of an update on the implementation of recommendations from previous reviews;

(f) The enhancement of transparency in most sectors and in relation to information on Article 3, paragraph 14, of the Kyoto Protocol.

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

B. Energy

1. Sector overview

39. The energy sector is the main sector in the GHG inventory of Australia. In 2008, emissions from the energy sector amounted to 416,604.06 Gg CO_2 eq, or 75.8 per cent of total GHG emissions. Since 1990, emissions have increased substantially, by 44.0 per cent. The key drivers for the rise in emissions were energy industries (+58.2 per cent), transport (+29.2 per cent) and manufacturing industries and construction (+35.0 per cent). Their respective contributions to the growth in energy sector emissions during the period 1990–2008 have been 69.6 per cent, 15.1 per cent and 10.6 per cent. Within the sector, 54.3 per cent of emissions were from energy industries, followed by 19.3 per cent from transport, 11.7 per cent from manufacturing industries and construction and 6.9 per cent from fugitive emissions from solid fuel mining. Other sectors accounted for 4.7 per cent and fugitive emissions from oil and gas accounted for 2.7 per cent. The remaining 0.4 per cent was from other.

40. Australia's reporting of emissions is generally complete and in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Overall, the NIR provides transparent information on the methods and EFs applied. Specific examples are provided and explained in the following paragraphs.

41. Australia's use of notation keys has improved since its 2009 submission and it has followed the recommendations made by the previous ERT on reducing the use of the notation key "NA" (not applicable). For example, Australia has reported fugitive emissions from oil and natural gas exploration activities together and is appropriately using the notation key "IE" (included elsewhere).

42. Australia has reported fugitive CO_2 emissions from surface coal mining and emissions from all post-coal mining activities as "NE", citing "no data or IPCC methodology available" as the reasons. However, tier 3 methodologies are generally available for all coal mines in Australia or are being elaborated, and Australia has in place systems to collect relevant data over time through the NGERS. The ERT encourages Australia to estimate these emissions as they become available and to report these emissions in future annual submissions. If considered necessary, the ERT encourages Australia to estimate country-specific EFs based on CH_4 and CO_2 levels in a mine before opening it for coal extraction.

43. Australia has recalculated several categories in the energy sector since its last submission due to revisions of energy consumption data by the Australian Bureau of Agricultural and Resource Economics (ABARE), most of which date back to 2003, the reallocation of non-energy use of fuels to the industrial processes sector and different fuel allocation. The explanations for these recalculations were provided in the NIR and were found to be sufficiently detailed and satisfactory.

44. The uncertainty estimates could be improved for the energy sector in Australia. For instance, the current 5 per cent uncertainty estimate in coal CO_2 emissions appears to be on the higher side for surveyed statistics compared with information in the IPCC good practice guidance. In response to a question from the ERT regarding the generally higher uncertainty estimated, Australia responded that current estimates are based on an almost decade-old exercise and that uncertainty would be re-estimated due to the recent availability of more detailed information through the NGERS. The ERT suggests that, for instance, the coal mine level data on activities and EFs could be used to plot distribution patterns for each coal type and estimate uncertainty levels based on confidence intervals. The number of data points would increase over the coming years, improving the accuracy of future uncertainty estimates. The ERT therefore recommends that Australia conduct and report on improved uncertainty estimates for its inventory in future annual submissions. This could also be useful for ensuring optimum resource allocation in the national system.

45. Australia has provided detailed information on QA/QC procedures and practices using IPCC tier 1 methods, which are in line with the IPCC good practice guidance requirements. These measures include running a standard set of tests on AD, checking Australian IEFs with those from other countries, secondary data source verification, external review of methodologies used, and establishing a carbon balance for all fuels supplied to and combusted in the Australian economy. The last measure was developed in response to recommendations from the 2007 inventory review and has helped to identify many minor, but otherwise difficult to identify, errors. The ERT commends Australia for this effort.

46. Australia has implemented a new mandatory system for the collection of data from enterprises, the NGERS, based on the National Greenhouse and Energy Reporting Act of 2007. This makes it mandatory for firms with emissions over specified reporting thresholds, such as 25 Gg CO_2 eq emissions for facilities and 50 Gg CO_2 eq emissions for corporations, to report their energy-, industrial processes- and waste-related data on an annual basis. The NGERS was implemented to start collecting data for the year 2009. NGERS data will provide depth and robustness to available bottom-up national statistics. Australia will start using data from the NGERS in its 2011 inventory report and onwards; however, some information from the NGERS has already been used in the 2010 submission, such as coal mining EFs. The ERT recognizes this as a positive improvement but also as a challenge in terms of implementation.

47. The Australian Bureau of Statistics (ABS) and ABARE databases are linked to national economic parameters, such as customs duty and taxes on fuels, to ensure complete top-down coverage of national fuel statistics. The ERT recognizes this to be a very

important function. It therefore recommends that this should not be discontinued and that the NGERS should complement the existing databases. The possible discontinuities between the 2010 and 2011 inventory reporting due to a change in the collection of AD and EFs from ABARE and ABS to the NGERS should be explained in detail in the next NIR. However, the ERT notes that some discontinuities could appear and that Australia needs to be careful when using NGERS data in its inventory reporting during a transition period. The ERT nevertheless considers that the NGERS will improve the availability of AD and EFs in the future. During the review, Australia indicated that it plans to revise its previous years' energy balances in light of the new information available through the NGERS, which will provide a more complete coverage, as well as the possibility of reallocating emissions from one category to another.

48. Reporting and coverage of AD from facilities below the NGERS thresholds should also be examined, especially from a completeness perspective. In response to a question from the ERT, the ABARE representative informed the ERT that ABARE is already examining this issue and is developing a plan to collect these data. The ERT encourages Australia to collect these data on a regular basis.

49. EFs for several fuels are based on analysis/measurements that are over a decade old, such as coke oven gas (1997), coal tar (1997), benzene, toluene and xylene (1997), coal used in the steel industry (2001), fuel oil (1997), naphtha (1997), ethane (2001), solvents (1997), and wood and wood waste (1993). Although there is no direct evidence that these EFs are not correct for current usage, the ERT encourages Australia to conduct fresh estimates of these EFs in order to bring them closer to those of other fuels, including through the use of NGERS reporting by refineries.

2. Reference and sectoral approaches

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

50. In 2008, Australia reported a difference of +0.88 per cent between CO_2 emissions estimated using the reference and the sectoral approaches. The ERT noted that across the inventory time series the difference in total CO_2 emissions is lower than 2 per cent and therefore does not require an explanation in CRF table 1.A(c). However, there are some reasons for this difference: emissions in offshore territories, such as Norfolk Island, Christmas Island, Cocos Islands, Heard and McDonald Islands and the Australian Antarctic Territory, are included in Australia's inventory, but the fuel used is reported as exports from Australia. The ERT recommends that Australia include this fuel use in its next annual submission.

51. Australia has, in response to the ERT's recommendations in the 2009 annual review, provided detailed explanations of the discrepancies between the fuel consumption reported in the CRF tables and that reported to the IEA in the 2010 NIR. The discrepancies are mainly due to higher calorific values reported to the IEA for brown coal and black coal, including ethane under natural gas for national energy statistics, and refinery feedstocks and natural gas liquids (NGLs) under crude oil statistics for national energy statistics as against separate reporting to the IEA.

