



FCCC/WEB/IRI(1)/2002/NZL

13 October 2003

**REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY OF  
NEW ZEALAND SUBMITTED IN THE YEAR 2002<sup>1</sup>**

**Desk review**

**I. OVERVIEW**

**A. Introduction**

1. The Conference of the Parties (COP), by its decisions 6/CP.5 and 34/CP.7, requested the secretariat to conduct individual reviews of greenhouse gas (GHG) inventories submitted by Parties included in Annex I to the Convention (Annex I Parties) according to the “UNFCCC reporting guidelines for the technical review of GHG inventories from Annex I Parties”, hereinafter referred to as the UNFCCC review guidelines.<sup>2</sup> The principal objectives<sup>3</sup> of the review of the GHG inventories are to ensure that the COP has adequate information on GHG inventories and GHG emission trends, and to examine the information submitted by Annex I Parties in accordance with the UNFCCC reporting guidelines<sup>4</sup> for consistency with those guidelines.

2. The desk review of New Zealand took place from 9 to 27 September 2002. It was carried out by a team of nominated experts from the roster of experts, working in their own countries. The assignments of the experts were as follows: Generalists – Mr. Moussa Cisse (Mali) and Mr. Riccardo De Lauretis (Italy); Energy – Ms. Anke Herold (Germany) and Mr. Eilev Gjerald (Norway); Industrial Processes – Mr. Philip Acquah (Ghana) and Ms. Marian Van Pelt (USA); Agriculture – Mr. Mingxing Wang (China) and Ms. Penny Reyenga (Australia); Land-use Change and Forestry – Mr. Wojciech Galinski (Poland) and Mr. Mikhail Gytarsky (Russian Federation); Waste – Mr. Eduardo Calvo (Peru) and Mr. Carlos Lopez (Cuba). Ms. Anke Herold and Mr. Moussa Cisse were the lead reviewers for this desk review. The review was coordinated by Ms. Sevdalina Todorova-Brankova (UNFCCC secretariat).

3. In accordance with the UNFCCC review guidelines, a draft version of this report was communicated to the Government of New Zealand, which provided comments that were considered and incorporated, as appropriate, in the final version of this report.

**B. Inventory submission and other sources of information**

4. In its 2002 submission, New Zealand submitted the common reporting format (CRF) tables for the year 2000 together with the national inventory report (NIR) containing, inter alia, sector-by-sector information on methodologies, activity data and emission factors. The submission was received in the secretariat on 15 April 2002 and the CRF for 2000 was updated in May 2002.

<sup>1</sup> In the symbol for this document, 2002 refers to the year in which the inventory was submitted, and not to the year of publication. The number (1) indicates that this is a desk review report.

<sup>2</sup> For the UNFCCC review guidelines and decision 6/CP.5 see document FCCC/CP/1999/7, pages 109 to 114 and 121 to 122, respectively.

<sup>3</sup> For the objectives of the review of GHG inventories see document FCCC/CP/1999/7, page 109, paragraph 2.

<sup>4</sup> 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 (FCCC/CP/1999/7), are referred to in this report as the UNFCCC reporting guidelines.

5. The full list of materials used during the review is provided in annex I to this report. The Party provided additional information and clarifications during the review at the request of the expert review team (ERT) that have been taken into consideration in this report.

### **C. Emission profile, trends and key sources**

6. In the year 2000, the most important GHG in New Zealand was methane (CH<sub>4</sub>), contributing 43.2 per cent to total<sup>5</sup> national GHG emissions expressed in carbon dioxide (CO<sub>2</sub>) equivalent, followed by CO<sub>2</sub> with 40.1 per cent and nitrous oxide (N<sub>2</sub>O) with 16.4 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF<sub>6</sub>) contributed for 0.3 per cent of the overall GHG emissions in the country.

7. Over the period 1990–2000, CO<sub>2</sub> emissions, without Land-use Change and Forestry (LUCF), increased by 22 per cent, CH<sub>4</sub> emissions decreased by 6 per cent and N<sub>2</sub>O emissions increased by 6 per cent. The overall trend for the PFCs, HFCs and SF<sub>6</sub> was downwards, with decreases of 70 per cent and 13 per cent for PFCs and SF<sub>6</sub> emissions, respectively, and an increase of 74 per cent for HFCs since 1995. Overall GHG emissions without LUCF in New Zealand have increased by 5.2 per cent since 1990.

8. New Zealand reported a key source analysis, both level and trend assessment, as part of its 2002 submission. The analysis is based on the tier 1 approach with few sources defined as key sources when applying the tier 2 approach. The choice of methodologies and the determination of areas for inventory improvement are based on the national key source analysis.

9. Since the 2002 submission included the CRF only for the year 2000, the secretariat has identified key sources only according to level assessment. The key sources analysis performed by the Party and the secretariat produced different results since different category splits and approaches were used. Thus, for example, only the secretariat has identified source category Fugitive emissions: oil and gas operations as a key source on the basis of its contribution to total emissions in 2000, while the level and trend assessment conducted by the Party added a few more key sources not defined as key sources by the secretariat. However, the trend assessment of the Party was carried out without consideration of emissions from stationary combustion: oil – because when included it accounts for 98 per cent of the trend.

10. The way the key source analysis is presented in the NIR is not transparent on the coverage of different source categories (e.g., Stationary combustion is given separately from Manufacturing industries and construction). The key sources discussed in this report cover those identified in either the secretariat's or the Party's approach with footnotes indicating the key sources that are identified only according to the analysis conducted by New Zealand.

