UNITED
NATIONS

UNFCCC Framework Convention on Climate Change

Distr.
RESTRICTED

FCCC/IDR.3/NZL
19 March 2003

ENGLISH ONLY

NEW ZEALAND

Report on the in-depth review of the third national communication of New Zealand

Review team:

Wayne Tamangaro King (Cook Islands)
Tomas Hernandez-Tejeda (Mexico)
Helena Princova (Slovakia)
Jo Mummery (Australia)
Harald Diaz-Bone (UNFCCC secretariat)
Katia Simeonova (UNFCCC secretariat, coordinator)

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS

A. Introduction

1. The secretariat received New Zealand's third national communication under the United Nations Framework Convention on Climate Change, further referred to as the NC3, on 30 November 2001. An in-depth review of the NC3 was carried out between May 2002 and November 2002, including a visit to Wellington from 23 to 28 June 2002. The review team consisted of Mr. Wayne Tamangaro King (Cook Islands), Mr. Tomas Hernandez-Tejeda (Mexico), Ms. Helena Princova (Slovakia), Ms. Jo Mummery (Australia), Dr. Harald Diaz-Bone (UNFCCC secretariat) and Dr. Katia Simeonova (UNFCCC secretariat, coordinator).[1]

2. The review team held a number of meetings with government officials, representatives of academia, and non-governmental organizations from the business and environmental sectors to discuss all aspects of the New Zealand climate policy as outlined in the NC3. During these meetings, the team was provided with a wealth of additional material and information, which supported the information provided in the NC3.

B. National circumstances

3. New Zealand is an island nation, comprising two major islands (North and South) and a number of small islands, with a land area of 270,000 square kilometres, located in a relatively isolated part of the South Pacific Ocean. The population of the country was 3.79 million in 1999, 75 per cent of whom resided in the North Island. The population profile is an ageing one typical of many Annex I Parties countries. Only 25 per cent of the population lives in small towns and rural areas. These factors have implications for the constantly growing demand for transportation and hence for the transport sector, which is a major source of greenhouse gas (GHG) emissions. Also, the location of the country far from its main foreign markets and cooperation partners results in a high demand for international transport of both goods and passengers.

4. New Zealand's economy is unique in the importance of its agricultural sector, which includes dairy farming, meat and wool production, forestry, horticulture and fishing, and which together with the associated industries accounts for around 17 per cent of gross domestic product (GDP) and 75 per cent of exports. The result is a unique emission profile, with methane (CH_4) the most important gas and agriculture the primary source of emissions. Other major sectors include manufacturing and processing, while tourism has recently become one of the fastest-growing sectors of the economy.

5. New Zealand's economy has undergone far-reaching structural change in the last two decades, aimed at fostering competitiveness and initiative. This included a major reform of the taxation system, which in terms of climate change created sizeable incentives for planting new forests and brought about a sharp drop in livestock numbers consequent upon the removal of agricultural subsidies. Another major development was the deregulation of the electricity market, which started in the late 1980s with the removal of franchising and was followed by a split between the generation and high-voltage transmission parts of the national electric utility in 1994. Moreover, by 1999 the electric retailing function had been removed from the local distribution networks and had been sold to the six independent generating companies that had been established by that date and the transmission company had been separated from the distribution and retailing companies. Finally, in 2000, the Government announced its package of electricity reforms, which included the setting up of the Electricity Governance Board and the Consumer Complaints Commission.

---

[1] One team member from a Party included in Annex I to the Convention was funded by the Government of New Zealand.

6. The natural resource endowment of the country includes fresh water and energy resources such as coal, natural gas and oil, which contribute to a diversified energy supply mix. In addition, it is expected that new gas fields will be discovered. Hence, New Zealand is self-sufficient in most energy resources. Around 83 per cent of its energy needs are met by domestic sources and it also exports almost half of the coal produced.

7. In 1999, the total primary energy supply (TPES) was dominated by oil (36 per cent) and natural gas (25 per cent). Other important energy sources were geothermal (14 per cent) and hydro (11 per cent), followed by combustible renewables and coal with almost equal shares of 6 per cent. This suggests a relatively high share of renewables of around 31 per cent in the TPES mix. At the sectoral level, transport was the largest and fastest-growing energy consuming sector with about 40 per cent of total final consumption (TFC), followed by the industrial sector (33 per cent), the residential sector (13 per cent), the commercial sector (9 per cent) and the agricultural sector (5 per cent).

8. Energy intensity in New Zealand is relatively high, having grown until 1992 and slightly decreasing thereafter. However, efficiency gains in industry have been largely offset by growing transport activities and to some extent energy demand in households. Recent years saw some shift in focus of energy policy from supply to demand, with considerable emphasis placed on energy demand management.

C. Institutional framework and recent developments in climate policies

9. New Zealand is a parliamentary democracy, with power distributed between parliament and two levels of government, central and local. The latter comprises two categories, regional and local authorities. While legislative power lies with the Parliament, executive powers are distributed between the central government and local authorities, with local authorities being empowered to implement some climate-related policies, such as waste management.

10. The Resource Management Act (RMA) introduced in 1991 lays down the legislative framework for the current distribution of powers between the central government and local authorities, with a view to achieving the principle of sustainable management of resources. In particular, concerning mitigation, all GHGs are listed under the RMA and local authorities control activities via resource consents in order to limit emissions. This may involve monitoring or offsetting activities (for example tree-planting). The RMA does not, however, contain explicit provisions on how to deal with adaptation. The review team noted that, while the development of an integrated national climate change strategy with elements of both mitigation and adaptation is likely to remain a priority for the central government, the local governments could play a role in adaptation at local level. Finding the right balance of powers between national and local governments in the operationalization of a climate change strategy is an important issue, the solution of which will depend on the scope and direction of this strategy.

11. Initially, climate change policy and climate change related activities were dealt with by the New Zealand Climate Change Programme. Eleven ministries and authorities participated in the programme, coordinated by the Ministry for the Environment (MfE). At the beginning of 2000, a ministerial group on climate change was set up, convened by the Minister responsible for Energy, Forestry, Small Business and Research, Science and Technology. Members of the group included the ministers for the environment, agriculture, finance, foreign affairs and trade, transport and local government. This institutional capacity was enhanced through the establishment in 2001 of the Climate Change Project (CCP). The CCP group was mandated to provide analytical support to the ministerial group and also support in formulating the evolving climate change strategy, which provides for a cross-agency approach to climate change. The CCP group works within the Department of the Prime Minister and the Cabinet and is directly accountable to the convenor of the ministerial group. This strengthening of the institutional framework stemmed from the priority given to climate change in the national policy agenda and, in particular, from the intention, clearly stated in the NC3, to ratify the Kyoto Protocol by September 2002.

12. The review team analysed the information provided in the NC3 together with data from the most recent inventory submission of New Zealand to the Convention secretariat, which contains data on 1990–2000 emission trends. The results from this analysis suggest that New Zealand contributed to achieving the aim of the Convention to return individually or jointly the emissions of all GHGs to 1990 levels by 2000, as its total GHG emissions in 2000 exceeded 1990 levels by 5 per cent, excluding emissions and removals of carbon dioxide (CO_2) in land-use change and forestry (LUCF), and by only 3 per cent if the LUCF sector is included. The New Zealand target under the Kyoto Protocol is 100 per cent of 1990 emissions for the first commitment period.

13. During the review visit, the team was informed of the participation of key stakeholders such as non-governmental organizations from the business and environmental sectors in the preparation of the NC3 and the evolving policy package. The team was advised that this participation level could be enhanced in the future. Enhancing economic efficiency was seen by the business community as a key element in addressing climate change. Other important elements included reducing uncertainty with regard to future policy directions, preserving the competitiveness of industry and avoiding carbon leakages, especially for the major exporting industries. Several business associations were already involved in voluntary reporting, using the GHG emission protocol elaborated by the World Business Council for Sustainable Development. Non-governmental organizations from the environmental sector, while broadly supportive of the Government's approach in the preparation of the climate policy package, were concerned that the consultation process was dominated by the consideration of business interests.

14. The team was provided with new information on policy developments after the publication of the NC3, which are highlighted throughout this report. One of the important documents prepared on the basis of the NC3 was the paper, *Kyoto Protocol: Ensuring our Future*, published in October 2001. The paper was used to launch the first round of consultations with a view to consolidating views on the ratification of the Kyoto Protocol, the proposed legislation and the best policy options and policy mix that will help to meet commitments under the Kyoto Protocol.

15. The most important development, however, was the preparation in April 2002 of the Government's Preferred Policy Package (PPP) in response to climate change and the Kyoto Protocol, and the launching of the second round of nationwide consultations on the PPP, with a view to shaping the future climate change response strategy, clarifying the cost involved and raising awareness and consensus on its implementation. Also, the PPP had to clarify action prior to and during the first commitment period in order to put New Zealand on the path to achieving long-term emission reductions.

16. The initial plans were for the Parliament to consider the Climate Change Response Bill in July 2002 based on the outcome of the consultations above and to ratify the Kyoto Protocol shortly thereafter. However, the team was informed that, due to the early elections called at the end of July, consideration by the Parliament was to be delayed until after the elections. Still, the team shared the view expressed by some participants during the meetings that the Government is on track to put in place an adequate climate change policy package and the necessary legislative framework to ratify the Kyoto Protocol. In this context, some non-governmental organizations expressed concern that there could be problems in securing the funding for the policy package, which in turn may influence its degree of implementation.

17. From the review of the NC3 and additional information provided during the visit, the team concluded that the NC3 is a comprehensive document, which reflects well all aspects of the New Zealand climate change policy relevant at the time it was prepared and published. It covers the inventory of GHGs by sources and sinks, policies and measures, projections and other issues required by the UNFCCC guidelines for the preparation of national communications by Parties included in Annex I to the Convention, part II: UNFCCC reporting guidelines on national communications (referred to below as the UNFCCC guidelines).

II. GREENHOUSE GAS INVENTORY INFORMATION

A. Inventory preparation and reporting

18. The MfE coordinated the preparation of and reporting on the New Zealand national inventory and submitted the relevant reports (common reporting format and national inventory report) to the UNFCCC secretariat. It also compiled emission estimates for agriculture, land-use change and forestry, waste and emissions from industrial processes other than CO_2. The Ministry for Economic Development (MED) prepared the inventory for the energy sector and for CO_2 emissions from industrial processes. The Ministry for Agriculture and Forestry (MAF) prepared the inventory concerning land-use change, forestry and agriculture, in cooperation with the MfE. This institutional arrangement is broadly consistent with responsibilities for the preparation of policies and measures and projections.

19. New Zealand's national inventory comprehensively covers emissions of all GHGs from major sources and removals by sinks. This encompasses direct greenhouse gases, such as CO_2, CH_4 and nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6), and indirect gases, or precursors, such as nitrogen oxides (NO_X), carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs), and sulphur dioxide (SO_2). The NC3 contains data from the 1999 inventory. The team did not note any differences between the data reported in the NC3 and 1999 data submitted by New Zealand to the UNFCCC secretariat. However, some small emission sources, such as fugitive emissions from crude oil production and distribution, from production and processing of natural gas and from small geothermal sources, noted in the report on the inventory review (FCCC/WEB/IRI/(2)/2000/NZL) were still not covered either in the NC3 or in the most recent 2002 inventory.