International bunker fuels

52. Australia collects domestic and international fuel AD through tax statistics obtained from the customs, in line with the IPCC good practice guidance and the Revised 1996 IPCC Guidelines. The definition of domestic and international fuel use follows the IPCC good practice guidance and the Revised 1996 IPCC Guidelines. In the interest of improving transparency, the ERT recommends that Australia make a clear statement in its next NIR regarding its definition for the split between domestic and bunker fuel use, especially when

considering a journey as international one which departs from a port in Australia, stops at another port in Australia and only picks up more passengers or freight, and then finally departs Australia.

53. There were several discrepancies between CRF tables 1.C and 1.A(b) regarding jet kerosene (international aviation), residual fuel oil and gas/diesel oil (international marine bunkers) for all the years of the time series. For jet kerosene, the differences are more significant for the period 2004–2006. Australia has noted the discrepancies and has explained that they were due to recalculations of bunker fuel AD (table 1.C) that have not been included in the reference approach (table 1.A(b)) for past inventory years. The ERT recommends that Australia include these bunker fuels in the reference approach in its next annual submission.

Feedstocks and non-energy use of fuels

54. Non-energy use of fuels has been dealt with in line with the IPCC good practice guidance. Australia has created a carbon balance for iron and steel production that has helped track all carbon flows within this activity. The ERT commends Australia for this good practice. The EF for coke is derived after balancing carbon.

55. Australia has reported emissions from the use of coke and natural gas as reductants in the industrial processes sector. The ERT again commends Australia for this good practice. The Party has identified, using NGERS data, a way to improve the reporting of pulverised coal in iron and steel, and of reductants used in ferroalloys.

3. Key categories

Stationary combustion: solid fuels – CO_2

56. Public electricity production was the largest contributor to Australia's GHG inventory in 2008. Australia has applied tier 2 and plant-specific AD and EFs to estimate CO_2 emissions from this category, in line with the IPCC good practice guidance. The Party indicated that the plant-level representation of national emissions from auto producers in different subcategories is reported within the respective subcategory under manufacturing industries and construction. Although this is in line with the Revised 1996 IPCC Guidelines, these Guidelines also recommend that, wherever possible, the quantities of fuel used for, and the resulting emissions from, auto production should be identified in the worksheets used for this calculation. The ERT therefore encourages Australia to report this information in the NIR in its future annual submissions. NGERS data could be useful in facilitating this allocation.

Road transportation: liquid fuels – CH_4

57. Australia uses a model to estimate road transportation emissions. The IEF for CH_4 from diesel combustion is 8.27–9.98 kg/TJ for various years in the NIR, which is one of the highest levels among reporting Parties that have a range of 0.18–11.23 kg/TJ. The hot and cold-start CH_4 EFs as given in COPERT IV, which Australia has used to derive its EFs, are different. Various explanations for the differences were discussed by the ERT with Australia during the review week. The differences may be due to the conversion of mg/km (COPERT IV) into g/start (Australia). Further, the EF deterioration rate for newer vehicles may need to be revisited.

58. An examination of the average diesel consumption rate of various vehicle types over the years in the NIR, which is an important model parameter, indicated that this parameter has decreased for cars, medium-duty trucks and buses, but has increased for heavy-duty trucks. During the review week, the ERT was provided with the Second National In-Service

Emissions Study (NISE2) testing report (2009) that established EFs for various light-duty petrol vehicles operating in Australia. The ERT recommends that Australia use the information in this report to calibrate the model. The ERT also recommends that Australia examine model assumptions such as average fuel consumption rates of various vehicle types over the years, cold-start percentages, EFs, average trip length, urban–non-urban activity shares and vintage vehicle performance curves to improve the accuracy of road transportation emission estimates.

59. The ERT also encourages Australia to include reporting by the refineries on oil product specifications, such as energy content, chemical composition and carbon content, in their reporting through the NGERS. This would help to improve oil product EFs used by Australia.

Domestic navigation – CO_2

60. Activity data between domestic marine and military navigation are split 60:40 per cent according to the Energy Workbook (1998). Although there is no direct evidence that this distribution is not correct for current usage, the ERT encourages Australia to check and confirm that this assumption is also valid for later years.

Coal mining – CH_4 and CO_2

61. This is a key category for both level and trend assessment. Australia has reported CH_4 and CO_2 emissions from coal mining activities and has also recovered considerable methane from those activities. Since coal mining is a widespread, large and expanding activity, and since volumes of CH_4 and CO_2 fugitive emissions are comparable, it is a challenge to ascertain whether all fugitive emissions that are drained (recovered), utilized, flared and vented are reported completely and accurately. The ERT therefore encourages Australia to develop a model to establish a carbon balance between inputs (CH_4 and CO_2 produced) and carbon output through recovered, utilized, flared and vented gases in order to provide a more accurate assessment in its next annual submission.

4. Non-key categories

Other sectors – CH_4 and N_2O

62. For some subcategories (e.g. combustion in the agriculture/forestry/fisheries), the ERT notes that there has been some difficulty in obtaining updated information to separate fuel used in stationary equipment from fuel used in mobile machinery through Australia's national energy statistics. However, new data will become available through the NGERS and the ERT recommends that Australia estimate these emissions using these data as they become available.

5. Areas for further improvement

Identified by the Party

63. Australia has identified many improvements to be incorporated into its next annual submission. These include utilizing NGERS data for more comprehensive reporting of stationary combustion emissions, implementing the energy balance/tracking system with AGEIS, utilizing NGERS data to improve the allocation of fuel use between the energy and industrial processes sectors and further investigation into the CH_4 EF from petrol and diesel for road transportation.

Identified by the expert review team

64. The ERT recommends that Australia utilize the NGERS database with care, caution and insight, since the possibilities are immense. The ERT also recommends that Australia check the assumptions used in the road transportation model.

C. Industrial processes and solvent and other product use

1. Sector overview

65. In 2008, emissions from the industrial processes sector amounted to 31,136.68 Gg CO_2 eq, or 5.7 per cent of total GHG emissions. Emissions from the solvent and other product use sector were included in the industrial processes sector for confidentiality reasons. Since the base year, emissions have increased by 27.7 per cent in the industrial processes sector and in the solvent and other product use sector. The key driver for the rise in emissions in the industrial processes sector is the growth in chemical industry and the use of synthetic halocarbons. Within the industrial processes sector, 35.5 per cent of the emissions were from metal production, followed by 23.1 per cent from chemical industry, 20.9 per cent from mineral products and 20.1 per cent from the consumption of halocarbons and SF_6. Food and drink accounted for 0.3 per cent.

66. The ERT considers that the inventory is of high quality and in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Australia is striving for the continuous improvement of its inventory and generally uses higher-tier methods and country- or plant-specific EFs, except for the category consumption of halocarbons and SF_6, where most EFs are default factors taken from the 2006 IPCC Guidelines. According to Australia, the default factors from the 2006 IPCC Guidelines have been chosen because they reflect the most recently available knowledge on losses from equipment most commonly in use in Australia.

67. Australia has taken all recommendations made by the ERT in the 2009 submission into consideration, many of which were implemented in this submission. Those that have not yet been implemented are identified in the NIR as being contingent on the review and assessment of the usefulness of incoming NGERS data.

