



New Zealand Climate Change Office
Te Hōtaka Rerekētanga Āhuarangi o Aotearoa

Climate Change



National Inventory Report New Zealand

Greenhouse Gas Inventory 1990-2001
(including the Common Reporting Format (CRF) for 2001)
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Executive summary of greenhouse gas emissions

Emissions by gas

Greenhouse gas emissions	Gg CO ₂ equivalents		Difference %
	1990	2001	
Net CO ₂ emissions/removals	3,497.88	8,278.76	136.66
CO ₂ emissions (without LUCF)*	25,266.88	32,430.19	28.35
CH ₄	25,600.37	27,065.36	5.72
N ₂ O	10,281.46	12,576.17	22.32
HFCs	0	231.65	231.65
PFCs	602.53	58.90	-90.22
SF ₆	2.87	16.86	487.46
Total (with net CO₂ from LUCF)	39,985.11	48,520.33	21.34
Total (without CO₂ from LUCF)	61,754.10	72,379.13	17.21

* Land-use change and forestry

Emissions by sector

Greenhouse gas source and sink categories	Gg CO ₂ equivalents		Difference %
	1990	2001	
Energy	23,850.05	30,932.22	29.69
Industrial processes	2,994.27	3,185.26	6.38
Solvent and other product use	0	0	0
Agriculture	31,907.64	35,846.63	12.34
Land-use change and forestry	-21,671.11	-23,762.95	9.65
Waste	2,904.26	2,319.16	-20.15

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Chapter 1

Overview

1.1 Introduction

New Zealand has been continuing the development of its greenhouse gas inventories and this submission is the sixth National Inventory Report submitted to the United Nations Framework Convention on Climate Change (UNFCCC). The document is provided to support the Common Reporting Format (CRF) for all years 1990 through to 2001.

This report is structured by sector (energy, industrial processes, solvents and other product use, agriculture, land-use change and forestry (LUCF) and waste). A list of references is provided at the end of each chapter.

1.2 Major changes since last submission

The most significant change in this year's submission is in data reported in the agricultural sector. A re-evaluation of animal productivity and feed intakes has been used in both the ruminant methane and nitrous oxide emissions estimates. The entire time series has been recalculated for both methane emissions from enteric fermentation and manure management, and also for nitrous oxide emissions from agricultural soils. Introduction of Good Practice to the estimation of emissions from this sector has resulted in the calculation of methane emissions from enteric fermentation using a higher tier method, and to a complete review of nitrous oxide emissions from soils. These changes are described in more detail in the following section on Good Practice and in the chapter covering the agricultural sector.

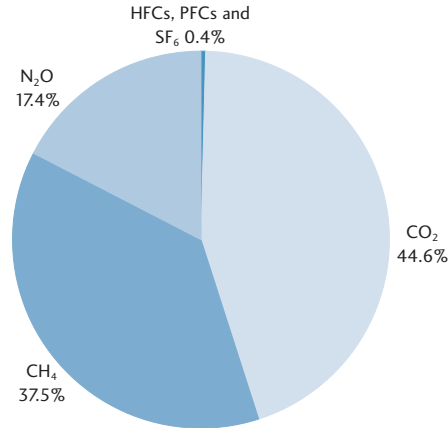
1.3 Institutional arrangements

The Climate Change Response Act (2002), which enabled New Zealand's ratification of the Kyoto Protocol, names the Ministry for the Environment as New Zealand's Inventory Agency. The New Zealand Climate Change Office, located within the Ministry for the Environment, is the Inventory Agency and it coordinates the compilation and submission of the annual inventory to the UNFCCC. The Ministry of Economic Development collects and collates the energy sector emissions and the CO₂ emissions from the industrial processes sector. The non-CO₂ gases from the industrial processes sector and the waste sector were collected and collated by environmental consultants contracted by the Ministry for the Environment. The agricultural and LUCF sectors of the national greenhouse gas inventory are managed by the Ministry of Agriculture and Forestry and the New Zealand Climate Change Office, and are underpinned by work undertaken by researchers at Crown Research Institutes and universities.

