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Report of the individual review of the annual submission of New Zealand submitted in 2012*

* In the symbol for this document, 2012 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the centralized review of the 2012 annual submission of New Zealand, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 10 to 15 September 2012 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Paul Filliger (Switzerland) and Ms. Batima Punsalmaa (Mongolia); energy – Ms. Duduzile Nhlengethwa-Masina (Swaziland) and Ms. Songli Zhu (China); industrial processes – Ms. Valentina Idrissova (Kazakhstan), Mr. Predrag Novosel (Montenegro) and Mr. Jacek Skoskiewicz (Poland); agriculture – Mr. Jorge Alvarez (Peru) and Mr. Daniel Bretscher (Switzerland); land use, land-use change and forestry (LULUCF) – Ms. Oksana Butrym (Ukraine), Mr. Agustin Inthamoussu (Uruguay) and Ms. Thelma Krug (Brazil); and waste – Ms. Maryna Bereznytska (Ukraine) and Mr. Sabin Guendehou (Benin). Ms. Bereznytska and Ms. Krug were the lead reviewers. The review was coordinated by Mr. Roman Payo (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 New Zealand, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2010, the main greenhouse gas (GHG) in New Zealand was carbon dioxide (CO_2), accounting for 46.3 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (37.5 per cent) and nitrous oxide (N_2O) (14.6 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.6 per cent of the overall GHG emissions in the country. The agriculture sector accounted for 47.1 per cent of total GHG emissions, followed by the energy sector (43.4 per cent), the industrial processes sector (6.7 per cent), the waste sector (2.8 per cent) and the solvent and other product use sector (0.04 per cent). Total GHG emissions amounted to 71,657.19 Gg CO_2 eq and increased by 19.8 per cent between the base year[2] and 2010. The trends for the different gases and sectors are reasonable.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, 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.

5. Tables 3–5 provide 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[a] to 2010

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010*
Annex A sources		CO_2	25 014.06	25 014.06	27 415.19	31 322.16	36 408.53	36 477.54	33 591.83	33 199.21	32.7
		CH_4	25 826.46	25 826.46	26 320.55	27 855.88	28 227.70	26 515.62	26 822.17	26 855.14	4.0
		N_2O	8 311.64	8 311.64	9 103.90	9 796.37	11 057.38	10 347.83	10 132.60	10 454.70	25.8
		HFCs	NA, NO	NA, NO	121.68	259.52	735.91	803.01	870.92	1 087.17	NA
		PFCs	629.87	629.87	131.16	58.06	59.57	38.84	46.14	40.81	–93.5
		SF_6	15.20	15.20	17.88	10.59	19.05	14.86	19.23	20.16	32.6
KP-LULUCF	Article 3.3[b]	CO_2						–17 562.27	–17 840.37	–18 312.13	
		CH_4						2.70	4.63	4.60	
		N_2O						0.27	0.47	0.47	
	Article 3.4[c]	CO_2	NA					NA	NA	NA	NA
		CH_4	NA					NA	NA	NA	NA
		N_2O	NA					NA	NA	NA	NA

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

[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 inventory years of the commitment period must be reported.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2010

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*Base year–2010*
Annex A		Energy	23 458.47	23 458.47	25 562.53	29 634.63	34 179.67	34 380.17	31 594.82	31 107.86	32.6
		Industrial processes	3 388.79	3 388.79	3 299.32	3 525.48	4 317.80	4 291.99	4 350.35	4 778.08	41.0
		Solvent and other product use	41.54	41.54	44.95	47.12	44.33	31.00	27.90	31.00	–25.4
		Agriculture	30 855.26	30 855.26	32 145.93	33 984.51	35 797.70	33 443.04	33 477.99	33 748.44	9.4
		Waste	2 053.17	2 053.17	2 057.62	2 110.83	2 168.64	2 051.51	2 031.84	1 991.82	–3.0
		LULUCF	NA	–27 388.31	–23 623.67	–26 570.42	–24 813.22	–27 847.93	–26 234.10	–19 980.46	NA
		Total (with LULUCF)	**NA**	**32 408.92**	**39 486.68**	**42 732.16**	**51 694.92**	**46 349.78**	**45 248.80**	**51 676.74**	**NA**
		Total (without LULUCF)	**59 797.23**	**59 797.23**	**63 110.35**	**69 302.57**	**76 508.14**	**74 197.71**	**71 482.90**	**71 657.19**	**19.8**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation						–19 132.58	–19 210.51	–19 356.99	
		Deforestation						1 573.29	1 375.25	1 049.93	
		Total (3.3)						–17 559.29	–17 835.27	–18 307.07	
	Article 3.4[d]	Forest management						NA	NA	NA	
		Cropland management	NA					NA	NA	NA	NA
		Grazing land management	NA					NA	NA	NA	NA
		Revegetation	NA					NA	NA	NA	NA
		Total (3.4)	**NA**					**NA**	**NA**	**NA**	**NA**

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, 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] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

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

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

Table 3
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2010, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	278 608 260			278 608 260
Annex A emissions for current inventory year				
CO_2	33 199 213			33 199 213
CH_4	26 855 141	26 855 142		26 855 142
N_2O	10 454 663	10 454 695		10 454 695
HFCs	1 087 175			1 087 175
PFCs	40 809			40 809
SF_6	20 158			20 158
Total Annex A sources	**71 657 158**	**71 657 192**		**71 657 192**
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	–19 512 386			–19 512 386
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	155 391			155 391
3.3 Deforestation for current year of commitment period as reported	1 049 927			1 049 927
Activities under Article 3, paragraph 4, for current inventory year[c]				
3.4 Forest management for current year of commitment period				
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 4
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	33 591 827			33 591 827
CH_4	26 822 171	26 822 172		26 822 172
N_2O	10 132 572	10 132 605		10 132 605
HFCs	870 924			870 924
PFCs	46 140			46 140
SF_6	19 233			19 233
Total Annex A sources	**71 482 868**	**71 482 901**		**71 482 901**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	–19 336 651			–19 336 651
3.3 Afforestation and reforestation on harvested land for 2009 as reported	126 137			126 137
3.3 Deforestation for 2009 as reported	1 375 245			1 375 245
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 5
Information to be included in the compilation and accounting database in t CO_2 eq for the year 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	36 477 539			36 477 539
CH_4	26 515 624	26 515 625		26 515 625
N_2O	10 347 802	10 347 834		10 347 834
HFCs	803 012			803 012
PFCs	38 844			38 844
SF_6	14 859			14 859
Total Annex A sources	**74 197 679**	**74 197 712**		**74 197 712**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	–19 228 609			–19 228 609
3.3 Afforestation and reforestation on harvested land for 2008 as reported	96 031			96 031
3.3 Deforestation for 2008 as reported	1 573 287			1 573 287
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 12 April 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). New Zealand also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraph 3, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 12 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. New Zealand officially submitted revised emission estimates on 24 October and 4 November 2012 in response to the list of potential problems and further questions raised by the expert review team (ERT) during the review (see para. 54 below). The values used in this report are those submitted by the Party on 4 November 2012.

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

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

Completeness of inventory

10. The inventory generally covers all mandatory[4] source and sink categories for the period 1990–2010, except for some categories in the LULUCF sector (see paras. 92 and 98 below). The inventory is complete in terms of years and generally complete in terms of geographical coverage (see para. 92 below).

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

[4] Mandatory source and sink categories under the Kyoto Protocol are all source and sink categories for which the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* 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) provide methodologies and/or emission factors to estimate GHG emissions.

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

Overview

11. The ERT concluded that the national system continued to perform its required functions.

12. New Zealand has reported in the NIR the changes and improvements in the national system since the 2011 annual submission. Efforts to improve the development of expertise, governance and quality assurance/quality control (QA/QC) procedures continue to be made. These changes are discussed in paragraph 142 below.

Inventory planning

13. The NIR describes the national system for the preparation of the inventory, which is under the overall responsibility of the Ministry for the Environment (MfE). Other ministries are also engaged in the preparation of the inventory, including the Ministry of Economic Development (which provides data for the energy and industrial processes sectors) and the Ministry of Agriculture and Forestry (responsible for the compilation of the inventory for the agriculture sector). Other agencies and institutes involved include research institutes and universities and Statistics New Zealand.

Inventory preparation

Key categories

14. New Zealand applied tier 1 level and trend assessments to identify the key categories for its 2012 annual submission. The key category analysis performed by the Party and that performed by the secretariat[5] produced similar, but not exactly the same, results, because the Party used a more disaggregated categorization. New Zealand has included the LULUCF sector in its key category analysis, which was performed in accordance with 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).

15. In response to a question raised by the ERT during the review, New Zealand explained that it uses the results of its key category analysis to prioritize data collection and the development of country-specific emission factors (EFs). The ERT commends the Party for the continuous improvements in its inventory, taking note of the limited resources available and the need to prioritize actions, including the Party's intention to implement a tier 2 key category analysis in the near future. In this regard, the ERT reiterates the encouragement contained in the previous review report for New Zealand to implement a tier 2 key category analysis for its next annual submission.

[5] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for 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.

16. New Zealand has identified key categories for activities under Article 3, paragraph 3, of the Kyoto Protocol (the Party has not elected to account for any of the activities under Article 3, paragraph 4, of the Kyoto Protocol). Land conversion to forest land (afforestation and reforestation) and forest land conversion to grassland (deforestation) were identified as key categories following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory, as provided in chapter 5.4.4 of the IPCC good practice guidance for LULUCF.

Uncertainties

17. New Zealand has provided a tier 1 uncertainty analysis in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines) and the IPCC good practice guidance. However, the uncertainty analysis is not completely in accordance with the IPCC good practice guidance for LULUCF (see para. 95 below). The uncertainties of EFs and activity data (AD) were determined either by sectoral experts on the basis of expert judgement, or by referring to the uncertainty ranges provided in the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

18. The uncertainties associated with the total GHG emissions, excluding and including emissions and removals from the LULUCF sector, were ±12.0 per cent and ±14.2 per cent, respectively. The trend uncertainty for 1990–2010, excluding emissions and removals from the LULUCF sector, was ±2.8 per cent, similar to that reported in the Party's 2011 annual submission. Meanwhile, the trend uncertainty including emissions and removals from the LULUCF sector has increased from ±4.5 per cent, as reported in the previous annual submission, to ±5.7 per cent, which is due mainly to the Party reverting to a tier 1 methodology for estimating emissions from mineral soils under the LULUCF sector (see para. 93 below).

19. New Zealand has also reported uncertainties for the emissions and removals from activities under Article 3, paragraph 3, of the Kyoto Protocol in table 11.3.4 of its NIR (the Party did not elect to account for any activity under Article 3, paragraph 4, of the Kyoto Protocol). For 2010, the uncertainty of the estimates for afforestation and reforestation is ±80.4 per cent, while it is ±156.3 per cent for deforestation. If the soil carbon pools are excluded, the uncertainties of the estimates are lower (±13.4 per cent and ±28.1 per cent, respectively).

Recalculations and time-series consistency

20. Recalculations have been performed and reported in accordance with the IPCC good practice guidance and were undertaken to take into account improvements in AD, EFs and/or methodologies in all sectors except solvent and other product use (see paras. 30, 58, 73, 86 and 112 below). The recalculations resulted in an increase in the estimates of total GHG emissions for 1990 and 2009 by 1.2 per cent and 1.3 per cent, respectively. The rationale for the recalculations has generally been transparently presented in the NIR and in CRF table 8(b), except for the recalculations for the energy sector (see paras. 30(f) and 31 below).

Verification and quality assurance/quality control approaches

21. New Zealand has provided in the NIR information on QA/QC procedures, reporting the use of both tier 1 and tier 2 QC checks, but without explicitly indicating the tier applied for each sector. The checks were carried out by MfE. The ERT encourages the Party to explicitly indicate the sectors for which a tier 2 QC check was implemented in its next annual submission, in order to improve transparency. MfE developed a QA/QC plan, as

required by the UNFCCC reporting guidelines, in 2004. The Party's tier 1 QC checks follow the procedures suggested in the IPCC good practice guidance. New Zealand has reported on page 16 of the NIR that all key categories for the 2010 inventory year were checked. All sectoral contributions to the NIR, CRF tables and tier 1 QC checks were signed off by the responsible sectoral agency. Furthermore, the data in the CRF database were visually checked for anomalies, errors and omissions. MfE used the QC procedures included in the database to ensure the data were complete. The ERT commends the Party for the QA/QC procedures in place, but noted that for some sectors there were some discrepancies between the information reported in the NIR and in the CRF tables (see paras. 36, 43, 45 and 122 below).

22. New Zealand has stated in the NIR that its QA system includes the prioritization of improvements, processes for approving inventory improvements, communication across the widespread QA system and improving the expertise of key contributors to the inventory. It has also been reported in the NIR that the QA system includes documentation on previous QA reviews conducted by independent experts, whose major conclusions and follow-up actions and information are available on the website of MfE.[6] However, the ERT could not find such information on the website. In response to a question raised by the ERT during the review, the Party distributed the spreadsheet that shows, sector by sector, the QA reviews conducted by independent experts, their major conclusions and follow-up actions. The ERT noted that the documented QA checks were not completely up to date, particularly with respect to the national system and the industrial processes sector, and that there has been no QA review for the solvent and other product use sector. The ERT encourages the Party to make the updated information easily accessible on the MfE website and to implement QA procedures for the solvent and other product use sector for its next annual submission.

23. New Zealand used data from its emissions trading scheme (ETS) to verify some estimates of CO_2 emissions from the industrial processes sector (for cement, limestone and dolomite use, and glass and metal production). The Party has described the discrepancies between the data reported to the ETS and estimates reported qualitatively in the NIR, including potential causes, and the improvements that resulted from the verification. In order to improve transparency, the ERT encourages the Party to also discuss the results of the verification quantitatively in its next annual submission. The Party also used data from its ETS to verify its estimates for deforestation (see paras. 134 and 135 below).

Transparency

24. The ERT acknowledges the improvements in the transparency of the Party's 2012 annual submission compared with its previous annual submissions, for example the additional information on liquid fuels used in fuel transportation and on the definitions on all land-use categories (see paras. 50 and 87 below). The information provided in the NIR is generally transparent and is, in most cases, sufficient to assess the inventory estimates. New Zealand has provided an extensive list of references to support the AD and EFs used. However, the consultation of those references did not always provide enough information (see paras. 46, 63 and 100 below). The ERT noted that the Party could improve the transparency of the information provided in some areas for every sector (e.g. see paras. 23 above and 31, 40, 41, 46, 48, 49, 59, 63, 99, and 122 below), including on the verification of emission estimates with data reported to the ETS.