68. Australia has improved the completeness of the industrial processes sector by including new sources in the inventory, some as a response to recommendations from previous ERTs and some under its own initiative. New sources included in the mineral products category are emissions of CO_2 from the use of several minor additional carbonates, from imports of soda ash and from limestone consumed in soda ash production, all of which are reported in limestone and dolomite use. In chemical industry, emission estimates from methanol production and of CO_2 recovered in ammonia production and used for urea production have been included. CO_2 from food and drink production has been added in this submission and includes CO_2 gas from ammonia production, from natural CO_2 wells, from ethylene oxide production and from emissive uses of sodium bicarbonate. Emission estimates are also reported for the use of HFCs in metered dose inhalers.

69. In its 2010 submission, Australia has implemented a revised method for soda ash production (carbon balance approach), which has been clearly explained in the NIR.

70. As part of its QA/QC plan, Australia has developed balances for carbonates and for HFCs, respectively. These balances are useful for tracking and for ensuring completeness in the reporting of these categories.

71. Confidentiality, and, as a result, aggregated and less transparent reporting of emissions, continues to be an issue. Improvements have been made by reallocating all previously aggregated emissions from the category other (industrial processes) (2.G), to

limestone and dolomite use or to chemical industry, where the aggregated emissions are separated by gas. Since the issue of confidentiality and lack of transparency is a recurring issue in the review process, the ERT encourages all further efforts towards less aggregation of emissions. In the meantime, the ERT encourages Australia to explore ways to include any clarifying information for individual confidential categories in the NIR. The ERT recommends that Australia include EFs or IEFs for individual confidential categories in the NIR, as appropriate, without disclosing confidential information, to enable a comparison between countries and to facilitate future reviews. During the review, confidential data were made available to the ERT (see para. 74 below).

72. A new source of information, the mandatory reporting system NGERS, will be implemented and used for the Party's 2011 submission. Until now, a large part of the data for the industrial processes sector has been provided in confidence to consultants on a voluntary basis. In the transition to the use of NGERS data, the ERT encourages Australia to develop an arrangement to ensure continuity so that the transition will not disrupt time-series consistency and so that vital knowledge and experience will not be lost.

73. The inventory of the industrial processes sector is generally complete regarding categories and gases. The NIR states that emissions of SF_6 from electrical transmission equipment of less than 220 kV are "NE" due to lack of data, but that incoming NGERS data will be assessed and used for improving completeness in future submissions. During the in-country review, the ERT was provided with confidential NGERS data for 2009 which showed that SF_6 used in electrical transmission equipment is covered. It also showed that the reported emissions of SF_6 in this submission are overestimated, despite the suspected incompleteness.

2. Key categories

Chemical industry – CO_2 and N_2O

74. Data from the chemical industry are confidential and reported in an aggregated manner to preserve confidentiality. Reported CO_2 emissions include ammonia production, acetylene use and synthetic rutile and titanium dioxide (TiO_2) production. Reported N_2O emissions include nitric acid production and other N_2O use for anaesthesia and in aerosols (usually reported under solvent and other product use). During the in-country review, plant-specific confidential data were made available to the ERT. The data show that there has been an increase in activity in the chemical industry since 1990 and that the EFs used are reasonable. The ERT recommends that Australia further explore, in particular, the possibility of reporting ammonia production separately.

75. All natural gas used for ammonia production is allocated to the industrial processes sector. The ERT reiterates the recommendation made in previous reviews to allocate the use of natural gas as feedstock to the industrial processes sector and energy use to the energy sector. The ERT encourages Australia to explore whether new data collected via the NGERS could facilitate this reallocation.

Iron and steel production – CO_2

76. The EF for coke produced in coke ovens (varying between 2.78–2.86 t/t for individual years since 1990), which, in previous review stages, has been identified as high compared to other Parties, is derived from a carbon balance for each year. During the in-country review, the carbon balance for the iron and steel industry was provided to the ERT. The ERT concluded that all carbon input to the coke ovens is accounted for by deriving an EF for coke, balancing the inputs and outputs of carbon.

77. The use of coke and natural gas as reducing agents are reported in the industrial processes sector, while the use of pulverised coal is allocated to the energy sector. The ERT reiterates the recommendation made in previous reviews that Australia reallocate the coal used as a reducing agent to the industrial processes sector. The ERT encourages Australia to determine whether new data collected via the NGERS could facilitate this reallocation.

Consumption of halocarbons and SF_6 – HFCs

78. Transparency has been improved in the reporting of HFCs consumed in refrigeration and air-conditioning equipment. Individual species of HFCs are reported and those not occurring are reported as "NO" (not occurring). The ERT encourages Australia to further increase transparency by exploring the possibility of reporting data for individual species for the other relevant subcategories (foam blowing, fire extinguishers and solvents) and by applying notation keys as appropriate.

3. Non-key categories

Lime production – CO_2

79. The issue of the fluctuation over time of the IEF for lime production has been raised in previous review stages. Australia has explained that the fluctuations are a result of the relative proportions of commercial and in-house lime produced, each with its own respective fractional purities. The ERT encourages Australia to present data in the NIR underpinning this explanation, for example by including information such as the amounts produced annually with different fractional purities.

Limestone and dolomite use – CO_2

80. Limestone and dolomite use is aggregated for confidentiality reasons and includes soda ash production and use, magnesia production and additional minor carbonates use. The additional carbonates were estimated and included for the first time in this submission.

81. The IEF for limestone and dolomite use has been identified as high in previous review stages compared to other reporting Parties and the IPCC default values. The AD in the CRF tables do not cover all activities aggregated in this category, while the total activity is presented in the NIR. According to Australia, this is due to an omission in the input of AD in the CRF tables.

82. The ERT recommends that Australia update the AD in the CRF tables in its next annual submission. This will lead to a lower and more comparable calculated IEF.

Electrical equipment – SF_6

83. Emissions of SF_6 in electrical equipment have been reported only for equipment with operating voltages above 220 kV and by a constant figure throughout the time series. Emissions originating from electrical transmission equipment with operating voltages of less than 220 kV are, according to the NIR, assumed not to have been included. During the in-country review, the ERT was provided with confidential data for 2009 from the NGERS which showed that equipment of a lower voltage was also included. In addition, the NGERS covered data reported from approximately 300 plants, while the reported SF_6 data in the 2010 annual submission was assumed to cover 109 plants. For SF_6 there is no threshold for requirements to report to the NGERS. NGERS data also showed that the assumption of the magnitude of stock of SF_6 used in the 2010 submission has resulted in a substantial overestimation of SF_6 emissions. By using data from the NGERS in future submissions, the ERT believes that SF_6 emissions from electrical equipment will cover a wider range of equipment and that reported emissions will be lower.

84. The ERT recommends that Australia assess and use, as appropriate, NGERS data to estimate and revise SF_6 emissions from electrical equipment in its 2011 annual submission, and that Australia explain and justify the recalculations in its NIR.

4. Areas for further improvement

Identified by the Party

85. The mandatory NGERS reporting and systematized data collection system is expected to provide improved information on AD and EFs. Australia will assess whether this will allow feedstock-/reductant-based approaches rather than production-based ones. NGERS data will also be assessed to determine the possibilities for further disaggregation of emissions and improved allocation between the industrial processes and energy sectors.

86. Enhanced AGEIS QC processes will, in general, also benefit the quality of the industrial processes sector.

Identified by the expert review team

87. Since confidentiality continues to be an issue in the reporting of data in the industrial processes sector, the ERT encourages Australia to explore ways to include any clarifying information for individual confidential categories in the NIR, such as to include EFs or IEFs for individual confidential categories. This would increase transparency by enabling comparison with other reporting countries and would also facilitate future reviews.