20. The base year for the inventory was 1990 and new inventories are produced every year, together with updated historical emissions, in order to obtain consistent time series. During the visit, the review team was provided with the most recent 2002 inventory containing data for the period 1990 to 2000. The inventory data for 1990–1999 in both the NC3 and the 2002 inventory are consistent and the small differences due to recalculations are well explained. The analysis below is based on recent data from the 2002 inventory.

21. The inventory presented in the NC3 broadly conforms with the UNFCCC and Intergovernmental Panel on Climate Change (IPCC) reporting guidelines. Emission levels were assessed using the IPCC methodology for energy, industrial processes, waste, and agriculture except for ruminant methane emissions. For ruminant methane emissions and for estimating emissions and carbon uptake by planted forests, New Zealand methodology was used. In most cases, the emission factors were country-specific but IPCC default factors were used as well.

22. The overall level of confidence in inventory estimates was assessed by New Zealand as medium. This assessment stems from the high share of emissions from agriculture and LUCF removals, and also from non-CO_2 emissions from energy, for which both activity data and emission factors contributed to the medium level of uncertainty. In preparing projections, New Zealand noted that for agriculture these were prepared to 2010 only, compared to 2020 for the other sectors, due to the high level of uncertainty.

23. A problem in the CO_2 sequestration estimate, identified in the NC2 and reflected in the second in-depth review, was related to the carbon content of indigenous forests and soils. The NC2 indicated funding of $NZ 1.9 million to carry out a three-year project on the monitoring of carbon. Considerable effort has gone into the development of the carbon monitoring system since the NC2. In 1999, the project was reviewed by an international expert panel, which concluded that the systems being developed were consistent with current forest inventory practices in other countries. The NC3 outlines the integrated approach that is being adopted, including the acquisition of remote-sensed imagery (Landsat 7 TM) every five years, in conjunction with regular plot measurements (initially after five and then ten years) and an overlay of associated data and mapping through an information management system which will allow for

the tracking of carbon in the terrestrial biosphere through time. The team was informed of the commencement of the plot measurements in early 2002. The team noted the importance of the ongoing carbon monitoring system for domestic purposes as well as for international reporting.

B. Emission profile and trends

24. New Zealand's emission profile is unique among Annex I Parties to the Convention because CH_4 is by far the most important gas compared to other GHGs. In 1990, the share of CH_4 was 48 per cent of the total emissions (excluding LUCF), followed by CO_2, 35 per cent, and N_2O, 16 per cent. This emission pattern changed at the end of the decade and, in 2000, the share of CH_4 fell to 43 per cent of total emissions, while that of CO_2 grew to 40 per cent and that of N_2O remained unchanged.

25. New Zealand's total emissions increased by 5 per cent between 1990 and 2000, while the total emissions including net LUCF sinks increased by only 3 per cent. The increase was mainly attributed to the rise of 22 per cent in CO_2 emissions and of 6 per cent in N_2O emissions. CH_4 emissions declined by 6 per cent, partly offsetting the growth in other emissions. Emissions of fluorinated gases plummeted by 60 per cent, but this did not influence the emission trend, as the share of these gases (less than 1 per cent) is insignificant in the overall emission balance of New Zealand.

Table 1. Total GHG emissions and emissions by gas, 1990–2000 (Gg CO_2 equivalent)

Emissions	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CO_2 (without LUCF)	25,267	25,882	27,763	27,136	27,199	27,206	28,223	30,210	28,684	30,331	30,852
CH_4	35,390	34,716	33,865	33,677	33,877	33,998	34,106	33,144	33,126	33,237	33,205
N_2O	11,899	11,768	11,687	11,801	12,001	12,099	12,096	12,132	12,100	12,469	12,654
Fluorinated gases	605	653	647	243	296	306	402	359	362	284	245
Total (with net CO_2 from LUCF)	**51,316**	**52,406**	**55,458**	**55,284**	**57,445**	**57,206**	**58,130**	**57,567**	**53,288**	**53,558**	**52,949**
Total (without CO_2 from LUCF)	**73,161**	**73,018**	**73,963**	**72,857**	**73,373**	**73,609**	**74,827**	**75,845**	**74,272**	**76,322**	**76,956**

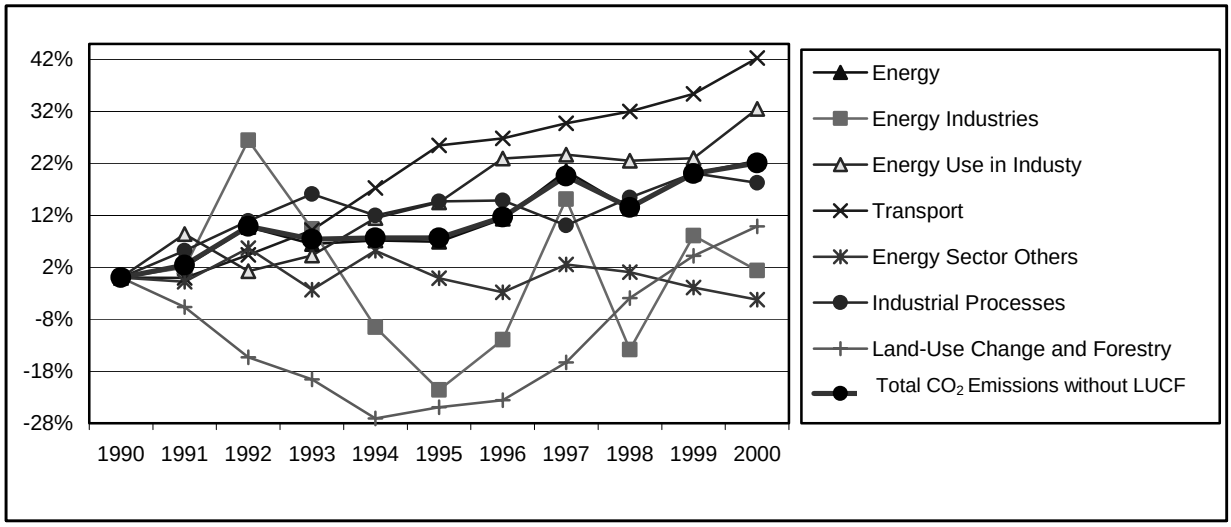
26. Total emissions of CO_2 in New Zealand amounted to 30,852 Gg in 2000. The growth of 22 per cent between 1990 and 2000 reflected the rapid growth of 42 per cent in emissions from transport, and of 32 per cent from industry. Fugitive emissions increased by 3 per cent and emissions from energy industries increased by only 1 per cent. Emissions from other sectors, including households, the commercial sector and energy use in agriculture, experienced a 6 per cent decline. Transport remained the largest source, responsible for 40 per cent of 2000 emissions, followed by energy industries (20 per cent) and energy use in industry (20 per cent). The remaining sectors accounted for small shares of emissions: energy use in others sector (residential and commercial) (9 per cent) and industrial processes (9 per cent).

Table 2. Carbon dioxide emissions by source, 1990–2000 (Gg)

Source and sink categories	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Energy	22,881	23,371	25,116	24,365	24,527	24,470	25,482	27,583	25,929	27,465	28,030
- *Energy industries*	6,032	6,151	7,628	6,598	5,458	4,728	5,314	6,945	5,197	6,520	6,116
- *Energy use in industry*	4,757	5,157	4,818	4,962	5,303	5,448	5,847	5,882	5,829	5,580	6,301
- *Transport*	8,664	8,662	9,047	9,458	10,160	10,869	10,989	11,242	11,439	11,732	12,330
- *Energy sector others*	2,812	2,701	2,956	2,717	2,926	2,797	2,658	2,755	2,801	2,694	2,647
- *Fugitive emissions from fuels*	615	700	667	631	680	628	673	760	663	670	635
Industrial processes	2,386	2,511	2,647	2,770	2,672	2,737	2,742	2,627	2,755	2,867	2,822
Land-use change and forestry	-21,845	-20,612	-18,504	-17,573	-15,927	-16,404	-16,697	-18,279	-20,984	-22,764	-24,007
Total CO_2 emissions/ removals with LUCF	**3,422**	**5,269**	**9,258**	**9,563**	**11,271**	**10,803**	**11,527**	**11,932**	**7,700**	**7,568**	**6,845**
Total CO_2 emissions without LUCF	**25,267**	**25,882**	**27,763**	**27,136**	**27,199**	**27,206**	**28,223**	**30,210**	**28,684**	**30,331**	**30,852**

27. Rapid growth in the number of cars and transport activities and the increased use of diesel fuel explained the growth in transport emissions. The fast growth of emissions from industry came mainly from the almost fourfold growth of energy consumption in methanol production, while the growth of other manufacturing sectors was much slower. Although emissions from the energy industries grew by 1 per cent only, different industries within this subcategory saw opposite tendencies in terms of emission growth. For example, emissions from thermal electricity generation grew by 44 per cent, reflecting the fast penetration of natural gas in electricity generation, mainly in cogeneration plants. This trend was almost completely offset by the drop in emissions from synthetic petrol production as a result of its discontinuation.

Figure 1. Carbon dioxide emissions by source, percentage change from 1990



28. Emissions of CH_4 amounted to 1,581 Gg in 2000. They declined by 6 per cent between 1990 and 2000, largely because of the 6 per cent decline in emissions from agriculture, the most important sector for these emissions. A decline in the number of sheep caused by the removal of agricultural subsidies and fluctuations in the international market for sheep products underpinned this trend. However, the team was informed that the current updating of estimates for methane emissions from agriculture using a tier 2 approach is likely to lead to an increase in historical emissions instead of a decrease. Emissions from waste, the second most important sector for CH_4 emissions, declined by 19 per cent, despite increases in the volume of waste produced. Reductions resulted from the significant drop in the number of landfills and from landfill gas capture and utilization for energy. Conversely, CH_4 emissions from energy registered a 44 per cent growth due to the increased production of coal and natural gas.

Table 3. Methane emissions by source, 1990–2000 (Gg)

Source and sink categories	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Energy	37	36	35	35	38	44	56	46	53	54	54
Agriculture	1,512	1,480	1,447	1,435	1,442	1,445	1,438	1,416	1,410	1,416	1,416
- Enteric fermentation	1,493	1,462	1,429	1,417	1,424	1,427	1,420	1,398	1,392	1,398	1,398
- Manure management and other sector	19	19	18	18	18	18	18	18	18	18	18
Land-use change and forestry	4	4	4	6	6	6	7	8	6	6	5
Waste	131	133	126	127	126	123	123	108	109	108	106
Total emissions	**1,685**	**1,653**	**1,613**	**1,604**	**1,613**	**1,619**	**1,624**	**1,578**	**1,577**	**1,583**	**1,581**

29. Emissions of N_2O reached 40.82 Gg in 2000 after growing by 6 per cent between 1990 and 2000. The overall emission growth reflected the growth in emissions from agricultural soils, which are by far

the most important source of N_2O emissions. The team was advised that one driver of this growth was an increase in the application of nitrogen fertilizers. As with methane emissions, New Zealand has not to date introduced any measures to abate nitrous oxide emissions in agriculture; the focus of the Government's effort in this area has been to reduce uncertainties in the nitrous oxide inventory.