1.4 Emissions trends

Figure 1: Emissions by gas and by sector 2001

Emissions by gas in 2001



Emissions by sector in 2001

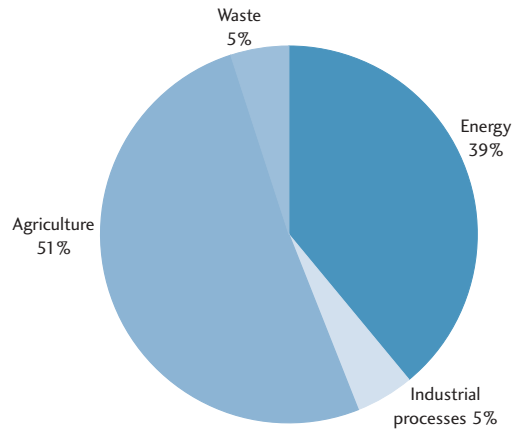
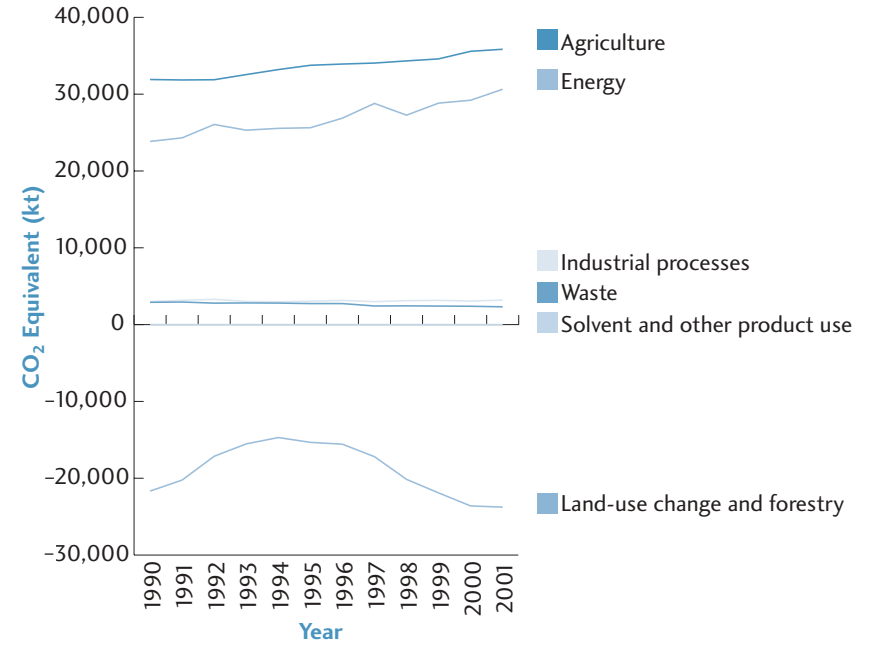


Figure 2: Emissions by sector from 1990 to 2001



Overall emissions in New Zealand have increased 2.8% since 2000 and by 17.2% since 1990. Increases since 2000 have occurred primarily in the energy sector with public electricity and heat production increasing by 29%. Emissions from agriculture and industrial processes have increased by 10% and 6% respectively, whilst waste emissions have decreased by 2.9% since 2000. Since 2000, CO₂ has increased by 5.8%, CH₄ has decreased by 0.3%, N₂O has increased by 2.2%, HFCs have increased by 35.1%, PFCs have increased by 3.6% and SF₆ has increased by 2.7%.

1.5 Good Practice

The revised 1996 Intergovernmental Panel on Climate Change (IPCC) methodology is used in the preparation of the inventory and the *IPCC Good Practice Guidance* is being implemented in stages, according to priorities and national circumstances.

In the 2001 submission for the year 1999, estimates of emissions of the fluorinated gases (HFCs, PFCs and SF₆) were upgraded to IPCC (2000) Tier 2 methodology, and in the 2002 submission for the year 2000, emissions from solid waste disposal were upgraded to Tier 2 as part of this development process.

In this year's submission the following elements of Good Practice have been introduced:

1. The methodology used to estimate methane emissions from ruminants has been upgraded from Tier 1 to a Tier 2 approach consistent with IPCC (2000). The Tier 2 approach has been applied across the whole time series from 1990.
2. As part of the ongoing improvement for estimates of nitrous oxide from agricultural sources, a complete recalculation of the time series has been carried out using revised emission factors from IPCC (2000), some revised country-specific emission factors and new annual nitrogen excretion rates for the most significant animal classes.
3. Quality Assurance/Quality Control (QA/QC) introduced throughout the entire inventory with scientific peer review has been carried out on the reports that underpin improvements to the agricultural sector emissions (1 and 2 above).

More detail of the above elements of inventory improvement are covered in the specific chapters of the report.

1.6 Key source analysis

The key sources in the New Zealand inventory have been assessed according to the IPCC Good Practice Guidance methodologies. Following are tables showing the level assessment and the trend assessment. The trend assessment has been done using 1990 and 2001 data.