Inventory management

25. New Zealand has no centralized archiving system. MfE estimates emissions for the solvent and other product use sector and the waste sector, and estimates emissions and

[6] <www.mfe.govt.nz/publications/climate>.

removals from the LULUCF sector. The Ministry of Economic Development is responsible for compiling the estimates for the energy and industrial processes sectors and the Ministry of Agriculture and Forestry is responsible for providing emission estimates for the agriculture sector. In response to a question raised by the ERT during the review, the Party explained that all of the data used for the estimation of emissions from the industrial processes, solvent and other product use, waste and LULUCF sectors, as well as the summary-level data for all sectors, are filed in the documentation system of MfE. Detailed data for the energy and agriculture sectors are archived at the Ministry of Economic Development and Ministry of Agriculture and Forestry, respectively. New Zealand recognized that the information on archiving was not very clear in the NIR and mentioned that more details will be provided in its next annual submission. The ERT encourages the Party to develop a centralized archiving system, accessible at a single location, as described in decision 19/CMP.1, annex, paragraph 17, for its next annual submission. In addition, the ERT recommends that the Party include more detailed information on the archiving system at each ministry, including the archiving of disaggregated EFs and AD and documentation on how they have been generated and aggregated for the preparation of the inventory, in its next annual submission. During the review, the ERT was provided with the requested additional archived information.

3. Follow-up to previous reviews

26. The ERT noted in particular the following improvements implemented following recommendations made in the previous review report:

(a) In the energy sector: the revision of data on coal consumption and mining (see para. 30(g) below); the use of a tier 2 method for estimating CH_4 and N_2O emissions from road transportation (see para. 52 below); the correction of the CH_4 EF for aviation gasoline and jet kerosene (see para. 55 below); and several corrections made by industry and identified through QA/QC procedures, described in detail in chapter 10 of the NIR;

(b) In the industrial processes sector: the use of improved assumptions for estimating emissions from refrigeration and air-conditioning equipment (see para. 68 below); the reallocation of emissions from soda ash use from the categories limestone and dolomite use and aluminium production to the soda ash use category (see paras. 58(b) and 60 below); the inclusion of an additional source of emissions from soda ash use; and the use of revised uncertainty values (see para. 59 below);

(c) In the agriculture sector: the inclusion of additional crops and the review and recalculation of the area of organic soils (see paras. 73 and 82 below);

(d) In the LULUCF sector: the return to a tier 1 methodology to estimate emissions from mineral soils following land-use change (see para. 93 below); and the development of a new yield table for post-1989 planted forest (see para. 127 below);

(e) In the waste sector: the use of improved AD for the meat industry (see para. 112(b) below); the correction of the commencement of operations of a CH_4 recovery system at one landfill site (see para. 112(a) below); and the correction of the AD for wastewater treatment plants (see para. 112(c) below).

4. Areas for further improvement identified by the expert review team

27. During the review, the ERT identified several issues for improvement. These are listed in table 6 below.

28. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 6 below.

B. Energy

1. Sector overview

29. In 2010, emissions from the energy sector amounted to 31,107.86 Gg CO_2 eq, or 43.4 per cent of total GHG emissions. Since 1990, emissions have increased by 32.6 per cent (7,649.39 Gg CO_2 eq). The key drivers for the rise in emissions between 1990 and 2010 are road transportation (emissions from which increased by 66.0 per cent, or 4,973.80 Gg CO_2 eq), public electricity and heat production (emissions from which increased by 55.0 per cent, or 1,906.95 Gg CO_2 eq) and fugitive emissions from the oil and gas system (emissions from venting and flaring and from geothermal systems increased by 207.1 per cent (586.43 Gg CO_2 eq) and 175.8 per cent (482.81 Gg CO_2 eq), respectively), which more than offset the decrease in emissions from manufacture of solid fuels and other energy industries (emissions from which decreased by 76.7 per cent, or 1,317.90 Gg CO_2 eq, owing primarily to the cessation of synthetic petrol production in 1997). Within the sector, 44.7 per cent of the emissions were from transport, followed by 21.5 per cent from energy industries, 16.2 per cent from manufacturing industries and construction and 9.4 per cent from other sectors. Fugitive emissions from oil and natural gas accounted for 6.5 per cent and those from solid fuels accounted for the remaining 1.8 per cent of the sectoral emissions.

30. New Zealand has made recalculations for the energy sector between its 2011 and 2012 annual submissions owing to the availability of revised AD and EFs, to rectify identified errors and in response to recommendations made in the 2011 annual review report. The impact of these recalculations on the energy sector is an increase in emissions for 2009 of 0.7 per cent (233.41 Gg CO_2 eq). The main recalculations took place in the following categories:

(a) Public electricity and heat production: the change of the CO_2 EF for gaseous fuels (natural gas) due to the revision of the AD resulted in the increase of the implied emission factor (IEF) reported in CRF table 1.A(a) (see para. 48 below). For example, for 2009, the CO_2 IEF increased from 52.90 t/TJ, reported in the 2011 annual submission, to 54.70 t/TJ, reported in the 2012 annual submission. On page 51 of its NIR, New Zealand has explained that the EF in question, which is the calculated weighted average for all of the gas production fields, fluctuates slightly from year to year mainly because of the different gas fields that were producing gas in each year. The carbon content of the natural gas produced from various gas fields has been provided in annex 2 to the NIR, and the ERT considers that this information is sufficient to explain the recalculation;

(b) Manufacturing industries and construction: recalculations were due to the revision of the AD for gaseous fuels mainly for chemicals, food processing, beverages and tobacco and other (especially for non-metallic minerals and other non-specified). As a result of the recalculations, the estimate of CO_2 emissions from gaseous fuels for manufacturing industries and construction decreased by 474.46 Gg. These recalculations have been explained in the NIR, but the ERT considers that the information provided is not sufficient to get a clear understanding of the change in AD, particularly in relation to manufacturing industries and construction. The ERT therefore recommends that New Zealand provide additional explanations for the recalculations for natural gas, including reallocations between categories, in its next annual submission;

(c) Petroleum refining: emissions from the combustion of refinery gas (obtained from the processing of crude oil), previously included with the emissions from gaseous fuels, have now been allocated to liquid fuels (see paras. 40 and 48 below). As a result, the estimate of CO_2 emissions from liquid fuels for 2009 increased from 135.31 Gg to 766.18 Gg, while the estimate of CO_2 emissions from gaseous fuels decreased from

762.16 Gg to 131.29 Gg. This reallocation did not involve a net change in the estimated CO_2 emissions from petroleum refining;

(d) Civil aviation: in response to a recommendation made in the previous review report, the CH_4 EF for civil aviation was revised (see para. 55 below) and the recalculations resulted in a decrease in the estimate of emissions from civil aviation for 2009 by 0.41 Gg CO_2 eq (0.04 per cent);

(e) Road transportation: the methodology used to estimate CH_4 and N_2O emissions from road transportation was changed from tier 1 to tier 2 and the recalculations resulted in a decrease in the estimate of CH_4 emissions for 2009 by 20.92 Gg CO_2 eq and an increase in the estimate of N_2O emissions for 2009 by 21.24 Gg CO_2 eq (see para. 52 below);

(f) Agriculture/forestry/fisheries: the estimate of CO_2 emissions from liquid fuels for 2009 decreased by 319.34 Gg (20.2 per cent) owing to revisions to the AD and the reallocation of some of the emissions to mining and construction (under other (manufacturing industries and construction)), resulting in an increase in the estimate of CO_2 emissions from mining by 133.85 Gg (27.0 per cent). New Zealand has reported some information on this recalculation in table 3.3.5 of its NIR, but the ERT considers that the transparency of the information could be improved by including the rationale for the recalculation and a comparison of the consumption of different fuels before and after the recalculation. The ERT therefore recommends that the Party improve the transparency of the information on recalculations in its next annual submission;

(g) The split of coal production between underground and surface mining was revised, resulting in a change to the estimate of fugitive emissions from coal production. The CH_4 EF for underground mining activities was also slightly revised. The estimate of emissions from coal mining and handling for 2009 increased by 93.43 Gg CO_2 eq (26.8 per cent) as a result.

31. The ERT considers that the information provided on recalculations undertaken for the energy sector is not completely transparent. The ERT therefore encourages New Zealand to improve the transparency of the information on recalculations in its next annual submission by including more background information on all recalculations made between the previous and the current annual submissions.

32. New Zealand's reporting of emissions from the energy sector is complete in terms of years and categories. The emission estimates have been prepared and reported in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC good practice guidance. Higher-tier methods and a combination of plant-specific, country-specific and default EFs from the Revised 1996 IPCC Guidelines and the IPCC good practice guidance were used to estimate emissions for key categories.

33. The latest external peer review of the energy sector inventory was conducted in late 2006 to ensure that the assumptions and methods used and the resulting estimates were reasonable. In response to a question raised by the ERT during the review, New Zealand explained that the data system for emissions from the energy sector is being redesigned to improve transparency and auditability, and that once the process has been completed, a full system review will be undertaken by an external reviewer. The ERT commends New Zealand for that plan and encourages the Party to report on the status of the redesign and the external review in its next annual submission, in order to improve transparency.

34. According to the NIR, on 1 July 2010 emissions from stationary combustion and the industrial processes sector began to be covered by New Zealand's ETS. In response to a question raised by the ERT during the review regarding use of ETS data in the national inventory, the Party clarified that ETS data will be used for the first time in its 2013 annual

submission. The ERT commends New Zealand for this improvement and encourages the Party, when using data from the ETS, to strengthen the QA/QC procedures to ensure that the data are in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, especially to avoid the omission or double counting of emissions and to ensure the consistency of the time series.

35. The ERT noted significant improvements in the methodologies used by the Party to estimate emissions from the energy sector, including: the use of a decision tree to guide the allocation of emissions from power-generating plants; the further disaggregation of the emissions from manufacturing industries and construction into specific subcategories, particularly for biomass burned as energy (reported aggregated in the subcategory other in previous annual submissions); the reallocation of the emissions from liquid fuels between mining and the primary industry; and the use of a tier 2 methodology to estimate non-CO_2 emissions from road transportation. The ERT commends New Zealand for these improvements and recommends that the Party continue improving its inventory for its next annual submission.

36. The ERT identified some inconsistencies between the information in the NIR and that in the CRF tables, including:

(a) The explanation of the difference in the estimates of CO_2 emissions for 2010 between the reference approach and the sectoral approach, which is different on page 46 of the NIR (where a difference of 4.7 per cent has been reported) from in CRF table 1.A(c) (where a difference of 4.5 per cent has been reported);

(b) The NIR indicates on page 52 that, for the Kapuni gas field, CO_2 emissions from the treated gas have been reported under manufacture of solid fuels and other energy industries, but on page 78 the NIR indicates that such emissions have been reported under fugitive emissions (in response to a question raised by the ERT during the review, the Party confirmed that the emissions have been reported under fugitive emissions);

(c) Page 47 of the NIR indicates that emissions from the natural gas used in methanol production have been reported under the industrial processes sector, but pages 59 and 60 indicate that all such emissions have been reported under the energy sector to maintain confidentiality (see para. 45 below);

(d) The CO_2 EF for diesel listed in annex 2 to the NIR (e.g., for 2010, a gross calorific value of 45.69 MJ/kg and a carbon content of 85.9 per cent (mass), leading to a calculated CO_2 EF of 68.94 t CO_2/TJ) is the same as the CO_2 IEF reported in CRF table 1.A(a) (68.94 t CO_2/TJ), but they should not be the same because the value in the CRF table includes the oxidation efficiency factor (0.99), while the data in the NIR should not include it.

37. In response to a question raised by the ERT during the review, New Zealand indicated that all of the errors and inconsistencies listed in paragraph 36 above will be resolved in its next annual submission. In order to improve transparency and consistency, the ERT recommends that the Party address the issues identified by the ERT for its next annual submission. The ERT encourages the Party to enhance its QA/QC procedures for the energy sector to minimize the inconsistencies for its next annual submission.

38. New Zealand has reported in the NIR that ETS data will be used to learn more about the properties of solid fuels and that the results might be used for its 2013 annual submission. Noting the generally low-level CO_2 IEF for solid fuel combustion (see para. 49 below) compared with the default EF from the Revised 1996 IPCC Guidelines, the ERT recommends that New Zealand review the CO_2 EF for solid fuels and report its findings in its next annual submission.

2. Reference and sectoral approaches

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

39. For 2010, CO_2 emission estimates calculated using the reference approach are 4.5 per cent higher than those calculated using the sectoral approach. The fluctuations in the difference between the two approaches are considerable over the time series, ranging from –8.5 per cent for 1992 to +4.5 per cent for 2010. According to pages 46 and 47 of the NIR, this is due largely to the inclusion of emissions from gas flared at offshore platforms during oil and gas production in the reference approach, while such emissions are considered fugitive in the sectoral approach and therefore not included in the emissions from fuel combustion. In response to a question raised by the ERT during the review, New Zealand provided the ERT with detailed information on the comparison of the reference and sectoral approaches when venting and flaring are excluded from the reference approach. The ERT recommends that the Party include the provided information in the NIR and, briefly, in the documentation box of CRF table 1.A(c) in its next annual submission.

40. Following the recommendation in the previous review report, the inconsistency in the treatment of refinery gas between the sectoral and reference approaches has been corrected for the Party's 2012 annual submission. The ERT commends the Party for this effort. The ERT noted that, in the reference approach, New Zealand has reported liquefied petroleum gas (LPG), a secondary fuel, together with natural gas liquids, a primary fuel. To improve transparency, the ERT recommends that New Zealand disaggregate LPG from natural gas liquids in its next annual submission.

International bunker fuels

41. Information on the fuel allocation between civil aviation and international aviation bunkers has been provided in section 3.3.3 of the NIR (on fuel combustion for transport), but not in section 3.2.2 (on international bunker fuels). The previous ERT considered that the information in those two sections should be cross-referenced in order to improve transparency. The present ERT reiterates the recommendation made in the previous review report that New Zealand improve the transparency of the information on domestic civil aviation and international aviation in its next annual submission.

42. The allocation of fuel between civil aviation and international aviation is based on the Delivery of Petroleum Fuels by Industry survey, which allocates the fuel sold to international or domestic aviation depending on the Good and Services Tax (GST) charged (GST is not charged on fuel sold for international flights).

43. The ERT identified an inconsistency in the information on consumption of jet kerosene for international bunkers between CRF table 1.A(b), where 32.95 PJ has been reported for 2010, and CRF table 1.C, which reports 33,945.85 TJ (or 33.95 PJ). In response to a question raised by the ERT during the review, New Zealand explained that the reference approach uses supply-side international transport figures and the sectoral approach uses demand-side international transport figures for consistency with each of their data sets. The ERT recommends that the Party address this inconsistency in its next annual submission.