Figure 2. Methane emissions by source, percentage change from 1990

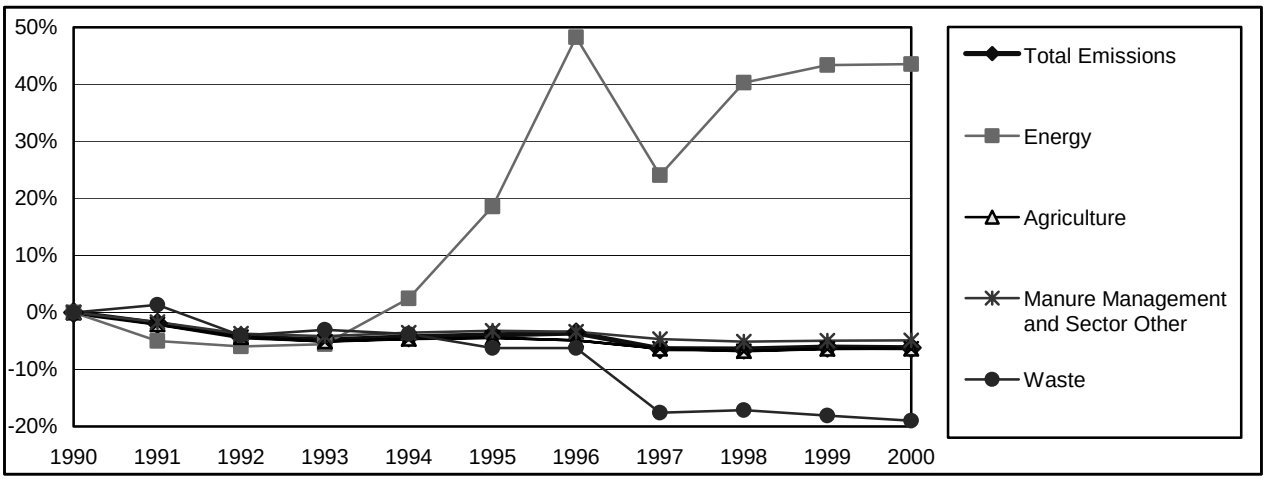
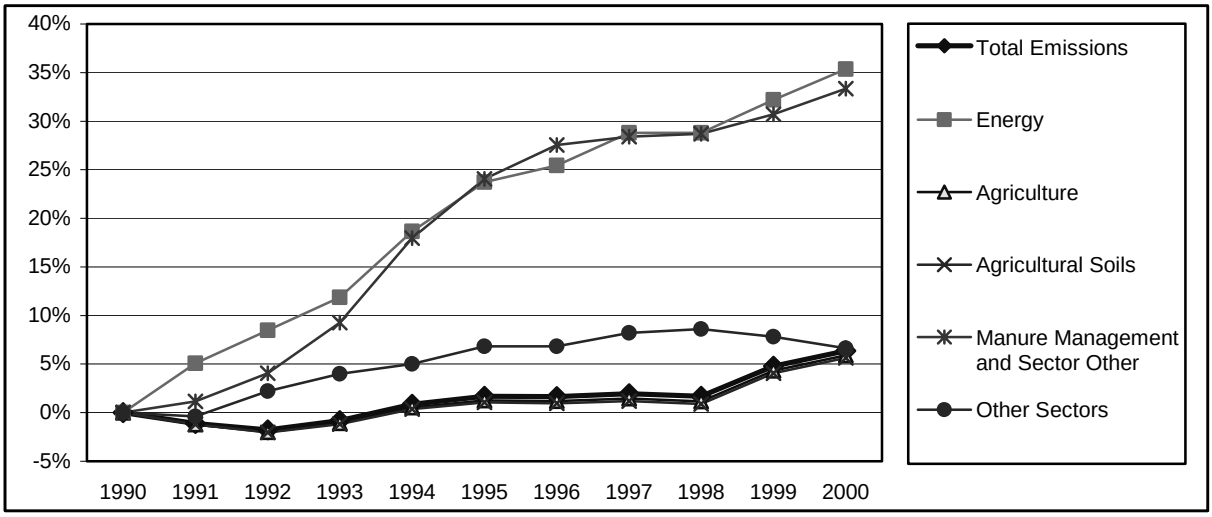


Table 4. Nitrous oxide emissions by source, 1990–2000 (Gg)

Source and sink categories	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Energy	0.59	0.62	0.64	0.66	0.70	0.73	0.74	0.76	0.76	0.78	0.80
Agriculture	37.29	36.85	36.55	36.89	37.49	37.77	37.75	37.84	37.73	38.91	39.49
- Agricultural soils	36.95	36.50	36.19	36.51	37.08	37.34	37.31	37.39	37.29	38.45	39.03
- Manure management and other sector	0.35	0.35	0.36	0.38	0.41	0.43	0.44	0.44	0.44	0.45	0.46
Other sectors	0.50	0.50	0.51	0.52	0.52	0.53	0.53	0.54	0.54	0.54	0.53
Total emissions	**38.38**	**37.96**	**37.70**	**38.07**	**38.71**	**39.03**	**39.02**	**39.14**	**39.03**	**40.22**	**40.82**

Figure 3. Nitrous oxide emissions by source, percentage change from 1990



30. Total emissions of fluorinated gases plummeted between 1990 and 2000 against a background of two opposing trends. Emissions of HFCs rose sharply, starting from a level of zero. The reason for this lay in the use of these gases as substitutes for the substances phased out under the Montreal Protocol. Emissions of SF_6 also grew. In the same period, emissions of PFCs declined dramatically due to an improvement in the efficiency of aluminium production and a resulting decrease in anode effects.

III. POLICIES AND MEASURES

31. The NC3 presented a comprehensive overview of the range of policies and measures in place or being developed by New Zealand to meet the nation's commitment under the UNFCCC. Reporting of information was structured according to both sector and gas, and policies and measures were summarized in tabular form with an estimation of the mitigation impact where available. The team noted that the UNFCCC guidelines required reporting of policies and measures by sector, subdivided by gas.

32. The NC3 reports on the mitigation impact of policies and measures. However, for a number of significant emitting sectors, this information was not available. The team noted that the early development and application of methods to quantify the reduction potential of individual measures will become even more important in the context of implementing measures in response to the Kyoto Protocol. Estimation of the potential impact of measures is encouraged even with wide uncertainty bounds.

33. Detailed reporting focused on CO_2 emissions from the energy sector, covering implemented measures (Energy Efficiency and Conservation Act, activities of the Energy Efficiency and Conservation Authority (EECA) and the National Energy Efficiency and Conservation Strategy (NEECS)), planned measures (negotiated greenhouse agreements (NGAs), transport sector measures, actions by local authorities) and measures under consideration (energy efficiency improvement and carbon charges). Measures relating to non-CO_2 gases from other sectors received less attention.

34. The team found that the institutional arrangements outlined in the NC3, particularly the creation of the ministerial group in May 2000 and the CCP group, provided a strong foundation for the consideration and analysis of a comprehensive and appropriately targeted set of policies and measures, including their interlinkages.

35. The policies and measures outlined in the NC3 showed continuity with those described in the NC2, the removal of subsidies and the opening up of the New Zealand economy to global competition being the most significant policy measure mentioned in both communications. This reform was extremely significant for the agricultural sector, which is the largest source of emissions in New Zealand, and it led to a reduction in methane emissions from livestock, the largest single source of emissions. Both reports also highlighted the role of renewable energy and carbon sinks in the national emissions profile. However, there were a number of key areas where policy had advanced between the NC2 and the NC3, for example placing emphasis on energy efficiency improvement (EECA and NEECS) and in addressing inventory uncertainties, which enhances the capacity to develop mitigation measures. One important point was that the "balance" of the set of policies had improved between the NC2 and the NC3, with greater emphasis placed on addressing key issues in the most dominant sectors of New Zealand's emissions profile – agriculture, forestry and energy. The team also noted that there has been significant development of policies and measures since the publication of the NC3, as summarized in this report.

36. Many of the policies and measures outlined in the NC3, for example the removal of subsidies, the enhancement of the commercial forest estate and the management of waste, do not have climate change mitigation as their main objective. Such policies and measures clearly recognize the opportunity of achieving multiple benefits, for example improved environmental quality and human health, and efficiency benefits for industry. For other policies associated primarily with climate change, most of which are currently being developed, the costs tend to be borne in accordance with the "polluter pays" principle, for example the proposed research levy for agricultural industry and the potential emissions charge in the PPP.

37. The 2002 draft PPP, designed to position New Zealand for the first commitment period of the Kyoto Protocol and beyond comprises two major blocks of policies and measures: foundation policies for which there is an existing government commitment; and new policies for the pre-commitment and first commitment periods, listed in table 5. The key elements forming the foundation policies are the NEECS, the waste strategy and the transport strategy. The new policies for the pre-commitment period are NGAs for competitiveness-at-risk firms, research (mainly in agriculture) projects/funding to stimulate emission reduction and sink creation, and measures for HFCs and SF_6. The new policies for the commitment period include a CO_2 emission charge, capped at $NZ 25 per tonne CO_2 (except for competitiveness-at-risk firms), possible emission trading, and retaining the sink credit assets and liabilities. These new policies for the first commitment period will only be introduced if the Kyoto Protocol comes into effect. The Government's timetable to ratify the Kyoto Protocol defines to a large extent the shaping of policies and measures outlined in the NC3 and in the PPP.

38. The estimates of the impact of existing policies on GHG emission trends and the need to allow sufficient time for transition of the economy shaped the design of the PPP. It was estimated that emissions in the first commitment period will be 440,000 Gg CO_2 eq. under the baseline scenario, while the assigned amount is 365,000 Gg CO_2 eq. The balance of 75,000 Gg CO_2 equivalent was to be covered by: (a) emission reductions, through the NEECS (20,000 Gg CO_2 eq.), the Waste Management Strategy (5,000 Gg CO_2 eq.) and research (effect not quantified), and (b) use of 50,000 Gg out of the total sink credits of 105,000 Gg CO_2 .

Table 5. Summary of the key elements of the Preferred Policy Package

Pre-commitment period	First commitment period
• Negotiated greenhouse agreements for competitiveness-at-risk firms • Industry- and Government-funded research in the agriculture sector • Projects and funding to provide incentives for efficient emission reductions and sink creation • Handling programme for HFCs • For SF_6 – develop solution with industry	• Negotiated greenhouse agreements for competitiveness-at-risk firms • Industry- and Government-funded research in the agriculture sector • Projects and funding to provide incentives for efficient emission reductions and sink creation • Handling programme for HFCs • For SF_6 – develop solution with industry • Introduction of an emissions charge for CO_2 approximating the international price of emissions, but capped at $NZ 25 per tonne of CO_2 equivalent (except for competitiveness-at-risk firms) • Retain option to introduce private sector emissions trading if conditions permit • Retain sink credit assets and liabilities
Foundation policies	
• Growth and Innovation Framework • Public awareness • National Energy Efficiency and Conservation Strategy • New Zealand Transport Strategy • Local government	• Business opportunities • New Zealand Waste Strategy • Research • Adaptation • Resource Management Act guidance

39. The team noted that several issues may influence the outcome of the PPP. In particular, the PPP relies mainly on forest sinks, associated with relatively high uncertainties, as compared to policies aimed at CO_2 emission reduction. It also relies on negotiated agreements for the largest energy consumers, which could be efficient in terms of emission reduction only if the consequences of non-compliance provide a strong incentive for implementation. The phasing-in of the carbon charge, which could bring substantial emission reductions, has been deferred in the past; if it is not implemented in the first commitment period this might diminish the overall efficiency of the PPP. In terms of PPP coverage of sectors and gases, emissions of CH_4 from agriculture, the most important gas and sector for New Zealand, are to be addressed through research, without any specific expectations as to how this research could

influence mitigation policies. The introduction of the carbon charge could be important also for transport, one of the most significant and fastest-growing sectors in New Zealand, but this could be done in conjunction with other measures offering passengers more attractive and convenient transportation options compared to private cars.