### **D. General assessment of inventory**

11. The inventory submitted by New Zealand is in conformity with the UNFCCC reporting guidelines with a few exceptions, as reported in the following paragraphs. The methodology used to estimate the GHG emissions was consistent with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, hereinafter referred to as the IPCC Guidelines. New Zealand is gradually introducing elements of the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, hereinafter referred to as the IPCC good practice guidance.<sup>6</sup>

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<sup>5</sup> Total national GHG emissions refer to aggregate emissions of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs and SF<sub>6</sub>, all expressed in terms of CO<sub>2</sub> equivalent, excluding CO<sub>2</sub> emissions/removals from LUCF.

<sup>6</sup> According to the conclusions of the Subsidiary Body for Scientific and Technological Advice (SBSTA) at its twelfth session, the IPCC good practice guidance should be applied by Annex I Parties as far as possible for inventories due in 2001 and 2002 and should be used for inventories due from 2003. Annex I Parties with economies in transition may phase in the IPCC good practice guidance two years later than other Annex I Parties.

## **1. Completeness**

12. The inventory submitted by New Zealand is reasonably complete in terms of gases, sectors and time series covered. However, only the CRF for 2000 was included in the 2002 submission, although recalculations for the previous years were reported. Some sectoral background tables were not filled in, such as 5.A to 5.D LUCF tables,<sup>7</sup> or only partially filled in, such as table 4.B(a) for the Agriculture sector. Concerning the LUCF tables, New Zealand explained this omission by the use of a modified form of the IPCC worksheets. Minor source categories have not been estimated, such as CO<sub>2</sub> from some subcategories under Iron and steel production and CO<sub>2</sub> from Solvent use because they are regarded as negligible. With these exceptions the inventory covers all major sources and sinks as well as all direct and indirect gases.

## **2. Transparency**

13. Information reported in the NIR and in the CRF submitted by New Zealand explains in a detailed way the methodologies used to estimate emissions, referencing activity data and emission factors and reporting gaps in the inventory. However, further explanations on the use of the notation keys “included elsewhere” (IE) and “not estimated” (NE) provided in the completeness table (table 9) would have improved transparency.

## **3. Recalculations**

14. New Zealand provided recalculated estimates, table 8(a), and explanatory information, table 8(b), for all the years of the period 1990–1999. The effect of the recalculations for 1999 was a decrease of 0.66 per cent in the total CO<sub>2</sub> equivalent emissions without LUCF (an increase of 0.13 per cent in 1990) and a decrease of 2.11 per cent with LUCF in 1999 (a decrease of 0.22 per cent in 1990). Justifications for the recalculations are provided in the CRF and the NIR in a clear and systematic way. The sectors most affected by the recalculations were Agriculture and Energy.

## **4. Uncertainties**

15. The Party provided both qualitative (table 7 of the CRF) and aggregated quantitative uncertainty estimates for each of the major sources. The NIR does not provide general information on the methodology followed for estimating the reported uncertainties but for each sector it is reported that figures were provided by expert judgement. As indicated in the NIR, work in the area is ongoing.

## **5. Quality assurance/quality control**

16. New Zealand provided information in the NIR concerning the national system and stated that quality assurance/quality control (QA/QC) procedures were introduced throughout the entire inventory. Independent peer scientific reviews have been carried out for estimates in the energy and agriculture sectors. No detailed documentation or references have been provided regarding QA/QC procedures implemented.

## **6. Issues related to previous reviews**

17. New Zealand has taken into account the suggested improvements from the previous stages of the review activities. In a separate section in the NIR it is indicated which of the recommendations have already been implemented and which are incorporated into a longer-term work plan. In comparison to its previous submissions, New Zealand supplied more detailed documentation, particularly regarding methodologies and emission factors used, in the NIR.

18. Findings from the draft 2002 synthesis and assessment (S&A) report that were already explained in a plausible way in the previous reports or for which explanations were found in thoroughly reviewing the NIR are not repeated in the following sections.

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<sup>7</sup> According to the UNFCCC reporting guidelines on annual inventories, these tables should be filled in only by Parties which use IPCC default methodologies.

## 7. Areas for further improvement

19. New Zealand plans improvements in the development of methodology and the revision of emission factors in different sectors for future submissions. It also plans improvement in cross-institutional verification procedures and uncertainty analysis.

20. The ERT recommends further improvements in the reporting of information and documentation, including references, particularly concerning expert judgements on uncertainties and QA/QC procedures used, as well as estimation of categories not hitherto estimated because emissions have been considered negligible. The ERT also recommends that the Party provide a full CRF where recalculations have been made, in compliance with UNFCCC reporting guidelines.

## II. ENERGY

### A. Sector overview

21. The Energy sector contributed 38.2 per cent to New Zealand's total GHG emissions in 2000. During the period 1990–2000, GHG emissions from the Energy sector increased by 23.3 per cent. The increase is mostly due to the CO<sub>2</sub> emission increase from Transport (42.3 per cent) and Manufacturing industries and construction (32.5 per cent) in the same period.