44. The ERT noted that the CH_4 IEF for jet kerosene for international aviation has been reported as 1.9 kg/TJ in CRF table 1.C, which is higher than the value reported for civil aviation (0.48 kg/TJ) in CRF table 1.A(a). The ERT considered that the use of the former EF for jet kerosene for international aviation could potentially have led to an overestimation of the CH_4 emissions. In response to a question raised by the ERT during the review, the Party confirmed that the CH_4 EF used for international aviation was incorrect and will be revised for its next annual submission. The ERT also noted that New Zealand has reported, on page 373 of its NIR, table 1-48 of the Revised 1996 IPCC Guidelines as the source for

the EF for aviation fuel/jet kerosene. The ERT considers that the reference is incorrect, as that table refers to navigation. The ERT recommends that New Zealand, for its next annual submission, correct the CH_4 EF for jet kerosene for international aviation, correct the reference to the source of the value and recalculate the associated emissions.

Feedstocks and non-energy use of fuels

45. Natural gas is used to produce methanol, which is one of the main sources of stored carbon. The ERT identified an inconsistency in the reporting of the emissions from methanol production (see para. 36(c) above). In response to a question raised by the ERT during the review, New Zealand confirmed that the emissions from methanol production were reported under the energy sector for confidentiality reasons. The ERT recommends that New Zealand improve the consistency of the information on methanol production in its next annual submission.

Country-specific issues

46. Estimates of fugitive geothermal emissions are provided by the 12 geothermal power stations directly and the methodology used, described in the NIR, is based on gas sampling or spot measurements of CO_2 and CH_4 at each plant. The ERT commends the Party for using plant-specific EFs (referred to as unique emission factors (UEFs) in the NIR). However, the ERT noted that the information on the application of the five approved UEFs used for 2010 for the 12 plants could be more transparent, including an explanation of how the Party ensured the consistency of the time series. The ERT recommends that the Party improve the transparency of the information provided on the CO_2 and CH_4 EFs used for geothermal energy and on the consistency of the time series in its next annual submission. The ERT also recommends that the Party reassess the UEFs when more data become available and report its findings in the following annual submission.

3. Key categories

Stationary combustion: solid and gaseous fuels – CO_2

47. Weighted average EFs for gas fields were used to estimate CO_2 emissions from the stationary combustion of natural gas. The CO_2 IEFs for natural gas for public electricity and heat production reported in CRF table 1.A(a) (51.89–55.35 t/TJ based on gross calorific value (GCV), or 57.66–61.50 t/TJ based on net calorific value (NCV)) are higher than the default EF for natural gas from the Revised 1996 IPCC Guidelines (56.1 t/TJ). In response to the encouragement contained in the previous review report, the Party has included information on EFs and carbon content by gas field in annex 2 to the NIR. The ERT commends the Party for the improvement and encourages the Party to also provide the annual production share by gas field in its next annual submission.

48. The AD for natural gas were revised across the time series to correct miscalculations. In addition, emissions from the combustion of natural gas at a co-generation plant (Whareroa) have now been included under public electricity and heat production (previously reported under manufacturing industries and construction). Emissions from the combustion of refinery gas (previously reported under gaseous fuels in the sectoral approach) have now been reported under liquid fuels, as the emissions are implicitly included under liquid fuels in the reference approach. Overall, the estimate of CO_2 emissions from gaseous fuel combustion for 2009 has decreased by 774.20 Gg (10.1 per cent) between the 2011 and 2012 annual submissions. In order to improve transparency, the ERT recommends that the Party include more detailed information on this noticeable recalculation, for example by including tables that compare the AD and estimated emissions for the appropriate categories, in its next annual submission.

49. Country-specific CO_2 EFs were used to estimate emissions from solid fuels across all subcategories of stationary combustion. The ERT noted that the overall CO_2 IEF for solid fuels (89.04–89.59 t/TJ based on GCV, or 93.81–94.31 t/TJ based on NCV) is below the range of default values for the CO_2 EFs for solid fuels from table 1-1 of the Revised 1996 IPCC Guidelines (94.6–106.7 t/TJ). The ERT also noted that the country-specific EFs were sourced from a study published in 1993,[7] and that New Zealand identified CO_2 emissions from the use of solid fuels for manufacturing industries and construction as a key category. In response to a question raised by the ERT during the review, New Zealand clarified that data on EFs by mine are not available to the inventory team and that this is an improvement that it hopes to implement by its 2013 annual submission (New Zealand's ETS requires coal mining companies to report, by mine, estimates of the emissions that would result from the combustion of all of the coal mined). In order to improve transparency, the ERT strongly recommends that New Zealand include additional information on how the CO_2 EFs used for solid fuels were calculated and their applicability to all solid fuels used in New Zealand across the entire time series in its next annual submission. If the Party uses mine-specific CO_2 EFs for solid fuels for its next annual submission, the ERT recommends that it ensure the consistency of the time series and explain any recalculations in its next annual submission.

Road transportation: liquid fuels – CO_2, CH_4 and N_2O[8]

50. Country-specific CO_2 EFs based on information provided by the New Zealand Refining Company were used to estimate CO_2 emissions from road transportation. The Party has reported the time series of GCVs and carbon content by liquid fuel in annex 2 to the NIR. The ERT commends the Party for the improvement in transparency and recommends that the Party cross-check the data presented in the NIR with the data reported in the CRF tables (see para. 36 above).

51. The previous review report indicated that New Zealand had overestimated the emissions from transport for previous annual submissions, up to its 2010 annual submission, owing to the inclusion of liquid fuels sold by resellers, which included fuel sold on to other businesses and farms and used by off-road machinery. In the previous review report it was recommended that New Zealand provide information on the impact of the reallocation of those emissions on other categories and subcategories. However, the ERT considers that this recommendation has not been addressed in the Party's 2012 annual submission. In response to a question raised by the ERT during the review, the Party confirmed that the impact of the recalculations due to the revisions to the Annual Liquid Fuel Survey (ALFS) will be tabulated and included in section 3.3.3 of its 2013 annual submission. The ERT reiterates the recommendation made in the previous review report that the Party include transparent information on the allocation of emissions from liquid fuels sold by resellers in its next annual submission.

52. In response to a recommendation made in the previous review report, New Zealand has moved from its previous tier 1 methodology to a tier 2 methodology to estimate CH_4 and N_2O emissions from road transportation. The ERT commends the Party for this improvement. The Party collected information on vehicle kilometres travelled by vehicle class and fuel type for the period 2001–2010, while for prior to 2001 an overlap method (splicing method) was developed following the IPCC good practice guidance, in order to ensure time-series consistency and accuracy. Generally, the shift in methodology has resulted in the estimates of emissions for up to 2005 increasing and those for after 2005

[7] Baines JT. 1993. *New Zealand Energy Information Handbook*. Christchurch: Taylor Baines and Associates.

[8] Not all emissions related to all gases under this category are key categories, particularly CH_4 emissions. However, since the issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

decreasing. In response to a question raised by the ERT during the review, more detailed information on vehicle fleet and the EFs used was provided. In order to improve transparency, the ERT recommends that the Party include that information and additional information on the overlap method used in its next annual submission.

Oil and natural gas – CO_2 and CH_4

53. The ERT noted that New Zealand has continued to report under flaring (combined) fugitive emissions from oil exploration and production, natural gas exploration and production/processing and from venting in CRF table 1.B.2. However, the ERT noted that the NIR indicates that individual gas field operators provide information on the amount of gas extracted, vented, flared and used on site at each gas field. In response to a question raised by the ERT during the review, the Party clarified that it will endeavour to be able to include disaggregated estimates of emissions from venting and flaring in its next annual submission. The ERT reiterates the recommendation made in the previous review report that the Party report estimates of emissions from venting and flaring separately. In addition, the ERT encourages the Party to report estimates of emissions from oil exploration and production and natural gas exploration and production/processing separately in its next annual submission.

4. Non-key categories

Stationary combustion: biomass – CH_4 and N_2O

54. In response to a question raised by the ERT during the review, New Zealand indicated that CH_4 and N_2O emissions resulting from the use of biogas recovered from the treatment of wastewater from a dairy plant to operate boilers had not been reported. The ERT considered that to represent a potential underestimation of emissions. In response to the list of potential problems and further question raised by the ERT during the review week, New Zealand submitted revised emission estimates, including estimates of CO_2, CH_4 and N_2O emissions from the use of biogas to operate boilers for the entire time series (1990-2010). The CO_2 emissions were reported as a memo item under the energy sector and the CH_4 and N_2O emissions were reported under "other non-specified" under other (manufacturing industries and construction). For 2010, the additional estimates resulted in an increase in the estimate of total GHG emissions by 0.03 Gg CO_2 eq. The ERT considers the potential underestimation to have been resolved and strongly recommends that New Zealand continue to report estimates of these emissions in its next annual submission.

Civil aviation: liquid fuels – CH_4

55. In response to a recommendation made in the previous review report concerning the incorrect use of the CH_4 EF for jet kerosene and aviation gasoline (1.90 kg CH_4/TJ for both fuels), which resulted in an overestimation of the CH_4 emissions from civil aviation, New Zealand has recalculated the estimates of CH_4 emissions from civil aviation. The ERT commends the Party for this improvement.

C. Industrial processes and solvent and other product use

1. Sector overview

56. In 2010, emissions from the industrial processes sector amounted to 4,778.08 Gg CO_2 eq, or 6.7 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 31.00 Gg CO_2 eq, or 0.04 per cent of total GHG emissions. Since 1990, emissions have increased by 41.0 per cent in the industrial processes sector and decreased by 25.4 per cent in the solvent and other product use sector. The key drivers for

the rise in emissions in the industrial processes sector are the increases in emissions from refrigeration and air-conditioning equipment (by 1,006.66 Gg CO_2 eq, from being reported as not applicable ("NA") and not occurring ("NO") for the base year) and from iron and steel production (by 340.15 Gg CO_2 eq, or 26.0 per cent), which more than offset the decrease in emissions from aluminium production (by 463.27 Gg CO_2 eq, or 42.9 per cent).

57. In 2010, within the industrial processes sector, 34.5 per cent of the emissions were from iron and steel production, followed by 21.1 per cent from refrigeration and air-conditioning equipment, 12.9 per cent from aluminium production and 12.2 per cent from cement production. Ammonia production accounted for 8.1 per cent and hydrogen accounted for 5.1 per cent of the sectoral emissions. The remaining 6.2 per cent were from other subcategories under mineral products and consumption of halocarbons and SF_6. The contribution of the industrial processes sector to the Party's total GHG emissions in 2010 (6.7 per cent) is relatively small compared with that of the energy and agriculture sectors (43.4 per cent and 47.1 per cent, respectively). However, there has been an increasing trend in the emissions from the industrial processes sector since the base year, with emissions peaking in 2010 (there was another peak in 2007). Emissions from solvent and other product use contributed little to the total national emissions when compared with the other sectors.

58. New Zealand has made recalculations for the industrial processes sector between its 2011 and 2012 annual submissions to address recommendations in the previous review report and following the revision of AD and EFs. The impact of these recalculations on the industrial processes sector is an increase in the estimate of emissions for 2009 of 0.1 per cent (4.80 Gg CO_2 eq). The main recalculations took place in the following categories:

(a) Refrigeration and air-conditioning equipment: the estimate of HFC emissions for 2009 decreased by 8.31 Gg CO_2 eq (0.9 per cent). The revisions were due to the inclusion of cars with an engine size of less than 1,000 cm^3 in the estimation of emissions from mobile air-conditioning and to improvements in the estimation of HFC-134a stocks;

(b) Soda ash use: CO_2 emissions, previously reported as included elsewhere ("IE") for confidentiality reasons (and reported under limestone and dolomite use), have been reported in the 2012 annual submission (5.10 Gg), although the AD have still been reported as confidential ("C");

(c) Ammonia production: the estimate of CO_2 emissions for 2009 increased by 4.51 Gg CO_2 eq (1.2 per cent) as a result of the revision of the EFs used;

(d) Aluminium production: the estimate of CO_2 emissions for 2009 increased by 2.39 Gg CO_2 eq (0.5 per cent) as a result of the revision made to the estimate of CO_2 emissions from anode consumption.

59. Following a recommendation made in the previous review report, New Zealand has reported new, more realistic uncertainty values and not reported 0 per cent uncertainty for any AD. The Party used the default uncertainty values from the IPCC good practice guidance for cement production (±1 per cent for AD and ±1 per cent for the CO_2 EF) and country-specific uncertainty values for glass production (±5 per cent for AD and ±7 per cent for the CO_2 EF). For ammonia production, the Party used the default values contained in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) (±2 per cent for AD and ±6 per cent for the CO_2 EF) because no default values are provided in the IPCC good practice guidance, while for methanol production the Party used the same uncertainty for the AD as for ammonia production (±2 per cent), because no default values are available, and a value of ±80 per cent for the CH_4 EF, without quoting the source. For iron and steel production, the Party used the default uncertainty values from the IPCC good practice guidance for AD (±5 per cent) and the CO_2 EF (±7 per cent). For aluminium production, the default uncertainty

value from the IPCC good practice guidance was used for AD (±5 per cent), while no information has been provided on the source of the reported uncertainty of the CO_2 EF (±2 per cent). The ERT considers the revised uncertainty estimates to be in line with the UNFCCC reporting guidelines. In order to improve transparency, the ERT recommends that the Party clearly provide the source of every uncertainty value reported in its next annual submission.

60. The ERT identified six categories in the industrial processes sector for which the AD were reported as "C" owing to the limited number of producers/consumers: cement production, limestone and dolomite use, soda ash use, glass production, methanol and steel (steel slab production). For cement production, limestone and dolomite use, soda ash use and steel, New Zealand has reported CO_2 emission estimates for each category, but has reported the IEFs as "C". For glass production, CO_2 emissions have been reported as "IE" and they have been reported under soda ash use. There is only one methanol producer in the country, hence CH_4 emissions from methanol production have been reported as "IE" and the Party has reported them under the energy sector, specifically under manufacturing industries and construction (see para. 70 below). In response to questions raised by the ERT during the review, the confidential data were made available. Considering that the emission estimates for two key categories in the industrial processes sector were maintained as confidential (steel (see para. 64 below) and cement production), the ERT recommends that New Zealand continue its efforts to improve the transparency of its reporting by providing more detailed information in the NIR, while maintaining the confidentiality of the sensitive data, in its next annual submission.