88. In the transition to the use of NGERS data, the ERT encourages Australia to develop an arrangement to ensure continuity in order to prevent the transition from disrupting time-series consistency and from vital knowledge and experience being lost.

D. Agriculture

1. Sector overview

89. In 2008, emissions from the agriculture sector amounted to 87,394.74 Gg CO_2 eq, or 15.9 per cent of total GHG emissions. Since the base year, emissions have increased by 0.7 per cent. The key drivers for the rise in emissions are strong growth in the more intensive industries such as feedlot cattle and poultry, an increase in the use of synthetic fertilizers and an increase in savanna burning (largely driven by climate cycles). Within the sector, 63.6 per cent of the emissions were from enteric fermentation, followed by 16.7 per cent from agricultural soils, 15.6 per cent from the prescribed burning of savannas and 3.8 per cent from manure management. The remaining 0.3 per cent was from the field burning of agriculture residues and rice cultivation.

90. AD are derived using data from different governmental (e.g. ABS) and private (e.g. industrial associations) organizations. The agriculture sector inventory is complete and covers all sources of emissions, having been compiled on a state-by-state basis to better reflect the large physical, climate and management differences between states and territories. The ERT commends Australia for its effort to explain these differences but continues to encourage Australia to further explain how these differences impact the determination of the emission parameters.

91. Most of the EFs and parameters used in the agriculture sector inventory are country-specific, based on Australian and non-Australian studies, and expert judgement. The ERT commends the efforts of Australia in providing extra information to support this country-specific approach (e.g. comparison with IPCC defaults). The ERT noted that many of the studies are relatively old (over 10 years). During the review, Australia recognized that "We

are now approaching the time to once again review these factors, however, as we do not have databases with these data we must rely on a process for eliciting expert assessments. In the past this process has proved to be very resource intensive so the exact timing of this review will have to be considered in light of the competing priorities for improvements in other categories and sectors". The ERT strongly recommends that Australia explain in its next annual submission how it plans to update such studies.

92. In the NIR, Australia addressed some of the recommendations made by previous ERTs, but others have not yet been addressed. The explanation given by Australia, in the NIR and during the review, was that some of the research is still in progress (see specific examples in the category findings, e.g. paras. 95 and 99 below); Australia expects to be able to address such recommendations in the future. The ERT encourages Australia to implement, in its next annual submission, the appropriate recommendations made during previous reviews or to at least indicate the progress made.

93. Recalculations were made due to: (i) changes in the AD (e.g. recalculations of the three-year average of emissions once the third year becomes available; corrections to 2006 animal numbers; revised allocation between dairy cattle age classes (2003–2007)); (ii) updates to preliminary data, such as milk production (2006–2007) and savanna burning (2007); (iii) annual lambing/cow lactating rates replacing averages; and (iv) more accurate data for allocating fertilizer to production systems, among others. The ERT noted that there were no recalculations due to changes in methodologies and/or EFs. The ERT concluded that the recalculations improve the accuracy of the inventory and that they have been prepared in accordance with the IPCC good practice guidance and are justified. The impact of the recalculations was a decrease in the emission estimates in 2007 by 0.6 per cent (519.81 Gg CO_2 eq) and a decrease in the emission estimates in 1990 by 0.02 per cent (20.06 Gg CO_2 eq).

2. Key categories

Enteric fermentation – CH_4

94. In 2008, this category emitted 55,552.27 Gg CO_2 eq (10.1 per cent of national total emissions). Australia uses a tier 2 method with country-specific EFs to estimate the emissions of dairy cattle, free-range beef cattle, feedlot cattle, sheep and swine. Other livestock were estimated using the tier 1 method and IPCC default EFs. The ERT considered this approach adequate to Australian conditions and in line with the IPCC good practice guidance. However, since some of the studies used to support such an approach are relatively old, the ERT encourages Australia to update these studies as soon as possible.

95. Several improvements have been made since the Party's last submission and recalculations were therefore undertaken, resulting in a decrease of 376.7 Gg CO_2 eq in the 2007 emission estimate (–0.7 per cent) and a 38.0 Gg CO_2 eq increase in the 1990 emission estimate (0.1 per cent). Nevertheless, there are still some recommendations from previous reviews that have yet not been implemented (e.g. a tropical cattle EF). During the review, Australia explained that "preliminary results are confirming the strong relationship between intake and emissions, however results for the feeds tested to date are indicating lower methane conversion rates. Once the final results from the research are available Australia will review the current EFs and revise as necessary". The ERT commends the efforts made by Australia and recommends that the Party provide an update of the results in the next annual submission.

Agricultural soils – N_2O

96. In 2008, this category emitted 14,556.70 Gg CO_2 eq (2.6 per cent of national total emissions). The estimates of direct soil emissions (synthetic fertilizers and animal waste

applied to soil) and animal production emissions were made using a tier 2 method with country-specific EFs. Indirect soil emissions (leaching and run-off) were estimated using a country-specific method and EFs. Other categories were estimated using a tier 1 method with IPCC default EFs (i.e. direct soil emissions (N-fixing crop, crop residues and cultivation of histosols) and indirect soil emissions (atmospheric deposition)). The ERT considered this approach adequate to Australian conditions and in line with the IPCC good practice guidance.

97. Following a recommendation made by the previous ERT, Australia has improved the allocation of fertilizer to production systems, which has increased the time-series consistency and accuracy. The impact of this and other improvements in AD was a decrease of 58.1 Gg CO_2 eq in the 1990 estimate (–0.4 per cent) and a decrease of 178.4 Gg CO_2 eq in the 2007 estimate (–1.2 per cent). No specific further improvements are planned for this category.

Prescribed burning of savannas – N_2O and CH_4

98. In 2008, this category emitted 13,614.51 Gg CO_2 eq (2.5 per cent of national total emissions). The methodology used is country-specific, with different fuel loads and burning efficiencies for different types of savannas. The ERT considered the methodology appropriate for Australia and in line with the IPCC good practice guidance.

99. The ERT commends Australia for its efforts to provide additional information in relation to burning efficiencies, as requested in previous reviews. During the review, Australia explained that "Additional measurements of burning efficiency have recently been undertaken in northern Australia. These studies indicate that there can be significant differences in burning efficiency between early and late season burn. Australia is currently investigating how to implement these results for the 2011 submission". The studies will also revise the Queensland fuel loads and vegetation classifications. The ERT welcomes this effort and recommends that Australia update its next annual submission accordingly.

3. Non-key categories

Manure management – CH_4 and N_2O

100. Australia explained during the review that previous recommendations made by the ERT had not yet been implemented, due to the fact that reviews are still under way. In particular, the N excretion rates for horses and mules/asses, and the effects of implementing the pre-weaning feeding regimes on the emissions. The ERT welcomes the efforts made by Australia and recommends that the Party implement the appropriate recommendations made during previous reviews or, at the least, indicate the progress made in its next NIR.

4. Areas for further improvement

Identified by the Party

101. In the NIR and during the review, Australia identified several areas for further improvement (also described in the category findings above):

(a) For enteric fermentation, additional experimental work is being undertaken to examine tropical feeds. The method used will be reviewed once data from the study are available;

(b) Intakes and N excretion rates for dairy calves will be revised to reflect pre-weaning feeding regimes;

(c) N excretion rates for horses and mules and asses will be reviewed for the 2011 submission;

(d) A review of savanna burning is currently under way, with the aim of incorporating the results of recent field experiments.