22. New Zealand provided a complete inventory in the Energy sector. All major emission sources from fuel combustion activities are included in the GHG inventory with some minor exceptions of sources reported as NE in the CRF, namely emissions from coal, residual oil, gas/ diesel oil under 1.A.3.d Navigation, emissions from 1.A.3.e Other transportation and emissions from most source categories under 1.A.2 Manufacturing industries and construction. According to table 1.C the estimation of emissions from marine bunkers and aviation bunkers is also incomplete. Emissions from oil and gas exploration, production and distribution were also not estimated, although these activities do occur in New Zealand. In some of these cases the ERT believes that New Zealand may have used wrong notation keys (i.e., NE instead of “not occurring” (NO)), and therefore a review of its use of the notation keys is recommended. Indirect emissions of CO<sub>2</sub> (oxidized CO<sub>2</sub>) from CH<sub>4</sub> and non-methane volatile organic compounds (NMVOC) are also not included in the inventory. The ERT encourages the Party to make efforts to include more complete estimates in future inventories.

23. New Zealand has submitted sufficient information in the NIR and in the CRF to enable the review team to review the inventory. However, like most of the Annex I Parties, New Zealand has still room for further development of the national documentation of the GHG inventory. For example, no clear justifications are provided for the recalculations performed in the Energy sector for the years 1990, 1998 and 1999. Although the NIR reports that the source of the Energy sector data was updated and includes a reference to supporting documentation, it remains unclear from the NIR what kind of updates were performed and why only the years 1990, 1998 and 1999 were affected. Therefore the ERT recommends further improvements with regard to the documentation of the recalculations.

24. As indicated in Summary 3, the methodologies used in the calculation of the GHG emissions from the Energy sector are tier 1 methodologies. The IPCC good practice guidance encourages the Parties to use the tier 2 methodology in the calculation of emissions from key sources. Therefore the ERT recommends that New Zealand include in its planned improvements the revision of methodologies in order to incorporate higher tier methods for key sources in the sector.

25. Although a generic overview of emissions calculations methodologies is provided, a detailed description of how energy data are compiled is not included in the NIR 2002. The ERT recommends that New Zealand give a detailed description of how data on energy consumption are compiled and distributed between emission sources and sectors in future submissions.

26. According to the NIR 2002 some modifications of the emission factors have been carried out since the previous inventory submission. It is not clear to the ERT what modifications were carried out because references for the emission factors in 2002 are the same as those in previous years. The ERT

recommends that New Zealand provide a more detailed description and documentation of the revisions carried out in its next NIR.

## **B. Key sources**

### **1. Stationary combustion**

#### Energy industries: coal, oil, gas – CO<sub>2</sub> and coal, gas – CH<sub>4</sub><sup>8</sup>

27. The draft 2002 S&A report stated that the CO<sub>2</sub> implied emission factor (IEF) for liquid and gaseous fuels in 1.A.1.b Petroleum refining is the highest of all reporting Parties. New Zealand has explained in FCCC/WEB/SAI/2000 that the emission factors are country-specific. In the answer to the draft 2002 S&A report the Party explained that the emission factors are derived from total refinery emissions reported divided by the total fuel used at the refinery differentiated by their energy content. It would be useful if New Zealand could give better documentation of the country-specific emission factor in next year's NIR.

#### Manufacturing industries and construction – CO<sub>2</sub><sup>9</sup>

28. Under 1.A.2 Manufacturing industries and construction, disaggregated data are provided only for emissions from 1.A.2.c Chemicals. For all other source categories only aggregated data are included in the CRF. In table 1.A(a)s2, NE is reported for all source categories with the exception of "Chemicals" and "Other", while for the same source categories "0" is reported in table 1s1. No further explanation is provided of what is reported under "other". The ERT recommends the use of IE for those source categories where emissions are included in the aggregated numbers, and the use of NE only in those cases where the respective source categories are excluded from the aggregated data. In addition, the tables should be filled in a consistent way. The NIR explains that a detailed breakdown of the source categories, as requested by the IPCC reporting tables, is currently not available owing to a lack of consistent data on consumption from the sources. The ERT encourages the Party to include this problem in the inventory improvement plans in order to be able to provide disaggregated data in the future and to provide further explanations on the coverage of aggregated emission estimates.

29. The draft 2002 S&A report stated that the CO<sub>2</sub> IEF for 2000 for gaseous fuels is the lowest among reporting Parties. New Zealand did not respond on this finding and an examination is still required. The ERT also lacks an explanation of how the activity data reported for this sector are compiled. The ERT recommends that the Party include this information in its next submission.

### **2. Mobile combustion**

#### Civil aviation – CO<sub>2</sub> and CH<sub>4</sub><sup>10</sup>

30. The draft 2002 S&A report indicated that activity data for jet kerosene and aviation gasoline in the CRF are respectively 31 per cent and 79 per cent higher than the International Energy Agency (IEA) data. The Party answered that this is due to procedural difficulties and varying reporting timeframes but acknowledged that this deviation is very large. The ERT recommends that efforts should be taken towards more consistent reporting of data to IEA and UNFCCC.

#### Road transportation – CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub><sup>11</sup>

31. The ERT is lacking a description of how activity data and emissions from road transportation were calculated and recommends the Party to provide such a description in its next inventory submission. The N<sub>2</sub>O IEFs for gasoline and diesel cars are the same. The N<sub>2</sub>O IEF for gasoline cars is among the lowest among reporting Parties. The ERT encourages the Party to document the reason for the low

<sup>8</sup> Defined as a key source in New Zealand's key source analysis only (CH<sub>4</sub>).

