UNITED
NATIONS

UNFCCC Framework Convention on Climate Change

Distr.
GENERAL

FCCC/ARR/2009/NZL
10 May 2010

ENGLISH ONLY

Report of the individual review of the annual submission of New Zealand submitted in 2009*

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

CONTENTS

I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of New Zealand, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 21 to 26 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Inga Konstantinaviciute (Lithuania) and Ms. Batima Punsalmaa (Mongolia); energy – Mr. Takeshi Enoki (Japan) and Mr. Pavel Fott (Czech Republic); industrial processes – Ms. Pia Forsell (Finland) and Mr. Kiyoto Tanabe (Japan); agriculture – Ms. Yauheniya Bertosh (Belarus) and Mr. Tom Wirth (United States of America); land use, land-use change and forestry (LULUCF) – Ms. Ana Morales (Canada) and Mr. Richard Volz (Switzerland); and waste – Mr. Philip Acquah (Ghana) and Mr. Qingxian Gao (China). Mr. Acquah and Mr. Tanabe were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa (UNFCCC secretariat).

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

B. Emission profiles and trends

3. In 2007, the main greenhouse gas (GHG) in New Zealand was carbon dioxide (CO_2), accounting for 46.6 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (35.2 per cent), and nitrous oxide (N_2O), (17.0 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.2 per cent of the overall GHG emissions in the country. The agriculture sector accounted for 48.2 per cent of the total GHG emissions, followed by energy (43.2 per cent), industrial processes (6.1 per cent), waste (2.4 per cent) and solvent and other product use (0.1 per cent). Total GHG emissions amounted to 75,550.19 Gg CO_2 eq and increased by 22.1 per cent between the base year[2] and 2007.

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

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

GHG emissions	Gg CO_2 eq							Change base year–2007 (%)
	Base year[b]	1990	1995	2000	2005	2006	2007	
CO_2	25 337.57	25 337.57	27 209.55	31 088.27	35 852.35	36 244.36	35 231.49	39.0
CH_4	25 428.52	25 428.52	25 712.75	27 034.75	27 231.57	27 405.59	26 560.06	4.4
N_2O	10 429.35	10 429.35	11 227.72	12 102.20	13 337.38	13 230.85	12 845.63	23.2
HFCs	NA, NO	NA, NO	148.30	304.28	675.47	612.40	856.63	NA
PFCs	642.22	642.22	150.26	57.68	58.98	90.56	41.67	–93.5
SF_6	15.20	15.20	17.88	10.52	18.95	15.39	14.70	–3.3

Abbreviations: NA = not applicable, NO = not occurring.
[a] "Total greenhouse gas emissions" includes emissions from Annex A sources only (excludes emissions/removals from the LULUCF sector).
[b] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO_2 eq							Change base year–2007 (%)
	Base year[a]	1990	1995	2000	2005	2006	2007	
Energy	23 452.84	23 452.84	25 042.72	28 987.28	33 479.00	34 010.64	32 653.10	39.2
Industrial processes	3 409.22	3 409.22	3 390.23	3 648.00	4 266.87	4 233.76	4 601.88	35.0
Solvent and other product use	41.54	41.54	44.95	47.12	44.33	40.30	43.40	4.5
Agriculture	32 511.08	32 511.08	33 728.91	35 835.96	37 519.09	37 491.19	36 430.00	12.1
LULUCF	NA	–18 138.46	–15 892.64	–19 971.47	–25 273.67	–23 877.33	–23 836.01	NA
Waste	2 438.18	2 438.18	2 259.65	2 079.33	1 865.41	1 823.25	1 821.80	–25.3
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	43 714.39	48 573.82	50 626.21	51 901.03	53 721.80	51 714.18	NA
Total (without LULUCF)	61 852.85	61 852.85	64 466.46	70 597.69	77 174.70	77 599.14	75 550.19	22.1

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable.
[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

C. Annual submission and other sources of information

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

6. In addition, the expert review team (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]

7. During the review, New Zealand responded to questions from the ERT in order to clarify information contained in the inventory. The full list of materials used during the review is provided in annex I to this report.

Completeness of the inventory

8. The inventory covers all source and sink categories for the period 1990–2007 and is complete in terms of years and geographical coverage. Completeness of the inventory has been improved in response to recommendations made by the previous ERT (for example, CO_2 emissions from grassland remaining grassland were reported). Some minor categories are reported as not estimated ("NE"): CH_4 and CO_2 from oil – exploration and oil – production; CH_4 and CO_2 from natural gas – exploration and natural gas – production; CO_2 from organic soils in land converted to forest land; N_2O emissions from organic soils in disturbance associated in forest land converted to cropland; CO_2, CH_4, and N_2O emissions from biomass burning in forest land converted to grassland, emissions, from settlements, and other land). In response to a question raised by the ERT, the Party indicated that notation key used for sub-categories of oil – exploration and – production are wrong, they should be included elsewhere ("IE"), not as "NE". The Party also indicated that some LULUCF categories are reported as "NE" due to lack of activity data (AD). New Zealand reports actual and potential emissions for HFCs from 1992 to 2007 and for PFCs from 1995 to 2007. The ERT recommends that New Zealand improve the completeness of its next annual submission, especially for those categories that are known to occur within the Party and for which methodologies are available in the *Revised 1996* Intergovernmental Panel on Climate Change (IPCC) *Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) to estimate emissions.

D. Main findings

9. The inventory is in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The 2009 inventory submission is of a high quality and shows improvement in the major issues, such as increased capacity of

[3] The SIAR, Parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paragraphs. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry. The SIAR is not publicly available.

the national system and increased quality assurance/quality control (QA/QC) activities and institutional arrangements, as compared with the 2008 submission.

10. The Party has submitted, in part, on a voluntary basis supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with Part I of the annex to decision 15/CMP.1. New Zealand did not submit on a voluntary basis information on activities under Article 3, paragraphs 3 and 4 of the Kyoto Protocol and information on minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

11. New Zealand has reported information on its accounting of Kyoto Protocol units in accordance with section I.E of the annex to decision 15/CMP.1, and used the SEF tables as required by decision 14/CMP.1.

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

13. 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 the relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). However, while the Party states in table A8.2.1 of the NIR that no significant testing was performed during the reporting period, the Party does not state whether or not there was a change in the test procedures or results. The ERT recommends that New Zealand state whether or not changes have been made to the test procedures or test results, as required by decision 15/CMP.1 paragraph 32 (j), in the NIR of its next annual submission.

14. The ERT encourages New Zealand to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, that can be found on the UNFCCC website.[4]

15. In the course of the review, the ERT urged New Zealand to implement all of the recommendations from the current and previous reviews in its next annual submission after the publication of this report.

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

1. Overview

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

17. The NIR submitted by New Zealand describes the national system for the preparation of the inventory. The Ministry for the Environment has the overall responsibility for the national inventory. Other agencies and organizations are also involved in the preparation of the inventory. The Ministry for the Environment coordinates all of the government agencies and contractors involved in the preparation of the inventory. The NIR also provides information on changes in the national system since the previous annual submission and these changes are discussed in chapter VII of this report.

18. New Zealand was able to respond to all the questions from the ERT and provide additional information during the review, therefore the ERT acknowledged that the existing national system has sufficient capacity to perform all required functions in a timely manner.