Identified by the expert review team

102. The ERT identified the following areas for improvement (also described in the sector overview and category findings above):

(a) More detailed explanations on how the large physical, climate and management differences between states and territories impact the determination of the emission parameters;

(b) The inclusion, in the next annual submission, of a plan to update the studies used to establish the methodology used and country-specific EFs;

(c) The inclusion, in the next annual submission, of an update on previous review recommendations that have not yet been implemented as well as a schedule to indicate when they will be implemented.

E. Land use, land-use change and forestry

1. Sector overview

103. In 2008, net emissions from the LULUCF sector amounted to 68,518.15 Gg CO_2 eq, or 11.2 per cent of total GHG emissions in Australia. Since the base year, net emissions have increased by 48.6 per cent. GHG net emissions by sources and removals by sinks in the LULUCF sector displayed high inter-annual variability and shifted between being a net sink and a net source throughout the time series. The key driver for this trend in the LULUCF sector is primarily the inter-annual climate variability and natural disturbance such as fire and drought.

104. Within the sector, 188,407.48 Gg CO_2 eq emissions were from grassland. Emissions were offset by removals of 104,224.53 Gg CO_2 eq from forest land and 12,127.67 Gg CO_2 eq from cropland. The remaining 3,537.13 Gg CO_2 eq was from harvested wood products and agricultural lime application.

105. Australia has reported emissions and removals for forest land, cropland and grassland. Emissions from harvested wood products and agricultural lime application are reported under the category other (LULUCF) (5.G). Australia does not report forest land converted to wetlands and settlements separately, but includes these estimates under the forest land converted to grassland category. During the review, the ERT was informed that Australia is considering the separation of forest land converted to settlements from forest land converted to grassland. The ERT recommends that Australia implement this separation in the next annual submission. Australia does not report conversions between cropland and grassland.

106. The emissions and removals in all land conversion categories were estimated using a sophisticated tier 3 approach, in which an ecosystem mass balance model, including all carbon pools (FullCAM model), is fully integrated with a spatially explicit land representation. A combination of tier 2 and tier 3 methods was used for lands remaining in the same category. In response to recommendations made by previous ERTs, Australia improved the documentation relating to the tier 3 approach and provided, for the first time, a comparison of the results from the tier 3 model with a tier 2 approach for the conversion categories. This comparison showed a reasonable agreement of the outputs between the two

approaches. However, the documentation in the NIR to explain the application of the tier 2 approach was incomplete, which prevented the ERT from making a full assessment of the tier 2 method and its comparison with the tier 3 approach. During the review, Australia demonstrated to the ERT the tier 2 method applied, including AD, parameters and an estimation spreadsheet. The ERT acknowledges the efforts made by Australia and recommends that Australia describe in a transparent manner the tier 2 approach used in its next annual submission (e.g. by explaining the method applied, AD and parameters).

107. The principal method of representing land areas is through a time series from a national remote sensing programme. Reconciliations are conducted for each land unit to ensure that there are no gaps or overlaps which could lead to the omission or double counting of areas of land. Non-spatial data derived from Australia's National Forest Inventory were also used to support the reporting in the forest land category. Land areas in the cropland remaining cropland and grassland remaining grassland categories are obtained from the land-use mapping programme of Australia's Bureau of Rural Sciences. Australia improved the transparency of its reporting by including land-use matrices for every year from 1990 to 2008. However, the ERT noted that the land-area table 7.D.5 provided in the NIR and the land areas reported in the CRF tables were not consistent. Australia chose 50 years as the transition period for land-use conversion but this was not fully applied in its disaggregation of land use into the land-use remaining and land-use conversion subcategories, which is inconsistent with the IPCC good practice guidance for LULUCF. The ERT recommends that Australia improve the consistency of its reporting in its next annual submission.

108. Australia used additional information to improve its AD, which led to significant changes from previous submissions. For example, there was a systematic reduction of the area of forest land remaining forest land and a significant change in the area of land conversion to and from forest land. However, this was not fully documented in the NIR. The ERT recommends that Australia increase the transparency of its recalculations by describing any significant changes associated with its recalculations in the next annual submission.

2. Key categories

Forest land remaining forest land – CO_2

109. The subcategory forest land remaining forest land is subdivided into "harvested native forest", "pre-1990 plantations", "other native forests", and "fuelwood" (which includes emissions from across the three other subdivisions). The ERT noted that the area of forest land remaining forest land increases and decreases over time, but that some of these changes do not correspond to changes in the subcategories of land converted to forest land or forest land converted to other land uses (i.e. cropland or grassland). For instance, although Australia reports land conversion to forest land since 1990 using a 50-year transition period (e.g. a new area of forest in 1990 will enter the subcategory forest land remaining forest land only in 2040), the reported area of forest land remaining forest land has increased in some years. Australia explained that this is due to permanent gain or loss of forest cover due to climate variation in areas where tree crown cover is close to the threshold selected to define forest land (20 per cent), and that these changes in forest cover (reported as changes in forest area under the subdivision "other native forests") do not correspond to changes in land use.

110. The ERT notes that Australia's current reporting is not consistent with the IPCC good practice guidance for LULUCF, which requires that any change in area of forest land should correspond to a change in land use. Furthermore, the ERT notes that, according to the IPCC good practice guidance for LULUCF: (i) grassland includes rangelands and

pasture land in which vegetation falls below the threshold used in the forest land category and is not expected to exceed, without human intervention, the threshold used in the forest land category; and (ii) forest land includes areas with vegetation that currently fall below, but are expected to exceed, the threshold of the forest land category. The ERT recommends that, for any area of managed land, Australia carefully assess if the gain or loss of forest cover due to climate variation is to be considered permanent and that Australia consistently apply the following criteria in the CRF tables and the NIR:

(a) Areas of managed rangelands and pasture land where, due to climate variation, the tree crown cover permanently exceeds the forest threshold can no longer be considered grassland: they should be reported as a separate subdivision (e.g. natural forest expansion on grassland) under the subcategory land conversion to forest land;

(b) Areas of managed forests where, due to climate variation, the tree crown cover is permanently below (i.e. it is not expected to exceed) the forest threshold can no longer be considered forest land: they should be reported as a separate subdivision under the subcategory forest land converted to a new land use (e.g. grassland).

111. The ERT notes that an appropriate disaggregation in the CRF tables is important for transparency purposes when future ERTs compare the reporting under the Convention and the Kyoto Protocol. The ERT recommends that Australia disaggregate in the CRF tables the causes of conversions to forest land (e.g. due to climate-driven gain of forest cover or due to plantations) and the causes of conversions from forest land (e.g. due to climate-driven loss of forest cover or due to harvest or other causes).

112. The ERT noted that Australia assumes no change in the soil carbon stock in forest land remaining forest land, following the tier 1 approach of the IPCC good practice guidance for LULUCF. Since forest land remaining forest land is a key category, the ERT encourages Australia to move to higher tiers in its next annual submission.

Land converted to forest land – CO_2

113. In the subcategory land converted to forest land Australia has reported plantations that have been established since 1990. The ERT notes the improvements implemented in this inventory, such as the application of a dynamic, spatially explicit growth model (including age, climate and management effects) calibrated to the latest growth data from the National Forest Inventory, the improved representation of silvicultural methods and the inclusion of a modelled soil carbon for the first time. The ERT noted an inconsistency in the data of area converted to forest between table 7.D5 of the NIR and the CRF tables, and recommends that Australia ensure full consistency between the NIR and the CRF tables in its next annual submission.