40. Some data on economic efficiency related to reduction potential were presented. Figures for activities of the EECA in 1999/2000 indicate that the average abatement costs for "soft/indirect" programmes (*Energy-Wise Campaign, Energy-Wise Councils*) are considerably less than for the "hard/quantifiable" group (*Energy Saver Fund, Crown Energy Efficiency Loan Scheme)*, the actual cost figures for the latter being about NZ$ 13/tonne CO_2. The estimation capacity is limited, however, particularly for the "soft/indirect" programmes.

41. Information on the mitigation effect of policies and measures was provided in the NC3. The methodological approaches used in estimating mitigation impacts ranged from modelling for carbon taxation, background analyses and estimations by EECA for measures under the NEECS, and projections of documented data from the Voluntary Agreement scheme to estimate the anticipated effect of the proposed negotiated greenhouse agreements. The mitigation effect of the planned vehicle fleet control strategy was not estimated. The team noted that the early development of methodological tools to measure energy efficiency and quantify the reduction potential of individual measures should remain a priority for New Zealand and would become more important in the context of ratification of the Kyoto Protocol and the proposed policy package (EECA, Modelling and Statistics Unit of MED). With regard to compliance with the UNFCCC guidelines, the team observed that reporting on mitigation effects in the policies and measures chapter and the distinct categorization of types of instruments rather than naming policies and measures would enhance the utility of future national communications.

A. Energy

Cross-sectoral policies and measures

42. Policies and measures for the energy sectors described in the NC3 represent continuity and progress from those in the NC2 (notably energy efficiency and conservation measures, wider utilization of renewable energy, and voluntary agreements for energy-intensive sectors). The principle of least-cost measures, expressed in the NC2, is maintained in the NC3. The NC3 also reports on new instruments related to the Government's intention to ratify the Kyoto Protocol. In this context, important policy developments since the NC2 include greater concentration on economic instruments (tradable emission permits or carbon tax), enhanced complementary instruments (energy efficiency, renewable energy) related to Kyoto Protocol provisions, and a commitment to develop and implement methodologies to measure energy efficiency and to quantify the reduction potential of individual measures.

43. The Energy Efficiency and Conservation Act (2000), a significant new policy initiative, provides a statutory basis for the Energy Efficiency and Conservation Authority, which was established in 1992. The Act defines the functions of the EECA, requires the development of a National Energy Efficiency and Conservation Strategy (NEECS) (completed in 2001), and provides a legislative framework for measures to enhance energy efficiency, energy conservation, and the use of renewable energy. An important responsibility of the EECA is the development and adoption of methodology for energy efficiency measurement, in order to monitor progress towards the target for energy efficiency. Documents submitted during the review indicate that the monitoring approach will centre on a national energy efficiency index, built up from sectoral and sub-sectoral monitoring of key indicators.

44. The NEECS, released in September 2001, defines economy-wide targets for energy efficiency and renewable energy, includes action plans for each of the strategy's sectors (central and local government, energy supply, industry, buildings and appliances, and transport), and supports voluntary measures for behavioral change and negotiated agreements, as well as regulatory measures, notably minimum energy performance standards for buildings and appliances. The plans, submitted to the team

during the visit, outline the objectives, actions, milestones and responsibilities, but lack information on the anticipated reduction potential of the measures and on the funding of implementation.

45. The NEECS seeks a 20 per cent improvement in energy efficiency by 2012, equivalent to about 3,000 Gg CO_2 saved annually. Analyses of historical data and projected trends (based on the 2000 EECA publication, *The Dynamics of Energy Efficiency Trends in New Zealand* and a 1994 study by Geoff Henderson) show that about 12 per cent of current annual energy consumption could be saved through implementation of cost-effective policy instruments. The sectoral breakdown of the saving in national energy use in 1996 shows that the highest saving potential lay in total energy use in the commercial sector (21 per cent), followed by residential (15 per cent), transport (12 per cent) and industry (9 per cent). In projections up to 2020 (*NZ Energy Outlook to 2020*, February 2000), energy intensity is expected to decline to 3.8 PJ/NZ$ 100 million in 2020 compared with 5.5 PJ/NZ$ 100 million in 1998. This should reflect a projected decrease in the ratio of energy demand to GDP growth from the past (25 years) average of 1.3 per cent to 0.37 per cent, due to the closure of petrochemical plants.

46. The NEECS seeks to increase the supply of energy from renewable sources to provide a further 25-55 PJ by 2012. The team was advised of the subsequent adjustment of this figure to 30 PJ annually, which would provide an annual reduction of around 1,000 Gg CO_2. According to historical estimates, the share of renewable sources (geothermal, wastes and wood, excluding hydro) in the final energy consumption in 1999 was about 10 per cent, or some 43.8 PJ. The review team was provided with an analysis of the technical feasibility of the target, which categorized the prospects for further renewable energy sources as "likely" (19 PJ) and "possible" (13 PJ). The sectoral split of the renewable energy target indicates that the highest contribution is expected to come from industrial process heat (12–16 PJ), followed by electricity generation (6–13.5 PJ), solar water heating (0.5 PJ) and transport (0–2 PJ).

Energy supply and transformation

47. Electricity generated from renewable energy sources, mainly large hydro plants, satisfies more than two thirds of the annual electricity needs (depending on rainfall). The remaining demand is supplied by fossil fuel plants (mostly gas, some coal). The share of electricity generation from renewable sources, including hydro, declined from about 80 per cent in 1996 to about 70 per cent in 2001. The share of gas increased during the same period from 12 per cent to about 25 per cent.

48. Information on the mitigation impact of legislative and regulatory reform in the energy sector was not given explicitly in the NC3. Such reform in the sector started in the late 1980s and the three phases of separation of the Electricity Corporation of New Zealand have resulted in a separate state-owned transmission company (1994), one privately owned generator/retailer (separated in 1996 and privatized in 1999) and three independent state-owned generators/retailers (1999). In recent years, a diverse range of entrants have added new capacity (mostly gas and wood cogeneration, geothermal and gas combined cycles and, to a lesser extent, wind and biomass generation) to meet the growing demand. The economics of cogeneration plants are very site-specific and no generic estimate of their costs exists. It is assumed that cogeneration growth is primarily driven by developments in the industrial and commercial sectors.

49. Environmental objectives are not directly stipulated in the legislative framework promoting energy market liberalization and, with the limited number of players, such liberalization is not expected to have much impact on emission levels. These objectives are incorporated indirectly in the adopted legislation, through the Electricity Governance Board and the Government's Policy Statement on the Development of the Electricity Industry. No specific data to estimate the impact of electricity market liberalization on the prices of energy carriers were presented to the team. The only changes in pricing and taxation policy in the last five years referred to the taxation of transport fuels. Projections of prices show slight changes. The price of electricity to 2005 is expected to be an average one (a mix of spot and contract prices), and thereafter to be close to the long-run marginal cost. It can be assumed that changes in the wholesale price resulting from the anticipated changes in generating capacities will not lead to any

great change in consumer prices, due to the constant or declining costs of transmission, distribution and retailing.

50. In addition, new measures under the NEECS are proposed in the PPP. Activities in the action plan for energy supply focus on maximizing benefits to New Zealand from renewable energy development (hydrogen, fuel cell technology), improvements in gas and electricity sector performance and programmes to support the utilization of renewable energy. Measures to improve the electricity sector's performance comprise investigation of demand-side measures, pricing by network companies, incentives to optimize network losses, investigation of net metering arrangements and effective measuring of the whole system's efficiency. The team noted that it is important to provide estimates of the effect of the NEECS in terms of savings for the whole programme and for its key components. The team was provided with estimates of emission savings only for the renewable energy part of the NEECS.

Industry

51. Policies and measures reported in the NC3 for the industry sector comprise activities to improve energy efficiency and increase the utilization of renewable energy under the NEECS action plans, as well as proposed negotiated greenhouse agreements from the PPP. According to information provided during the team's visit, the budget for EECA activities in the industrial sector in 2001–2002 was around NZ$ 0.8 million, and the proposed budget for the year 2002–2003 some NZ$ 1.8 million.

52. The Voluntary Agreement (VA) scheme operated from 1995 to 2000 and included agreements with participants responsible for 47 per cent of New Zealand's CO_2 emissions in 1990. The emissions reduction resulting from the programme was estimated to be 1,500 Gg CO_2, less than the target of about 2,000 Gg CO_2 annually against the output-adjusted baseline in 1990. The major sources for this reduction were cogeneration and efficiency improvements in electricity production (30 per cent). It was not possible to clearly identify the contribution of VAs to the total reduction achieved due to the frozen efficiency approach applied and to the slight decline in the level of industrial activity from 1996 to 2000.

53. Based on the performance of the VAs, the successor NGA programme will likely involve greater negotiation to adopt more challenging targets than VAs, cover a wider range of firms, and involve more binding commitments with consequences if targets are not achieved. The NGAs will target "competitiveness-at-risk" firms in the pre-commitment and first commitment periods.

54. The NEECS action plan for industry is part of a foundation policy in the PPP. The reported measures span information and research (sector studies, international benchmarking and woody biomass research), voluntary commitments (NGAs and programmes to improve energy management in small and medium-scale industries), financial assistance in energy grant audits, mandatory energy performance standards for electric motors, programmes on best practice equipment use and management, and standards and labelling measures.

Residential and commercial sectors

55. Data on policies and measures implemented and planned in the residential and commercial sectors were reported in the NC3 in activities under the NEECS. The action plan under this strategy, provided to the team during the visit, contains a number of actions related to research, education and information, as well as time frames to adopt regulatory measures for energy labelling and minimum energy performance standards (MEPS). Data on the budget allocation to implement this plan were not presented.

56. New Zealand has an above-average home area per capita and per unit of GDP compared to other countries of the Organisation for Economic Co-operation and Development (OECD). In 1999, residential energy use accounted for 13.3 per cent (57 PJ) of national consumer energy. Water heating (38 per cent) and space heating (36 per cent) are the two largest end-uses in the average New Zealand household. Between 1991 and 1998, the per capita residential sector energy use declined by 5 per cent and

New Zealand now has one of the lowest values of OECD countries. The review team was informed that about 8 per cent of annual residential energy use could be saved by applying widely available low- to medium-cost measures. A major opportunity for improvement lies in water heating (insulation of water cylinders), as current losses represent about 40 per cent of total energy used.