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

2. Inventory planning

19. The Ministry for the Environment is responsible for the overall development, compilation and submission of the inventory. The Ministry for the Environment estimates emissions for the waste sectors and emissions and removals for the LULUCF sector. The Ministry of Economic Development collects and compiles all emission estimates for the energy sector and CO_2 emission estimates for the industrial processes sector. Emission estimates for non-CO_2 gases from the industrial processes sector are obtained through industry surveys administered by consultants contracted by the Ministry for the Environment. The Ministry of Agriculture and Forestry has been responsible for the compilation of emission estimates for the agriculture sector and has provided the removal estimates for planted forestry in the LULUCF sector since the 2008 annual submission.

20. New Zealand's national statistical agency, Statistics New Zealand, provides many of the official statistics for the agriculture sector, which are acquired through regular agricultural censuses and surveys. Statistics New Zealand also provides statistics on fuel consumption through the *Deliveries of Petroleum Fuels by Industry Survey* and *New Zealand Coal Sales Survey*. Population census data from Statistics New Zealand are used in the waste and solvent and other product use sectors.

21. The ERT recognized that the overall organization of the national system is sufficient to ensure accurate estimation and timely reporting of GHG emissions.

3. Inventory preparation

Key categories

22. New Zealand has reported a tier 1 key category analysis, both level and trend assessment, as part of its 2009 annual submission. New Zealand has included the LULUCF sector in its key category analysis, which was performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The key category analysis performed by New Zealand and that performed by the secretariat[5] produced similar results. Fugitive CO_2 emissions from geothermal operations was identified as a key category by New Zealand but not by the secretariat, taking into account country-specific conditions that electricity generation by geothermal energy creates CO_2 emissions. The results of the key category analysis are a driving factor for the preparation of the inventory by prioritizating the development of methodologies for each category. New Zealand has reported uncertainty estimates for all categories; therefore the ERT encourages the Party to develop a tier 2 key category analysis in its next submission.

Uncertainties

23. New Zealand reported a tier 1 uncertainty analysis that was prepared in accordance with the IPCC good practice guidance, and reported these estimates in the NIR 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). Total inventory uncertainties for 2007 are 16.7 per cent (including LULUCF) and 20.6 per cent (excluding LULUCF). The trend uncertainties for the period 1990 to 2007 are 4.5 per cent (including LULUCF) and 5.5 per cent (excluding LULUCF). There is almost no change in the uncertainty estimates when compared with the 2008 annual submission. New Zealand has used the uncertainty analysis to prioritize further improvements in the inventory.

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[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.

Recalculations and time-series consistency

24. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by New Zealand for the entire time-series (1990–2006) have been undertaken in all sectors, except the solvent and other product use sector. The recalculations take into account improvements in AD (energy, industrial processes, agriculture, LULUCF and waste sectors) and emission factors (EFs) (energy, industrial processes and LULUCF sectors). The magnitude of the impact includes: a decrease in the estimate of total GHG emissions in 1990
(0.2 per cent) and a decrease in the estimate in 2006 (0.3 per cent). The rationale for these recalculations is provided in the NIR and in CRF table 8(b).

Verification and quality assurance/quality control approaches

25. New Zealand provided information on QA/QC procedures in accordance with the IPCC good practice guidance. The Ministry for the Environment developed a QA/QC plan in 2004 and this plan is updated annually in conjunction with the inventory improvement plan. The Ministry for the Environment used tier 1 QC checks for all categories in accordance with the IPCC good practice guidance. Following a recommendation made by the previous ERT, New Zealand's inventory compilation schedule was changed to allow more time for QC checks, and an additional person was contracted by the inventory team at the Ministry for the Environment from December through February 2009 to undertake QC procedures for key categories for the 2007 inventory year. New Zealand provided a link to a website which contains examples of QC checks undertaken for each key category with a MS Excel worksheet.

26. New Zealand indicated that in 2008 KMPG developed a risk register to highlight potential risks in the inventory data compilation process. The NIR states that, following a recommendation made during the previous review, the Ministry for the Environment will continue to use the risk register to assist in prioritizing future improvements to the inventory. The current ERT further encourages New Zealand to integrate the KMPG risk register into its QA/QC plan.

Transparency

27. The NIR includes information on the key category analysis, methods, data sources, EFs, uncertainty estimates and QA/QC procedures. Transparency of the inventory has improved since the previous submission but the information is not elaborated sufficiently. More detailed information is needed in the NIR, such as complete information on methodologies and assumptions and more information on country-specific EFs, in particular for the energy, industrial processes and agriculture sectors (see chapters II and IV). The ERT recommends that New Zealand expand its methodological description for the estimation and provide a rationale for the selection of country-specific EFs in the NIR. The ERT notes that New Zealand intends to continue to provide further method descriptions as necessary and provide a rationale for the selection of country-specific EFs in the NIR. The ERT encourages New Zealand to continue to improve the transparency in the NIR.

4. Inventory management

28. New Zealand has a centralized archiving system. The NIR states that the inventory and all required data are stored in a controlled file system on the central computer network of the Ministry for the Environment. The inventory is available on the website of the Ministry for the Environment. During the review New Zealand provided additional information on its archiving system. New Zealand explained that all files related to the overall compilation of the inventory are kept in the archive. This includes planning documents, copies of references, QA/QC and improvement plans, tier 1 QC checklist results, memos to sector leads on the schedule for preparation, any updates to the CRF Reporter, and QA/QC procedures for the next annual submission. The uncertainty analysis and key category analysis spreadsheets are also stored in the archive. The system is on a network drive and is backed up every evening as part of the Ministry's routine backup procedures. The ERT acknowledged that New Zealand

was able to respond to requests for information to clarify questions relevant to the inventory throughout the different stages of the review process.

F. Follow-up to previous reviews

29. New Zealand has addressed some of the recommendations from the previous review. The ERT noted that the capacity of the national system has been increased and improved: the inventory compilation schedule has been changed to allow more time for QC, and an independent review of the inventory by persons not directly involved with its preparation has been introduced. However, the ERT observed that New Zealand has not implemented all of the recommendations from the previous review, particularly:

(a) Collecting data on the carbon content and heating value of imported coals and, if necessary, updating the CO_2 EF to reflect this;

(b) Revising the allocation of emissions from fuels that are typically used in mobile combustion;

(c) Providing information on how and where CO_2 emissions associated with feedstocks and other non-energy use of fuels are accounted for;

(d) Providing more information in the NIR on how recalculations affect the time-series and a justification of how the recalculations have improved the accuracy of emission and uncertainty estimates, time-series consistency and completeness of the inventory;

(e) Performing a tier 2 key category analysis;

(f) Improving the transparency of the inventory by providing in the NIR elaborated documentation on methods used and a rationale for the selection of country-specific EFs.

G. Areas for further improvement

1. Identified by New Zealand

30. The 2009 NIR identifies several areas for improvement. Priorities for inventory development are determined based on the analysis of key categories, uncertainty estimates and recommendations from the previous review. The key areas are outlined as follows:

(a) Investigation of the allocation of liquid fuels, particularly diesel consumption in the road transportation and commercial/institutional subcategories;

(b) Continuation of research on N_2O EFs for New Zealand's pastoral soils;

(c) Continuation of research to refine the methodology used to estimate N_2O emission reductions using dicyandiamide nitrification inhibitors;

(d) Development of the Land Use and Carbon Analysis System (LUCAS) model to improve reporting of the LULUCF sector in the 2010 submission;

(e) Investigation of the potential use of country-specific EFs for the cropland category;

(f) Development of the new estimates of landfill gas.