<sup>9</sup> Defined as a key source in New Zealand's key source analysis only.

<sup>10</sup> Defined as a key source in New Zealand's key source analysis only (CH<sub>4</sub>).

<sup>11</sup> Defined as a key source in New Zealand's key source analysis only (CH<sub>4</sub> and N<sub>2</sub>O).

factors. The study referenced in the NIR as a source for the low emission factors is from 1991. As the use of catalytic converters has increased since then, the ERT recommends using a more up-to-date source for the emission factor.

#### Navigation<sup>12</sup> – CO<sub>2</sub> and CH<sub>4</sub>

32. The draft 2002 S&A report stated that emissions from residual oil and gas/diesel oil are reported as NE in the CRF whereas those fuels are consumed according to the IEA data set. The Party's response to this is that in recent years marine diesel data have not been available from Statistics New Zealand. From the Party's answer it is not clear if this explanation is also valid for residual oil. Since this source category is key according to both level and trend assessment according to New Zealand's own key source analysis, the ERT recommends that the Party include emissions from these fuels used in the Navigation sector in the national inventory.

### **3. Fugitive emissions**

#### Fugitive emissions from coal mining – CH<sub>4</sub> and oil, natural gas, venting and flaring – CO<sub>2</sub><sup>13</sup>

33. The ERT encourages the Party to fill in the gaps in the inventory for these two source categories as addressed in the sectoral overview.

#### **C. Non-key sources**

34. The draft 2002 S&A report raised some questions about the IEFs for non-key sources in the Energy subsectors. Thus it states that the value of the CH<sub>4</sub> IEF from venting and flaring of oil and gas is outside the IPCC default range, and therefore the ERT recommends further examination and possibly revision of the value. Most of the source categories, however, are defined as key sources in the Party's own key sources analysis and therefore the questions were discussed in chapter B. Key sources.

#### **D. Reference and sectoral approaches**

35. The CO<sub>2</sub> emissions from fuel combustion were calculated using both the reference and the sectoral approaches in the 2000 inventory. The emissions in 2000 calculated by using the reference approach match the emissions from the sectoral approach.

36. A comparison of all fuel-specific carbon emission factors provided in table 1.A(b) (reference approach) with those used by other Annex I Parties indicated that for crude oil the carbon emission factor (17.8 t C/TJ) is the lowest of the range provided by Annex I Parties. The ERT recommends that New Zealand provide an explanation for this comparatively low emission factor.

#### **E. Bunker fuels**

37. The data on bunker fuels are collected from the Ministry of Economic Development's Energy Data file. Data on total deliveries of petroleum fuels included in the file are reported by the oil companies. It is not explained how consumption from international bunkers for marine activities and aviation was separated from the total consumption of fuels. The ERT recommends that the Party provide a more detailed description on how international bunkers are estimated in the subsequent GHG inventory submission.

#### **F. Feedstocks and non-energy use of fuels**

38. The Party has reported the use of feedstock and non-energy use of fuels in table 1.A(d) in accordance with the reporting guidelines. The use of notation keys in the table is complete except for gas/diesel oil. There may be an error in table 1.A(d) since stored carbon from the use of sub-bituminous coal is not included in that table, whereas it is included in table 1.A(b). The consumption data for natural

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<sup>12</sup> Defined as a key source in New Zealand's key source analysis only.

<sup>13</sup> CO<sub>2</sub> emissions from flaring defined as a key source in New Zealand's key source analysis only (trend assessment).

gas in table 1.A(d) are confidential and the calculation of stored carbon cannot be reviewed. In the description of the methodologies in the NIR further information about the activity data sources for the estimation of non-energy use should be provided.

### **G. Country-specific issues**

39. New Zealand estimated fugitive CO<sub>2</sub> and CH<sub>4</sub> emissions from geothermal plants under 1.B.2.d Other fugitive emissions from oil, natural gas and other sources.

## **III. INDUSTRIAL PROCESSES AND SOLVENT USE**

### **A. Sector overview**

40. Emissions from industrial processes in New Zealand accounted for approximately 4 per cent of total weighted emissions in 2000, and have increased by 2.5 per cent since 1990. Emissions from this sector have decreased by 2.7 per cent since 1999. The main source category in the sector is Metal production, representing 67 per cent of total weighted emissions in the sector, followed by Mineral products with 20 per cent. Chemical industry and Consumption of halocarbons and SF<sub>6</sub> represent 13 per cent.

41. The NIR indicates that emission estimates from industrial processes are country-specific, based on information supplied by industry. New Zealand cites the small number of industrial processes plants emitting non-combustion-related GHG emissions to explain its ability to use a high level of country-specific information. Where industries were unable to supply data on emissions, New Zealand applied default emission factors to the production data supplied. The ERT notes that the methodological choices, which are said to be documented in the main references to the industrial processes section of the NIR, should be also summarized in the NIR. New Zealand is encouraged to integrate the IPCC good practice guidance in the 2002 plan to review the Industrial processes sector.

42. Reported recalculations for the Industrial processes sector in New Zealand address HFC consumption for the years 1992–2000, leading to changes that range from a 24 per cent decrease to a 17 per cent increase. Changes made to the data from 1993 through 2000 yielded lower reported emissions relative to the 1999 submission. New Zealand explains the changes by the availability of new activity data.

