Ministry for the Environment
Manatū Mō Te Taiao

NEW ZEALAND'S GREENHOUSE GAS INVENTORY 1990–2008

Environmental Snapshot
April 2010

Key points

- In 2008, New Zealand's total greenhouse gas emissions were 74.7 million tonnes of carbon dioxide equivalent (Mt CO_2-e), which means total emissions are now 13.9 Mt CO_2-e (22.8%) higher than the 1990 level of 60.8 Mt CO_2-e.
- In 2008, net removals from afforestation, reforestation and deforestation under the Kyoto Protocol were -14.4 Mt CO_2-e, including deforestation emissions of 2.8 Mt CO_2-e, primarily from the conversion of forest land to grassland for dairy farming.

Between 2007 and 2008:

- Total emissions decreased by 0.1 Mt CO_2-e (0.1%).
- Agricultural emissions decreased by 0.7 Mt CO_2-e (2.1%), largely due to widespread drought reducing livestock numbers.
- In the energy sector, road transport emissions decreased for the first time due to high fuel prices and the onset of the global recession. However, this was offset by an increase in emissions because of greater use of coal in electricity generation due to the impact of drought on hydro-inflows.

This snapshot provides a summary of the information reported in *New Zealand's Greenhouse Gas Inventory 1990–2008* submitted on 15 April 2010. The inventory is the official annual report of all human-caused emissions and removals of greenhouse gases in New Zealand. The inventory measures New Zealand's progress against its obligations under the Kyoto Protocol as well as the United Nations Framework Convention on Climate Change (UNFCCC). The complete inventory submission is available on the Ministry for the Environment's website at: www.mfe.govt.nz/publications/climate/.

The first part of the snapshot summarises New Zealand's total emissions and net removals from forestry as reported under the Kyoto Protocol. The second part summarises information on New Zealand's total emissions, net removals and net emissions as reported under the UNFCCC.

Reporting under the Kyoto Protocol

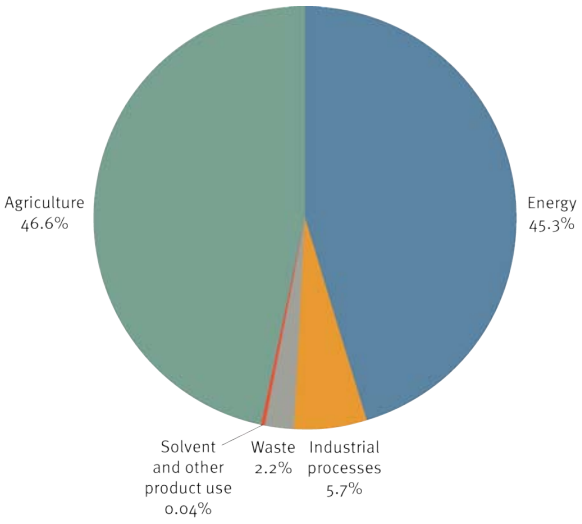
The activities reported under the Kyoto Protocol have financial implications for New Zealand due to our target that average annual emissions over the first commitment period are less than, or equal to, emissions in 1990.

Total emissions

Total emissions come from the following sectors: agriculture, energy, industrial processes, waste, and solvent and other product use.

In 1990, New Zealand's total emissions were 60.8 million tonnes of carbon dioxide equivalent (Mt CO_2-e). In 2008, this total had increased by 13.9 Mt CO_2-e (22.8%) to 74.7 Mt CO_2-e. This is largely due to growth in energy sector emissions. Figure 1 provides a breakdown of total emissions by sector in 2008 and Figure 2 shows the trend in emissions over the period 1990–2008 (see also Tables 2 and 3 on page 6).

+ FIGURE 1
NEW ZEALAND'S PERCENTAGE OF EMISSIONS BY SECTOR IN 2008



Net removals

Removals relate to the ability of trees to remove carbon dioxide from the atmosphere.

Net removals under the Kyoto Protocol consist of afforestation and reforestation activities which act as carbon sinks, as well as deforestation activities which release emissions into the atmosphere.

The difference between reporting forestry under the Kyoto Protocol and the UNFCCC

Under the Kyoto Protocol, emissions and removals from forestry are primarily from:

- afforestation (conversion to forested land that has not been forested for at least 50 years)
- reforestation (conversion to forested land that was not forested on 31 December 1989)
- deforestation (conversion of forested land to non-forested land).