57. Relative to sectoral GDP, the built-up area in the commercial sector in New Zealand is greater than the average for OECD countries, but energy use in this sector relative to floor area is lower than in most others. In 1999, the commercial sector's energy use (38 PJ) accounted for 9 per cent of TFC. Major energy end-uses are space heating and space cooling (39 per cent), lighting (14 per cent), water heating (13 per cent), refrigeration (12 per cent) and electronic equipment (6 per cent). The sector's aggregate energy intensity decreased between 1991 and 1998 by 12.5 per cent as a combined result of increased energy efficiency of buildings and equipment with improved energy management practices. Analysis specific to the banking subsector show that, if bank sites consuming more than the weighted average of energy shifted to the average level, they could reduce their energy use by about 17 per cent.

58. The NEECS action plan on buildings and appliances embraces technical, research and behavioural components. The buildings programme includes 15-year targets for the improvement of existing buildings (retrofitting of pre-1977 homes, annual energy demand for heat in commercial buildings at 150 kWh/sq m), and best practice in energy performance beyond the minimum level required by the building code for new buildings (annual energy demand for heat in commercial buildings at 100 kWh/ sq m). Building code revisions reflect the review of recently enacted energy efficiency requirements and new requirements such as an increase in insulation requirements in cooler parts of the country, maximum heat loss levels for hot water systems, and limits on building heat loss and lighting levels. Further implementation of mandatory MEPS for agreed product classes and mandatory energy performance labelling for product classes to be regulated in Australia is also proposed. It is estimated that energy provisions will reduce CO_2 emissions by 1,500 Gg after 15 years of implementation.

B. Transport

59. New Zealand's transport sector, which accounted for 22 per cent of total greenhouse gas emissions in 1999, ranks second in terms of contribution to the total emissions. Road transport produces 90 per cent of the sector's CO_2 emissions, followed by domestic air transport, 6.4 per cent, marine, 2 per cent, and rail, 1.5 per cent. Passenger transport has a share of 65 per cent in transport energy use and freight transport the remaining 35 per cent.

60. New Zealand's transport-related per capita GHG emissions are among the highest of Annex I Parties, and they are growing at one of the highest rates. Between 1990 and 2000, CO_2 emissions from international bunkers grew by 5.6 per cent and from domestic transport by 42 per cent.

61. New Zealand's specific national circumstances underpinning this trend include its relatively low population density, its remote geographic location relative to its main trading partners, and a high motorization rate. The main causes of the increase in transport sector emissions include the population growth of 10.2 per cent during the period 1991 to 2000, an increased demand for passenger and freight transport, and a modal shift towards road transport. In Auckland, which is New Zealand's biggest city, with around one third of the total population, the share of car transportation in overall transport activities grew from 85 per cent in 1991 to 87 per cent in 1996. In 1998, bus and rail travel accounted nationwide for only 7 per cent and 0.4 per cent, respectively.

62. The share of diesel fuel in the domestic transport energy market climbed steeply from 21 per cent in 1990 to 33 per cent in 1999. The share of aviation fuel rose from 5 per cent to 7 per cent during the same period, while that of gasoline fell from 68 per cent to 58 per cent.

63. Under the NEECS, the Government released a transport action plan in 2002 that contains measures aimed in part at holding emission growth from this sector. The plan includes substitutes for

travel and demand management, eco-efficient vehicles and fuel options, pricing, energy efficient modes, energy efficient road networks and traffic management, and education and information. The review team learned that this plan had been adopted but still lacked the necessary funding of NZ$ 40 million annually.

64. Furthermore, in February 2002 the Government announced a land transport policy and funding package. The package included the adoption of a New Zealand Transport Strategy, which is expected to complement and reinforce energy efficiency measures for transport under the NEECS, provide additional funding for more energy-efficient transport modes, a change in the principal purposes of Transfund NZ and Transit NZ, additional funding of NZ$ 94 million for road construction, which will be used to complete key motorway links, and approval in principle of the development of electronic road user charges as well as further work on congestion pricing.

65. The PPP includes a price on CO_2 emissions, applied at first through an emission charge on the carbon content of fuels. This price will approximate the international level, but be capped at NZ$ 25 per tonne of CO_2 equivalent, and will not apply before 2007. Estimated price increases reach 6 per cent for petrol and 12 per cent for diesel fuel.

66. The review team noted that, compared to the NC2, which contained no explicit or effective policies to tackle emissions from the transport sector, an important step forward in this sector has been made. However, the review team acknowledged that further efforts might be required to respond adequately to the magnitude of growth in transport emissions.

C. Industrial processes

67. Emissions of PFCs, HFCs and SF_6 are relatively minor contributors to New Zealand's inventory and, in aggregate, declined substantially between 1990 and 2000. This decline reflected the reduction in PFC emissions from New Zealand's single aluminium smelter, which enjoyed better emission control systems and a continuous improvement in cell stability over the period, broadly in line with good industry practice elsewhere.

68. In contrast to PFCs, emissions of HFCs, although very slight, increased between 1990 and 2000. A notable development since the NC2, outlined in the NC3, was the development of a training scheme aimed at improving work practices that minimize refrigerant emissions. During the country visit, the team was briefed on the proposed policy framework for synthetic gases, which forms part of the PPP. Key elements of this framework for HFCs are in line with "best practice" and include expanded recovery action, promotion of no gas loss and application of a code of practice for the reduction of emissions of fluorocarbon refrigerants in refrigeration and air-conditioning. Increasing awareness forms part of the framework and the team was provided with a quality set of materials targeting industry and the public.

D. Agriculture

69. Agriculture was responsible for about 55 per cent of New Zealand's greenhouse gas emissions in 2000. The sector is economically very important, being the main industry of New Zealand and the principal source of exports. It contributed around 5.5 per cent of GDP in 2001, with associated industries contributing another 10.7 per cent. Non-CO_2 gases, particularly methane and nitrous oxide, dominate this sector, the bulk of emissions being methane from enteric fermentation. As noted in the NC2, the removal of agricultural production subsidies in the mid-1980s led to a decline in sheep numbers, to reduced methane generation from 1990 to 1999, and to land-use change in some areas from grazing to forest. In recent years, animal (dairy cattle and deer) numbers have been increasing.

70. The NC3 indicated that to date New Zealand has not adopted any direct policies to limit agricultural sources of methane. This was also noted in the NC2. The second in-depth review noted the difficulty of implementing measures to reduce methane emissions from livestock, and recognized the emphasis placed by the Government on reducing uncertainty in emissions sources and research into

technical options for methane reduction. Building on this research, the NC3 mentions additional research funding to address methane mitigation in ruminants. The team was briefed on the inclusion of research into methane reduction, with additional funding of $NZ 1.5 million, as a priority research strategy within the investment framework of the Foundation for Research, Science and Technology. The MAF and the MfE have established an expert working group on methane to advise on the most appropriate strategies for research into improving methane inventories and mitigation options.

71. The importance of targeted, mitigation-relevant research into reducing methane emissions from livestock is underpinned by the share of these emissions and their projected levels. While two scenarios are presented in the NC3, the team was briefed that the best projection, based on an extrapolation of past trends, was that of increasing emissions through to 2012. While greater animal productivity was noted as having the potential to reduce emissions, in practice the trend in New Zealand has been to increase carrying capacity and animal performance, which, together, are leading to increased methane emissions.

72. Emissions of N_2O from agricultural soils also represented a sizeable source of emissions from this sector, and there was some growth in such emissions between 1990 and 2000, mainly driven by an increase in the application of nitrogen fertilizers. As with CH_4 emissions, New Zealand has not yet introduced any abatement measures for N_2O emissions in agriculture; the focus of the Government's effort in this area has been to reduce uncertainties in the N_2O inventory.

73. Since the NC2, much research has been done on N_2O emissions which will both enhance the accuracy of New Zealand's inventory and underpin future mitigation measures. In particular, field trials have supported the differentiation of emission factors for nitrous oxide between soils that are well, imperfectly and poorly drained, and the team was briefed on studies into hill country versus lowland pastures, and dung versus urine, that may lower baseline nitrous oxide emissions. These trials are guided by an expert committee established to advise on N_2O inventory and mitigation strategies.

74. With regard to institutional capacity, the team noted that, while emissions from nitrogen fertilizer application and from dairy shed effluent are relatively small, the responsibility for the development and implementation of abatement measures for these sources rests with local government through the RMA. In recognizing the complexity of measuring emissions of these gases, the team noted the importance of effective guidance from the Government and information flows from the outcome of the field research.

75. The PPP provides for increased research through a negotiated partnership with sectoral groups, with the potential to impose a research levy on the agricultural sector to fund research, should insufficient investment be forthcoming. While the quantum of funding was not specified in the briefing, officials suggested that research funds of around $NZ 20 million up to the first commitment period would be required to underpin the development of practicable mitigation options. The team noted the importance of maintaining a strong focus on the progress of research in the context of development and implementation of mitigation measures for agricultural emissions.

E. Forestry and land-use change

76. Indigenous and plantation forests and woodland cover 40 per cent of the New Zealand land area. In 2000, plantation forests provided a carbon sink of 23,900 Gg CO_2 and in 2001 the industry contributed some 4 per cent to the GDP. The NC3 reiterated the Government's commitment to maintain taxation and legislative policies that provide a favourable environment for forestry investment, as outlined in the NC2. New planting rates averaged 55,000 hectares per annum from 1990 to 2000, and the team was advised that the best estimate of the future rate is from 30,000 to 34,000 hectares per year. This contrasts with the future rate of 55,000 hectares per year from 2001 quoted in the NC2, and of 40,000 hectares per year until 2010 quoted in the NC3. Worthy of note is the NC3 estimate that, based on the plantings since 1990 including the forecast average new planting rate, plantation forests will sequester around 117,000 Gg of CO_2 over the first commitment period of the Kyoto Protocol.

77. In line with the more conservative estimates of future average annual planting rates, the sequestration potential of the East Coast Forestry Project has also been reduced, although quantification of the estimated sink to be achieved by the project was not available. In 1999, the project was reviewed and its objectives altered to focus more on soil erosion and land-use sustainability. The NC3 reported that under the project, 120,000 hectares of the most erosion-prone land on the east coast of North Island will be planted, using a range of approaches for erosion control including commercial forestry, in contrast to the target of 7,000 hectares per year of new plantings outlined in the NC2.

78. That indigenous forests and scrubland (often earlier succession vegetation which will reach tall native forest over time if undisturbed) represent a considerable reservoir of carbon was again highlighted in the NC3. Since the NC2, extensive areas of land have been added to the indigenous forest estate, including 130,000 hectares through the Nga Whenua Rahui, by which financial assistance is provided to landholders to enter into a voluntary forest protection agreement with the Government, a further 130,000 hectares retired from production on the west coast of South Island, and some 69,000 hectares retired from grazing through the land tenure review programme. With the voluntary retirement of around 1 million hectares of land from productive use, as mentioned in the NC3, much of which is likely to revert to scrub and eventually forest, the land tenure review programme has the potential to contribute substantially to carbon sequestration in New Zealand in the future. However, as noted in the second in-depth review, no estimate is yet available of the changes in carbon storage over time in these indigenous forests. The NC3 outlines the development of the carbon monitoring system for indigenous forests and scrubland, which aims to fill this key information gap.