2. Identified by the expert review team

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

(a) Implementation of outstanding recommendations from previous reviews: revising the allocation of emissions from fuels that are typically used in mobile combustion; and

providing information on how and where CO_2 emissions associated with feedstocks and other non-energy use of fuels are accounted for;

(b) Increased transparency of the method used for estimating emissions by providing a more precise description of the methodologies and rationale for the selection of country-specific EFs in the NIR;

(c) Improved completeness of the inventory by providing emission estimates for categories reported as "NE" in accordance with the list developed and agreed to by the Party for ensuring completeness of the inventory. The ERT recommends that New Zealand improve the completeness of its next annual submission, especially for those categories that are known to occur within the Party and for which methodologies are available in the Revised 1996 IPCC guidelines and the IPCC good practice guidance to estimate emissions.

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

II. Energy

A. Sector overview

33. The energy sector is the the second largest sector in the GHG inventory of New Zealand. In 2007, emissions from the energy sector amounted to 32,653.10 Gg CO_2 eq, or 40.9 per cent of total GHG emissions. Since 1990, emissions have increased by 39.2 per cent. The key driver for the rise in emissions is increased emissions from road transportation. Within the sector, 45.6 per cent of the emissions were from transport, followed by 24.1 per cent from energy industries, 16.5 per cent from manufacturing industries and construction and 8.5 per cent from other sectors. Fugitive emissions from oil and natural gas accounted for 4.6 per cent and fugitive emissions from solid fuels accounted for 0.8 per cent.

34. In general, the methodological approaches used to estimate emissions are presented transparently in the NIR. However, there are some exceptions which are described in paragraphs 35 and 36. The energy sector inventory has been compiled by the Ministry of Economic Development based on its own database together with the energy balance from Statistics New Zealand. For the most part, country-specific EFs are used for estimating CO_2 emissions applying gross calorific values (GCVs) for the calculation of EFs. In the case of natural gas, site-specific CO_2 EFs are provided for different mining fields. On the other hand, emissions of non-CO_2 gases from combustion processes, which are not key categories, are estimated by using tier 1 methods and default EFs converted from net calorific values to GCVs. The NIR includes the complete set of EFs used and the energy balance.

35. New Zealand's combustion processes inventory is consistent and complete, and the classification of categories is in most cases in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The manufacturing industries and construction category is aggregated and relevant AD and corresponding emissions are reported under other (manufacturing industries and construction). New Zealand reports methanol production in the chemicals category; this should be reported in the industrial processes sector under the chemical industry category, and all data except CO_2 emissions are considered confidential. The ERT reiterates the recommendation made during the previous review that New Zealand improve transparency by providing in the NIR a carbon flow cycle (e.g. carbon mass balance for natural gas (from the well to the end consumer) and associated products) and by clearly indicating where and how CO_2 is accounted for in the CRF tables in order to avoid double counting or the possible underestimation of emissions from fuel combustion.

36. The fugitive emissions inventory is not as complete as that of combustion processes and there are several instances where the notation keys "NE" and "IE" are used. The explanation in table 9 of the

CRF tables states that, based on expert judgement, the corresponding emissions are insignificant. The ERT recommends that New Zealand evaluate estimate of emissions that are currently reported as "NE" as far as is practicable (e.g. by using the IPCC default methodology) and limit the number of "IE" cases. During the review, New Zealand explained that the use of notation key "NE" for fugitive CH_4 and CO_2 emissions in the oil and natural gas exploration and production categories was incorrect and expressed its intention to revise the use of this notation key in the 2010 submission. Additionally, New Zealand explained that the relevant oil and gas companies do not provide separate data for exploration activities; they are currently reported together with venting and flaring under flaring (combined). The ERT recommends that New Zealand improve its existing approach to data collection in order to report emissions at a sufficient level of detail and increase transparency.

37. In its 2009 submission, New Zealand performed recalculations for both stationary combustion and fugitive emissions. For stationary combustion, the constant calorific values of liquid and solid fuels were substituted with year-specific values for the entire period 1990–2007. For oil and gas, the recalculation was conducted with reallocation emissions and AD from flaring (gas) to flaring (combined) subcategory. The impact of this recalculation was a 0.16 per cent decrease in total CO_2 emissions (excluding LULUCF) in 2007 and a 0.08 per cent decrease in 1990. In the energy chapter of the NIR, New Zealand provides only aggregated uncertainty information that is generally applied to the whole sector including fugitive emissions (5 per cent for CO_2 and 50 per cent for CH_4 and N_2O), and states that a tier 1 approach was used for QA/QC procedures. The ERT encourages New Zealand to gather more specific uncertainty data and supplement its QA/QC plan by including higher tier QA/QC procedures.

B. Reference and sectoral approaches

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

38. In 2007, CO_2 emissions estimated using the reference approach were 0.82 per cent higher than those estimated using the sectoral approach. The reported differences, by type of fuel, were: –1.6 per cent for liquid fuel, 1.7 per cent for solid fuel and 5.2 per cent for gaseous fuel. However, the differences in energy consumption between the reference approach and sectoral approach were higher and in all cases positive (the reference approach being higher than the sectoral approach): 10.7 per cent for liquid fuel, 2.4 per cent for solid fuel and 7.4 for gaseous fuel. During the review, the ERT asked New Zealand to explain some discrepancies in CO_2 emissions and energy consumption between the reference approach and sectoral approach in CRF table 1.A.(c). In its response, New Zealand admitted that there were some errors in the AD and suggested corrections for the table. After corrections, the differences in energy consumption would be 4.7 per cent for liquid fuel, 2.4 per cent for solid fuel and –4.7 for gaseous fuel. The ERT recommends that New Zealand revise its method of comparing the reference and sectoral approaches by taking into account all relevant feedstocks and non-energy fuels.

2. International bunker fuels

39. The NIR reports that the allocation of fuel consumption between domestic and international air transport is based on refuelling at the domestic and international terminals of New Zealand's airports. Currently splitting the domestic and international components of fuels used for international flights with a domestic segment was not considered; however, the number of international flights with a domestic segment is considered to be negligible. The ERT notes that in 2006, New Zealand began consultations with the airlines to clarify the situation and improve the relevant AD, and is currently working on a methodology that will allow for better international and domestic fuel use allocation. New Zealand is encouraged to adopt the new approach and report the outcome in its 2010 submission.

3. Feedstocks and non-energy use of fuels

40. The non-energy use of bitumen, the use of natural gas as a feedstock for methanol production and the amount of carbon contained in the coal used in iron and steel production are taken into account in the

reference approach. The IPCC default value is used for the fraction of carbon stored in bitumen, and for confidentiality reasons only the total amount of carbon stored for the production of methanol is reported.

41. As stated earlier, CO_2 emissions from methanol production are reported under the energy sector while CO_2 emissions associated with other chemical products (e.g. ammonia (NH_3)) are reported under the industrial processes sector. The ERT reiterates the recommendation made in previous reviews that New Zealand improve transparency by providing flow charts for carbon and a carbon balance, most importantly the carbon balance for natural gas (from the well to the end consumer, including relevant products), and by indicating where and how CO_2 is accounted for in the CRF tables in order to avoid a potential double counting or underestimation of emissions from fuel combustion. During the review, New Zealand informed the ERT that the next submission will include mass balance flow diagrams for coal, oil and gas. These diagrams will better illustrate where fuels are being used for non-energy purposes. The ERT welcomes such a plan and looks forward to its implementation.