Emissions and removals from Kyoto Protocol forests are only reported for the years 2008–2012 (the first commitment period).

Under the UNFCCC, emissions and removals are reported for all forests established pre-1990 and post-1989 for the period 1990 to the most recent inventory year. The land use, land-use change and forestry (LULUCF) sector also reports emissions and removals from other land uses including cropland, grassland, wetlands and settlements.

In 2008, the first year of the first commitment period (2008–2012), net removals from afforestation, reforestation and deforestation activities (Article 3.3 activities under the Kyoto Protocol) were -14.4 Mt CO_2-e (Table 1).

Afforestation and reforestation – post-1989 forest

Between 1990 and 2008, it is estimated that 580.5 kilo hectares (kha) of post-1989 forest were established and 11.7 kha of this was deforested, resulting in a net forest area of 568.8 kha. This has resulted in a removal of -17.3 Mt CO_2-e in 2008.

Deforestation – all forest types

During 2008, 4.8 kha of all forest types (natural forest, pre-1990 planted forest and post-1989 forest) were deforested, resulting in emissions of 2.9 Mt CO_2-e. This is a decrease from the 18.2 kha of deforestation of all forests in 2007 which resulted in emissions of 13.1 Mt of CO_2.

+ TABLE 1

NEW ZEALAND'S NET EMISSIONS AND REMOVALS FROM LAND SUBJECT TO AFFORESTATION, REFORESTATION AND DEFORESTATION AS REPORTED UNDER ARTICLE 3.3 OF THE KYOTO PROTOCOL IN 2008 (A NEGATIVE SIGN INDICATES A REMOVAL)

SOURCE	GROSS AREA (kha) 1990–2008	NET AREA (kha) 2008	EMISSIONS AND REMOVALS IN 2008 (Mt CO_2 EQUIVALENT)
Afforestation and reforestation	580.5	568.8	-17.3
Deforestation	96.4	4.8	2.9
Total			**-14.4**

Reporting under the UNFCCC

Total emissions

Analysis of total emissions is provided on page 1.

Net removals

Net removals are the sum of removals and emissions from the LULUCF sector.

1990–2008

Between 1990 and 2008, net removals decreased by 4.9 Mt CO_2-e (15.7%) (Figure 2). This decrease in net removals is largely due to the harvesting and replanting of plantation forests in the five years prior to 2008. These activities have lowered the average age and therefore the CO_2 absorptive capacity of planted forests. Another factor in this decrease of net removals is an increase in emissions from deforestation, as forests are converted to grassland and emit greenhouse gases into the atmosphere.

Net emissions

Net emissions are the sum of total emissions and net removals.

1990–2008

In 1990, New Zealand's net emissions were 29.7 Mt CO_2-e. In 2008, net emissions had increased by 18.8 Mt CO_2-e (63.2%) to 48.5 Mt CO_2-e. This increase is largely due to the growth in energy emissions as well as the effects of forest harvesting and deforestation.

2007–2008 summary

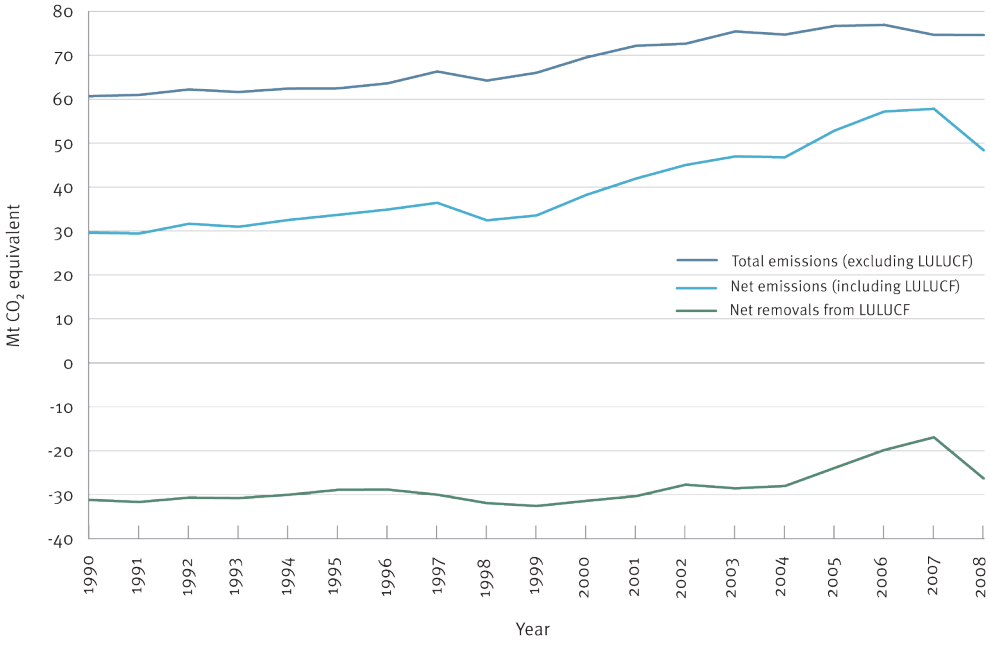
Total emissions decreased by 0.1 Mt CO_2-e, largely due to widespread drought reducing livestock numbers (Table 3). Net removals from the LULUCF sector increased by 9.4 Mt CO_2-e, largely due to a fall in deforestation from the previous year. Net emissions overall therefore fell by 9.4 Mt CO_2-e (16.3%) over the period.