Table 1: Key source analysis – level assessment

CRF category	IPCC source categories	Gas	Current year estimate ¹	Level assessment	Cumulative total
4A	Enteric fermentation - domestic livestock	CH ₄	23,126.46	0.32	0.32
1A3b	Mobile combustion (road vehicles)	CO ₂	11,102.53	0.15	0.47
4D2	Animal production N ₂ O from agricultural soils	N ₂ O	7,123.80	0.10	0.57
1A2	Manufacturing industries and construction	CO ₂	6,249.31	0.09	0.66
1A1a	Stationary combustion electricity (gas)	CO ₂	5,172.34	0.07	0.73
4D3	Indirect N ₂ O from agricultural soils	N ₂ O	3,134.10	0.04	0.77
6A	CH ₄ from solid waste disposal sites	CH ₄	1,993.95	0.03	0.80
4D1	Direct N ₂ O from agricultural soils	N ₂ O	1,807.30	0.02	0.82
2C1	Iron and steel industry	CO ₂	1,560.68	0.02	0.85
1A1a	Stationary combustion electricity (coal)	CO ₂	1,283.50	0.02	0.86
1A4c	Stationary combustion agriculture/forestry/fisheries	CO ₂	1,217.17	0.02	0.88
1A4a	Stationary combustion commercial/institutional	CO ₂	1,142.62	0.02	0.90
1A3a	Mobile combustion (aviation)	CO ₂	725.91	0.01	0.91
1A1b	Stationary combustion petroleum refining (gas)	CO ₂	653.17	0.01	0.92
4B	CH ₄ from manure management	CH ₄	550.83	0.01	0.92
1B1a	Fugitive emissions from coal mining and handling	CH ₄	525.84	0.01	0.93
2A1	Cement production	CO ₂	523.98	0.01	0.94
2C3	Aluminium production	CO ₂	504.34	0.01	0.94
1A4b	Stationary combustion residential	CO ₂	482.67	0.01	0.95

¹Units are Gigagrams of CO₂ equivalent

Table 2: Key source analysis – trend assessment

CRF category	IPCC source categories	Gas	% contribution to trend	Cumulative total
1A3b	Mobile combustion (road vehicles)	CO ₂	18.07	18.07
4A	Enteric fermentation - domestic livestock	CH ₄	15.44	33.51
1A1a	Stationary combustion electricity (gas)	CO ₂	13.18	46.69
6A	CH ₄ from solid waste disposal sites	CH ₄	8.46	55.15
4D1	Direct N ₂ O from agricultural soils	N ₂ O	7.64	62.79
1A1a	Stationary combustion electricity (coal)	CO ₂	5.67	68.46
2C3	Aluminium production	PFCs	5.11	73.57
1A2	Manufacturing industries and construction	CO ₂	4.88	78.45
4D2	Animal production N ₂ O from agricultural soils	N ₂ O	4.43	82.88
1A4a	Stationary combustion commercial/institutional	CO ₂	2.20	85.08
1B1a	Fugitive emissions from coal mining and handling	CH ₄	1.89	86.97
2F1 - 5	Emissions from ODS* substitutes	HFCs	1.86	88.83
1A3a	Mobile combustion (aviation)	CO ₂	1.52	90.35
1B2d	Fugitive emissions from geothermal	CO ₂	1.21	91.55
1A4b	Stationary combustion residential	CO ₂	1.01	92.56
4B	CH ₄ from manure management	CH ₄	0.97	93.53
1A3a	Mobile combustion (rail)	CO ₂	0.78	94.31
1A4c	Stationary combustion agriculture/forestry/fisheries	N ₂ O	0.78	95.09

*Ozone Depleting Substances

1.7 UNFCCC reviews in 2001

The greenhouse gas inventory was reviewed in 2001 by the UNFCCC as part of a pilot study of the technical review process. A separate review was also carried out by an energy sector expert from New Zealand. Several of the recommendations of these reviews appeared in last year's inventory (Tier 2 approach applied for methane emissions from solid waste disposal sites, and emissions from small sources previously unreported (lime and dolomite) included), some appear for the first time in this inventory (Tier 2 approach applied for methane emissions from ruminants), whilst others are being incorporated into a longer-term work plan. The longer-term work programme includes a review of the country-specific emission factors for fuels in the energy sector, and ongoing research has been funded to improve the nitrous oxide emissions estimation. Overall, a process of cross-verification between the different government departments responsible for the inventory has been implemented and additional work is planned to formalise the verification process further.

1.8 Planned and ongoing work

The following work is continuing or is planned for ongoing inventory improvement:

1. Further revision of country-specific emission factors for nitrous oxide emissions from soil.
2. Energy sector emission factors review (commenced February 2003).
3. Development of transport emissions model (VTEC).
4. Review of the industrial processes sector.
5. Further methodological development of forestry models for the LUCF sector.
6. Establishment of a process to approve changes to emission factors.

1.9 Uncertainty

The current level of uncertainty in the inventory is very high because of the large contribution of non-CO₂ emissions from the agricultural sector to total emissions. A numerical value of total inventory uncertainty has not yet been estimated. However, included in this submission are uncertainty analyses for both CH₄ from enteric fermentation and N₂O from agricultural soils using the Monte Carlo approach. This is described in more detail in the agriculture chapter.