79. With regard to the future, the NC3 states that an important component of the Government's domestic climate change policy will be the design of a system that enables carbon accumulated in eligible forest sinks to be verified and traded. The Preferred Policy Package pinpoints the role of sinks as a risk management tool, as the country makes the transition through the first commitment period and beyond, the estimate being that some 105,000 Gg CO_2 will be generated as sink credits in the first commitment period.

F. Waste management

80. Methane emissions from landfill and waste water represent a small proportion of New Zealand's emissions. In 2000, they amounted to some 2,389 Gg CO_2 equivalent, or 3 per cent of the national total. Importantly, methane emissions from the waste sector have been decreasing in recent years despite an increase in the volume of waste produced; emissions in 2000 were 18 per cent below 1990 levels. Much of this decrease is attributable to improved solid waste management practices, including the closure of older and substandard landfill sites and the establishment of modern regional disposal facilities, and increasing use of methane recovery systems at larger landfills, the methane either being flared or used for power production.

81. Waste water from human settlements and primary industries is usually collected and treated, generally through aerobic processes which produce no methane. If anaerobic treatment is used, the methane is collected and flared. The team noted, however, that the recently released inventory for 2000 flags the significant number of anaerobic ponds of high-strength industrial waste water produced by primary industry, particularly the meat processing industry, that do not have methane collection.

82. The broader policy framework for waste management in New Zealand is founded on waste minimization and the "generator pays" principle. Local government has a number of clear responsibilities for waste management through both the 1991 RMA and the Local Government Amendment Act 1996, which brought into law the "5R" hierarchy of reduction, reuse, recycling, recovery and residual disposal, and required local authorities to prepare waste management plans.

83. The team was briefed on the New Zealand Waste Management Strategy published in March 2002 by the MfE. The strategy sets a number of quantifiable targets for waste minimization, hazardous wastes

and waste disposal, which should contribute to further reducing methane emissions from waste. It also outlines a commitment to put a monitoring and evaluation system in place by February 2003. The Waste Management Strategy is one of the foundation strategies of the PPP and is expected to achieve a reduction in emissions of 5,000 Gg CO_2 equivalent for the period 2008–2012.

IV. PROJECTIONS AND THE TOTAL EFFECT OF POLICIES AND MEASURES

84. Projections of GHG emissions reported in the NC3 covered emissions of CO_2, CH_4, N_2O, NO_X, CO and NMVOCs from all key sources in the energy, industry, land-use change and forestry, waste and agriculture sectors. They also covered CO_2 sinks. Future levels of emissions from international bunkers were estimates and were reported separately. Projections of HFCs, PFCs and SF_6 from industrial processes were not reported. Most of the projections extended to 2020, but for agriculture up to 2010 only, as projections beyond this year were considered highly uncertain. The base year for projections was 2000. The review team acknowledged that projections were broadly consistent with inventory data given in the NC3, except for CH_4 and N_2O emissions from agriculture, where significant differences exist between projections data and inventory data for 2000.

85. Information on projections did not strictly follow the UNFCCC guidelines as regards the presentation by sector and by gas. In some cases, projections were given jointly for two sectors, e.g. CO_2 emissions from the energy sector and industrial processes, and sometimes emissions and sinks for the same sector were presented in different sections of the report. Projections for each sector and for national totals under different scenarios expressed in carbon equivalent by using the global warming potential (GWP) were also missing. This made it difficult to gain a clear understanding of emission trends by sector and national totals under different scenarios. The team encouraged New Zealand to improve the transparency of reporting on projections and to follow the UNFCCC guidelines in presenting the information by sector and by gas, and also in carbon equivalent using GWP.

86. Projections for the energy and industrial sectors were prepared by the Energy Modelling and Statistics Unit of the MED, for agriculture and LUCF by the MAF, and for waste by the MfE. The MED prepares and publishes projections of emissions from the energy sector and industry. The Energy Outlook to 2020 contains projections which are consistent with projections reported in the NC3.

87. Different scenarios were prepared for different sectors and gases, relying on different sets of assumptions. A baseline scenario was reported for CO_2 emissions from the energy sector and industrial processes, which incorporates all measures implemented as of 1999. In this sense, it corresponds to the "with measures" scenario of the UNFCCC guidelines and is referred to as "with measures" in this report. It included the same package of cross-sectoral measures (RMA, energy sector reforms, NEECS activities, measures to stimulate renewable energy) and sector-specific measures (VAs, transport sector measures and actions by local government) as in the NC2 scenarios.

88. In addition to the main "with measures" scenario, several scenarios incorporating different assumptions as to the success of the measures envisaged in the NEECS in terms of energy efficiency and renewables were reported, as were scenarios with different levels of CO_2 charges, which could be interpreted as "with additional measures" scenarios. For the agricultural sector, two scenarios which could be considered as baseline scenarios were given, as no current or future effect of measures in this sector was estimated. For the LUCF sector, three scenarios were reported, one of them being a central scenario. As in the NC2, no baseline or "without measures" scenario was presented, except for agriculture.

A. Projections of emissions from the energy sector and industrial processes

89. The same energy supply and demand model (SADEM) and related modelling approaches were used for projections in all three national communications submitted by New Zealand. SADEM is a partial

equilibrium model,[2] which identifies market clearing prices through balancing energy demand and supply quantities. It contains quantitative demand models for the industrial sector (petrochemicals, basic metals, forest products and transport other than land transport) and econometric models for a sector called "other industrial and commercial", land transport (gasoline and diesel) and the residential sector. On the supply side, simulation models are used to represent plans for electricity expansion and scheduling, which also reflect interaction between the electricity and coal supply systems, as well as the use of coal, oil and renewable generation options. In particular, the supply of coal and oil is considered unlimited due to import options. The parameters of the models are updated regularly, including after reporting in the NC3 to reflect recent data, which will have a bearing on the new projections.

90. Technologies are presented in detail in SADEM at the supply level, e.g. for electricity and gas. In particular, new electricity technologies and fuels are chosen for the future fuel and technology mix through least-cost planning. The review team was informed of the forthcoming model updates, including costing of electricity options on the supply side. The model has some limitations, as it does not contain feedback from the results of energy sector modelling to the macroeconomic parameters, such as GDP. It also does not allow for modelling of fuel switching and competition between demand and supply technologies, e.g. technologies with higher energy efficiency. Finally, it does not cater for the effect of energy market liberalization and its impact on future energy and emission trends.[3]

91. The transport sector is modelled at a very aggregated level in the SADEM model. The team was briefed on the ongoing work to develop and implement a vehicle fleet fuel model which could, among other objectives, estimate the effect of mitigation measures in the transport sector. In view of the steep increase recorded in the share of this sector's emissions, it would seem to be a critical area for attention.

92. Key parameters and assumptions for the modelling of energy-related emissions were transparently reported in the NC3. A comparison of the key assumptions made in the NC2 and NC3 is provided in table 6 below. This comparison reflects the changes observed in the New Zealand economy between the times when the NC2 and NC3 were prepared, in terms of expectations for lower GDP growth rates, exchange rates, and oil, coal and gas prices. The same assumption concerning closure of the petrochemical plant, once the Maui gas field is depleted in 2005, was used in both the NC2 and NC3.

Table 6. Comparison of key assumptions in the NC2 and NC3

Key indicators	NC2	NC3
GDP growth rate	3 per cent annually 2 and 4 per cent for sensitivity analyses	2.5 per cent annually 1.5 and 3.5 per cent for sensitivity analyses
Exchange rate	NZ$ 1 = US$ 0.65 for whole period	NZ$ 1 = 0.44 in 2001, increase from 0.45 in 2002 to 0.50 in 2007, then 0.55 by 2020
Crude oil price	US$ 22/bbl in 2000 up to US$ 25/bbl in 2005	US$ 20/bbl in 2004 up to US$ 25/bbl in 2020
Coal price	NZ$ 3.70/GJ with projected slight increase	NZ$ 2.50/GJ as wholesale price
Gas price	Rising to NZ$ 3.36/GJ in 2000 and NZ$ 5.32/GJ by 2020	Rising to NZ$ 3.5/GJ by 2010 and NZ$ 3.9/GJ by 2020
New gas discovery rate	85 PJ per annum from 2000	80 PJ per annum from 2005

93. The growth of energy-related emissions was a result of the growth in energy demand and hence in energy supply.[4] The TFC was projected to grow by around 1.1 per cent annually between 1998 and 2020. The relatively high growth rates of 2.1 per cent in the residential sector and 2 per cent in transport were expected to be outweighed by a decline in consumption of around 0.3 per cent annually in the

[2] SADEM is a partial equilibrium model as it does not cover the economy as a whole; only part of it is covered by the energy demand and supply relationship. In particular, GDP is an exogenous variable and not a result of the model.

[3] New Zealand is deregulating its energy market, including electricity. Models used to project the future structure of the energy system in such markets reflect the fact that, in a deregulated system, expansion decisions are no longer made from a single, system-wide perspective, looking at future loads, existing capacity, and certain reliability goals to determine how much capacity will be built. Instead, decisions are based on the perception of multiple market participants.

[4] Figures are from the Energy Outlook to 2020, published by the Ministry of Commerce, 2000.

industrial and commercial sector, mainly as result of the petrochemical plants' closure. The differences in growth rates were expected to boost the share of transport in the TFC from 44 per cent in 1998 to 54 per cent in 2020, and that of the residential sector from 9 per cent in 1998 to 12 per cent in 2020. At the same time, the share of the industrial and commercial sector was expected to decline from 47 per cent to 35 per cent. The TPES was projected to grow by 1.3 per cent annually between 1998 and 2020, from 652 PJ to 872 PJ. The projected increase in TPES by fuels is broadly consistent with historical trends, except for the decrease in gas supply from 2005 due to depletion of the Maui gas field.

94. New electricity generating capacity is to be commissioned by 2020 in addition to the 1,100 MW of capacity commissioned between 1998 and 2000. This new capacity of around 2,000 MW comprises 300 MW of gas combined cycle plants, 675 MW of new coal plants, 260 MW of geothermal plants, 395 MW of hydro plants, 295 MW of cogeneration plants, 150 MW of wind generators and 125 MW of oil peaking plant. The share of renewables in energy demand will decline over the period to 2020, despite the large new hydro and geothermal capacities being built, the reason being that most of the low-cost options available with traditional renewables technology and resources have already been utilized. The new capacity will increase the carbon intensity of the fuel mix for electricity generation as the share of fossil fuels rises from 22 per cent in 2000 to 36 per cent in 2020, stemming from a marked shift from gas to coal.

95. Projections under the "with measures" scenario, given the central assumption of 2.5 per cent annual GDP growth, suggest that CO_2 emissions will grow by 30 per cent between 1990 and 2005 and by 75 per cent between 1990 and 2020. This is equivalent to annual emission growth rates of 1.6 per cent by 2010 and 1.8 per cent by 2020. Between 2000 and 2005, the emission levels projected in the NC3 are somewhat lower than those projected in the NC2, but thereafter the NC3 projects faster growth (75 per cent) than the NC2 (71 per cent). This comparison suggests that "lower economic growth, energy efficiency improvement, and an energy mix with lower gas supplies, together with increasing competition in the energy sector", which the NC3 sees as the main drivers behind the emissions, may lead to higher mid-term emission trends, i.e. after 2005, compared to the NC2.