4. Country-specific issues

42. New Zealand reports fugitive CO_2 and CH_4 emissions from geothermal plant operations; however, no methodology is provided in the NIR. The ERT reiterates the recommendation from the previous review that New Zealand improve transparency by providing a description of the relevant methodology in the NIR. During the review, New Zealand informed the ERT that New Zealand has talked to all geothermal operators in the country about the accuracy of their emissions data to ensure that the reported emissions are correct. All operators have said that the data are correct but have noted the large variability in geothermal emissions in New Zealand. This is mainly due to the varying CO_2 content of new wells which have come online, and the lack of regular measurements. When the New Zealand Emissions Trading Scheme (ETS) comes into force, geothermal plants will be required to take regular measurements of associated emissions. The ETS data will also be available for national inventory purposes. The ERT welcomes this development but insists that New Zealand clearly explain the method for estimating these emissions in the NIR in its next annual submission.

C. Key categories

1. Stationary combustion: liquid, solid and gaseous fuels – CO_2

43. In previous inventory submissions (before 2008), a constant calorific value was applied to convert the amount of fuels measured in mass units into energy units (PJ). In the 2008 and 2009 submissions, improvements were made by applying year-specific calorific values for all liquid fuels. At the same time, relevant recalculations were made for the whole time-series. The ERT welcomes this improvement, but is short on information about mean calorific values for all fuels and possible trends for these values since 1990. As for EFs, relevant country-specific CO_2 EFs are presented in table A2.1 of the 2009 NIR, but there is no indication of how frequently these values are updated, or any information on possible trends or uncertainties. In order to improve transparency of reporting, the ERT recommends that New Zealand provide all above-mentioned values in the NIR of its next annual submission.

44. In the previous inventory submission, New Zealand's emissions from coal combustion in the public electricity and heat production subcategory were calculated using the EF for sub-bituminous coal (92.99 t CO_2/TJ), while for all other coal combustion activities, a lower EF (91.20 t CO_2/TJ) was used. Since 2008, New Zealand has decided to use only the second (lower) value for all coal burning activities and this change has been applied to the whole time-series (1990–2007). The reason for this decision, which leads to lower CO_2 emissions in the energy industries subcategory, is not sufficiently explained in the NIR. The ERT recommends that New Zealand give a proper explanation for this decision in the NIR of its next annual submission. From a long-term point of view in terms of development of the inventory, the ERT encourages New Zealand to revise older country-specific CO_2 EFs coming from Baines (1993), as was recommended during the previous review.

45. New Zealand has one gas field, Kapuni, with a particularly high CO_2 content corresponding to CO_2 EF 84.1 t CO_2/TJ. Historically, this field has been valued by the petrochemicals industry as a feedstock. However, most of the gas from this field is now treated and the excess CO_2 removed. The EF for treated gas from Kapuni is 53.2. t CO_2/TJ. In CRF table 1.B.2 no fugitive CO_2 emissions are reported for production or venting of natural gas; only a value of 752.73 Gg is reported for flaring (combined oil and gas). Also, in the NIR, relevant information about the fate of CO_2 removed from Kapuni is missing. The ERT recommends that New Zealand provide an explanation in the NIR of its next annual submission, including relevant information on methods used, data processing, etc.

2. Fugitive emissions: gaseous fuels – CH_4

46. Fugitive emissions from natural gas are only reported for distribution and flaring. CO_2 and CH_4 emissions from transmission are confidential and are included in the distribution estimate. It appears to the ERT that a considerable amount of data exists for New Zealand's natural gas system, which involves production, processing, transmission and distribution. It is good practice to estimate emissions separately for each of these elements of a natural gas system. The ERT recommends that New Zealand provide disaggregated estimates of fugitive emissions from natural gas, including estimates for the gas production category (previously reported as "NE", currently as "IE"), and include a transparent description of the relevant methodology.

D. Non-key categories

Road transportation: liquid fuels – N_2O

47. N_2O emissions from road transportation were not identified as a key category, perhaps because New Zealand applied a constant EF (1.5 kg N_2O/TJ) to gasoline-powered vehicles for the whole period (1990–2007), which is an approach that is only appropriate for uncontrolled vehicles (i.e. vehicles without catalytic converters). This approach does not correspond to the present fleet of cars in New Zealand, which likely contains a significant number of cars equipped with catalytic converters for which N_2O EFs will be considerably higher than 1.5 kg N_2O/TJ. The ERT strongly recommends that New Zealand revise its approach to estimating non-CO_2 emissions (mainly N_2O), taking into consideration advances in vehicle technology since 1990.

III. Industrial processes and solvent and other product use

A. Sector overview

48. In 2009, emissions from the industrial processes sector amounted to 4,601.88 Gg CO_2 eq, or 6.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 43.40 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since 1990, emissions have increased by 35.0 per cent in the industrial processes sector, and increased by 4.5 per cent in the solvent and other product use sector. The key drivers for the rise in emissions in the industrial processes sector are metal production and the consumption of HFCs. Within the industrial processes sector, 49.2 per cent of the emissions were from metal production (CO_2 and PFCs), followed by 18.7 per cent from mineral products, 13.1 per cent from the chemical industry and 19.0 per cent from the consumption of halocarbons and SF_6.

49. The 2009 submission include a description of QA/QC procedures for verification of plant-specific information; for example, six industrial companies were visited by the Ministry for the Environment to validate the data submitted by each company. The ERT welcomes these activities. However, there are very few descriptions about QA/QC procedures performed for each category and the results of these activities. Regarding key categories, tier 2 QC activities are desirable, especially for the categories using plant-specific information. The ERT encourages New Zealand to implement category-specific QA/QC activities for key categories and verify plant-specific information.

50. New Zealand has provided, in the main body of the NIR, information on methods for calculating indirect GHG emissions in the industrial processes categories. The ERT encourages New Zealand to explore other options for reporting this information within the NIR in order to increase transparency.

51. Some recalculations were performed in the 2009 submission, HFC emissions from the consumption of HFCs and SF_6 (+19.45 Gg, +3.3 per cent), CO_2 emissions from cement production (–21.71 Gg, –3.9 per cent) and CO_2 emissions from ammonium production (+7.46 Gg, +2.0 per cent). The ERT acknowledges that New Zealand did not mention the recalculation performed for CO_2 emission from cement production in the NIR (it was only mentioned in the CRF tables). The ERT recommends that New Zealand provide more information on how recalculations affect the time-series in the category-specific sections of the NIR and how recalculations improve the accuracy of emission estimates, time-series consistency and completeness of the inventory in its next annual submission.

52. New Zealand has reported emissions from methanol and NH_3 production inconsistently. Rather than presenting emissions by fuel combustion, CO_2 emissions from methanol production have been reported in the energy sector and CH_4 emissions from methanol production have been reported in the industrial processes sector. Similarly, CO_2 emissions from NH_3 production have been reported in the industrial processes sector while CH_4 emissions from NH_3 production have been reported in the energy sector.