61. New Zealand has reported both actual and potential emissions from consumption of halocarbons and SF_6 in CRF tables 2(I) and 2(II). The potential emissions were estimated using a tier 1 methodology. For HFC emissions, the potential to actual ratio varied from 1.00 for HFC-23 to 5.35 for HFC-227ea. For PFC emissions, the Party has only reported actual and potential estimates for hexafluoroethane (C_2F_6), for which the ratio was equal to 1.00. The ratio of potential emissions to actual emissions was the highest for SF_6, at 5.53. In order to improve transparency, the ERT recommends that the Party explain the circumstances that led to the highest emission ratios in its next annual submission.

62. New Zealand has reported in the NIR that it performed tier 1 QA/QC checks for the key categories, including CO_2 emissions from iron and steel production, in the industrial processes sector. The ERT noted that tier 1 QA/QC checks are required for all categories, not just for the categories identified as key. However, the ERT noted that the verification exercise described by the Party fulfils the requirements of a tier 2 QA/QC check, which is encouraged for key categories, and recommends that the Party correct the tier reported for its QA/QC procedures in its next annual submission. The Party has reported that the estimates of CO_2 emissions from mineral products and iron and steel production were verified using data from its ETS. However, the ERT noted that the results of the checks and verification have not been reported in the NIR. In response to a question raised by the ERT during the review, the Party explained that some of this information is confidential. In order to improve transparency, the ERT recommends that New Zealand provide information on QA/QC checks and verification procedures performed, while maintaining the confidentiality of sensitive data, in its next annual submission.

63. The ERT noted that some of the assumptions used to calculate emission estimates have not been provided directly in the NIR, rather references to other external documents have been provided. In response to a question raised by the ERT during the review, New Zealand provided more information on the relevant assumptions, which was necessary to appropriately analyse the emission estimates provided for key categories like iron and steel production, aluminium production and refrigeration and air-conditioning equipment. The Party explained that some of this information is confidential. The ERT commends the Party for providing the requested information during the review, and recommends that the Party

report this information, while maintaining the confidentiality of sensitive data, in the NIR of its next annual submission.

2. Key categories

Iron and steel production – CO_2

64. New Zealand explained that there are only two steel producers in the country, so the relevant AD and EFs have been reported as "C" (see para. 60 above). For one of the two steel plants, CO_2 emissions were estimated for the entire time series using a tier 2 method and a plant-specific CO_2 EF. For the second one (Pacific Steel), CO_2 emissions for 2000 onwards were also estimated using a tier 2 method and a plant-specific CO_2 EF but, owing to the limited data for the period 1990–1999, emissions for that period were calculated using the production volume and average IEF for the plant for the period 2000–2008. The ERT noted that New Zealand has followed the recommendation made in the previous review report and improved the transparency of its reporting by including more detailed descriptions of assumptions and calculations for the emission estimates for steel production. However, the ERT considered that the information on Pacific Steel was not completely transparent. In response to a question raised by the ERT during the review, the Party transparently explained the assumptions made to estimate emissions in the period 2000–2007, including billet production and stock changes. The ERT recommends that the Party include the information provided in its next annual submission, in order to improve the transparency of its reporting.

Aluminium production – CO_2 and PFCs

65. The ERT noted an increase in the AD for hot metal aluminium production, from 270.80 kt in 2009 to 343.98 kt in 2010, and a corresponding increase in the associated CO_2 emissions, from 453.90 Gg CO_2 in 2009 to 575.00 Gg CO_2 in 2010. At the same time, PFC emissions from hot metal aluminium production decreased from 44.82 Gg CO_2 eq to 40.59 Gg CO_2 eq. As a result, the tetrafluoromethane (CF_4) and C_2F_6 IEFs for 2009 (0.022 kg/t and 0.0026 kg/t, respectively, as reported in CRF table 2(II).C) were different from those for 2010 (0.015 kg/t and 0.0019 kg/t, respectively), but the Party has not included any explanations for this in the NIR. In response to a question raised by the ERT during the review, New Zealand explained that the variation was due to the failure of the transformer at the aluminium smelter in November 2008 and provided detailed explanations to justify the variation in the IEFs between 2009 and 2010. The ERT found the explanations to be sufficient and recommends that the Party include this and, if appropriate, additional information in the NIR in relation to any change in the emission trend, in its next annual submission. The ERT also noted that the reported IEFs for CF_4 and C_2F_6 are significantly lower than the default EFs contained in the IPCC good practice guidance (in table 3.10, on page 3.44, the default EFs for the calculation of PFC emissions from aluminium production (centre-worked prebake technology) are 0.31 kg/t for CF_4 and 0.04 kg/t for C_2F_6), but no information thereon has been reported in the NIR for confidentiality reasons. In response to a question raised by the ERT during the review, the Party provided information on hot metal production, CO_2 emissions from carbon anode oxidation, and CF_4, C_2F_6 and CO_2 emission from soda ash consumption. The ERT commends the Party for providing this information.

66. The uncertainty associated with the PFC EF for aluminium produced with the use of centre-worked prebake technology was estimated as ±30 per cent. The assumptions made during the uncertainty analysis were based on a 2006 report by CRL Energy and have not been provided in the NIR. In response to questions raised by the ERT during the review, New Zealand explained the assumptions used to estimate the uncertainty. The Party also explained that the assumptions did not take into consideration the results of the analysis

performed by inventory compilers together with the aluminium company in 2010, but that it will review the assumptions and, if appropriate, revise the uncertainty estimates in its next annual submission. The ERT recommends that the Party include information on the assumptions used to estimate the uncertainty of the PFC EFs for aluminium production and, if appropriate, explain any revised uncertainty values in its next annual submission.

Consumption of halocarbons and SF_6 – HFCs and PFCs

67. The transparency of the reporting on refrigeration and air-conditioning equipment has been slightly improved by the inclusion in the NIR of additional data on annual sales of new refrigerants. However, the Party was not able to report HFC emissions from refrigeration and air-conditioning equipment separately for domestic refrigeration, commercial refrigeration, transport refrigeration and industrial refrigeration, as encouraged in the previous review report. In the 2012 annual submission, all emissions have been reported under domestic refrigeration. In response to a question raised by the ERT during the review, the Party explained that the provision of separate estimates for these categories is not a priority. Considering that this is a key category, the ERT reiterates the encouragement to the Party to provide separate estimates of emissions for domestic, commercial, transport and industrial refrigeration in its next annual submission.

68. New Zealand has improved the accuracy of the industrial gas estimates and recalculated the HFC-134a data set for stationary refrigeration and air-conditioning equipment, providing more accurate data from a newly introduced model. For mobile air-conditioning, the emissions from cars with an engine size of less than 1,000 cm^3 have been included in the inventory. Assumptions related to HFC-32, HFC-125 and HFC-143a emissions from stationary refrigeration and air-conditioning equipment have also been introduced in the Party's 2012 annual submission.

69. The ERT considers the information reported on PFC emissions from refrigeration and air-conditioning equipment to be limited. The ERT noted that New Zealand, in CRF table 2(II).F, has reported only C_2F_6 emissions from stocks and has reported the AD, IEF and emission estimates for octafluoropropane as "NA", "NE" or "NO". In order to improve transparency, the ERT recommends that the Party include additional information on PFC emissions from refrigeration and air-conditioning equipment in the NIR and in the relevant CRF table in its next annual submission.

3. Non-key categories

Other (chemical industry) – CO_2 and CH_4

70. New Zealand has reported the AD for methanol production as "C" in CRF table 2(I).A–G and the CH_4 emissions as "IE" in CRF tables 2(I) and 2(I).A–G. The Party has explained on page 96 of its NIR that CO_2 and non-CO_2 emissions from methanol production have been reported under the energy sector (under manufacturing industries and construction, specifically under chemicals), owing to business data confidentiality (there is only one methanol producer in New Zealand). However, the ERT noted that the yearly methanol production is publicly available on the company's website.[9] In response to a question raised by the ERT during the review, the Party explained that while the data on methanol production are publicly available, the Party has used natural gas consumption to estimate emissions, and this consumption and the associated emissions are considered confidential. The ERT recommends that the Party report this explanation in its next annual submission.

[9] <http://www.methanex.com/investor/documents/>. For example, see the 2011 annual report, available at <http://www.methanex.com/investor/documents/2012/Annual%20Report.pdf>, in which the capacity and the production of the plants in New Zealand in 2011 are reported.

71. According to page 59 of the NIR, methanol production is the largest source of fuel combustion emissions reported for chemicals. The ERT noted that if the process emissions from methanol production were reported under the industrial processes sector, the category other (chemical industry) could potentially become a key category. In response to a question raised by the ERT during the review, New Zealand explained that it is working with the methanol producer to attempt to resolve the confidentiality issues (see para. 70 above). The ERT recommends that the Party continue to work with the producer to resolve the confidentiality issues and report on the status of this work in its next annual submission.

D. Agriculture

1. Sector overview

72. The agriculture sector is the main sector in the GHG inventory of New Zealand. In 2010, emissions from the agriculture sector amounted to 33,748.44 Gg CO_2 eq, or 47.1 per cent of total GHG emissions. Since 1990, emissions have increased by 9.4 per cent (2,893.17 Gg CO_2 eq). The key drivers for the rise in emissions are the 96.6 per cent (4,838.24 Gg CO_2 eq) increase in CH_4 emissions from enteric fermentation for dairy cattle and the 25.5 per cent (2,013.9 Gg CO_2 eq) increase in N_2O emissions from agricultural soils, which more than offset the 34.3 per cent (4,049.69 Gg CO_2 eq) decrease in CH_4 emissions from enteric fermentation for sheep. The increase in emissions from agricultural soils since 1990 is due largely to the increase by 462 per cent in the amount of synthetic nitrogen (N) fertilizer applied to soils between 1990 and 2010. The increase in emissions from enteric fermentation is due largely to the 72 per cent increase in the dairy cattle population over the time series. Since 1990, the profitability of dairy products has become relatively higher, while the profitability of sheep products has reduced. Within the sector, 68.6 per cent of the emissions were from enteric fermentation, followed by 29.4 per cent from agricultural soils and 2.0 per cent from manure management. The remaining emissions were from field burning of agricultural residues (0.07 per cent) and from prescribed burning of savannas (0.03 per cent). Agriculture is one the main economic sectors in New Zealand (accounting for 58 per cent of the total value of the exported merchandise).

73. New Zealand has made recalculations for the agriculture sector between its 2011 and 2012 annual submissions following: changes in AD; improvements to the country-specific model used to estimate emissions from enteric fermentation, manure management and agricultural soils; the revision of the N excretion rates for goats, swine and poultry; the revision of the live weights of cattle and sheep; the revision of the proportions of excreta treated by different animal waste management systems, particularly the new information for poultry and swine; new methodologies and inclusion of new crops to estimate emissions from N-fixing crops and from crop residue; changes to area of cultivated organic soil in agriculture; and changes in the EFs and methodology used to estimate emissions from prescribed burning of savannas and field burning of agricultural residues. The impact of these recalculations on the agriculture sector is an increase in the estimate of emissions for 2009 of 2.0 per cent (667.47 Gg CO_2 eq). The main recalculations took place in the following categories:

(a) Enteric fermentation for non-dairy cattle: the CH_4 emission estimate for 2009 increased by 6.6 per cent (320.17 Gg CO_2 eq);

(b) Enteric fermentation for sheep: the CH_4 emission estimate for 2009 increased by 4.7 per cent (354.56 Gg CO_2 eq);

(c) Manure management for swine: the CH_4 emission estimate for 2009 decreased by 70.3 per cent (95.31 Gg CO_2 eq);

(d) Manure management for poultry: the CH_4 emission estimate for 2009 decreased by 79.1 per cent (35.51 Gg CO_2 eq);

(e) Direct soil emissions: the N_2O emission estimate for 2009 decreased by 4.9 per cent (76.77 Gg CO_2 eq);

(f) Pasture, range and paddock manure: the N_2O emission estimate for 2009 increased by 2.3 per cent (125.33 Gg CO_2 eq);

(g) Prescribed burning of savannas: the GHG emission estimate for 2009 increased by 463.8 per cent (4.80 Gg CO_2 eq).

74. Following the recommendation made in the previous review report, New Zealand has reported in the NIR category-specific information on the country-specific EFs and parameters used to estimate emissions from the agriculture sector and justifications for the differences between the EFs used and the default EFs contained in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The ERT commends New Zealand for the improved transparency.

75. In response to a question raised by the ERT during the review, New Zealand explained its intention to continuously improve the inventory for the agriculture sector, particularly with respect to the major categories of emissions, including the four main livestock species (dairy cattle, non-dairy cattle, sheep and deer). Improvements are already being implemented and will continue in the future, including, for instance, the availability of information on birth and death dates and rates, which will result in recalculations of the estimates of emissions from enteric fermentation, manure management and agricultural soils for the above-mentioned livestock categories. The ERT commends the Party for its planned initiatives and improvement plans and encourages it to report on the progress of such activities in its next and future annual submissions.

2. Key categories

Enteric fermentation – CH_4

76. In line with the IPCC good practice guidance, New Zealand applied tier 2 methods using country-specific CH_4 EFs to estimate emissions from dairy cattle, non-dairy cattle, sheep and deer. Emissions from other livestock were estimated using tier 1 methods and default EFs (horses, alpaca and swine) or a country-specific EF (goats).

77. Following the recommendation made in the previous review report, New Zealand has reported more detailed information on the digestibility of cattle feed in the NIR. In response to a question raised by the ERT during the review, New Zealand provided a report containing more information on the digestibility of feed.[10] The Party explained that the document is currently being updated, to reflect the improvements made to the tier 2 methodology. The ERT recommends that the Party include a summary of this information in its next annual submission, in order to improve the transparency of its reporting. New Zealand also explained that it is currently scoping a project to review pasture quality across the entire country. Depending on the successful implementation of the project, the research results may be incorporated into the Party's 2014 or subsequent annual submissions. The ERT commends New Zealand for its efforts to continuously improve the transparency and accuracy of the inventory and encourages it to provide information on new advances in its next and future annual submissions.

[10] Detailed methodologies for agricultural greenhouse gas emission calculation, Version 1.0. MAF Technical Paper No: 2011/40. Ministry of Agriculture and Forestry. April 2011. Available at <http://www.mpi.govt.nz/news-resources/publications?title=Detailed%20methodologies%20for%20agricultural%20greenhouse%20gas%20emission%20calculation%20version>.

78. Recalculations were carried out owing mainly to the use of new AD related to the (increased) live weights of beef cattle and sheep and to the improvement of the tier 2 model used, which resulted in increased emission estimates.