Trends in New Zealand's emissions

New Zealand's total emissions trend is different to that of other developed countries. Instead of a predictable increase or decline in emissions, the trend for New Zealand is year-to-year fluctuations. These fluctuations are largely due to two factors. The first is the change in the proportion of non-renewable electricity generation, affecting CO_2 emissions. The second is the effect of droughts on agricultural productivity and livestock numbers, leading to changes in nitrous oxide and methane emissions.

+ FIGURE 2

NEW ZEALAND'S TOTAL EMISSIONS, NET REMOVALS AND NET EMISSIONS FROM 1990 TO 2008



Emissions and removals by sector

The inventory reports emissions and removals by six industry sectors:

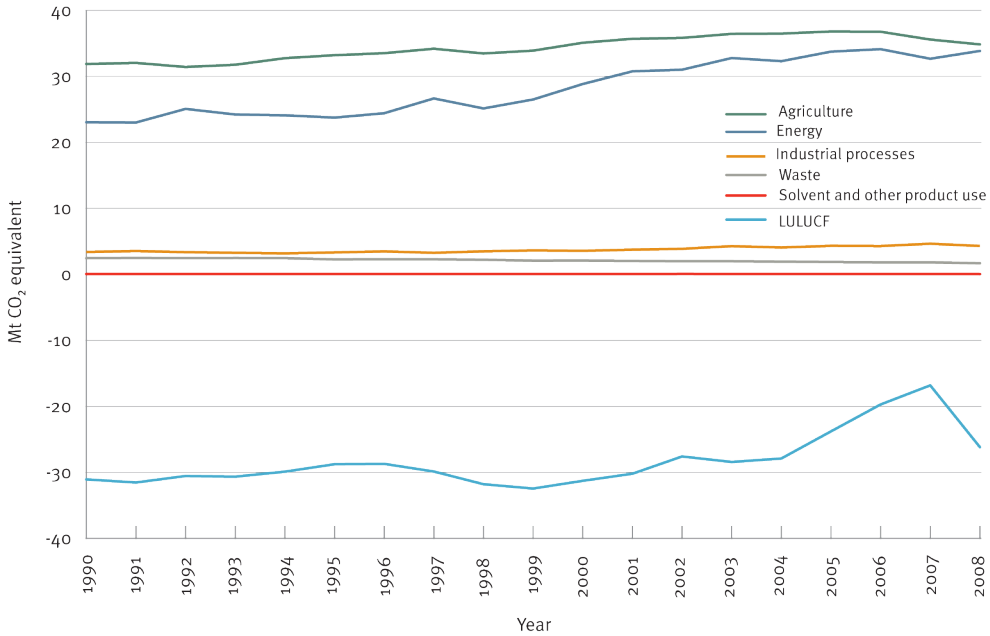
- land use, land-use change and forestry (LULUCF)
- agriculture
- energy
- industrial processes
- waste
- solvent and other product use.

New Zealand's emissions are dominated by the agriculture and energy sectors, which in combination contributed over 90 per cent of total emissions in 2008. Between 1990 and 2008, growth in emissions from the energy sector was three times greater than that from the agricultural sector.