Cropland remaining cropland – CO_2

114. The CO_2 emissions and removals from cropland remaining cropland were estimated using the tier 3 FullCAM model which includes estimates of emissions and removals in living biomass, dead organic matter and mineral soil associated with land management practice and annual climate variability. However, Australia reported the CO_2 emissions and removals from this land category as an aggregate number. The ERT recommends that Australia disaggregate by crop type in CRF table 5.B.1 cropland remaining cropland, and document in a transparent manner in the NIR the method used to estimate CO_2 emissions and removals due to transition among crop types.

Grassland remaining grassland – CO_2

115. CO_2 emissions and removals from grassland remaining grassland have significantly influenced the total emissions trend in the LULUCF sector. In 2008, grassland remaining

grassland amounted to a net source of 137,823.85 Gg CO_2 eq and contributed to 22.5 per cent of national GHG emissions. The tier 3 FullCAM model was used to estimate CO_2 emissions and removals in this category. However, Australia reported the CO_2 emissions and removals from this category as an aggregate number. The ERT recommends that Australia, in its next annual submission, disaggregate by grassland type, including grass and shrub transitions, in CRF table 5.C grassland remaining grassland.

Forest land converted to cropland and to grassland – CO_2

116. All the lands that were cropland or grassland prior to 1972 are reported in the categories cropland remaining cropland and grassland remaining grassland, respectively. The conversion categories include only forest land converted to cropland or to grassland after 1972, leading to a variable land conversion period from 18 years for 1990 to 36 years for 2008, which is inconsistent with the IPCC good practice guidance for LULUCF. During the review, Australia explained that precise information on the conversion of land prior to 1972 is not available. The ERT acknowledged this explanation and recommends that Australia include an explanation for this in its 2011 inventory submission.

117. For some years, Australia has reported an increase in carbon stock in mineral soil for forest land converted to cropland. In response to the ERT's question, Australia explained that cropland converted from forest land is primarily a crop-pasture system with a high input of dead organic matter. The ERT reiterates the recommendation made by the previous ERT that Australia provide additional documentation in the NIR to justify this pattern in its next annual submission.

Biomass burning – CO_2, CH_4 and N_2O

118. In CRF table 5.V., Australia reports annual emission estimates from non-CO_2 gases (derived using country-specific EFs), while CO_2 is implicitly included in the other CRF tables. The ERT notes that a time series of CO_2 emissions from forest fires in "other native forests" (including both emissions and subsequent removals from forest recovery) is shown in table 7.E3 of the NIR. During the review, it emerged that this table indeed shows emissions from all forest land remaining forest land. For transparency purposes, the ERT encourages Australia to include in future NIRs the time series of emission estimates from fires, disaggregated by gas, by land-use category, and by subdivision (e.g. "harvested native forests", "post-1990 plantations" and "other native forests") and separated from removals due to subsequent forest recovery.

3. Areas for further improvement

Identified by the Party

119. Australia's planned improvements for the LULUCF sector include completing the use of the tier 3 approach for forest land remaining forest land and developing and using a new crop growth model and a new grass growth model.

Identified by the expert review team

120. Australia uses a very complex set of models and approaches in its LULUCF inventory. The ERT, while acknowledging the improvements made regarding the documentation on the QA/QC procedures for the LULUCF sector, considers that further efforts (e.g. increased transparency of model outputs and additional verification activities) are needed to allow future ERTs to fully evaluate the model outputs.

F. Waste

1. Sector overview

121. In 2008, emissions from the waste sector amounted to 14,216.41 Gg CO_2 eq, or 2.6 per cent of total GHG emissions. Since the base year, emissions have decreased by 19.6 per cent. The key driver for the fall in emissions is the steady increase in the recovery rate of CH_4 from landfills. Within the sector, 76.9 per cent of the emissions were from solid waste disposal on land, followed by 22.9 per cent from wastewater handling, and 0.2 per cent from waste incineration.

122. Over the period 1990 to 2008, emissions from solid waste disposal on land and wastewater handling decreased by 22.1 per cent and 8.4 per cent, respectively. The steady increase in the recovery rate of CH_4 from landfills was mainly responsible for the decrease in GHG emissions in the waste sector.

123. All categories in the waste sector were reported in line with the UNFCCC reporting guidelines and the IPCC good practice guidance. GHG emissions from biological recycling processes (e.g. composting) of solid waste were not reported as there is no methodology available in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The ERT encourages Australia to explore ways of estimating the GHG emissions from the biological treatment of solid waste using country-specific and/or other available methodologies.

2. Key categories

Solid waste disposal on land – CH_4

124. Australia applied the IPCC tier 2 methodology using country-specific degradable organic carbon fraction (DOC_f) values and the IPCC default parameter values for degradable organic carbon (DOC) and methane generation constant (k) in line with the UNFCCC reporting requirements and the IPCC good practice guidance. In order to accurately assess CH_4 emissions from landfills, Australia back-calculated the compositional landfilled amounts of solid waste to 1940 in a reasonable manner, assuming that the total landfilled waste is correlated with the sum of paper and wood waste disposed to landfill that are available back to 1936.

125. The ERT strongly encourages Australia to develop country-specific DOC and methane generation constant (k) values. The ERT also encourages Australia to improve the data quality of the past landfilled amounts to develop a functional relationship between waste generation rates and drivers (e.g. waste management policies, population, GDP and income) by applying statistical regression techniques. The ERT further encourages Australia to verify the methane conversion factor (MCF) values for the years prior to 1990 as it is probable that unmanaged landfill practices were carried out during those years.

Wastewater handling – CH_4

126. Australia's CH_4 emission estimates from domestic/commercial wastewater and industrial wastewater handling are in line with the UNFCCC reporting requirements and the IPCC good practice guidance. Australia has developed country-specific biochemical oxygen demand (BOD)/chemical oxygen demand loadings and MCF values to produce accurate estimates of CH_4 generation from the wastewater handling category.

127. The uncertainty of the category was reported in the NIR without describing the methodology used to derive it. Several key parameter values shown in the CRF tables, such as MCF values, were not explained in the NIR. Some data were missing in the CRF tables and trivial typing errors were also found in the CRF tables. The ERT recommends that

Australia provide additional information on key parameters, such as MCF values and BOD loadings, in the NIR in accordance with the CRF tables and that it develop better QA/QC procedures to prevent mistakes such as those found in the CRF tables.

128. Some parameter values (e.g. the MCF value for unsewered systems) were used without explanation and justification in the NIR. The ERT recommends that Australia include information to support the values and assumptions used in its next annual submission.

3. Non-key categories

Wastewater handling – N_2O

129. Australia has developed a country-specific methodology and parameter values (e.g. N loadings and N amounts in effluents) to estimate N_2O emissions from human sewage in order to enhance the accuracy of N_2O emission estimates in this category. Australia has, for the first time, divided the N_2O emission sources in a detailed manner to reflect the real situation regarding N_2O emissions, including emissions during the wastewater treatment process, emissions during the discharge of wastewater into an aquatic environment, and emissions from the application of sludge to agricultural soils.