Manure management – CH_4 and N_2O

79. For the estimation of CH_4 emissions from manure management, New Zealand used a tier 2 approach and a country-specific method to estimate N excretion for cattle, sheep and deer. For other minor livestock categories, New Zealand applied a tier 1 method and, for the first time, in its 2012 annual submission, country-specific EFs for swine and poultry. In the absence of default EFs from the IPCC good practice guidance for goats, horses and alpaca, New Zealand used country-specific EFs obtained using expert judgement to estimate emissions for those animals. The ERT considers the Party's approaches to be in line with the IPCC good practice guidance.

80. Regarding the estimates of CH_4 emissions from manure management for ostriches and emus, New Zealand has reported that there are no specific relevant methodologies in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance. However, the Party indicated that it may include corresponding emission estimates in its 2013 or 2014 annual submission. The ERT encourages the Party to estimate these emissions and explain the methodology used in the annual submission in which they are reported for the first time. The ERT also encourages the Party to explore the possibility of using the method on page 4.20 of the IPCC good practice guidance for characterizing animals without emission estimation methods and to report the results of the analysis in its next annual submission.

81. New Zealand has developed a country-specific N_2O EF based on the country-specific average nitrogen excretion rate per head (Nex) for goats which is based on the different population characteristics over the time series. The EF presents small inter-annual variations, since it is based on the different proportions of dairy and other goats in the herd over the entire time series. Updated country-specific EFs were applied to each year and, therefore, recalculations were carried out for the entire time series. Nevertheless, in response to a question raised by the ERT during the review, New Zealand explained that Statistics New Zealand collects statistics on the total goat population only and does not distinguish between dairy and non-dairy goats (one of the main characteristics used to estimate Nex). However, the Party also explained that such a differentiation is available for 1990 and 2009 and that it performed interpolation and extrapolation to obtain data for the missing years (1991–2008 and 2010). The ERT encourages the Party to seek ways of verifying the proportion of dairy and non-dairy goats, in order to avoid using interpolations, extrapolations and assumptions, for its next annual submission.

Direct soil emissions – N_2O

82. In its 2012 annual submission, New Zealand has reported an area of cultivated histosols (organic soils) of 8,019 ha/year for the entire time series 1990–2010, compared with 10,109 ha/year reported in its 2011 annual submission. In response to a recommendation in the 2010 review report to harmonize the definition of organic soils between the LULUCF and the agriculture sectors, the Party commissioned a study.[11] The study estimated that the area of organic soils and mineral soils with peat layers that were cultivated for agriculture was 160,385 ha. The study recommended that New Zealand continue to use the assumption that 5.0 per cent of the potentially cultivated organic soils and mineral soils with peaty layers are cultivated annually. In response to a question raised by the ERT during the review, the Party explained that more work has been commissioned

[11] Dresser M, Hewitt A, Willoughby J, Bellis S. 2011. *Area of organic soils*. Report prepared for the Ministry of Agriculture and Forestry by Landcare Research. Wellington: Ministry of Agriculture and Forestry.

to improve the understanding of the rates of pasture renewal and cultivation since 1990. The ERT commends New Zealand for harmonizing the definition of organic soil between the LULUCF and agriculture sectors, and encourages New Zealand to continue this research and, when completed, report back on the findings in the subsequent annual submission.

3. Non-key categories

Prescribed burning of savannas – CH_4 and N_2O

83. Some improvements to the AD, methodology and country-specific EFs used to estimate emissions from prescribed burning of savannas have been introduced for the Party's 2012 annual submission, in accordance with the IPCC good practice guidance. For example, the area of savanna burned reported in the previous annual submission (2.26 kha for 2009) was based on the fraction of the total grassland area burned. However, in the Party's 2012 annual submission, that value has been replaced by the total area of tussock grassland actually burned (6.81 kha for 2009). According to expert judgement, the best estimate for the tussock grassland burned from 1990 to 2004 is the total area granted official consent to be burned under New Zealand's Resource Management Act 1991. In 2005, however, Statistics New Zealand started to collect data on the tussock grassland actually burned, and these data for 2005 onwards have been included in the 2012 annual submission. The ERT commends the Party for the improvement and recommends that New Zealand explain how the consistency of the time series 1990–2010 has been ensured in its next annual submission.

Field burning of agricultural residues – CH_4 and N_2O

84. For its 2012 annual submission, New Zealand used for the first time a country-specific methodology for estimating emissions from field burning of agricultural residues. The AD and country-specific EFs have been reported in section 6.7.3 of the NIR. The ERT commends the Party for this improvement, which resulted in the recalculation of the estimates of emissions for this category for the entire time series 1990–2009.

E. Land use, land-use change and forestry

1. Sector overview

85. In 2010, net removals from the LULUCF sector amounted to 19,980.46 Gg CO_2 eq. Since 1990, net removals have decreased by 27.0 per cent (7,407.85 Gg CO_2 eq). The key drivers for the decrease in removals are the increased harvesting of plantations and deforestation. Between 2009 and 2010 net removals decreased by 6,253.64 Gg CO_2 eq (23.8 per cent), driven by an increase in the harvesting of pre-1990 planted forest and increased new planting. Within the sector, net removals occurred from forest land only (23,539.13 Gg CO_2 eq). All of the other land categories were net sources of emissions, the largest one being grassland (contributing 3,120.84 Gg CO_2 eq). The net emissions from cropland, settlements and other land amounted to 392.11 Gg CO_2 eq, 34.89 Gg CO_2 eq and 10.84 Gg CO_2 eq, respectively. The overall net removals resulted from net CO_2 removals of 20,048.90 Gg CO_2 eq, net CH_4 emissions of 53.83 Gg CO_2 eq and net N_2O emissions of 14.61 Gg CO_2 eq.

86. New Zealand has made several recalculations for the LULUCF sector between its 2011 and 2012 annual submissions owing to: revised AD (improvements made to the land-use maps; the reallocation of land to the different land-use categories; updated AD for biomass burning; and the inclusion of new AD for dolomite and liming); improved EFs (EFs derived from yield tables for planted forest and EFs for wildfires); and updated

methodologies (use of the Forest Carbon Predictor, version 3). The overall effect of the recalculations on the LULUCF sector is an increase in the estimated net removals for the base year (by 3,937.23 Gg CO_2 eq, or 16.8 per cent) and a decrease in the estimated net removals for 2009 (by 448.65 Gg CO_2 eq, or 1.7 per cent). The Party has presented explanations and justifications for all recalculations in its 2012 annual submission. Compared with the estimates reported in the Party's 2011 annual submission, the impact of the recalculations on the main land categories is as follows:

(a) For forest land, an increase in the estimate of net removals by 2.0 per cent for 2009;

(b) For cropland, an increase in the estimate of emissions by 17.4 per cent for 2009;

(c) For grassland, an increase in the estimate of emissions by 37.4 per cent for 2009 and a change from an estimate of net emissions (1,309.09 Gg CO_2 eq) to an estimate of net removals (–1,075.37 Gg CO_2 eq) for 1990;

(d) For settlements, an increase in the estimated emissions by 1,301.9 per cent for 2009 (from 2.49 to 34.93 Gg CO_2 eq) and a change from an estimate of net removals (–7.19 Gg CO_2 eq) to an estimate of net emissions (97.68 Gg CO_2 eq) for 1990;

(e) For other land, an increase in the estimated emissions by 143.9 per cent for 2009.

87. The ERT commends the Party for providing clearer definitions of all land-use categories and subcategories in its 2012 annual submission, thereby improving the transparency of the reporting compared with the 2011 annual submission. In response to a question raised by the ERT during the review, New Zealand explained that the improved definitions did not affect the previous land-use mapping. Specifically, the ERT commends New Zealand for the clear provision of the definitions of all of the subcategories considered under forest land (natural forest, pre-1990 planted forest and post-1989 forest), cropland (annual and perennial), grassland (high-producing, low-producing and with woody biomass) and wetlands, settlements and other land.

88. The ERT noted that New Zealand estimated all of the emissions from the conversion of natural forest to grassland, wetlands, settlements and other land using the biomass carbon stock value before conversion of 173 t carbon (C)/ha through to the year 2007 (NIR table 7.1.3). For 2008 onward, the Party disaggregated the natural forest into shrub and tall forests, assuming carbon stocks of 57.1 t C/ha and 217.9 t C/ha, respectively. However, the Party has not applied the same disaggregation to the conversion of natural forest prior to 2008. In response to a question raised by the ERT during the review, the Party stated that it has not yet recalculated the emissions pre-2008, and that these recalculations are planned and scheduled for implementation in its 2014 annual submission. The ERT recommends that the Party ensure a consistent time series and, if appropriate, recalculate the emission estimates for this conversion in the next annual submission.

89. In 2010, cropland covered 1.6 per cent of the total national territory. Most of the cropland consisted of annual crops (92.2 per cent). Since 1990, slight changes in the cropland area have occurred (in 1990 cropland accounted for 1.5 per cent of the country's land). Over the period 1990–2010 there was a slight increase in the area of cropland remaining cropland (6.8 per cent) and a similar decrease in the area of land converted to cropland (6.7 per cent). In addition, small changes in the area of cropland allocated to annual and perennial crops have occurred over the entire time series since 1990. Estimated emissions from cropland decreased by 30.9 per cent between 1990 and 2010.

90. Grassland changed from a net sink in the base year (1,075.37 Gg CO_2 eq net removals) to a net source of emissions from 1995 onwards. In 2010 the change in the

estimated net emissions from grassland, relative to the base year, was 390.2 per cent. This increase was due primarily to deforestation and the conversion of plantation forests to grassland in the five years prior to 2008.

91. The emissions and removals from the LULUCF sector were estimated using a data collection and modelling programme called the Land Use and Carbon Analysis System (LUCAS).

92. New Zealand estimated the changes in carbon stock in mineral and organic soils for forest land, cropland and grassland using a tier 1 method. For most of the country a classification by soil type and climate zone was possible. However, for some areas (around the margins of mainland New Zealand and offshore islands), data were not available and the attributes of neighbouring areas were used to fill the data gaps. The ERT agrees with the approach used. However, for islands not touching mainland New Zealand for which the climate and soil types were unknown, emissions from mineral soils were not estimated. Although the total area of such islands is small (around 109 kha, representing 0.0004 per cent of the total area of the country), the ERT recommends that the Party use proxy variables such as vegetation cover and meteorological data to classify the islands' climate and soil types and report carbon stock changes in soils for the islands, in order to improve the geographical completeness of the reporting in its next annual submission.

93. In response to a concern raised in the 2010 annual review report regarding the statistical validity of the model used by New Zealand to estimate emissions from mineral soils (a tier 2 soil carbon monitoring system model), New Zealand has expanded the LUCAS programme database to include soil data for perennial cropland, recalibrated the model using the more comprehensive data set and validated the model results using field studies. A new version of the model is under consideration by the Party, for use for its 2013 annual submission. For its 2012 annual submission, the Party decided to change the tier 2 model approach previously used and to apply a tier 1 approach. The ERT commends the Party for its efforts to acquire additional data in order to make the model results more robust and encourages New Zealand to apply the revised tier 2 model for its next annual submission, as planned.

94. New Zealand has developed an average reference soil organic carbon stock based on the areas of the soil and climate classification and the default reference values in the IPCC good practice guidance for LULUCF. Only 5 per cent of soils were not included in the estimates. Additionally, the Party included estuarine soils, for which the IPCC good practice guidance for LULUCF does not provide a default reference value. Although the ERT agrees with the approach used to develop an average reference value (92.59 t C/ha) for mineral soils, it noted that it would be more precise to use the specific reference values for each soil type and climate zone than the average. Considering that the country already uses geographic information systems that could facilitate the integration of different databases, the ERT encourages the Party to use the specific reference values instead of the average reference value for its next annual submission.

95. New Zealand carried out a tier 1 uncertainty analysis for the major land-use transitions (NIR table 7.1.9). Uncertainties were allocated to the AD and to the EFs individually. Although the Party has indicated in NIR table 7.3.7 some uncertainties associated with certain pools (biomass and soils), it has not reported individual uncertainty assessments for all land-use categories and subcategories. The ERT recommends that the Party provide, in its next annual submission, a detailed, disaggregated assessment of uncertainty, as well as the aggregated uncertainty associated with the LULUCF sector, consistent with the IPCC good practice guidance for LULUCF.

96. New Zealand has presented detailed information on the approach taken to identify land and subsequent land-use changes, including wall-to-wall mappings of forest areas using satellite imagery and airborne data acquired early in 1990 and 2008. Additional

satellite imagery, aerial photographs and data from the Party's ETS have been used to further refine the mappings since 2008. The ERT commends New Zealand for the comprehensive approach that it is taking to ensure an accurate representation of the country's land use and cover and changes therein. This comprehensive approach enabled the Party to provide land-use transition matrices for different time periods, including for the period 1990–2010, for all of the reported categories as well as for the subcategories defined by the Party (natural forest, pre-1990 planted forest, post-1989 planted forest, high- and low-producing grassland and grassland with woody vegetation).

2. Key categories

Forest land remaining forest land – CO_2

97. Forests cover 37.6 per cent of the national territory. Since 1990 forest land has been a steady carbon sink, but with highly variable removals, with inter-annual changes in net removals ranging from 0.04 per cent (1992–1993) to 21.9 per cent (2009–2010). From 1990 to 2010 the carbon sink reduced by 13.3 per cent and the sink potential has been steadily decreasing since 2007. Despite forest land being a steady carbon sink since 1990, forest land remaining forest land has varied between being a net sink and a net source of emissions, depending on the year. All forests in New Zealand are considered managed and most are considered natural forest. The remaining are classified as pre-1990 planted forest or post-1989 planted forest. In 2010, 90.9 per cent of the forest land area fell under forest land remaining forest land and, within this subcategory, 80.0 per cent was natural forest and 10.9 per cent pre-1990 planted forest. Despite the persistently large proportion of natural forest, the proportion of natural forest to forest land remaining forest land has been steadily decreasing since 1990 and at a more pronounced rate since 2002 (mean rate of decrease from 2002 to 2010 was 0.46 per cent/year and 0.09 per cent/year from 1990 to 2001). On the other hand, the proportion of pre-1990 planted forest in the forest land remaining forest land subcategory has been steadily increasing (from a 4.5 per cent share in 1990 to 12.0 per cent in 2010). No post-1989 planted forest is included in the forest land remaining forest land subcategory, since New Zealand applies a 28-year transition period and no land converted to forest land has reached that age as yet. The Party considers 28-years old to be the average age at which the majority of its planted forests are harvested, after having reached a state of equilibrium.