Figure 3 illustrates the contribution each sector has made to New Zealand's emissions profile over the period 1990 to 2008.

+ FIGURE 3

NEW ZEALAND'S EMISSIONS AND REMOVALS BY SECTOR FROM 1990 TO 2008



Land use, land-use change and forestry (LULUCF)

This is the only sector that acts as an overall carbon sink, absorbing more greenhouse gases from the atmosphere than it emits. Net removals from LULUCF can fluctuate greatly due to the planting, harvesting and deforestation of New Zealand's planted forests.

1990–2008

Between 1990 and 2008, net removals decreased by 4.9 Mt CO_2-e (15.7%). This decrease in net removals is largely due to the harvesting and replanting of plantation forests in the five years prior to 2008. These activities have lowered the average age and therefore CO_2 absorptive capacity of planted forests. Another factor in this decrease of net removals is an increase in emissions from the conversion of forestland to grassland, emitting greenhouse gases into the atmosphere.

2007–2008

The increase in net removals by 9.4 Mt CO_2-e (55.6%) in 2008 was largely due to a reduction in deforestation from the previous year.

Agriculture

Agricultural emissions come from enteric fermentation (methane produced by ruminant livestock such as cattle and sheep), agricultural soils and manure management (Figure 4). This sector produced 46.6 per cent of New Zealand's total emissions in 2008. New Zealand is unique amongst developed countries as agriculture is the source of nearly 50 per cent of total emissions, whereas in other developed countries such emissions are typically less than 10 per cent of the total.

1990–2008

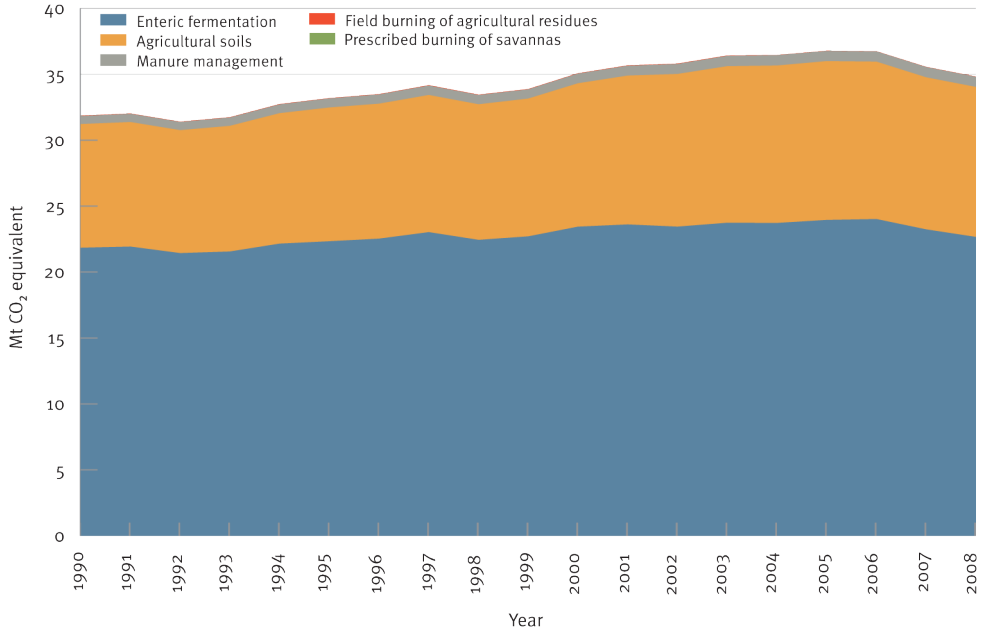
Between 1990 and 2008, agricultural emissions increased by 3.0 Mt CO_2-e (9.3%). The increase in agricultural emissions between 1990 and 2008 has resulted from increases in agricultural intensity and productivity in all main areas of agriculture including dairy, sheep, beef and deer. Emissions from dairy cattle have increased more rapidly than those from other livestock as pastoral land has increasingly been converted from sheep farms to dairy farms.

2007–2008

Agricultural emissions decreased by 0.7 Mt CO_2-e (2.1%) between 2007 and 2008 largely due to the drought that affected most of New Zealand in 2008, which caused a decrease in livestock numbers.