53. The uncertainty analysis has been performed using tier 1 methods. There are some very small (0 per cent) uncertainties for AD and the description of the uncertainty estimate for CO_2 is missing. The ERT recommends that New Zealand reassess the uncertainty estimates for AD, report uncertainty estimates for each EF and provide a more detailed description of the uncertainty estimates used at least for every key category.

B. Key categories

1. Cement production – CO_2

54. New Zealand's description of the method used for this category in the NIR is sufficient even though it uses indexed data on AD and implied emission factors (IEFs) for confidentially reasons. The ERT recommends that New Zealand further improve transparency of the NIR by discussing which tier method has been used and how the method is consistent the IPCC good practice guidance and cement CO_2 protocol[6], which was developed by the World Business Council for Sustainable Development (WBCSD), used for the estimation. The ERT also recommends that New Zealand provide a description of the QC procedures that have been performed on the reported data by cement plants or the inventory team. The ERT welcomes New Zealand's efforts to improve the transparency of selected cement kiln dust correction factor values and trend of cement kiln dust correction factor values in its next annual submission and the Party's plan to verify emissions in the future using data from the ETS. The ERT noted that guidelines such as the cement CO_2 protocol are not always in line with the IPCC good practice guidance. The ERT recommends that New Zealand demonstrate in the NIR that this method is in line with the IPCC good practice guidance.

2. Ammonia production – CO_2

55. New Zealand has identified CO_2 emissions from NH_3 production as a qualitative key category. New Zealand provides a good description of the calculation methods and reasons for fluctuations in the IEFs in the NIR. However, information on the consumption of natural gas as raw material is not transparent enough, and cannot be used to verify that there is no double counting between the energy and industrial processes sectors. The ERT recommends that New Zealand provide a more thorough explanation on consumption of natural gas as raw material and that there is no double counting in the NIR

[6] <http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=MTU5MjQ>.

of its next annual submission, including information demonstrating that the amount of natural gas used in NH_3 production has been subtracted from total natural gas used, preventing double counting.

3. Iron and steel production – CO_2

56. New Zealand has recalculated CO_2 emissions from production of steel from recycled steel for the whole time-series. During the review, New Zealand informed the ERT that there will be a new allocation of CO_2 emissions from this category between energy and process emissions and improved estimates for the years 2000–2008 in the 2010 submission. The ERT welcomes New Zealand's willingness to improve the estimates and their allocations. The ERT recommends that New Zealand provide more information on which flux elements are included in the mass balance calculation and how their emissions are reported in the CRF tables.

57. New Zealand reported that a tier 2 method has been used to calculate CO_2 emissions from iron sand process, but New Zealand provides little information on the EFs used and the carbon content of the raw materials. The ERT recommends that New Zealand explain the methodology used in more detail, including the EFs used and the carbon content of the raw materials.

4. Aluminium production – PFCs

58. New Zealand provides a good description of the tier 2 method used for estimation of emissions from this category. The transparency of the description has been improved by increasing the quantity of information on EFs used and providing reasons for the fluctuating emissions. During the review, New Zealand informed the ERT that it has found some inconsistencies between datasets used for the estimation and will perform recalculations in the next annual submission. This will improve the consistency and accuracy of the inventory. The ERT welcomes these efforts.

5. Consumption of halocarbons and SF_6 – HFCs

59. New Zealand provides more detailed information on this category for the largest sources than in the previous submission. New Zealand has also performed recalculations for emissions from this category for the whole time-series using corrected data, updated assumptions and new AD. However, there is very little information on EFs, product life factors and leakage rates. The ERT recommends that New Zealand continue to improve the description of the method for the estimation of emissions from this category in the NIR and the quality of estimates where possible.

C. Non-key categories

Limestone and dolomite use – CO_2

60. New Zealand recalculated CO_2 emissions from limestone and dolomite used in iron and steel production and briefly explained the method used in the NIR. During the review, New Zealand gave further explanation of how this recalculation was performed. The ERT recommends that New Zealand provide a more thorough description of the original calculation and recalculation methods used in its next annual submission.

61. During the review, New Zealand informed the ERT that it had discovered a potential CO_2 emitter. The ERT encourages New Zealand to continue its efforts to identify CO_2 emitters and to report them in future submissions.

IV. Agriculture

A. Sector overview

62. In 2007, emissions from the agriculture sector amounted to 36,430.00 Gg CO_2 eq, or 48.2 per cent of total GHG emissions. Since 1990, emissions have increased by 12.1 per cent. The key driver for the rise in emissions is increased emissions from enteric fermentation (+6.9 per cent) and

agricultural soils (+22.4 per cent). Within the sector, 64.0 per cent of the emissions were from enteric fermentation, followed by 33.8 per cent from agricultural soils and 2.2 per cent from manure management. Field burning of agricultural residues accounted for 0.05 per cent and the prescribed burning of savannas accounted for the remaining 0.003 per cent.

63. For the 2009 submission, New Zealand provided a complete set of CRF tables which include emission estimates for all gases and most categories of the agriculture sector, except rice cultivation. There is no rice production in New Zealand therefore the notation key not occurring ("NO") was used. Some notation keys in the CRF tables need to be reviewed, in particular for CRF table 4.D. The notation key used for the fraction of manure burned for fuel was "0"; however, as indicated in the NIR, this activity does not occur in the country. The notation key "NO" should have been used. New Zealand's inventory is quite transparent but some country-specific EFs and parameters should be better documented in the NIR, such as the fraction of crop residue burned. The tier 1 QA/QC checks were performed for AD for all key categories in this sector. The recalculations were conducted for all categories caused by all AD being updated with the latest available data.

B. Key categories

1. Enteric fermentation – CH_4

64. CH_4 emissions were calculated using a country-specific model based on estimations of dry matter feed intake for major livestock species such as dairy and non-dairy cattle, sheep and deer. The tier 1 and default EFs were applied to minor livestock such as goats, horses and swine. This is in line with the IPCC good practice guidance. The ERT considers that the CH_4 emission estimates are of a good quality.

2. Direct soil emissions – N_2O

65. Direct N_2O emissions from soil have increased from 1.57 Gg in 1990 to 5.42 Gg in 2007 due to an increase in the amount of fertilizer and manure applied to soil. The tier 1a and a country-specific EF (0.01 kg N_2O-N/kg N; Kelliher and de Kleine, 2006) were used for all subcategories, except cultivated organic soils, where the default EF (8.0 N_2O-N/kg N) was used.

66. New Zealand does not take into account all types of crops, in particular tubers, roots, vegetables and other crops, for estimates of N_2O emissions from agricultural soils. This leads to an underestimation of emissions from non-fixing crops which then results in an underestimation of emissions from crop residue returned to soil. During the review, New Zealand explained to the ERT that potatoes are grown on approximately 2 per cent of the total crop area, and other vegetables including carrots, cabbage, cauliflower, lettuce, etc., are grown on 4 per cent of the total crop area. A report commissioned by the Ministry of Agriculture and Forestry (Thomas et al., 2008) indicated that the area grown in forage brassica's may have doubled between 1990 and 2007 according to best available estimates. For the first time, production on forage, fodder and green feed crops was included in New Zealand's agricultural production survey in 2009 in order to begin collecting AD on these crops. The report results will be available in May 2010 and will be included in New Zealand's 2011 annual submission. The report also recommended that potatoes be included in the inventory as an important crop, even though they are grown on a reasonably small area. The ERT welcomes New Zealand's improvements and recommends that it revise its list of crops and improve the coverage of crop data in its next annual submission.