98. The ERT noted with concern that carbon stock changes in natural forest remaining natural forest were not estimated since the changes cannot presently be quantified. New Zealand has reported all of the carbon stock changes for natural forest remaining natural forest as "NA" in CRF table 5.A, indicating the assumption that carbon stocks in natural forest are in a steady state. The ERT commends New Zealand for the establishment of a number of permanent sample plots distributed systematically across the country, which have already been measured in 2002 and 2007. However, the Party has indicated in the NIR that the entire plot network needs to be remeasured in order to quantify the carbon stock changes in natural forest and hence it was assumed for the 2012 annual submission that they were in a steady state. The Party has noted, however, that recent studies suggested that natural forest has a minor role as a carbon sink. The ERT understands that the changes in carbon stock in natural forest are composed of gains and losses, the latter being the result of disturbances such as fires or pest attacks. The ERT strongly recommends that New Zealand provide estimates of changes in carbon stock in natural forest for forest land remaining forest land in its next annual submission, even if they are based on the analysis of a sample from the full set of permanent plots to be updated at a later date, in order to improve completeness.

99. The ERT noted large variations (per unit of area) over the time series in the data (gains, losses, dead organic matter and net removals) associated with the conversion of

natural forest to pre-1990 planted forest. For example, carbon stock change in living biomass decreased between 1990 (9.45 t C/ha) and 2002 (0.77 t C/ha), then increased slightly up to 2007 (1.30 t C/ha), steeply up to 2008 (7.25 t C/ha for 2008) and slightly thereafter (7.65 t C/ha and 8.01 t C/ha for 2009 and 2010, respectively). In response to a question raised by the ERT during the review, the Party justified these variations. For example, the Party explained that the net removals reported for prior to 2002 were dominated by the carbon stock gains in pre-1990 planted forest that originated from the peak in forest plantation in the period 1964–1974. Between 2002 and 2007 the removals from pre-1990 planted forest were offset by the emissions from natural forest conversions; but, from 2008 onward, natural forest conversion ceased and the removals from pre-1990 planted forest became more apparent as they were no longer offset by the emissions from natural forest conversion. In the previous review report it was recommended that the Party present more information on the subcategory natural forest (conversion) to pre-1990 planted forest and on the methods applied to estimate carbon stock changes. Although some additional information has been provided in the Party's 2012 annual submission, the ERT reiterates the recommendation made in the previous review report that the Party include, in the NIR of its next annual submission, additional explanations for any large variations in the time series, in order to improve the transparency of the reporting.

Land converted to forest land – CO_2

100. The major conversion to forest land in New Zealand is from grassland. In 2010, 99.5 per cent of all land converted to forest land was previously grassland, while the rest was previously other land. This has been the pattern since 1990, with the fraction of grassland converted to forest land being no less than 99 per cent. However, there has been a minor but steady increase in the conversion from other land in recent years. New Zealand subcategorized grassland into low-producing, high-producing and grassland with woody biomass and used the default values from the IPCC good practice guidance for LULUCF for the living biomass in both low- and high-producing grassland before conversion (3.05 t C/ha and 6.75 t C/ha, respectively). For the carbon stock in all biomass pools for grassland with woody vegetation, the Party used a value (29 t C/ha, reported in NIR table 7.1.3, page 175, provided by a single reference[12]) which the ERT considers to be high for a temperate region. The ERT recommends that the Party review the estimated carbon stock changes for grassland with woody vegetation for its next annual submission, or provide additional references to support the value used, even if they are for countries with similar conditions.

Grassland remaining grassland – CO_2

101. Grassland remaining grassland comprises about 53.6 per cent of New Zealand's total land area and the area decreased little between 1990 and 2010 (by 179.6 kha, or about 1.2 per cent). New Zealand has indicated in the NIR that it assumed the tier 1 approach of no change in carbon stock based on static management practices and an approximate steady state. However, the Party has provided estimates in the appropriate CRF tables for conversions among grassland subcategories (e.g. from high-producing to low-producing grassland). The net emissions associated with such conversions have been reported under grassland remaining grassland. The Party used the default methodology from the IPCC good practice guidance for LULUCF to estimate the carbon stock change in living biomass and used the IPCC default values for high-producing and low-producing grassland. Since the IPCC good practice guidance for LULUCF does not provide a default value for grassland with woody biomass, New Zealand used a country-specific value (see para. 102 below). The Party has provided estimates of carbon stock change in the dead organic matter

[12] Wakelin SJ. 2004. *Review of Shrubland Clearance – Assumptions in the National Carbon Inventory*. Contract report prepared for Ministry for the Environment by New Zealand Forest Research Institute Limited (trading as Scion). Wellington: Ministry for the Environment.

pool for grassland with woody biomass. The ERT commends the Party for providing those estimates, and recommends that the Party report, in the documentation box of the appropriate CRF table in its next annual submission, that the tier 1 assumption of no change in carbon stock has been made.

102. The ERT considered that the annual biomass growth for grassland with woody biomass (1.04 t C/ha/year, reported in NIR table 7.1.4) seemed high for a temperate climate zone and for the 28-year cycle assumed by New Zealand. In response to a question raised by the ERT during the review, the Party clarified that there were no references available to support the value in addition to the one reported in the NIR, which was published in 2004.[13] The ERT recommends that the Party clarify, in its next annual submission, that the annual estimate of biomass growth for grassland has been adjusted to take into account the 28-year cycle by including the estimate of carbon stock derived from the aforementioned 2004 publication, and that it clarify the meaning of "all biomass pools" mentioned in NIR table 7.1.4.

Land converted to cropland – CO_2

103. New Zealand used a tier 1 method to estimate emissions from land converted to cropland and applied country-specific data for forest land and for grassland with woody vegetation. For annual crops, the Party assumed the full biomass growth in the first year after conversion, applying the default value for a temperate climate region from the IPCC good practice guidance for LULUCF and zero gains and losses thereafter. For perennial crops, the Party assumed a country-specific value for the annual growth, assuming a transition period of 28 years (see para. 107 below). For the dead organic matter pool, New Zealand has reported only the losses associated with the previous land-use category, assuming zero carbon gains after conversion, owing to insufficient information. The Party has reported the changes in carbon stock in soils using a tier 1 method, assuming a linear 20-year (IPCC default) transition period in the absence of specific data on the rate of change. The ERT noted that the carbon stock in perennial crops reported by the Party is country specific and based on a single reference.[14] The ERT also noted that table 3.3.6 from the IPCC good practice guidance for LULUCF indicates that, for a tier 2 method, at least some country-specific carbon stock parameters to estimate carbon stock changes from land use conversion to cropland should be used. The ERT thus encourages New Zealand to seek to increase the number of country-specific references on this issue to be more in line with the IPCC good practice guidance for LULUCF.

Land converted to grassland – CO_2

104. New Zealand used a tier 1 method to estimate emissions from land converted to grassland and applied country-specific data for forest land and perennial cropland converted to grassland. Where available (e.g. land converted to grassland with woody biomass), the Party has provided estimates for the annual change in carbon stock in the dead organic matter pool using the 28-year transition period. The ERT commends the Party for providing this information in a clear way in the NIR.

Land converted to wetlands – CO_2

105. New Zealand has reported in the NIR that no conversion to wetlands has occurred since 1988 and that in 2010 only 3.60 kha remained in this subcategory. The Party has reported in section 7.6.1 of the NIR (page 249) that the area of land converted to wetlands

[13] Wakelin. 2004. *Review of Shrubland Clearance* (see footnote 12).

[14] Davis MR and Wakelin SJ. 2010. *Perennial Cropland Biomass: Sampling Requirements*. Report prepared for the Ministry for the Environment by New Zealand Forest Research Institute Limited (trading as Scion). Wellington: Ministry for the Environment.

has not yet reached the steady state condition to enable its transition to the wetlands remaining wetlands subcategory, which is assumed to occur after a 28-year period. However, in section 7.6.2 of the NIR (page 250), the Party has indicated that no emissions from land converted to wetlands have been reported since 2009 (the notation key "NO" has been used), since the IPCC default 20-year transition period since 1988 has elapsed. The Party has reported emissions from the soil carbon pool for up to 2009, while carbon stock changes in living biomass and dead organic matter have been reported as "NE". This is justified since New Zealand assumed that all of the emissions from the carbon stock changes in living biomass and dead organic matter occurred in the year of the land conversion to wetlands (tier 1 assumption) (i.e. before 1988). The ERT recommends that the Party clarify, in the NIR of its next annual submission, how the net annual carbon stock changes for land converted to wetlands were calculated for 1990 to 2009 and, if a 28-year transition period has been assumed, that it continue to report the associated emissions accordingly.

106. New Zealand has reported in CRF table 5.D the area of land converted to wetlands (3.60 kha), but the corresponding changes in carbon stock for all pools have been reported as "NO". The ERT strongly recommends that the Party report these carbon stock changes in its next annual submission, in order to improve the completeness of the reporting.

3. Non-key categories

Cropland converted to other land uses – CO_2

107. New Zealand assumed a value of 18.76 t C/ha (0.67 t C/ha/year and 28 years until a steady state) for the above-ground biomass in perennial cropland before conversion to other land uses. The ERT noted that this value is substantially lower than the default value in table 3.3.2 of the IPCC good practice guidance for LULUCF for a temperate climate region (63 t C/ha). In response to a question raised by the ERT during the review, the Party clarified that the perennial crops are mainly grape and kiwifruit vines, for which the expected biomass/unit area is lower than that assumed for the IPCC default. The ERT recommends that the Party provide more information about the value used in the inventory, if possible disaggregated by the main crops indicated by the Party, in its next annual submission.

108. The ERT noted that the annual growth of above-ground biomass reported for perennial crops (0.67 t C/ha/year for a transition period of 28 years (NIR table 7.1.4)) is different from the default value provided in table 3.3.2 of the IPCC good practice guidance for LULUCF (2.1 t C/ha/year for a temperate climate region over a cycle period of 30 years). In response to a question raised by the ERT during the review, the Party clarified that the country-specific value was based on the results of research published in 2010, and that no further work has been carried out, as improvements in this area have a relatively low priority in relation to other inventory improvements. The ERT recommends that the Party include these clarifications in its next annual submission and provide more information regarding the representativeness of the value used, given the large discrepancy compared with the default value provided by the IPCC. The ERT encourages the Party, in doing so, to research the annual biomass growth values of other Parties with similar conditions, as this may be helpful to justify the value applied.

Agricultural lime application – CO_2

109. The ERT commends New Zealand for the inclusion of new, disaggregated AD for estimating emissions from dolomite and liming in its 2012 annual submission, as indicated on page 185 of the NIR. The ERT noted that the Party has reported the amount of lime for other as "IE" in CRF table 5(IV) and has indicated as a comment that all amounts of lime applied have been reported under cropland or grassland. The ERT recommends that the

Party provide this information in the documentation box of CRF table 5(IV) in its next annual submission, in order to increase the transparency of the reporting.

Biomass burning – CH_4 and N_2O

110. The ERT noted that New Zealand has reported estimates for the amount of biomass burned and the associated CH_4 and N_2O emissions for forest land remaining forest land (wildfires), land converted to forest land (controlled burning) and grassland remaining grassland (wildfires) only, and that the Party has reported all other subcategories as "NE" or "IE" in CRF table 5(V). New Zealand has reported in the NIR that emissions from controlled burning on land converted to grassland have not been reported owing to a lack of information on the proportion of land burned during that conversion. The ERT commends the Party for its efforts to continuously improve its reporting and strongly recommends that estimates of emissions from all sources currently not reported, even if such emissions are at a low level, be provided in its next annual submission. The ERT also recommends that the Party continue the investigation to identify whether controlled burning occurs on forest land remaining forest land, in order to increase the accuracy of its reporting.

F. Waste

1. Sector overview

111. In 2010, emissions from the waste sector amounted to 1,991.82 Gg CO_2 eq, or 2.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 3.0 per cent. The key driver for the fall in emissions is the decrease in CH_4 emissions from solid waste disposal on land as a result of the implementation of policies to improve solid waste management practices, including waste minimization and CH_4 recovery. Within the sector, 67.5 per cent of the emissions were from solid waste disposal on land, followed by 32.3 per cent from wastewater handling and 0.1 per cent from waste incineration.

112. New Zealand has made recalculations for the waste sector between its 2011 and 2012 annual submissions following changes in AD and EFs. The impact of these recalculations on the waste sector is an increase in the estimate of emissions for 2009 of 0.7 per cent (13.41 Gg CO_2 eq). The main recalculations took place in the following categories:

(a) Managed waste disposal on land: the estimate of CH_4 emissions for 2009 decreased by 0.5 per cent (7.07 Gg CO_2 eq), owing to the revision of the amount of untreated sewage sludge disposed to landfill and of the date when a landfill started operating a CH_4 recovery system (earlier than previously assumed);

(b) Industrial wastewater: the estimates of CH_4 and N_2O emissions for 2009 increased by 4.7 per cent (16.48 Gg CO_2 eq), owing to the revision of the total annual wastewater output for the different meat industry producers;

(c) Domestic and commercial wastewater: the estimate of CH_4 emissions for 2009 increased by 1.5 per cent (4.00 Gg CO_2 eq), owing to the revision of the correction factors for additional industrial biochemical oxygen demand (BOD) discharged into sewers for certain treatment plants.

113. The ERT found the inventory for the waste sector to be complete in terms of categories. However, in response to a question raised by the ERT during the review, New Zealand could not confirm whether there are still illegal landfills in the country for which emissions should be accounted (see para. 119 below).

114. New Zealand has reported that the majority of the sludge (90.4 per cent) from domestic wastewater treatment plants was sent to landfill (page 285 of the NIR). However,

the ERT noted that 0.3 per cent of the sludge is spread, untreated, on land and 1.4 per cent of the sludge has an unknown disposal in 2006, and the ERT considered that some of this sludge could have been spread on agricultural soils. In response to a question raised by the ERT during the review, New Zealand explained that it has a regulation that prevents domestic wastewater from being used on agricultural land, owing to concerns about human health and food safety. The ERT recommends that the Party explain how the sludge not sent to landfill is disposed of in its next annual submission.

115. In response to a question raised by the ERT during the review, New Zealand provided the references requested to support the AD, EFs and methods reported in the NIR and the CRF tables. New Zealand provided the requested documents in a timely manner and the information increased the transparency of the reporting. Most of the recommendations made in the previous review report have been addressed by New Zealand.

116. The ERT found that the uncertainties associated with the emission estimates for the waste sector are relatively high (±40 per cent for CH_4 emissions from landfills and +100 per cent to –50 per cent for wastewater handling (sludge)). The ERT encourages New Zealand to increase its efforts to reduce the uncertainty of its estimates, for its next annual submission. The ERT noted that New Zealand has reported as zero the uncertainty of the AD for solid waste disposal on land and wastewater handling in NIR tables A7.1.1 and A7.1.2. The ERT recommends that New Zealand revise and explain this uncertainty estimate in its next annual submission.