### **B. Key sources**

#### **1. Iron and steel production – CO<sub>2</sub>**

43. The draft S&A report indicated that there are no emissions or activity data for sinter and coke provided. No explanation is provided in the response of the Party. Emissions from pig iron are reported together with emissions from steel production. No explanation for including the emissions together is contained in the completeness table. The ERT notes that the emissions estimation methodology employed at the plant level should be summarized in the NIR to increase the transparency of reporting. There is also a need for New Zealand to integrate the IPCC good practice guidance in the iron and steel industry, which derives the CO<sub>2</sub> emission factor from the relevant unit processes, namely coke consumption as a reducing agent and carbon sequestration in blast furnace pig iron production; carbon oxidation in pig iron basic oxygen furnace (BOF) in steel making; and electric arc furnaces (EAF) electrode carbon consumption in scrap steel production. The emission factors for each unit process can be developed at the plant level so as to obtain the aggregated IEF.

#### **2. Hydrogen production – CO<sub>2</sub><sup>14</sup>**

44. Hydrogen production was identified as a key source according to both the level and the trend assessment. The emission factor used (6.32 t/t) is country-specific. This emission factor was not documented, however a reference to supporting documentation was provided in the NIR. Without

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<sup>14</sup> Defined as a key source in New Zealand's key source analysis only.

knowing the process used to generate hydrogen, it is difficult to comment on the methodology used for estimating CO<sub>2</sub> emissions from this source.<sup>15</sup> It is recommended that further explanation of the hydrogen production process be provided in the NIR.

### 3. Cement production – CO<sub>2</sub><sup>16</sup>

45. The draft 2002 S&A report noted a reduction in the CO<sub>2</sub> IEF from 1990–2000. It was the same for 1990 through 1996 and has shown minor annual variations since 1997. No clarification has been provided on the issue. The ERT notes that, as New Zealand reviews the industrial processes sectoral emissions as part of the indicated work plan, the IPCC good practice guidance should be integrated at the plant level with respect to the assessment of specific factors that affect the CO<sub>2</sub> IEF, namely the purity of limestone, the lime content of clinker and cement kiln duct (CKD) losses.

### 4. Lime production – CO<sub>2</sub><sup>16</sup>

46. The CO<sub>2</sub> IEF from lime production (0.719 t/t) is lower than the IPCC default (0.785 t/t). The plausible explanations are the purity factor of the limestone source as well as the type of lime produced. New Zealand should encourage the determination of these factors at the plant level and they should be documented in the NIR to increase transparency of reporting.

### 5. Aluminium production – PFCs<sup>16</sup>

47. Aluminium production PFC emissions are identified by New Zealand as a key source on the basis of a 27 per cent contribution to the trend assessment, making this source the greatest contributor (other than stationary combustion: oil) to the overall trend. The draft S&A report notes that the PFC IEFs are among the lowest of the reporting Parties. As the NIR indicates, PFC emissions from the production of aluminium are reported by the sole aluminium smelter in New Zealand. In the response to the draft version of this report, New Zealand has indicated that while the reason for decreased PFCs from Aluminium smelting is not stated in the NIR 2002, it was documented in New Zealand's National Communication 2001. The Party attributed the reduction in the PFCs emissions to improvements in carbon consumption, emission control systems and continuous improvements in cell stability. The ERT recommends the explanation to be included also in the NIR to improve its transparency.

### 6. Consumption of halocarbons and SF<sub>6</sub> – HFCs<sup>16</sup>

48. Emissions of HFCs have increased by 2060 per cent since 1992, when they were first used. The high rate of increase can be explained by the phasing out of ozone depleting substances (ODS). Emissions are estimated using a top-down tier 2 approach. Activity data and IEFs are not included in the CRF, but the CRF documentation refers to attached Excel files for detailed data and the methodological approach for estimating emissions. New Zealand is encouraged to include in the CRFs the activity data and IEFs for HFC consumption in its next inventory submission.

49. The CRF indicates that no HFC/PFC use for foam blowing or solvent use is recorded in New Zealand (table 2(II).Fs2). However, it is possible that open-cell foams blown with HFCs are in use in New Zealand, and lifetime and/or disposal emissions from those foam applications are not estimated. New Zealand is encouraged to develop methods to estimate these emissions from foams that are in use in the country.

50. The tier 2 approach for estimating HFC and PFC emissions from stationary refrigeration yields a negative value for 1992 which is therefore reported as zero.<sup>17</sup> This may indicate a problem with the data collected on annual sales of new refrigerant or total charge of new equipment. New Zealand is encouraged to review the data to establish the reason for the negative value and to consider whether it indicates any problems with the estimation methodology.

<sup>15</sup> Note that if an electrolysis process is used, then the CO<sub>2</sub> emissions generated are electricity-related and the emissions could belong in the Energy sector.

<sup>16</sup> Defined as a key source in New Zealand's key source analysis only.

<sup>17</sup> Source: file "Halocarbons 2000 (1990–2000 data).xls," sheet "HFC PFC Consumption".

51. Potential emissions of HFCs are not estimated. Potential emissions of HFC-227ea are reported as NO even though actual emissions are estimated (see Table 2 (II) s2). For the other HFCs for which actual emissions are reported, potential emissions are indicated as NE. New Zealand is encouraged to verify the use of the notation key in the case of potential emissions of HFC-227ea.