96. Sensitivity analyses of the "with measures" scenario with low (1.5 per cent, compared to 2.0 per cent in the NC2) and high (3.5 per cent, compared to 4.0 per cent in the NC2) GDP growth rates show a uniform pattern of change in projected emission levels of ±4 per cent in 2005 and ±10 per cent in 2020.

97. "With additional measures" scenarios were prepared jointly by MED, MfE and EECA. They build on the main "with measures" scenario and provide an assessment of the possible impact on emission levels of foundation policies relating to increases in energy efficiency (NEECS) and a carbon charge considered in the NC3 and later included in the PPP. On energy efficiency, the first scenario assumes a 1 per cent annual improvement in the energy efficiency of all sectors over the non-policy-driven efficiency improvements (autonomous) and the second scenario assumes a 1 per cent improvement in transport and 1.5 per cent improvement in all other sectors. These figures reflect the NEECS policy goal of a 20 per cent improvement in energy efficiency by 2012. These scenarios suggested that emissions in 2010 could be between 16 and 20 per cent per cent lower than in the main "with measures" scenario, and in 2020 around 35 to 45 per cent lower. This result highlights the importance of the NEECS as one of the main elements of the New Zealand climate change strategy.

98. With regard to the question of a carbon charge, the first scenario entails a charge of $NZ 15 per tonne of CO_2 and the second a charge of $NZ 60. These scenarios would lead to emissions in 2010 being respectively 5 per cent and 20 per cent lower than in the main "with measures" scenario, and emissions in 2020 being around 20 and 40 per cent lower. In the PPP, it is proposed that the charge for the first commitment period be capped at $NZ 25, which is somewhere between the modelled levels.

99. Emissions of CO_2 from road transport are projected to rise from 10,995 Gg in 2000 to 11,715 Gg in 2012, taking into account a reduction of 1,160 Gg from overseas vehicle technology improvements. The effects of national measures such as labelling, other technology standards, the promotion of walking and cycling and public transport are projected to bring additional reductions in CO_2 emissions, estimated at 300–400 Gg CO_2 annually by 2012.

100. Projections of energy-related emissions of CH_4, N_2O, NO_X, CO and NMVOCs for the main "with measures" scenario in the NC3 suggest significant changes compared to the NC2, both in trends and in projected levels, in particular for CH_4, N_2O and NO_X. While in the NC2 the highest increase was projected for NO_X (100 per cent between 1990 and 2020), in the NC3 the highest increase was for CH_4 (170 per cent for the same period). Step changes in projection levels in the NC3 for energy-related CH_4 emissions stemmed from the assumption that the Maui gas field will be depleted by 2005 and from expected coal cogeneration in 2015. Because of changes in the modelling team since the time of the NC2 and some lack of source data for non-CO_2 projections, the team was unable to clarify the reasons for these differences during the visit.

101. Projections were made for CO_2 emissions from industrial processes, mainly from aluminium, steel, hydrogen, cement and lime production. These emissions increased between 1990 and 1999 by around 20 per cent, due to increased activity in steel and cement production. Projections of these emissions by 2005 were prepared on the basis of an extrapolation of activity levels to 2020. Emissions of CO_2 were projected to be 42 per cent higher in 2020 than in 1990.

B. Projections of emissions from LUCF, agriculture and waste

102. For the projections of CO_2 emissions and removals from land-use change and forestry, the NC3 presents three "with measures" scenarios, with emission levels projected to 2020. Scenarios were prepared by combining the modelling approach with expert opinions and surveys. The three scenarios were constructed using different forest planting rates, which constituted the main driver in the projections. The central projection for CO_2 removals by planted forests is based on the best estimate of the new planting rate of 40,000 hectares per year from 2001, and indicates a total removal of 16,900 Gg in 2020. Upper and lower projections of new planting rates are within the range of ± 20,000 hectares per year around the central projection. The team queried whether it would be possible to incorporate key economic drivers, in particular the influence of private investment flows and potential developments in the international market, in the scenarios.

103. For the LUCF sector, the NC3 projection of new forest planting rates is considerably lower than that presented in the NC2, which assumed rates of 70,000 hectares annually from 1998 to 2000, and 55,000 hectares annually from 2001 onward. The NC3 projections are based on the actual planting rates, which averaged 55,000 hectares annually over the period 1990 to 2000, with 40,000 hectares in the year ended 2000. The team was informed that evidence based on more recent survey information made available after the publication of the NC3 suggests that annual planting rates after 2002 are likely to be closer to 30,000 hectares than the 40,000 hectares assumed in the NC3 projection. As in the NC2, the host country noted that comparing the total annual removals of CO_2 by planted forests can give a misleading picture of the underlying sink changes, and stressed the importance of the projected increase in the total quantum of CO_2 sinks.

104. The projection of removals in the NC3 also demonstrates much greater fluctuation from 2000 to 2020 than that in the NC2, the former showing a considerable decline in annual removals between 2000 and 2008 that is not apparent in the latter. The reason for this fluctuation is a planned increase in harvesting (estimated by expert judgement at 20,000 to 30,000 cubic metres per annum over this period).

105. As in the NC2, projections of emissions of non-CO_2 gases arising from wildfires and prescribed burning were also considered in the NC3, based on a ten-year average for the area burnt in wildfires and

by prescribed burning, and the fraction of forest planting where fire is used for the removal of on-site scrub before planting. These are assumed to be relatively constant over time in the projection.

106. Projections of emissions from the agricultural sector in the NC3 were made under two scenarios for methane emissions from livestock from 2000 to 2012, and nitrous oxide emissions from agricultural soils to 2010 (which differs in the assumption of sheep numbers). As a result of the reform in the agricultural sector, notably the removal of subsidies, overall livestock numbers are projected to decline to 2012, although dairy and beef cattle and deer numbers are expected to increase in this period. The livestock projection is based on a combination of modelling, survey work and expert opinion. During the in-country visit, the team was informed that the "increasing" projection in the NC3 represents the current best estimate. The projection for methane emissions from livestock in 2012 based on this assumption was 1,595 Gg CH_4, up from 1,533 Gg in 2000 and 1,471 Gg in 1990.

107. Projections of nitrous oxide emissions from agricultural soils in the NC3 suggest that direct soil emissions will increase sharply by 2010, due to greater use of nitrogen fertilizer and greater nitrogen intake from improved pastures, with increased dairy farm numbers and improved animal performance. The NC3 stresses the high levels of uncertainty surrounding the various sources of, and sinks for, nitrous oxide, and states that recent research through the New Zealand OVERSEER nutrient-balance model indicates that nitrous oxide emissions will be in the range of 55 to 58 per cent over 1990 levels in 2010. This contrasts with the 38 per cent estimate obtained using IPCC methodology.

108. Waste is the only sector which is expected to contribute to a decline in emissions below 1990 levels as a result of the implementation of the Waste Management Strategy. The projected decline is based on the assumption that the increase of methane recovery from landfills observed between 1990 and 2000 will continue to 2003 and stabilize thereafter at the level of 50 Gg CH_4.

C. Total emissions projection

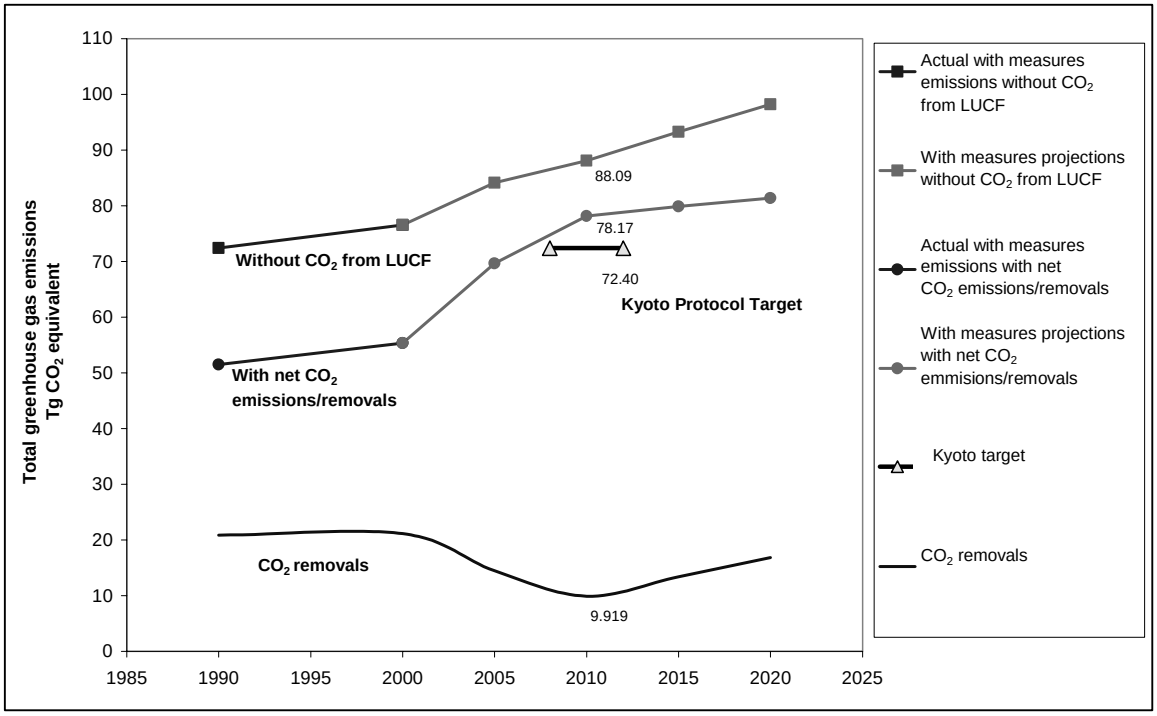
109. The analysis of historical data on emission levels and their projections by sector given in table 7 suggests that energy, notably transport, and agriculture are not only the largest sources of emissions, but also the fastest growing sectors in terms of emissions. Projections suggest that total emissions in the first commitment period under the Kyoto Protocol without the measures included in the PPP are likely to be above the Protocol target, whether with or without LUCF sinks.

110. The difference between the projections and New Zealand's target under the Kyoto Protocol (see paragraph 11 above) for the first commitment period amount on average to 15,000 Gg CO_2 eq. annually. New Zealand expected to cover this difference by means of (a) existing policies, also included as foundation policies in the PPP, such as measures under the NEECS (3,000 to 4,000 Gg CO_2) and the Waste Management Strategy (1,000 Gg CO_2 eq.); (b) new policies under the PPP, such as emission charges (760 to 5,800 Gg) and NGAs (1,500 Gg); and (c) credits for sinks (up to 11,000 Gg).