130. Australia's approach has resulted in higher emission estimates from wastewater handling than in previous years because emissions from sludge applied to agricultural soils were reported under the waste sector. N_2O emissions from the application of sludge to agricultural soils should be reported under the agriculture sector. The ERT recommends that Australia report N_2O emissions from the application of sludge to agricultural soils in the agriculture sector in order to improve comparability.

Incineration – CO_2 and N_2O

131. Australia reported emission estimates of CO_2 from the incineration of solvents and clinical waste as well as emission estimates of CO_2 and N_2O from the incineration of municipal solid waste (MSW) (which ceased in 1996) for the period 1990 to 1996. Although Australia has resolved certain transparency issues (regarding references for data sources and proportions of waste of fossil fuel origin) raised by the previous ERT, the information in the NIR is not transparent in relation to the methods used to derive EFs for MSW and clinical waste. The ERT recommends that Australia provide this information in the next annual submission.

4. Areas for further improvement

Identified by the Party

132. Australia plans to move towards the development of a tier 3 method to estimate emissions from solid waste disposal on land in the next annual submission. The NGERS will play a major role in supplying facility-level data. New measurement systems operated by landfill operators and supplemented by ongoing research activities will be combined with NGERS data to improve data quality in the next annual submission.

133. Australia plans to introduce a tier 3/tier 2 method to estimate CH_4 emissions from domestic and commercial wastewater in the next annual submission. NGERS data will be used to improve the estimates of facility-specific data and to estimate country-specific parameters.

134. Australia plans to adopt the NGERS framework, which should improve the availability and quality of data on the incineration of waste.

Identified by the expert review team

135. The ERT recommends that Australia develop better QA/QC procedures to prevent trivial mistakes such as those found in the CRF tables.

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

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

Overview

136. The Party has provided complete information in the NIR with respect to the requirements outlined in paragraphs 5 to 9 of the annex to decision 15/CMP.1 and further described by the IPCC good practice guidance for LULUCF. In its NIR, Australia reported only generic qualitative information on the size and geographical location of forest areas that have lost forest cover but which are not yet classified as deforested. During the review, at the request of the ERT, the Party provided a map showing non-human induced forest cover change (not land-use change) on land that was forest on 31 December 1989. The ERT encourages Australia to provide in the next annual submission a quantitative assessment of forest areas that have lost forest cover but which are not yet classified as deforested. Overall, the Party provided evidence to show that the national system has the ability to identify areas of land and areas of land-use changes.

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

137. For activities under Article 3, paragraph 3, of the Kyoto Protocol, Australia used the same tier 3 methodologies applied under the Convention for conversions to and from forests. Overall, the ERT considers that these methodologies are in line with the IPCC good practice guidance for LULUCF.

138. For transparency purposes, the ERT encourages Australia to provide in the next annual submission the following information:

(a) With regard to afforestation and reforestation activities, additional information on the share of thinning and final harvest in the emission estimates from lands harvested since the beginning of the commitment period;

(b) With regard to deforestation activities, the non-CO_2 emission estimates from wildfires, currently reported under the agriculture sector.

139. The ERT noted that the emissions reported for deforestation activities under KP-LULUCF are lower (by 7.462,02 Gg CO_2 eq) compared to the emissions reported under the Convention in the forest land converted to cropland and forest land converted to grassland since 1990. During the review, the Party explained that these differences are due to the exclusion from deforestation activities of areas of land which were not forest in 1990 but which have subsequently naturally regrown (i.e. not directly human-induced and therefore not included as afforestation/reforestation) and then been re-cleared as part of re-growth and re-clearing cycles. The ERT noted that the definitions of activities under Article 3, paragraph 3, of the Kyoto Protocol in the annex to decision 16/CMP.1 include a temporal reference for afforestation and reforestation, but not for deforestation (para. 1(d)).

140. After discussion and further clarification from Australia, the ERT understood the explanations provided by the Party. In particular, it emerged that the IPCC good practice guidance for LULUCF indicates a temporal reference for deforestation. More specifically, section 4.2.6.2 indicates that “The identification of units of land subject to deforestation

activities requires the delineation of units of land that (…) have met the definition of forest on December 1989". As a consequence, while human-induced deforestation occurring on forests planted after 1990 (i.e. afforestation/reforestation activity) should be accounted as deforestation (see the IPCC good practice guidance for LULUCF, page 4.16), direct human-induced deforestation occurring on naturally regrown forests after 1990 should not be accounted as deforestation under the Kyoto Protocol.

141. The ERT, as previous ERTs, found it difficult to review the results of a complex model such as FullCAM, which itself is a combination of different models. In particular, the ERT noted that:

(a) Overall, the verification activities included in the NIR do not appear fully adequate to assess the outputs of the model. In particular, the NIR contains very little data or information on the field verification of the model's outputs for biomass of afforestation/reforestation and deforestation activities. The verification of the modelled estimates of biomass is conducted with only 15 field plots (figure 7.J11 of the NIR), which does not appear to be a representative sample for a large country such as Australia. During the review, the Party explained that only the formal verification activities undertaken are reported in the NIR and that a range of additional collaborations and data exchanges, some of which have been provided to the ERT, are not included. The Party agreed to document these verification activities more comprehensively in the next annual submission;

(b) The FullCAM model does not appear to be flexible enough to provide output to answer questions from the ERT. This issue has also been raised during previous reviews. The ERT noted the improvements made by the Party (e.g. in the CRF tables, emissions and removals from forest conversions are now reported by state and territory and major vegetation group), but considers that further steps are necessary. For instance, some intermediate model outputs requested by the ERT and considered important for the assessment of the model's results (e.g. carbon loss per ha due to all deforestation events in a given year, excluding lagged emissions from deforestation in previous years) were not provided because the model is not currently designed to produce them.

142. Given the limited verification with field data and without some intermediate parameters that would be useful to assess the model's output, the ERT's confidence in the accuracy of the model's results was based to a considerable extent on the comparison of the results from the tier 3 model and the tier 2 method applied. The ERT considers that this comparison showed a reasonable agreement of the outputs between the two approaches, but sees this only as a first step in the process of verifying the tier 3 model outputs.

143. In order to increase the transparency of the inventory and to assist future ERTs to assess the outputs of the model, the ERT:

(a) Recommends that Australia define the terms used for its verification activities (e.g. "calibration", "validation", "verification", "model evaluation") in its next annual submission and that Australia more clearly describe and document the range of activities and the various steps carried out to verify the various components of the model in the context of the "continuous improvements" approach, including a more complete explanation of the tier 2 method applied;

(b) Strongly recommends that Australia carry out additional verification activities, such as a comparison of the model's output with existing field data, the collection of additional field data, verification by independent bodies and a discussion of the differences in the results with other remote sensing programmes carried out by individual states (e.g. Queensland and New South Wales). The ERT further recommends that Australia include in its next annual submission a plan to implement these additional verification activities;

(c) Recommends that Australia further increase the flexibility of the FullCAM model with regard to the possibility of producing specific parameters and intermediate outputs that could be useful to assess the model's results (e.g. emissions per year of conversion and final land use).

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

144. Australia has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and the SEF comparison report.[5] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

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

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

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

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

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

Activity	*Accounting quantity* $t\ CO_2\ eq$	
	As reported	*Final*
Afforestation and reforestation	–23 032 901	–23 032 901
Deforestation	49 650 531	49 650 531
Forest management	NA	NA
Article 3.3 offset[a]	NA	NA
Forest management cap	NA	NA
Cropland management	NA	NA

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

Activity	*Accounting quantity t CO_2 eq*	
	As reported	*Final*
Grazing land management	NA	NA
Revegetation	NA	NA

Abbreviations: NA = not applicable.