### **C. Non-key sources**

#### **1. Ammonia production – CH<sub>4</sub>**

52. CH<sub>4</sub> emissions are estimated in worksheets submitted with the NIR but are not presented in the CRF. It appears that CH<sub>4</sub> emissions may be mistakenly reported under silicon carbide production.

#### **2. Chemical industry – Other**

53. The CRF reports NE for emissions from carbon black, ethylene, dichloethylene and styrene in the documentation box in table 2(I).A-Gs2, although no information is available to the Ministry for the Environment as to whether or not New Zealand produces these compounds. The ERT recommends further revision of the notation keys used.

54. The NIR worksheets indicate emissions from formaldehyde which do not appear to be reported in the CRF tables.

## **IV. AGRICULTURE**

### **A. Sector overview**

55. Agricultural emissions of CH<sub>4</sub> and N<sub>2</sub>O contributed 54.6 per cent (41,985 Gg) of total emissions in 2000 expressed in CO<sub>2</sub> equivalent. Emissions have declined by 3.1 per cent from 43,315 Gg in 1990. The main source categories in the sector were Enteric fermentation (70 per cent) and Agricultural soils (29 per cent). The remaining source categories, Manure management and Field burning of agricultural residues, represented 1 per cent of the total in the sector.

56. Emission reporting in terms of coverage of emission sources is incomplete, as CH<sub>4</sub> emissions from enteric fermentation and manure management are not estimated from a number of minor livestock species. The reporting of emissions, notation keys and recalculations is complete in the CRF with the exception of the additional information requested in the sectoral background data tables. The ERT recommends that the Party provide additional information on emissions from enteric fermentation and manure management where available or use the notation NA (“not applicable”) to indicate that the data requested are not applicable to the method used.

57. The methodologies used to estimate emissions are consistent with the requirements of the IPCC guidelines and include a mix of IPCC default and country-specific emission factors and input parameters.

58. According to the tier 1 key source analysis conducted by New Zealand all agricultural source categories are defined as key sources. In contrast, the UNFCCC secretariat defines only CH<sub>4</sub> emissions from enteric fermentation as a key source.

59. Information about the activity data, methodologies and emissions factors, QA/QC procedures, uncertainty and areas for future improvement are provided in the NIR in a transparent manner.

### **B. Key sources**

#### **1. Enteric fermentation – CH<sub>4</sub>**

60. The reason why New Zealand’s country-specific emission factors differ from the IPCC defaults was clearly explained during the 2001 in-country review and in the response to subsequent S&A reports. To assist transparency it is recommended that a clear explanation of the inclusion of slaughtered lambs/calves in the development of the emission factors be included in the NIR.

61. The NIR reported that research is under way to upgrade the methodology to tier 2. When the new methodology is introduced the emissions from livestock species currently not estimated will be addressed.

## **2. Manure management – CH<sub>4</sub><sup>18</sup>**

62. The country-specific emission factors used to estimate emissions from cattle are significantly lower than the IPCC defaults. The NIR indicates that research has been commissioned to review these values. The ERT encourages New Zealand to conduct such a review.

## **3. Other source categories**

63. No problems were identified in the estimation and reporting of emissions from agricultural soils and the field burning of agricultural residues.

# **V. LAND-USE CHANGE AND FORESTRY**

## **A. Sector overview**

64. The LUCF sector is a net sink offsetting 30.5 per cent of total GHG emissions of New Zealand in 2000. From 1990 to 2000, net CO<sub>2</sub> equivalent removals in the LUCF sector increased by 9.9 per cent as a result of substantial carbon accumulation in planted forests as derived from the latest National Exotic Forest Description (NEFD) survey.

65. New Zealand's reporting in the NIR is consistent with the UNFCCC reporting guidelines. New Zealand reports 5.A Changes in forest and other woody biomass stocks, 5.B Forest and grassland conversion, and CO<sub>2</sub> emission from liming under 5.D CO<sub>2</sub> emissions and removals from soils. CRF Sectoral table 5 was completed, while tables 5.A to 5.D were not completed owing to use of the national methodology and lack of data on abandoned lands and carbon reserves in soil. The NIR includes a detailed description of a national methodology and parameters used for GHG inventory in the LUCF sector. Alternative reporting sheets are provided in a format consistent with the IPCC Guidelines. Notation keys are properly used in the CRF. Activity data are taken from the NEFD and the Ministry of Agriculture and Forestry of New Zealand.

66. Changes in forest and other woody biomass stocks constituted a sink of 32.7 per cent of total CO<sub>2</sub> emissions of New Zealand in 2000. From 1990 to 2000, it increased by 11.6 per cent due to changes in growing stock in forest plantations. Forest and grassland conversion is a source of CO<sub>2</sub> and non-CO<sub>2</sub> emissions that are 1.6 per cent of total equivalent CO<sub>2</sub> emissions of New Zealand. From 1990 to 2000, they increased by 59.7 per cent. This was mainly associated with annual changes in scrub burning for new forest planting. CO<sub>2</sub> emissions from liming were 0.6 per cent of total GHG emissions in 2000. From 1990 to 2000, CO<sub>2</sub> emissions from liming increased by 42.2 per cent, apparently, because of increased use of lime. However, the NIR does not provide clear evidence of that.

67. New Zealand reports on recalculations of GHG emissions and removals for 1990–1999 in the CRF table 8(a). The reasons for recalculations are documented in the CRF and the NIR. According to the NIR, the differences between previous and recalculated values are generally less than 2 per cent.