2. Key categories

Solid waste disposal on land – CH_4

117. New Zealand applied the first order decay (FOD) model, bulk waste option, from the 2006 IPCC Guidelines to estimate emissions from solid waste disposal on land. New Zealand has explained on page 273 of the NIR that the 2006 IPCC Guidelines were used because New Zealand considers them to contain the most appropriate and current methodologies, particularly regarding default CH_4 generation rates, for estimating emissions from solid waste disposal on land. In response to a question raised by the ERT during the review, New Zealand provided the spreadsheets used to implement the model. The Party clarified that the model was applied to estimate emissions from individual landfills with CH_4 recovery systems, and that data on landfills without CH_4 recovery systems were combined onto a separate spreadsheet, in order to address the different CH_4 generation rates (k values). The evaluation of the spreadsheets together with the input data (AD and EFs) used suggested that the FOD model was applied mostly in accordance with the IPCC good practice guidance. However, the ERT encourages New Zealand to implement the FOD model to estimate emissions from each individual landfill, taking into account landfill-specific information (amount of waste sent to landfill, k values and methane correction factor (MCF)).

118. In response to a question raised by the ERT during the review regarding the accuracy of the reported amount of waste sent to landfill, New Zealand confirmed that the annual total waste disposal to all landfills was estimated on the basis of national surveys conducted in 1995, 1998, 2002 and 2006. New Zealand indicated that, in order to fill data gaps for the years between surveys, solid waste disposal/person was estimated by interpolation, and that, for the years 1990–1994 (before the earliest survey) and 2007–2010 (after the latest survey), the closest survey-based value for waste disposal/person (those for 1995 and 2006, respectively) was used. Although the ERT considers that the Party's approach has probably not resulted in an underestimation of emissions for the years 2007–2010, the ERT encourages New Zealand to extend the surveys to other years in order

to improve the accuracy of the reported amount of waste sent to landfill for its next annual submission.

119. In response to a question raised by the ERT during the review, New Zealand indicated that it is possible that illegal landfills are operating in the country. Even if such operations are small scale, the ERT recommends that the Party investigate, taking into account the available resources, whether illegal landfills exist and are still operating and, if applicable, that it include estimates of the associated emissions in its inventory, in order to improve completeness, in its next annual submission.

120. The parameters used to estimate CH_4 emissions from solid waste disposal on land (k values, MCF, degradable organic carbon (DOC), DOC that actually decomposes, fraction of CH_4 in the landfill gas, and oxidation factor) were a combination of country-specific and default data from the 2006 IPCC Guidelines. The ERT noted a lack of data on the composition of municipal solid waste and industrial solid waste: New Zealand has waste composition data and information for 1995 and 2004 only, collected through national surveys, and applied linear interpolation to derive data for between those years. The ERT considers that implementing linear interpolation over a long period (8 years) is not in line with the IPCC good practice guidance. The ERT recommends that New Zealand justify why a linear interpolation between 1995 and 2004 is appropriate or collect more information on waste composition between 1995 and 2004 and outside the time period 1995–2004 for its next annual submission. This will, in turn, improve the Party's DOC values, as New Zealand currently uses constant DOC values for the time periods 1950–1995 (0.146 Gg C/Gg waste) and 2004–2010 (0.170 Gg C/Gg waste). The ERT also recommends that New Zealand improve the DOC values used for its next annual submission.

Wastewater handling – CH_4 and N_2O[15]

121. New Zealand estimated CH_4 emissions from domestic and commercial wastewater and from industrial wastewater using the default method from the Revised 1996 IPCC Guidelines. Country-specific data on total organic wastewater and chemical oxygen demand and a country-specific MCF were used together with the default maximum CH_4 producing capacity (B_o) from the Revised 1996 IPCC Guidelines. For domestic wastewater, New Zealand has indicated that most of the treatment processes are aerobic and has reported emissions from anaerobic processes only, such as oxidation ponds and septic tanks. The ERT considers the Party's approach to be in line with the IPCC good practice guidance. Data on the population using the treatment plants were used together with a combination of country-specific and default parameters from the Revised 1996 IPCC Guidelines for the MCF, BOD and B_o. New Zealand has explained transparently how the sludge from domestic wastewater treatment was taken into account in the inventory.

122. For industrial wastewater, New Zealand has listed, on page 281 of the NIR, meat processing, pulp and paper, and dairy processing as the major industries treating organic-rich wastewater anaerobically and the Party has reported the corresponding CH_4 emissions. In addition, wastewater from wine production and wool scouring was also accounted for to ensure that all industries known to have wastewater treatment facilities were included. However, in the additional information to CRF table 6.B, data have been reported only for pulp and paper, the meat industry except for poultry (reported under other), poultry and wool scouring (although wastewater output for wool scouring has been reported as "C"). Data for dairy processing and food and beverages have been reported as "NE". In response to a question raised by the ERT during the review, New Zealand was able to provide an

[15] Not all emissions related to all gases under this category are key categories, particularly N_2O emissions. However, since the issues related to this category are discussed together, the individual gases are not assessed in separate sections.

explanation (AD and EFs were provided, except for AD for wool scouring, reported as "C"). The ERT recommends that New Zealand include the explanation provided in its next annual submission, in order to increase transparency and the consistency between the NIR and the CRF tables.

123. In response to a question raised by the ERT during the review, New Zealand indicated that emissions resulting from the use of biogas recovered from the treatment of wastewater from the dairy industry to operate boilers had not been reported. In response to the list of potential problems and further questions raised by the ERT during the review week, New Zealand provided revised emission estimates for CO_2, CH_4 and N_2O resulting from the use of biogas to operate boilers for the entire time series (1990–2010), which resulted in an increase in the estimated total GHG emissions by 0.03 Gg CO_2 eq for the time series. New Zealand has reported the CH_4 and N_2O emissions under the energy sector, while the CO_2 emissions have been reported as a memo item, in line with the IPCC good practice guidance (see para. 54 above). The ERT recommends that New Zealand continue to report these emissions under the energy sector in future annual submissions, if biogas is used for energy purposes. The emissions resulting from the use of CH_4 recovered from other wastewater treatment plants have been included under the energy sector, as clarified by New Zealand during the review. The estimates of emissions from the wine industry are based on expert judgement for some years and extrapolation for the remaining years of the time series 1990–2010. New Zealand indicated that work is being conducted to improve the emission estimates for the wine industry and to obtain the wastewater output and information on DOC. The ERT recommends that New Zealand collect plant-specific data and improve the emission estimates for the wine industry for its next annual submission.

124. The ERT commends the Party for its efforts to report estimates of N_2O emissions from industrial wastewater in order to improve the completeness of the inventory. A country-specific method and EFs were used. To estimate N_2O emissions from human sewage, New Zealand used the method and default EFs from the 2006 IPCC Guidelines, together with country-specific statistics on population and per capita protein consumption. The ERT commends New Zealand for having taken into account the protein fraction from industrial and commercial wastewater co-discharged.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

125. There is no incineration of municipal waste in New Zealand. The Party used the tier 1 method contained in the 2006 IPCC Guidelines to estimate emissions from the incineration of quarantined hazardous and clinical waste and sewage sludge. The 2006 IPCC Guidelines were used because New Zealand considered them to contain the most appropriate and current methodologies for estimating emissions from waste incineration. New Zealand also considered, in its estimations, the incineration devices that do not control combustion to maintain adequate temperature and that do not provide sufficient residence time for complete combustion as open burning systems, as defined in the 2006 IPCC Guidelines. The ERT found that waste incineration is another category for which the Party does not have detailed AD and applied extrapolation or interpolation and used default data on waste composition and EFs. The ERT encourages New Zealand to collect more data on the waste incinerated in the country and report improved emission estimates in its next annual submission.

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

126. New Zealand has provided estimates for all activities under Article 3, paragraph 3, of the Kyoto Protocol (afforestation and reforestation, and deforestation) and has reported in the KP-LULUCF CRF tables for 2008, 2009 and 2010. The NIR contains complete information with respect to the requirements outlined in decision 15/CMP.1, annex, paragraphs 5–9. The Party has not elected to account for any of the activities under Article 3, paragraph 4, of the Kyoto Protocol. In 2010, net removals from land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol amounted to 18,307.07 Gg CO_2 eq, an increase of 2.6 per cent relative to 2009.

127. New Zealand has made recalculations for afforestation and reforestation, and deforestation owing to improvements in AD, the revision of the post-1989 planted forest yield table using an updated version of the Forest Carbon Predictor, improved methods for land identification and new EFs. Information derived from high spatial resolution satellite imagery allowed a more accurate identification of deforested areas (e.g. for 2009, the Party reported 98.67 kha deforested in KP-LULUCF table 5(KP-I)A.2 in its 2011 annual submission, but 104.29 kha in its 2012 annual submission, a 5.7 per cent increase). The impact of the recalculations on each KP-LULUCF activity for 2009 is as follows:

(a) Afforestation and reforestation: the estimate of net removals increased by 9.0 per cent (1,586.22 Gg CO_2 eq);

(b) Deforestation: the estimate of net emissions increased by 286.4 per cent (1,019.37 Gg CO_2 eq).

128. The Party has reported in the NIR that emissions from liming of afforested and reforested lands have not been reported since this activity does not occur in the country (reported as "NO" in KP-LULUCF CRF table 5(KP-II)4).

129. New Zealand has not provided estimates of non-CO_2 emissions from controlled burning and wildfires on land subject to deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol, owing to lack of data. In the previous review report it was recommended that the Party apply the IPCC tier 1 method to estimate and report such emissions in its 2012 annual submission. New Zealand, however, has reported in the NIR that it is searching for possible sources of information to allow the reporting of the emissions in a future annual submission. The ERT reiterates the recommendation made in the previous review report that the Party report estimates of the emissions concerned in its next annual submission and provide in the NIR additional information on potential future improvements.

130. New Zealand has reported a tier 2 uncertainty analysis for the activities under Article 3, paragraph 3, of the Kyoto Protocol in NIR table 11.3.4. The uncertainty of the net removals is 80.4 per cent for afforestation and reforestation activities (7.0 per cent uncertainty in the AD and 80.1 per cent uncertainty in the EFs). For deforestation, the Party has reported the uncertainty of AD and EFs of deforestation of natural forest, pre-1990 planted forest and post-1989 planted forest separately. The aggregated uncertainty of the AD and EFs for deforestation was 7.9 per cent and 156.1 per cent, respectively. The total uncertainty associated with the estimates for deforestation was 156.3 per cent.

131. The Party has indicated in the NIR its intention to use high-resolution satellite data as the key source of data and information to explicitly identify harvesting, deforestation and

land-use changes between 1 January 2008 and 31 December 2012. The ERT considers that this will help to improve the accuracy of the estimates and increase the transparency of the reporting and commends the Party for its initiative.

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

Afforestation and reforestation – CO_2

132. In the period 1990–2010 New Zealand established 611,149.0 ha of new forest (post-1989 planted forest) through afforestation and reforestation. Of this total, 17,328.0 ha were deforested, resulting in a net increase in the forest area of 593,821.0 ha in 2010. The planting rate has been highly variable since 1990, having reached a peak in 1994 (86,558.0 ha) and then steadily declining from 1996 until 2008, when the lowest value since 1990 was observed (1,900.0 ha). In 2008 and 2009 New Zealand introduced new legislation and initiatives to stimulate the establishment of forest and discourage the deforestation of planted forest, including the Climate Change Response Act, amended in 2009, the Permanent Forest Sink Initiative and the Afforestation Grant Scheme. In 2009 and 2010 the country experienced a new spurt of afforestation and reforestation, which resulted in 4,300.0 ha and 6,000.0 ha of newly established forest, respectively.

133. New Zealand used reporting method 1 from the IPCC good practice guidance for LULUCF to estimate emissions and removals from afforestation and reforestation. The units of land comprise the North Island (including the Great Barrier and Little Barrier Islands) and the South Island (including Stewart Island, the Chatham Islands and New Zealand's offshore islands). The uninhabited offshore islands (the sub-Antarctic Islands (Auckland Islands, Campbell Island, Antipodes Islands, Bounty Islands and Snares Islands), the Kermadec Islands and the Three Kings Islands) are assumed to be in a steady state and hence the net emissions are zero. These protected conservation areas total 74,052 ha and are not subject to land-use change.

Deforestation – CO_2

134. The area of deforestation has decreased since 2008, from 3.26 kha (2008–2009) to 2.62 kha (2009–2010). The total estimated emissions from deforestation in 2010 were 1,049.93 Gg CO_2 eq, 23.7 per cent lower than those in 2009 (1,375.25 Gg CO_2 eq) and 33.3 per cent lower than the emissions from deforestation in 2008 (1,573.29 Gg CO_2 eq). The decreased emissions in 2010 resulted from the higher proportion of deforestation of post-1989 planted forest (46.6 per cent of the total, compared with 33.8 per cent in 2009), which have a lower carbon content than the other types of forest, as well as New Zealand's ETS, to which forest land was introduced in 1 January 2008: since then, land owners of pre-1990 planted forest can only deforest 2 ha in any five-year period without having to surrender emission units.

135. In previous review reports some concerns were raised regarding the classification of land as deforested or temporarily unstocked and the procedures adopted by the Party to identify land subject to deforestation, which could lead to some uncertainty in the reporting at the end of the first commitment period of the Kyoto Protocol. New Zealand only classifies land as deforested if the land is either converted to another land use, or if, four years after identification of the forest cover loss, no reforestation (replanting or revegetation) has occurred. In response to a question raised by the ERT during the review, the Party clarified that the word revegetation was incorrect and should be replaced by regeneration. The ERT noted that the Party's procedure may indeed lead to an underestimation of deforestation at the end of the commitment period, for the forest areas that lost their forest cover in 2011 or 2012. New Zealand has indicated in the NIR that it will use a number of data sources (satellite and airborne data, and information on deforestation from the Party's ETS) to improve its estimates for deforestation. The Party

has also indicated in the NIR that it is investigating improvements to enable it to confirm the occurrence of deforestation in the last reporting years of the first commitment period, and that these refinements will be introduced in its 2013 annual submission. The ERT commends the Party for its efforts and reiterates the recommendation made in previous review reports that the Party provide in its next annual submission more transparent information on how it will avoid the potential underestimation of deforestation at the end of the first commitment period.

136. New Zealand used several sources of data to identify and improve the accuracy of the estimated areas deforested. One of the sources was satellite imagery (22 m resolution), used to identify areas deforested during 2008 and 2009. At the end of 2010 the Party partially covered the national territory using higher spatial resolution satellite data (10 m resolution) to map deforestation occurring in 2010 in high priority areas. This mapping highlighted areas deforested in 2008 and 2009 that had not been previously identified and therefore not included in previous annual submissions. Estimates were made for 2008, 2009 and 2010 of deforestation in the areas not covered by the satellite imagery. The ERT commends the Party for the use of satellite data of increasingly higher spatial resolution, which is allowing for increased accuracy in the estimates of deforestation. However, the ERT encourages the Party to provide additional information, in its next annual submission, on how it estimated the areas deforested outside of the area covered by the imagery, in order to increase the transparency of the reporting.