C. Non-key categories

Field burning of agricultural crop residue – CH_4, N_2O

67. CH_4 and N_2O emissions were estimated on the basis of expert judgement on fraction of crop residue burned. For the period 1990–2003 it was estimated that 50 per cent of crop residues were burned and for 2003–2007 it was estimated that 30 per cent were burned. The NIR does not provide an explanation of the assumptions underlying the selection of these parameters, or the reason why

New Zealand has changed the common practice for crop burning. The ERT encourages New Zealand to improve transparency and include this information in the next annual submission in order to facilitate the review. The ERT also notes that all country-specific EFs and parameters should be well documented in the inventory.

V. Land use, land-use change and forestry

A. Sector overview

68. In 2007, net removals from the LULUCF sector amounted to 23,836.01 Gg CO_2 eq. Since 1990, net removals have increased by 31.4 per cent. The key drivers for the rise in removals are forest land remaining forest land and land converted to forest land. Within the sector, removals from forest land amounted to 24,527.90 Gg CO_2 eq and removals from cropland amounted to 510.28 Gg CO_2 eq. Emissions from grassland amounted to 1,063.68 Gg CO_2 eq, emissions from settlements amounted to 97.16 Gg CO_2 eq, emissions from other land amounted to 40.61 Gg CO_2 eq and emissions from wetlands amounted to 0.72 Gg CO_2 eq.

69. New Zealand reported estimates for all land-use categories except wetlands remaining wetlands, settlements remaining settlements and other land remaining other land. The ERT noticed that New Zealand made an effort to improve the reporting quality in the LULUCF sector. The main improvements since the last submission concern the updating of AD for forest land, the estimation of the area of newly planted forest converted to other land-use categories, and the estimation of emissions from liming on cropland and grassland. A recalculation was performed using the new estimates, resulting in a decrease in removals of 2,369.23 Gg CO_2 eq in 1990 and in an increase in removals of 1,128.07 Gg CO_2 eq in 2006. A land-use change matrix was provided based on reclassified land-use maps for the years 1997 and 2002. AD from 1990 to 2007 were extrapolated from this land-use matrix. In addition, an annual survey of plantation forests was used to estimate the area of forests. However, a land-use change matrix for the complete time-series 1990-2007 was not available.. To estimate changes in carbon stock resulting from land-use change, pools of living biomass and soil carbon were derived from calculations using default values, except for living biomass and dead organic matter (DOM) of planted forests, for which country-specific data based on a model approach were developed. The ERT notes that New Zealand plans to introduce additional, country-specific data on carbon stocks for the pools in the different land-use categories in future submissions, as part of a process of ongoing improvement which is prioritised according to LULUCF key categories, and recommends that New Zealand implement these changes as soon as practicable. The ERT welcomes New Zealand's plans to include organic soils in its reporting in its 2010 submission, and recommends that New Zealand continue to improve its methodology and AD in relation to organic soils. The AD on organic soils will be particularly important for the accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol. The ERT further invites New Zealand to reconsider the application of notation keys, especially the application of the notation key not applicable ("NA") that should be applied only for activities that do not result in emissions or removals of a specific gas (FCCC/SBSTA/2004/8, para. 28).

70. New Zealand provides, in the description of every land-use category, information on QA/QC procedures, uncertainties, recalculations and planned improvements. Tier 1 QA/QC procedures were applied for the categories forest land, cropland and grassland. Uncertainty was estimated to be +/–16 per cent for removals from planted forests but no estimation could be made for the annual decrease in carbon stocks due to biomass loss by felling, fuelwood gathering and other losses. For all other land-use categories, except other land, the uncertainty for emissions or removals was estimated to be +/–75 per cent. New land-use data (as mentioned in para. 71) will improve the reporting, as it will enable New Zealand to provide historic information on AD for the main land-use categories and explicit estimations of carbon stock change from the conversion of planted forests to grassland.

71. New Zealand is planning to make substantial improvements for estimating emissions and removals of this sector in its next submission. Data from the LUCAS system, based on a systematic 8 km

grid net, will be available and will provide a consistent time-series of land use for the whole period since 1990. Areas of land-use change will be identifiable and will provide consistent estimates of carbon stock changes for the whole time-series. Data from the LUCAS system, based on land-use mapping, will be available and will provide a consistent time-series of land use for the whole period since 1990. Areas of land-use change will be identifiable and will provide consistent estimates of carbon stock changes for the whole time-series. New Zealand affirms that the new LUCAS database will meet the requirement for GHG inventory information under Article 7, paragraph 1, of the Kyoto Protocol which is described in the annex to decision 15/CMP.1. The ERT greatly appreciates the efforts made by New Zealand and welcomes the planned improvements. The ERT also noted that, consistent with the IPCC good practice guidance for LULUCF, New Zealand documents afforestation and reforestation through data collected annually from forest owners and through land-use change mapping, and further notes that decisions taken to plant new trees or to allow forest regeneration will be confirmed by the production of a full-coverage, land-use map of New Zealand at the end of 2012.

B. Key categories

1. Forest land remaining forest land – CO_2

72. New Zealand reports an area of forest land of 9,993 kha in 2007, of which approximately 80 per cent is comprised of natural forests and approximately 20 per cent comprised of planted forests. Few data are available on natural forests. However, harvesting is subject to legal requirements and is very limited. It is estimated that less than 0.1 per cent of the total harvested volume is taken from natural forests. The growth increment is assumed to be zero. For planted forests, national coefficients were established and models developed to simulate planting and harvesting and to estimate the change in carbon stock including DOM. Carbon stock changes in mineral soils are assumed to be zero if there is no land-use change. The ERT welcomes the ongoing relevant research projects and encourages New Zealand to also investigate carbon stock change in the soil, as a higher tier is recommended for estimating key categories.

2. Land converted to forest land – CO_2

73. Conversion to forest land is reported for grassland only. Land converted to forest land is kept in this category for a whole rotation period (27–29 years, on average) without shifting to the category forest land remaining forest land. The converted grassland consists of two subcategories, namely, grassland and grassland with woody biomass. It is assumed that 25 per cent of the converted grassland with woody biomass has been using controlled burning. This is reported in table 5.A (CO_2) and 5(V) (CH_4 and N_2O). The ERT found an unexpected increase in the loss of carbon per ha in mineral soils during the reporting period from 1990 to 2007. New Zealand explains that this is a result of not having information on land-use change areas prior to 1990. Eliminating this inconsistency is part of the improvement plan. The ERT welcomes the efforts of New Zealand, noting that it plans to introduce additional country-specific methods and data in its 2010 submission, and recommends that it continue to develop country-specific data for all relevant carbon stocks. The ERT also reminds New Zealand that it is good practice to report key categories using higher tier methods. The ERT encourages New Zealand to improve its data base concerning the changes in the carbon stock of soils.