+ FIGURE 4

NEW ZEALAND'S AGRICULTURAL EMISSIONS BY CATEGORY FROM 1990 TO 2008



Note: Emissions from 'prescribed burning of savannas' are negligible.

Energy

Energy emissions come from the combustion of fuel and other activities related to the production of energy resources (Figure 5). This sector produced 45.3 per cent of New Zealand's total emissions in 2008.

1990–2008

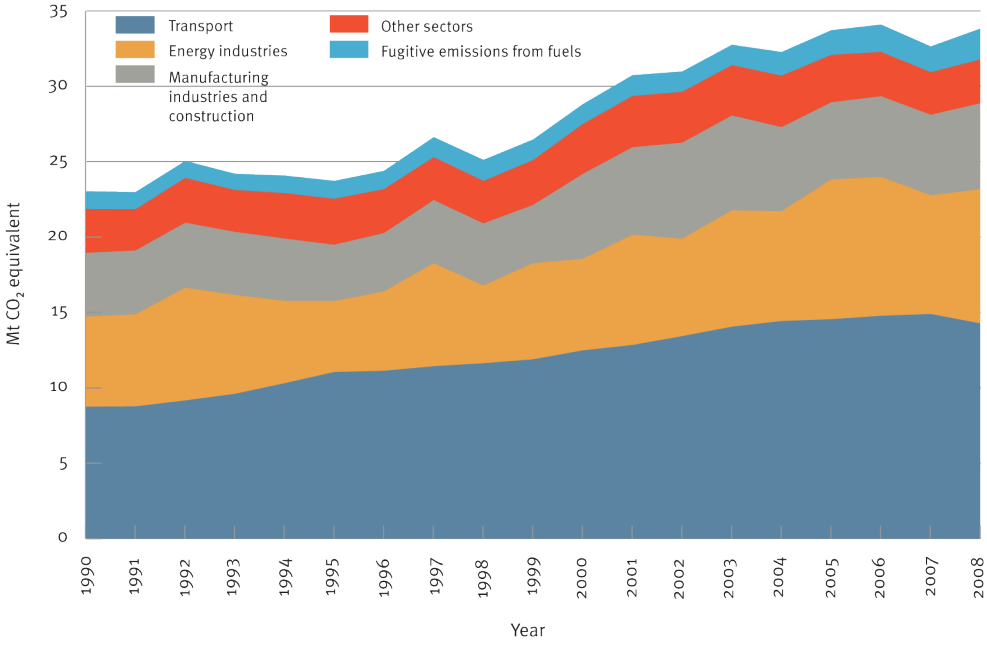
Between 1990 and 2008, energy emissions increased by 10.8 Mt CO_2-e (46.9%). This increase was largely caused by the growth in emissions from increased use of motor vehicles in road transport and electricity generation.

2007–2008

In 2008, road transport emissions decreased for the first time since 1990, due to high fuel prices and the onset of the global recession. However, this decrease in road transport emissions was countered by an increase in energy emissions related to low hydro-inflows due to drought, and the resulting increase in the use of coal for electricity generation.

+ FIGURE 5

NEW ZEALAND'S ENERGY EMISSIONS BY CATEGORY FROM 1990 TO 2008



Note: Emissions from electricity generation are included in energy industries.

Industrial processes

This sector includes emissions from the chemical transformation of materials from one substance to another, for instance in the production of aluminium.

1990–2008

Between 1990 and 2008, emissions from industrial processes increased by 0.9 Mt CO_2-e (26.8%), largely due to increased emissions from the use of hydrofluorocarbons (Figure 6).

2007–2008

Between 2007 and 2008, emissions from this sector decreased by 0.3 Mt CO_2-e (7.4%), most likely due to the global recession.

Waste

Waste emissions come from the disposal of solid waste, waste water and the incineration of waste, and contributed 1.7 Mt CO_2-e (2.2%) of total emissions in 2008.