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

148. Based on the information provided in table 4, Australia shall cancel 26,617,630 assigned amount units (AAUs) in its national registry.

National registry

149. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate. However, the SIAR identified the following problems: Australia needs to clearly identify the publicly available list of legal entities and clearly state on the website (https://nationalregistry.climatechange.gov.au/eats/au/) whether current unit holdings are confidential and that representative identifiers are confidential. The ERT recommends that Australia address these problems and report the results in its next annual submission.

Calculation of the commitment period reserve

150. Australia has reported its commitment period reserve in its 2010 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (2,661,821,229 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

151. In its NIR, Australia reported the following changes in its national system since the previous annual submission: the name of the single national entity has changed from the Department of Climate Change to the Department of Climate Change and Energy Efficiency (DCCEE); the DCCEE has formed the National Inventory Systems Executive Committee to oversee the preparation of the NIR; and additional QA/QC activities and procedures have been implemented. These changes were elaborated on during the review week and the ERT learned that the national system has been further enhanced as the GHG inventory and NCAS are now managed within the same division of the DCCEE, with joint oversight and full involvement in the inventory planning process. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

152. Australia reported that there have been no changes in its national registry since the previous annual submission. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

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

153. Australia has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1, in its 2010 annual submission. The report was received on 26 May 2010 and the ERT notes that the submission due date was 15 April 2010.

154. The reported information is considered complete but could be more transparent. The information is reported at a very high level and transparency could be improved by providing further detail in terms of examples of relevant actions and activities in which Australia is engaged. During the review, Australia provided the ERT with additional information clarifying these issues (see para. 156 below). The ERT recommends that Australia improve the transparency of the information by including examples of its activities in its next annual submission.

155. In its NIR, Australia reported that it has implemented support programmes that assist vulnerable countries in building economic resilience. These activities include: support for the International Finance Corporation's Pacific Enterprise Development Facility; support to Pacific Island countries in moving towards closer economic integration through the negotiation of the Pacific Agreement on Closer Economic Relations; support under Aid for Trade-related activities intended to assist developing countries in building the economic resilience necessary to adjust to the impacts of climate change response measures; and support for the development of clean and affordable energy in the Pacific region.

156. During the review week, in response to questions from the ERT, Australia provided additional information that improved the transparency of the reported information. This additional information covered Australia's engagement in a number of initiatives aimed at helping developing countries transition to a lower carbon future and diversifying their economies to minimize exposure to measures taken to mitigate climate change. Such initiatives include:

(a) The establishment of the Global Carbon Capture and Storage Institute (GCCSI), which has been officially operating for 14 months and has 247 participating organizations (including 26 national governments). Capacity and capability-building actions are under way with several countries, working in partnership with the Asian Development Bank and the World Bank;

(b) Active involvement in the Carbon Sequestration Leadership Forum (CSLF) since its formation in 2003. The CSLF aims to make carbon dioxide capture and storage (CCS) technology broadly available and has worked to inform its members on appropriate technical, political and regulatory environments that will allow the development of CCS technology with the additional focus of building capacity in developing countries;

(c) The Asia-Pacific Partnership on Clean Development and Climate (APP) which, through collaboration, aims to reduce the carbon intensity of products and services in different sectors, including power generation. The APP focuses on project-based initiatives that bring the private and public sectors together to accelerate the development, deployment and transfer of cleaner, more efficient technologies. The Australian

Government was instrumental in the formation of the APP in 2006 and has been a major financier of APP projects;

(d) The building of trade resilience and economic diversification in the Pacific through the activities mentioned in paragraph 155 above as well as under the Private Enterprise Partnership for the Pacific (PEP-Pacific) that works with institutions, organizations and associations to strengthen the economic resilience of developing countries and in doing so helps to reduce the impact that any measures taken to reduce climate change have on those countries.

III. Conclusions and recommendations

157. Australia made its annual submission on 26 May 2010. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

158. The ERT concludes that the inventory submission of Australia has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2008 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as largely complete in terms of categories and gases. Some minor categories, particularly in the industrial processes sector, were reported as "NE", but these only relate to categories where the Revised 1996 IPCC Guidelines or the IPCC good practice guidance do not provide a methodology.

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

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

161. 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. Enhanced transparency is needed where country-specific methods and EFs are used. Australia continues to improve its overall report by revising AD, including additional sources of data, and refining estimation methodologies.

162. With regard to activities under Article 3, paragraph 3, of the Kyoto Protocol, Australia has provided detailed information in the NIR with respect to the requirements outlined in paragraphs 5 to 9 of the annex to decision 15/CMP.1. Overall, the ERT considers that the methodologies applied to these activities are in line with the IPCC good practice guidance for LULUCF. However, additional efforts are needed to increase the transparency of the inventory and to assist future ERTs to assess the outputs of the model. The ERT further noted that there is limited verification of the model with field data

163. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1; however, the ERT identified issues relating to timeliness of reporting that will need to be addressed by Australia.

164. 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.

165. Australia has reported the information requested in chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2010 annual submission. The information was provided on 26 May 2010. The reported information is considered complete but because the information is reported at a very high level, the ERT considers that transparency could be improved by providing further detail in terms of examples of relevant actions and activities in which Australia is engaged.

166. In the course of the review, the ERT formulated a number of recommendations relating to timeliness of reporting, transparency of the information presented in Australia's annual submission, and use of NGERS data. The key recommendations are that Australia:

(a) Review the elements of its national inventory system that would enable the timely submission of its inventory report, and submit its next report by 15 April 2011;

(b) Improve transparency in cases where country-specific methods and EFs are used by providing clearer or additional explanation in the NIR; in particular, improvements are needed in relation to the use of confidential information and to the LULUCF sector, including with regard to activities under Article 3, paragraph 3, of the Kyoto Protocol;

(c) Include information in the NIR on verification already carried out to verify the FullCAM model and to further verify the model based on field data;

(d) Utilize the NGERS database with care, caution and insight;

(e) Improve transparency in the reporting of information under Article 3, paragraph 14, of the Kyoto Protocol.

IV. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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"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>.

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B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Rob Sturgiss, Ms. Penny Reyenga, Mr. Mark Hunstone, Ms. Nicola Gabay, Mr. Steven Oliver, Mr. Glen Whitehead, Mr. Gary Richards, Mr. Rob Waterworth (Department of Climate Change and Energy Efficiency), Mr. Jeff Deslandes (EnerGreen Consulting) including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Australia:

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[1] Reproduced as received from the Party.

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Annex II

Acronyms and abbreviations

AAU	assigned amount unit
AD	activity data
BOD	biochemical oxygen demand
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
CCS	carbon dioxide capture and storage
CRF	common reporting format
DOC	degradable organic carbon
DOC_f	degradable organic carbon fraction
EF	emission factor
ERT	expert review team
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
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
k	methane generation constant
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	and use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
Mg	megagram (1 Mg = 1 tonne)
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NE	not estimated
NGL	natural gas liquid
N_2O	nitrous oxide
NIR	national inventory report
NO	not occuring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
TiO_2	titanium dioxide
UNFCCC	United Nations Framework Convention on Climate Change