Table 7. Emissions in 1990 by sector, historical growth in 2000 and projected emission growth for 2000, 2005 and 2010

Sector	Gas	Emissions in 1990 (Gg CO_2 eq.)	Growth in 2000 according to inventory, per cent to 1990	Projected growth in 2000 in NC3, per cent to 1990	Projected growth in 2005 in NC3, per cent to 1990	Projected growth in 2010, in NC3, per cent to 1990
Energy	CO_2	22,881	22	20	33	38
	CH_4	777	45	42	71	74
	N_2O	183	35	33	50	50
Industrial processes	CO_2	2,386	18	20	28	32
Agriculture	CH_4	31,752	–7	3.3–4.2	3.3–8.2	0.7–7.3
	N_2O	11,559	5	35–50	NA	36.4–55.4
LUCF	CH_4	84	25	32	32	32
	N_2O	12.4	0	30	30	30
Waste	CH_4	2,751	–19	–15	–19	–16

Figure 4. Historical and projected levels of total GHG emissions (Tg CO_2 eq.)



Note: The values for CH_4 and N_2O emissions in 2015 and 2020 have been extrapolated.

V. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

111. The National Science Strategy Committee for Climate Change (NSSCCC) provides a mechanism to identify research gaps and needs, and to provide scientific advice on climate change issues, including in the area of impacts and adaptation. The team noted that New Zealand has complied with the UNFCCC guidelines for reporting on vulnerability, climate change impacts, and adaptation measures. Consideration of adaptation is important for New Zealand, given that the cost of adaptation for a country so dependent on primary production may be higher than the cost of mitigation.

112. New Zealand has taken a comprehensive approach to the development of specific scenarios, and has identified expected impacts of climate change. The development of a suite of tools including the integrated assessment tool, CLIMPACTS, has greatly assisted New Zealand to begin sector-specific application. While it is recognized that CLIMPACTS was in its development phase during the period between the NC2 and NC3, further improvement of the tool by adding human and socio-economic components is a priority in impact research. Enhanced application of the tool by both central and local government will assist research efforts relating to impacts.

113. While the reduction of uncertainties remains a difficult and often costly process, the roles of key stakeholders such as central government ministries, local authorities, and institutions need further defining so that frameworks for adaptation planning and implementation can be developed. In this context, education and awareness on climate variability and climate change are of paramount importance, as well as ensuring that human resource capabilities are sufficient to enable these developments.

114. A number of research programmes covering the most important adaptation sectors, including primary production sectors such as agriculture, and the coastal margins, have yielded specific information

to define potential adaptation measures. While New Zealand recognizes that its knowledge of climate change impacts is limited, it has provided the catalysts for collaboration and partnerships among government bodies, local authorities and the public at large.

VI. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

115. New Zealand's primary official development assistance institution, the Development Cooperation Division of the Ministry of Foreign Affairs and Trade, has recently been restructured to become the New Zealand Agency for International Development (NZAID). Among a number of guiding principles, the primary principle for assistance and support is the alleviation of poverty and the development of human resources.

116. New Zealand contributed NZ$ 8.31 million to the second replenishment phase (1998–2001) of the Global Environment Facility (GEF), which is the primary financial mechanism for the UNFCCC. For the forthcoming third replenishment phase (2002–2005), New Zealand's contribution has been increased to NZ$ 12.13 million. In 2001, during the resumed sixth session of the Conference of the Parties to the UNFCCC, the New Zealand Government along with a number of other countries made a political pledge to contribute a total of US$ 410 million annually by 2005 (New Zealand's share would be US$ 2.5 million) to climate change funding for developing countries. It was unclear, however, whether this would be additional to New Zealand's recent pledge to contribute to the replenishment of the GEF.

117. New Zealand has a wide range of bilateral, regional and multilateral support and assistance programmes, totalling NZ$ 227 million in 2001–2002, or 0.24 per cent of GNP. Assistance centred on forestry, agriculture and capacity-building related to adaptation. While New Zealand met the requirements of the UNFCCC reporting guidelines, it remained unclear to the team what could be highlighted as specific climate change activities out of the activities supported in a general development context.

118. New Zealand continues to promote the transfer of both "hard" and "soft" technology through its assistance programmes, which include the NZAID Pacific Initiative for the Environment. However, in New Zealand, as in other developed countries, the private sector is the main vehicle for technology transfer. During the in-depth review consultations, information was made available on the Technology for New Zealand initiative, currently set at NZ$ 23.64 million over the 2002–2003 period, which targets innovative businesses to encourage technology development. Other technology-related initiatives include Research for Industry, and Grants for Private Sector Research and Development.

VII. RESEARCH AND SYSTEMATIC OBSERVATION

119. The team noted with appreciation that support for climate-related research continued to be a priority in New Zealand. The NSSCCC identifies the following areas of research relevant to climate change: emissions from agriculture, transport and energy use, the role of forest sinks, reducing uncertainties in climate scenarios and ocean/troposphere/stratosphere interactions. According to the NSSCCC, New Zealanders must be well-informed about the human impact on climate, understand better the uncertainties involved in predicting the effects of climate variability and climate change, and participate effectively in managing and adapting to climate variability and change at national and international levels. However, the review team noted that funding may not be sufficient to cover all relevant research targets adequately.

120. The NC3 described New Zealand's international and domestic activities related to research and systematic observation. Its obligations in promoting and cooperating in scientific and technical research and systematic observation of the climate system are fulfilled through activities supporting capacity-building in technical research as well as relevant social, economic and technical research and development covered in the policies and measures section of the NC3. The team noted that New Zealand

has contributed to meeting the commitments under Article 5 of the UNFCCC, including assistance to developing countries thus enabling them to participate in research and development.

121. In its NC3, New Zealand provided summary information on its global climate observing system. A separate report on the system following the UNFCCC reporting guidelines was also submitted.

122. The team noted the wide range of research activities being undertaken in both the mitigation and adaptation areas. In view of New Zealand's ratification of the Kyoto Protocol, the Government has accorded high priority to research that promotes and encourages emission reductions, particularly of CH_4 and CO_2. Financing for these activities comes primarily through the Foundation for Research, Science and Technology. Climate-related research funding amounted to NZ$ 23.5 million in 2000.

VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS

123. The scope of activities and number of institutions involved suggests that much progress has been made by New Zealand in education, training and raising public awareness on climate change. The MfE, in cooperation with the New Zealand Climate Project, released the *Impacts Report* in 2001 which included recent results from climate change studies. For more specific target groups, a monthly newsletter, *Climate Wise,* was published by the MfE from 2001 and *Energy Wise Monitoring Quarterly* was published by the EECA.

124. A great deal of information (in the form of fact sheets, surveys, public meetings and training kits) was prepared for the general public to facilitate consultations on climate policy in 2001 and 2002. A wealth of information was also displayed on the Government's web site (www.climatechange.govt.nz) in 2001. The main outcome of the first phase of consultations was the recognition by the general public that action must be taken on climate change. The results were reflected in the comprehensive *2002 Climate Change Consultation Report*, which contained among other things submissions on the issue of ratification of the Kyoto Protocol by New Zealand and the results of a public survey on that subject.

125. The second phase of consultation, conducted through activities such as roadshows and a national stakeholders' meeting, focused on domestic policy and measures to meet the Kyoto Protocol target. The end-product of the consultations and information activities was the 2002 paper, *Climate Change – the Government's Preferred Policy Package,* which was discussed earlier in this report. Within only a few months, 800 enquiries were registered and about 1,200 submissions received.

126. The review team was provided with a creatively designed package of information tools for schools and young people prepared by the Climate Change Programme and the MfE, comprising an information brochure, Kiwi Conservation Club Magazine, and Certificate of Merit. The review team was impressed by the way New Zealand was pursuing activities on education, training and public awareness and found the approach taken promising and potentially replicable.

IX. CONCLUSIONS

127. The team did not identify any major gaps in the reporting of information in the NC3, and concluded that New Zealand broadly met the UNFCCC guidelines. It acknowledged the improvements made compared to reporting in the NC2, particularly as concerns information on GHG inventories and policies and measures. Some specific reporting issues identified by the review team are mentioned in the relevant sections of the report.

128. The team noted that the presentation of information in the NC3 would benefit from closer adherence to the UNFCCC guidelines, especially in projections and policies and measures. More analysis could also be provided on the factors underlying the historical and future emission trends. Such analysis would be useful both in the national circumstances chapter, where more explicit links could be made between national and sector profiles, and in the chapter on the GHG inventory to explain the past

emission trends. Finally, such analysis is essential in the context of the policies and measures chapter, where the monitoring and evaluation of the effect of policies and measures could be given more attention.

129. Analysis of historical emission levels led the team to conclude that New Zealand contributed to achieving the aim of the Convention and slowed its emission growth, such that its total GHG emissions in 2000, excluding LUCF, exceeded 1990 levels by only 5 per cent, and by 3 per cent if LUCF emissions and removals are taken into account. This analysis suggested that while some of the policies and measures, such as the RMA, energy sector reform, energy efficiency activities, afforestation activities and waste management may have helped slow the emission growth, the effect of these policies was outweighed by the growth in emissions from transport and energy use in industry, together with fugitive methane emissions. Other possible reasons for emissions being higher in 2000 than in 1990 may include insufficient funding of the 1994 policy package, deferment of the consideration and introduction of the carbon charge envisaged in the package, and a reliance on voluntary approaches, which did not fully achieve the outcome expected.

130. In its NC3, New Zealand underlined its commitment to ratify the Kyoto Protocol. The team acknowledged with appreciation the scale of activities, ambitious timetable and targeted approach the Government has adopted in preparing for ratification. The team also acknowledged the role of the PPP as a major step forward in the development of an integrated climate strategy, in which both mitigation and adaptation are taken into account. Such an integrated strategy could help to identify the most efficient climate change policy portfolio for New Zealand. Although early elections in July 2002 delayed the ratification process to some extent, the team concluded that the consideration of legislation is sufficiently well under way to allow ratification by the end of 2002. After the visit, the team was informed that the PPP was adopted by the Government with slight modifications in September 2002.

131. Analysis of the future emission trends presented in the NC3 suggests that with the measures presented in the NC3, but without the PPP, it will be very difficult for New Zealand to reach its target under the Kyoto Protocol. This emphasizes the significance of the PPP, which could help to bridge the difference between the projected emissions according to the “with measures” scenario and the target under the Kyoto Protocol. It also emphasizes the prominent role of the National Energy Efficiency and Conservation Strategy in bringing about emission reductions through the promotion of energy efficiency and the use of renewables as part of the PPP. However, the team formed the impression that there are some issues (outlined in paragraph 38 above) which might influence the outcome of the implementation of the PPP and attainment of the target under the Kyoto Protocol. Also, issues related to efficiency improvements and increasing the share of renewables are addressed only in the context of the National Energy Efficiency and Conservation Strategy, and not in the context of the major reform of the energy sector aimed at liberalizing the energy market. The joint efforts of the EECA and energy authorities could help to utilize the potential of non-traditional renewable sources, such as solar and wind energy, which could make a greater contribution to the existing high share of renewables in the energy mix. It may also help to better integrate climate change in the mainstream energy policies.

132. The review team commended New Zealand for its endeavour to fill key information gaps and uncertainties arising from estimates of carbon in the LUCF sector, which has implications for policy choices. The team acknowledged the recent development of the carbon monitoring system for indigenous forests and scrubland, including an international review in 1999 and plot measurements initiated in 2002, and noted the importance of this ongoing monitoring for domestic purposes and international reporting.

- - - - -