137. In the previous review report it was recommended that New Zealand improve the transparency of its reporting of lagged emissions from deforested land before 2008 and that it refine the methodology used to distinguish between deforested and harvested land during the period 2008–2012. For its 2012 annual submission, the Party modified the deforestation mapping, classifying destocked land into harvested, deforested and awaiting (areas which cannot be classified as harvested or deforested because there is no clear evidence). Four priority areas were assessed and classified, resulting in 13.3 per cent of the total destocked area (4,422 ha) being classified as the awaiting area, disaggregated into natural forest, pre-1990 planted forest and post-1989 planted forest. New Zealand indicated that there is insufficient data to estimate the total awaiting area at present, but that it will continue its efforts to provide a complete estimate in its 2014 annual submission. The ERT commends the Party for its efforts to provide this information and recommends that the Party report any updates in its next annual submission.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

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

139. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, 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 referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions

[16] 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.

of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

National registry

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

Calculation of the commitment period reserve

141. New Zealand has reported its commitment period reserve in its 2012 annual submission. The Party has reported that its commitment period reserve has not changed since the initial report review (278,608,260 t CO_2 eq), as it is based on the assigned amount and not on the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

142. New Zealand has reported that there have been changes in its national system since the previous annual submission. New Zealand has continued to develop the expertise of the main inventory contributors and several government officials have been trained to compile the national inventory and to perform review activities under the Convention and the Kyoto Protocol. In addition, the terms of reference of the Reporting Governance Group were reviewed with a view to more precisely specifying engagement with different institutions, and some sectoral changes that relate to the national system have been implemented, including: improved QA procedures for the industrial processes sector through verification using data from New Zealand's ETS; improved tier 1 QC procedures for the LULUCF sector; and improved documentation on the estimation process for the waste sector. 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

143. New Zealand has reported that there have been changes in its national registry since the previous annual submission. The Party has described the changes in its NIR, including changes to: the contact details of the registry administrator, the contact points and the release manager; the hosting provider; the database and backup application; the disaster recovery plan; and the security plan.

144. The ERT concluded that, taking into account the confirmed changes, New Zealand'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 decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

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

145. New Zealand has reported that there have been changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The changes have been described in the NIR, including: a meeting of the Pacific Islands Forum in September 2011 to work with Parties not included in Annex I to the Convention (non-Annex I Parties) on climate change; the development of carbon capture and storage technology (the Party is now a member of the Cooperative Research Centre for Greenhouse Gas Technologies); improvements in fossil fuel efficiencies (the Party is supporting the implementation of Tonga's Energy Roadmap to improve Tonga's energy efficiency and energy self-reliance, and similar work is being planned for Tuvalu and Tokelau, two of the most vulnerable island countries in the Pacific); and the assistance provided to non-Annex I Parties that are dependent on the export and consumption of fossil fuels in diversifying their economies (the Party is helping to provide new economic opportunities in Timor-Leste by: rehabilitating the coffee sector to increase the quality, quantity and value of coffee products; and providing capacity- and capability-building for small businesses in rural areas, particularly those run by women).

146. New Zealand has reported on the consultations associated with the establishment of climate change response measures, and that to date there have been no specific concerns raised by other Parties about any negative impacts of the Party's climate change response policies.

147. The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent.

III. Conclusions and recommendations

A. Conclusions

148. New Zealand made its annual submission on 12 April 2012. The annual submission contains the GHG inventory (comprising the CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraph 3, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

149. The ERT concludes that the inventory submission of New Zealand 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 1990–2010 and an NIR; these are complete in terms of years, gases and sectors, and generally complete in terms of categories (see para. 98 above) and geographical coverage (see para. 92 above).

150. 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.

151. The Party's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF, except for some transparency issues (see para. 24 above).

152. The Party has made recalculations for the inventory between its 2011 and 2012 annual submissions in response to the 2011 review report, following changes in AD and EFs and in order to rectify identified errors. The impact of these recalculations on the

national totals is an increase in the estimate of emissions of 1.3 per cent for 2009. The main recalculations for 2009 took place in the following sectors:

(a) Energy: estimated emissions increased by 0.7 per cent;

(b) Agriculture: estimated emissions increased by 2.0 per cent;

(c) LULUCF: estimated net removals decreased by 1.7 per cent;

(d) Waste: estimated emissions increased by 0.7 per cent.

153. New Zealand estimated and has reported removals by sinks and emissions by sources from afforestation and reforestation, and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol. The Party has not elected to account for any activities under Article 3, paragraph 4, of the Kyoto Protocol. The Party has provided in the NIR complete information with respect to the requirements outlined in decision 15/CMP.1, annex, paragraphs 5–9. The Party has chosen to account for the KP-LULUCF activities at the end of the first commitment period.

154. New Zealand has made recalculations for the KP-LULUCF activities between its 2011 and 2012 annual submissions following changes in AD and EFs. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows.

(a) Afforestation and reforestation: the estimate of net removals increased by 9.0 per cent (1,586.22 Gg CO_2 eq);

(b) Deforestation: the estimate of net emissions increased by 286.4 per cent (1,019.37 Gg CO_2 eq).

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

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

157. 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 CMP.

158. New Zealand has reported information under decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its 2012 annual submission. The information in complete and transparent.

B. Recommendations

159. The ERT identifies issues for improvement as listed in table 6 below.

Table 6
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
Overview	Inventory management	Include more detailed information in the NIR about the archiving system at each ministry, including the archiving of disaggregated EFs and AD and documentation on how they have been generated and aggregated for the preparation of the inventory	25

Sector	*Category*	*Recommendation*	*Paragraph reference*
Energy	Overview	Provide additional explanations for the recalculations, including reallocations among categories, for natural gas	30(b)
		Improve the transparency of the information on the recalculations for agriculture/forestry/fisheries	30(f)
		Enhance the QA/QC procedures for the energy sector and address the inconsistencies identified	37
		Review the CO_2 EF for solid fuels and report the findings	38
	Comparison of the reference approach with the sectoral approach	Include additional information on the comparison of the reference and sectoral approaches when venting and flaring are excluded from the reference approach	39
		Disaggregate liquefied petroleum gas from natural gas liquids	40
	International bunker fuels	Improve the transparency of the information on domestic civil aviation and international aviation	41
		Address the inconsistency in the reporting of the consumption of jet kerosene	43
		Correct the CH_4 EF and the source of the value for jet kerosene used for international aviation, correct the reference to the source of the value and recalculate the associated emissions	44
	Feedstocks and non-energy use of fuels	Improve the consistency of the information on methanol production	45
	Country-specific issues	Improve the transparency of the information on the CO_2 and CH_4 EFs used for geothermal energy and on the consistency of the time series, and reassess the country-specific unique emission factor when more data become available	46
	Stationary combustion: solid and gaseous fuels – CO_2	Include additional information on the revision of the AD for natural gas	48
		Include additional information on how the CO_2 EFs used for solid fuels were calculated and their applicability to all solid fuels used in New Zealand across the entire time series, and, if the Party uses mine-specific CO_2 EFs for solid fuels for its next annual submission, ensure the consistency of the time series and explain any recalculations	49
	Road transportation: liquid fuels – all gases	Address the inconsistency in the values of the CO_2 EF for diesel oil reported in the NIR	36 and 50
		Include additional information on the recalculations in the 2010 annual submission due to the double counting of fuels sold by resellers	51
		Include additional information on the estimation of CH_4 and N_2O emissions	52
	Oil and natural gas – CO_2 and CH_4	Report emissions from venting and flaring separately	53

Sector	*Category*	*Recommendation*	*Paragraph reference*
	Manufacturing industries and construction: biomass – CH_4 and N_2O	Report estimates of CH_4 and N_2O emissions resulting from the use of biogas recovered from the treatment of wastewater from a dairy plant	54
Industrial processes and solvent and other product use	Overview	Report clearly the source for every uncertainty value reported	59
		Improve the transparency of the information provided on categories considered confidential	60
		Explain the circumstances that led to the highest ratios of potential to actual emissions of fluorinated gases	61
		Report correctly the tier of the QA/QC checks for key categories and include additional information on QA/QC and verification, while maintaining the confidentiality of sensitive data	62
		Improve the transparency of the information on assumptions, while maintaining the confidentiality of sensitive data	63
	Iron and steel – CO_2	Explain transparently the assumptions made for the recalculations for the time series 2000–2007, including the revision of billet production and stock changes	64
	Aluminium production – PFCs	Justify the variations in the IEFs for PFCs	65
		Include additional information on the uncertainty of the PFC EFs	66
	Consumption of halocarbons and SF_6 – HFCs and PFCs	Include additional information on PFC emissions from refrigeration and air-conditioning equipment	69
	Other (chemical industry) – CO_2 and CH_4	Report additional information on how emissions for methanol production are estimated and continue to work with the producer to resolve the confidentiality issues	70 and 71
Agriculture	Overview	Include more information on the digestibility of cattle feed	77
	Prescribed burning of savannas – CH_4 and N_2O	Explain how the time series 1990–2010 is consistent	83
LULUCF	Overview	Ensure the consistency of the time series for the conversion of natural forest to grassland, wetlands, settlements and other land and, if appropriate, recalculate the emission estimates	88
		Use proxy variables such as vegetation cover and meteorological data to classify the climate and soil types of the islands for which the climate and soil types are unknown, and report carbon stock changes in soils	92
		Report a detailed, disaggregated assessment of uncertainty, as well as the aggregated uncertainty associated with the LULUCF sector, consistent with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	95

Sector	*Category*	*Recommendation*	*Paragraph reference*
	Forest land remaining forest land – CO_2	Provide estimates of changes in carbon stock in natural forest for forest land remaining forest land	98
		Report additional information on the large variations (per unit of area) in the time series for the data (gains, losses, dead organic matter and net removals) associated with the conversion of natural forest to pre-1990 planted forest	99
	Land converted to forest land – CO_2	Review the estimated carbon stock changes for grassland with woody vegetation	100
	Grassland remaining grassland – CO_2	Report the value zero where the tier 1 assumption of no change in carbon stock has been made and include this information in the documentation box of the appropriate CRF table	101
		Confirm that the annual estimate of biomass growth has been adjusted to take into account the 28-year cycle by including the estimate of carbon stock derived from the 2004 publication, and clarify the meaning of "all biomass pools" mentioned in NIR table 7.1.4	102
	Land converted to wetlands – CO_2	Explain how the net annual carbon stock changes were calculated for 1990 onwards and whether a 28-year transition period was assumed	105
		Report estimates of carbon stock changes for all pools	106
	Cropland converted to other land uses – CO_2	Provide more information on the value for carbon stock in above-ground biomass in perennial cropland used in the inventory, if possible disaggregated by the main crops	107
		Provide more information on the value used for the annual growth of above-ground biomass for perennial crops	108
	CO_2 emissions from agricultural lime application	Include the information now reported as a comment in the documentation box of CRF table 5(IV)	109
	Biomass burning – CH_4 and N_2O	Report estimates of emissions from all sources currently not reported, even if the emissions are at a low level, and continue the investigation to identify whether controlled burning occurs on forest land remaining forest land	110
Waste	Overview	Explain how the sludge with unknown disposal is disposed of	114
		Revise the uncertainty reported as zero	116
	Solid waste disposal on land – CH_4	Investigate, taking into account the available resources, whether illegal landfills exist in the country and are still in operation and, if applicable, estimate and report the associated emissions	119
		Justify why a linear interpolation between 1995 and 2004 is appropriate or conduct additional surveys to collect more information on waste composition between 1995 and 2004 and outside the time period 1995–2004, and improve the DOC values	120
	Wastewater handling – CH_4 and N_2O	Report additional information on the AD for the major industries that treat wastewater	122
		Report the emissions from the combustion of the biogas captured at a dairy plant	123

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Collect plant-specific data and improve the emission estimates for the wine industry	123
Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Overview	Provide estimates of non-CO_2 emissions from controlled burning and wildfires on land subject to deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol	129
	Deforestation – CO_2	Explain how the potential underestimation of deforestation at the end of the first commitment period will be avoided	135
		Report additional information on the lagged emissions from deforested land and the estimation of the area of "awaiting" land	137

Abbreviations: AD = activity data, CH_4 = methane, CO_2 = carbon dioxide, CRF = common reporting format, DOC = degradable organic carbon, EF = emission factor, ETS = emission trading scheme, HFCs = hydrofluorocarbons, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, N_2O = nitrous oxide, NIR = national inventory report, LULUCF = land use, land-use change and forestry, PFCs = perfluorocarbons, QA = quality assurance, QC = quality control, SF_6 = sulphur hexafluoride.

IV. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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

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

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

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

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

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

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

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

Status report for New Zealand 2012. Available at <http://unfccc.int/resource/docs/2012/asr/nzl.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2012. Available at <http://unfccc.int/resource/webdocs/sai/2012.pdf>.

FCCC/ARR/2011/NZL. Report of the individual review of the annual submission of New Zealand submitted in 2011. Available at <http://unfccc.int/resource/docs/2012/arr/nzl.pdf>.

UNFCCC. *Standard independent assessment report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Olia Glade and Ms. Sonia Petrie (Ministry for the Environment), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by New Zealand:

Dresser M, Hewitt A, Willoughby J, Bellis S. 2011. *Area of organic soils*. Report prepared for the Ministry of Agriculture and Forestry by Landcare Research. Wellington: Ministry of Agriculture and Forestry.

Ministry of Agriculture and Forestry. 2011. *Detailed methodologies for agricultural greenhouse gas emission calculation, Version 1.0. MAF Technical Paper No: 2011/40*. Available at <http://www.mpi.govt.nz/news-resources/publications?title=Detailed%20methodologies%20for%20agricultural%20greenhouse%20gas%20emission%20calculation%20version>.

[1] Reproduced as received from the Party.

Annex II

Acronyms and abbreviations

AD	activity data
BOD	biochemical oxygen demand
C	carbon
CH_4	methane
cm	centimetre
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
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
ETS	emissions trading scheme
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
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
kt	kilotonne
LULUCF	land use, land-use change and forestry
m	metre
MCF	methane conversion factor
MJ	megajoule (1MJ = 10^6 joules)
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
Nex	nitrogen excretion rate per head
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joules)
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} joules)
UEF	unique emission factor
UNFCCC	United Nations Framework Convention on Climate Change