68. New Zealand conducted a sensitivity analysis to estimate the uncertainty of the inventory as well as uncertainties related to specific components of the LUCF inventory as provided in the NIR (e.g., uncertainty for carbon sequestration is estimated to ±25 per cent). The CRF table 7 indicates that the coverage of the sources is only partial and the estimates are of medium quality. The NIR states that for part of the emissions uncertainty estimates are not available.

69. The NIR describes activities to check the quality of LUCF activity data and verify modelling results. International review of the carbon monitoring system (CMS) currently under development was conducted.

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<sup>18</sup> Defined as a key source in New Zealand's key source analysis only.

70. The NIR states that there is a lack of data on abandonment of managed lands and soil carbon. New Zealand is developing a CMS to report on abandonment of managed lands and CO<sub>2</sub> emissions and removals from soils. Provisional results of this work are already available and are reported in the NIR. New Zealand is encouraged to continue the work on the CMS so that it can report on CO<sub>2</sub> emissions and removals from abandonment of managed lands and soils. This will allow for more complete and transparent reporting on GHG emissions and removals in the LUCF sector.

71. The regular NEFD provides updated and new data on forest area and merchantable stem-wood volume. The latest findings require adjustment in the area of each age class and affect previous estimates of uptake and harvest. The NEFD results are incorporated in forest models and CO<sub>2</sub> removals are then recalculated. These efforts are being undertaken to improve forest models to avoid back-calculation.

## **B. Sink and source categories**

### **1. Changes in forest and other woody biomass stocks**

72. As noted in previous reviews,<sup>20</sup> New Zealand used mathematical models (C-change and Forest-Oriented Linear Programming Integrator (FOLPI)) to account for changes in forest and other biomass stocks. They are described in the NIR. CO<sub>2</sub> removals are estimated only in planted forests, while CO<sub>2</sub> emissions are calculated from harvesting in planted and natural forests. This approach provides for more accurate results than those achieved using the IPCC methodology. Although supporting documentation for the modelling is referenced, it is not clear from the NIR what is the basis for simplifications in wood density factors for different age classes. New Zealand is encouraged to include in the NIR more explanation as to how the simplifications made in modelling correspond to the actual state of forest plantations.

73. New Zealand used country-specific conversion factors derived from model calculation. Their values are provided in the NIR. An expansion factor of value 2.04 t dm/m<sup>3</sup> was applied to include non-stem forest biomass. However, the NIR does not justify how it was derived. New Zealand is encouraged to include in the NIR more explanation on the expansion factor used for the calculation of carbon removals in biomass.

### **2. Forest and grassland conversion**

74. New Zealand used the combination of country-specific (mathematical models) and IPCC default methods and emission factors to account for CO<sub>2</sub> emissions from land clearing for new forest planting and non-CO<sub>2</sub> emissions from land clearing, scrub burning and wildfires.

75. IPCC default emission ratios were used to calculate emissions of non-CO<sub>2</sub> gases. Background information is provided in the NIR. Activity data and emission factors used in calculations are provided in worksheets attached to the NIR.

76. The draft 2002 S&A report also noted annual fluctuations in CO<sub>2</sub> and non-CO<sub>2</sub> emissions from forest and grassland conversion. New Zealand explained that fluctuations are caused by annual changes in scrub burning for forest planting. Areas of scrub burning are given in worksheets attached to the NIR.

### **3. Emissions and removals from soils – CO<sub>2</sub>**

77. Under this source category New Zealand reports CO<sub>2</sub> emissions from liming in the CRF. These estimates are included in the inventory for the first time, but were not included in the NIR. According to additional information provided upon the ERT's request, New Zealand used IPCC default methodology and emission factors to account for emissions from this source. New Zealand is encouraged to include in its NIR a description of the methodology, activity data and emission factors used to calculate CO<sub>2</sub> emissions from liming and to check that it is represented consistently in recalculations made for the LUCF sector.

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<sup>20</sup> See document FCCC/WEB/IRI(2)/2000/NZL.

## VI. WASTE

### A. Sector overview

78. The waste sector accounted for 2,904 and 2,389 Gg of CO<sub>2</sub> equivalent in 1990 and 2000, respectively, the major emission source being CH<sub>4</sub> from solid waste disposal sites (92.7 per cent). Decreasing CH<sub>4</sub> emissions from solid waste caused the decreasing trend, while emissions from CH<sub>4</sub> and N<sub>2</sub>O from waste-water handling were growing slightly over time. The decreasing CH<sub>4</sub> emissions are explained mainly by improved waste management practices (waste minimization and resource recovery) in New Zealand.

79. The inventory is practically complete in terms of gas, source and years covered. Emissions from unmanaged waste disposal sites reported as NE were included through the methane correction factor (MCF) together with managed waste disposal sites and should be noted as IE in table 6. Emissions from waste incineration were considered negligible and therefore not estimated. References and documentation on methodologies and country-specific emission factors, as well as additional information in the CRF tables are provided, enhancing transparency. Estimates in the sector are self-assessed in table 7 as being of medium quality. Uncertainty analyses were provided for each emission source.

80. Recalculations in the sector involved the application of the tier 2 approach, the revision of emission factors and a comprehensive survey of all landfills in New Zealand. They are well documented and the information provided is sufficient.