1990–2008

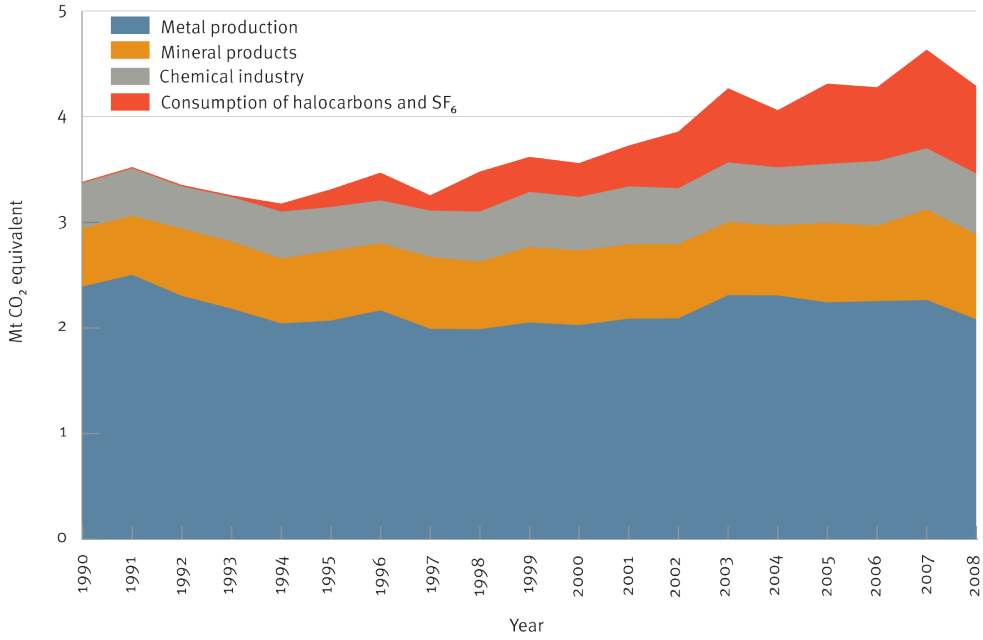
Between 1990 and 2008, waste emissions decreased by 0.8 Mt CO_2-e (31.5%). This decrease has largely resulted from improvements in solid waste management practices.

2007–2008

There was a small decrease of 0.2 Mt CO_2-e (8.3%) in emissions between 2007 and 2008.

+ FIGURE 6

NEW ZEALAND'S INDUSTRIAL PROCESS EMISSIONS BY CATEGORY FROM 1990 TO 2008



Solvent and other product use

This sector includes emissions from a number of activities related to the evaporation of volatile chemicals and makes up only 0.03 Mt CO_2-e (0.04%) of total emissions. There has been negligible change in the emissions from this sector between 1990 and 2008.

+ TABLE 2

NEW ZEALAND'S EMISSIONS BY SECTOR FROM 1990 TO 2008 IN Mt CO_2 EQUIVALENT

SECTOR	1990	2008	CHANGE FROM 1990	% CHANGE FROM 1990
Agriculture	31.9	34.8	3.0	9.3%
Energy	23.0	33.8	10.8	46.9%
Industrial processes	3.4	4.3	0.9	26.8%
Waste	2.4	1.7	-0.8	-31.5%
Solvent and other product use	0.04	0.03	-0.01	-25.4%
Total (excluding LULUCF)	**60.8**	**74.7**	**13.9**	**22.8%**
LULUCF	-31.1	-26.2	4.9	15.7%
Net Total (including LULUCF)	**29.7**	**48.5**	**18.8**	**63.2%**

+ TABLE 3

NEW ZEALAND'S EMISSIONS BY SECTOR FROM 2007 TO 2008 IN Mt CO_2 EQUIVALENT

SECTOR	2007	2008	CHANGE FROM 2007	% CHANGE FROM 2007
Agriculture	35.6	34.8	-0.7	-2.1%
Energy	32.7	33.8	1.2	3.6%
Industrial processes	4.6	4.3	-0.3	-7.4%
Waste	1.8	1.7	-0.2	-8.3%
Solvent and other product use	0.04	0.03	-0.01	-28.6%
Total (excluding LULUCF)	**74.7**	**74.7**	**-0.1**	**-0.1%**
LULUCF	-16.8	-26.2	-9.4	-55.6%
Net Total (including LULUCF)	**57.9**	**48.5**	**-9.4**	**-16.3%**

FOR MORE INFORMATION:

- about the state of New Zealand's environment see: www.mfe.govt.nz/environmental-reporting
- about climate change see: www.mfe.govt.nz/publications/climate
- about the Ministry for the Environment's reporting on New Zealand's greenhouse gases contact: ccreporting@mfe.govt.nz

New Zealand Government

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