3. Cropland remaining cropland – CO_2

74. The carbon stock changes in living biomass of perennial vegetation were estimated using methods and default parameters from the IPCC good practice guidance for LULUCF. However, only carbon gain was accounted for, which led to an overestimation of CO_2 removals. During the review, New Zealand stated that this will be corrected in the LULUCF estimates for the 2010 submission, as part of New Zealand's ongoing LULUCF inventory improvement plan. Carbon stock changes in DOM and soils were reported as "NE". New Zealand improved the estimate by including CO_2 from liming. During the review, New Zealand has explained that the available land-use data do not provide information on destocked perennial crops, as this is not a significant activity in New Zealand, but that the LUCAS system

will provide improved estimates for carbon stock change for perennial cropland in its 2010 submission. The ERT welcomes this and notes the recommendation made during the previous review that New Zealand use country-specific parameters, including carbon loss from perennial crops, and estimate changes in soil carbon stock, including cultivated organic soils, in future submissions. New Zealand has indicated that it intends to introduce additional country-specific methods and data in its 2010 submission, and the ERT recommends it continue to develop country-specific data for all relevant carbon stocks.

4. Grassland remaining grassland – CO_2

75. Grassland is divided into two subcategories: low producing and high producing. As no information on carbon stock change in living biomass or changes to grassland management is available, the carbon stock changes in living biomass, DOM and soils are reported as "NE". Further to this, no information on organic soils is provided. According to New Zealand, herbaceous freshwater vegetation is categorized as grassland, therefore grassland areas on organic soils are to be expected. The emissions from this category come from agricultural lime application only, which are reported for the first time in this submission. As this category is identified as a key category, the ERT encourages New Zealand to develop country-specific data for the estimation of emissions and removals, and to provide more information on organic soils.

5. Land converted to grassland – CO_2

76. The emissions in this category result from the conversion of natural forests to grassland. During the review, New Zealand stated that this will be corrected in the LULUCF estimates for the 2010 submission, as part of New Zealand's ongoing improvement plan. The stock change of carbon in living biomass and of carbon in mineral soils is estimated using country-specific data. The emission from the conversion of planted forest to grassland is reported under the forest land-land category. New Zealand plans to separate it and to report the estimates of emissions from the conversion of planted forest to grassland under the grassland category in its next annual submission. The change in DOM is reported as "NE". The ERT found an unexpected increase in the carbon stock per area of soil. New Zealand explains that this increase resulted from a lack of information on land-use change areas prior to 1990. The elimination of this inconsistency is part of the improvement plan. During the review, New Zealand also stated that this will be addressed in the 2010 submission, as part of New Zealand's ongoing improvement plan for the LULUCF inventory. The ERT welcomes the efforts of New Zealand and, noting that it plans to introduce additional country-specific methods and data in its 2010 submission, recommends that it continue to develop country-specific data for all carbon stocks concerned.

C. Non-key categories

Wetlands remaining wetlands, other land remaining other land – CO_2, CH_4 and N_2O

77. These categories are described in the annexes to chapter 3 of the IPCC good practice guidance for LULUCF. Reporting on these categories is therefore not mandatory. New Zealand considers other land as managed as it argues that the whole territory is managed. However, the ERT found that New Zealand denotes wetlands as flooded land and regulated water bodies as unmanaged, even though these areas are obviously impacted by human activities. The ERT encourages New Zealand to consider this inconsistency in the application of managed and unmanaged for land areas and to describe, in a transparent manner, how it distinguishes between managed and unmanaged land.

VI. Waste

A. Sector overview

78. In 2007, emissions from the waste sector amounted to 1,821.80 Gg CO_2 eq, or 2.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 25.3 per cent. The key driver for the fall in emissions is the reduction in per capita waste generation from 2.35 kg/capita/day (1990) to 2.05 kg/capita/day (2007). New Zealand attributes this to an increased emphasis on waste minimization

in its policy development and legislation. Within the sector, 78.9 per cent of emissions were from solid waste disposal and 21.0 per cent from wastewater handling. The remaining 0.1 per cent was from incineration.

79. The ERT notes the enactment of the Waste Minimization Act in 2008, which requires landfill operators to, inter alia, report on waste targets and measures, and encourages New Zealand to use the enforcement of the regulations under the Act to improve AD for waste streams. Specifically, New Zealand is encouraged to obtain data on waste types that are co-deposited with municipal solid waste at solid waste disposal sites (SWDS), particularly industrial solid waste and wastewater sludge, as well as CH_4 recovery and utilisation data, to improve transparency of the allocations in the CRF tables. The improvement will also enable the appropriate disaggregation and transparent accounting of the fraction of gas used for energy recovery under the energy sector and the other fraction of gas which is flared under memo items as biomass combustion.

80. In 2009, New Zealand recalculated CO_2, CH_4 and N_2O emissions from incineration, CH_4 emissions from solid waste disposal on land, CH_4 and N_2O emissions from wastewater handling (resulting from changes in the methodological approach), and AD and EFs in response to comments made during the previous review. The reason for the recalculations has been explained in the NIR and the IPCC model worksheets included in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). The ERT recommends that New Zealand report the reason for the recalculations in CRF table 8(b). The ERT commends New Zealand for making corrections to typographical errors and errors resulting from incorrect units, which were identified during the previous review.

B. Key categories

Solid waste disposal on land – CH_4

81. New Zealand estimates emissions using the IPCC tier 2 first order decay method. New Zealand improved the transparency of the application of the methodology by using the spreadsheet for the model described in the 2006 IPCC Guidelines. The most significant improvement of the method used to estimate emissions includes most recent AD including waste composition data based on the 2006–2007 National Landfill Census and the 2006 Report on Waste Composition and Construction Waste Data. The results of the studies led to a revision of the quantity of solid waste going to SWDS in 2006 (from 2.078 to 2.053 kg/person/day), resulting in a 1.1 per cent decrease in emissions compared with the 2008 submission. The spreadsheet for the model described in the 2006 IPCC Guidelines also incorporated a default six-month delay in the anaerobic decomposition process, used default degradable organic carbon for decomposable waste, and applied individual half-life (k) values to the estimation instead of an aggregated value for the various waste streams. The starting year was also changed from 1940, as reported in earlier submissions, to the default model year 1950. The ERT notes that the revisions address comments made during the previous review with respect to the key parameters used in the model. Recalculations were performed for the entire time-series. The recalculations resulted in a 58.3 Gg CO_2 eq decrease in sectoral emissions in 1990 and a 35.6 Gg CO_2 eq decrease in 2006, and resulted in a 0.05 per cent reduction in the national total in 2006. The ERT commends New Zealand's efforts to increase the transparency of the application of the methodology and the improvement in estimation method over the previous submission.

82. New Zealand estimates emissions from recovered gas using a country-specific model. The methodology is considered to be inconsistent with the common practice of using facility-specific data on recovery and utilization (avoiding a potential overestimation of recovery that can lead to an underestimation of the net CH_4 emissions from the category). The ERT recommends that New Zealand validate the model using metered values from selected sites, and reiterates the recommendation made during the previous review that New Zealand provide more detailed justification for the use the current methodology, demonstrating that estimated emissions from recovered CH_4 are not overestimated.

C. Non-key categories

Wastewater handling – CH_4 and N_2O

83. In the 2007 submission, CH_4 emissions from industrial wastewater and sludge handling included emissions from wool scouring and wine processing. In the NIRs of the 2008 and 2009 submissions, emissions from those industries were removed. New Zealand explains that the 2006 IPCC Guidelines recommend that emissions be estimated for only the largest three industrial sources, which excludes wool scouring and wine processing. The ERT recommends that New Zealand include these estimated emissions since the data are readily available, and since the UNFCCC reporting guidelines require that Parties submit a complete inventory.