### B. Key sources

#### 1. Solid waste disposal on land – CH<sub>4</sub>

81. Explanations of the rationale for the choice of parameters used and references were provided in the NIR. The additional information and documentation boxes were provided with table 6.A. Comparisons between tier 1 and tier 2 estimates were provided and seem to be consistent. However, table 6.A. does not include information on solid waste deposition to uncategorized sites, which should be included under “Other”. The amounts of solid waste are not comparable to those of other Organisation for Economic Co-operation and Development (OECD) countries owing to different methodological approaches that include bulky waste (from the construction and demolition industries) in New Zealand.

82. Industrial waste is also considered along with municipal solid waste as documented in the NIR. This approach along with the inclusion of construction and demolition waste ensures completeness. Although supporting documentation is referenced, the Party is encouraged to provide more information on industrial waste surveys and methodologies used in order to enhance the overall quality of its data on solid waste disposal site emissions.

83. The CH<sub>4</sub> oxidation factors in table 6.A and in the NIR are not consistent. The ERT recommends consistent reporting between the CRF and the NIR in the next inventory submission.

84. In the calculation of the degradable organic carbon (DOC) fraction using the default DOC values there are two aspects that influence the result obtained. Textiles were included in the category “Other - organic” and not in the category “Paper and textiles”. This reduces the DOC fraction calculated. Similarly, food wastes were included in the category “Other - organic” and not in the category “Food waste”. This increases the fraction of DOC calculated. The ERT recommends that the Party attempt to make the calculation, locating the textiles and foods fractions correctly.

### C. Non-key sources

#### 1. Waste-water handling – CH<sub>4</sub> and N<sub>2</sub>O

85. Activity data and related additional information were not provided in table 6.B of the CRF, except for the information on handling systems for domestic waste water, while they were included in the

NIR. The sum of percentages for handling systems of domestic waste water in table 6.B does not match exactly, possibly because of rounding errors.

86. The CH<sub>4</sub> emissions from industrial waste water in this sector are low because of a high degree of collection and burning and the assumption of no leakage based on expert judgement. Meat processing industries that use anaerobic ponds with no CH<sub>4</sub> collection are the major sources of industrial waste water CH<sub>4</sub>.

## **2. Emissions from human sewage – N<sub>2</sub>O**

87. Data for protein consumption were not included in the CRF and were assumed to be the same for the whole period 1990–2000. The estimate of N<sub>2</sub>O emissions was derived from measured raw sewage nitrogen content.

## **3. Waste incineration**

88. No estimations were provided for this sector as only negligible quantities of waste are incinerated in New Zealand. The ERT recommends that New Zealand provide references to support this statement. In some tables of the CRF the incineration is reported as NE and in others as 0.00. The ERT recommends that New Zealand improve the use of notation keys in this source category.

**Annex 1:**

**MATERIALS USED DURING THE REVIEW**

**A. Support materials on the CD ROM and the web page for the review**

- 2000, 2001 and 2002 *Inventory submissions of New Zealand*. 2002 submissions including CRF for 2000 and an NIR [unpublished].
- UNFCCC secretariat. *2000 Status report for New Zealand* [available at <http://unfccc.int/program/mis/ghg/statrep00/nzl00.pdf>].
- UNFCCC secretariat. *2001 Status report for New Zealand* [available at <http://unfccc.int/program/mis/ghg/statrep01/nzl01.pdf>].
- UNFCCC secretariat. *2002 Status report for New Zealand* [available at <http://unfccc.int/program/mis/ghg/statrep02/nzl02.pdf>].
- UNFCCC secretariat. *Synthesis and assessment report of the greenhouse gas inventories submitted in 2000*. FCCC/WEB/SAI/2000 [available at <http://unfccc.int/program/mis/ghg/sai2000.pdf>].
- UNFCCC secretariat. *Synthesis and assessment report of the greenhouse gas inventories submitted in 2001*. FCCC/WEB/SAI/2001 [available at <http://unfccc.int/program/mis/ghg/sai2001.pdf>].
- UNFCCC secretariat. *Draft synthesis and assessment report of the greenhouse gas inventories submitted in 2002* (Part I and Part II – the section on New Zealand, [unpublished]).
- New Zealand's comments on the *Draft synthesis and assessment report of the greenhouse gas inventories submitted in 2002* [unpublished].
- UNFCCC secretariat. *Report of the individual review of the GHG inventory of New Zealand submitted in the year 2000* [available at <http://unfccc.int/program/mis/ghg/countrep/nzincountrep.pdf>].
- UNFCCC secretariat. *Key source analysis for the year 2000*, [unpublished].
- UNFCCC secretariat. *Handbook for review of national GHG inventories*. Draft 2002, [unpublished].
- UNFCCC secretariat. *UNFCCC guidelines on reporting and review*. FCCC/CP/1999/7, [available at <http://www.unfccc.int/resource/docs/cop5/07.pdf>].
- UNFCCC secretariat. Database search tool – *Locator* [unpublished].
- IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. 2000. [available at <http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm>].
- IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3*, 1997. [available at: <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>].

**B. Additional materials provided by the Party**

Responses to questions during the review were received from the working team in charge of emission inventories (New Zealand UNFCCC Focal Point) including additional material and information, such as: assumptions and simplifications applied in model calculation for planed forests, references on expansion factor for non-stem forest biomass, emission factor used to account for CO<sub>2</sub> emissions from land clearing and from liming, and use of liquid fuels in Public electricity and heat production.

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