84. New Zealand states in a paragraph in the NIR that methane recovery from flaring is known to occur at eight plants whose gases are generated from the anaerobic components of the treatment facilities. The ERT also questions why there should be emissions at these plants, given that wastewater treatment plants are categorized as "centralized aerobic treatment plant, well managed" according to New Zealand's statistical classification. The text seems to suggest that the wastewater treatment plants contain both aerobic and anaerobic systems. The ERT recommends that New Zealand investigate and verify the wastewater treatment systems and report on this in order to ensure transparency of its reporting in its next annual submission.

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

A. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

85. New Zealand has reported information on its accounting of Kyoto Protocol units in the appropriate SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and their comparison report.[7] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterates the main findings and recommendations contained in the SIAR.

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

2. National registry

87. The ERT took note of the SIAR and its finding that 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 that the national registry continues to perform the functions as 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

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

between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate. However, the SIAR identified that New Zealand needs to improve its reporting on changes made to the test procedures or test results, in accordance with paragraph 32(j) of the annex to decision 15/CMP.1 and report on those changes in its next annual submission.

3. Calculation of commitment period reserve

88. New Zealand has reported its commitment period reserve in its 2009 annual submission. The Party 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 the most recently reviewed inventory. The ERT agrees with this figure.

B. Changes to the national system

89. New Zealand reported on changes in its national system since the previous annual submission. The major change since the 2008 submission has been a shift in the responsibility for the compilation of the agriculture sector. The Ministry of Agriculture and Forestry has taken over this responsibility from the Ministry for the Environment. The capacity of the national system has increased since the 2008 submission. The Ministry of Agriculture and Forestry has hired new inventory staff for the agriculture and LULUCF sectors. The Ministry for the Environment has employed a backup person for the national inventory compiler. Further, documentation on the role of the compiler in the process of preparation and development of the national inventory has increased. During the compilation of the inventory, another person was employed from December 2008 to February 2009 to assist with QC. Following the recommendations made by the previous ERT, the inventory compilation schedule has been changed to allow more time for QC, and the number of QA/QC activities undertaken has since increased.

90. The ERT concluded that New Zealand's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

C. Changes to the national registry

91. New Zealand reported changes in its national registry since the previous annual submission. According to the table A8.2.1 of the NIR, New Zealand reported that changes were made to the contact information for the administrator, main contact, alternative contact and release manager resulting from a change in office location. The ERT concluded that, taking into account the confirmed changes in the national registry, 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.

VIII. Conclusions and recommendations

92. New Zealand made its annual submission on 15 April 2009. New Zealand indicated that it is a voluntary submission under the Kyoto Protocol. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on Kyoto Protocol units, and changes to the national system and the national registry). This is in line with decision 15/CMP.1.

93. 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 New Zealand has submitted a complete set of CRF tables for the years 1990–2007 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases. Some of the categories, particularly in the energy sector (CH_4 and CO_2 emissions from fugitive emissions of oil and natural gas for exploration and production) and the LULUCF sector (carbon stock change in organic soil from land converted to forest land, N_2O emissions from disturbance associated with land-use conversion to cropland and emissions from biomass burning), were reported as not estimated. The ERT recommends that New Zealand provide estimates for these categories in its next

annual submission, especially for those categories that are known to occur within the Party and for which methodologies are available in the Revised 1996 IPCC guidelines and the IPCC good practice guidance to estimate emissions.

94. The information submitted on a voluntary basis under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. New Zealand has not reported on a voluntary basis information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and information on minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

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

96. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. The capacity of the national system has also improved significantly since the 2008 submission, including increased staffing for the agriculture and LULUCF sectors, backup person for the national inventory compiler, documentation on the role of the compiler. In response to recommendations made by the previous ERT, the inventory compilation schedule has also been changed to allow more time for QA/QC activities, resulting in an improvement in the quality of the inventory.

97. 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.

98. In the course of the review, the ERT formulated a number of recommendations[8] relating to the completeness and transparency of New Zealand's annual submission. The key recommendations are that New Zealand:

(a) Implement outstanding recommendations from previous reviews: revising the allocation of emissions from fuels that are typically used in mobile combustion; and providing information on how and where CO_2 emissions associated with feedstocks and other non-energy use of fuels are accounted for;

(b) Increase transparency of the NIR by providing more precise descriptions of the methodologies used and rationale for the selection of country-specific EFs;

(c) Ensure, to the extent possible, the inclusion in its next annual submission, of emissions for categories currently reported as "NE" and for which methods exist for these categories in the Revised 1996 IPCC guidelines and/or the IPCC good practice guidance, and if emissions for a given category cannot be estimated then the Party is to provide sufficient explanation in the NIR as to why it cannot be estimated;

(d) Report whether or not any changes have been made to the national registry test procedures;

(e) Improved transparency by providing a flow charts for carbon and a carbon balance, most importantly the balance for natural gas;

(f) Revise the approach for estimating N_2O emissions for road transportation, taking into account advancements in vehicle technology since 1990;

(g) Improve transparency of the NIR by discussing which tier method has been used and how the method is consistent with the IPCC good practice guidance and the cement CO_2 protocol used for the estimation;

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

(h) Revise the list of crops for calculation of N_2O emissions from soil and improve the coverage of crop data in the inventory;

(i) Develop country-specific data for all relevant carbon stocks;

(j) Provide more detailed justification for the use of the current method for estimating emissions from recovered CH_4 in order to demonstrate that they are not overestimated.

IX. Questions of implementation

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

Annex I

Documents and information used during the review

A. Reference documents

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

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. *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.html>.

"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 2009. Available at <http://unfccc.int/resource/docs/2009/asr/nzl.pdf>.

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

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

UNFCCC. *Standard Independent Assessment Report*, Parts I and II. Unpublished document.

B. Additional information provided by New Zealand

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

Baines JT. 1993. *New Zealand Energy Information Handbook: energy data conversion factors and definitions*. Taylor Baines and Associates: Christchurch, New Zealand.

Kelliher FM, de Klein CAM. 2006. *Review of New Zealand's fertiliser nitrous oxide emission factor (EF1) data*. A Report for the Ministry for the Environment (April 2006). New Zealand.
Thomas et al. 2008. *Unpublished Report Commissioned by the Ministry of Agriculture and Forestry of New Zealand*.

Wakelin SJ 2008: Carbon Inventory of New Zealand's Planted Forests – Calculation revised in October 2008 for New Zealand's 2007 Greenhouse Gas Inventory. *Unpublished Report Commissioned by the Ministry of Agriculture and Forestry of New Zealand*.

Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CRF	common reporting format
EF	emission factor
ERT	expert review team
ETS	Emissions Trading Scheme
GCV	gross calorific values
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
Gg	gigagram (1 Gg = 10^9 gram)
HFCs	hydrofluorocarbons
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1 thousand grams)
kha	kilohectare (1 kha = 1 thousand hectares)
LUCAS	Land Use and Carbon Analysis System
LULUCF	land use, land-use change and forestry
NA	not applicable
NE	not estimated
NH_3	ammonia
N_2O	nitrous oxide
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SWDS	solid waste disposal sites
t	tonne
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change

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