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

Review team:

Janaka Ratnasiri, Sri Lanka
Ivan Mojik, Slovakia
John Moss, United Kingdom of Great Britain and Northern Ireland
Peer Stiansen, UNFCCC secretariat, Coordinator

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Under Articles 4 and 12 of the Convention, Parties are required to prepare national communications on their implementation of the Convention. Guidelines for the preparation of national communications and the process for their review were agreed on by the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, by its decisions 9/2 and 10/1, and by the Conference of the Parties, at its first session, by its decisions 2/CP.1 and 3/CP.1 (see FCCC/CP/1995/7/Add.1). In accordance with these decisions, a compilation and synthesis of the first 15 national communications from Annex I Parties was prepared (A/AC.237/81).

When reviewing the implementation of the Convention by Parties, the subsidiary bodies and the Conference of the Parties will have this report available to them in English as well as the summary of the report in the six official languages of the United Nations. (These bodies will also have before them the executive summary of the first national communication of New Zealand and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary¹

1. The in-depth review was carried out during the period June to November 1995 and included a visit by the team from 3 to 7 July 1995. The team included experts from Sri Lanka, Slovakia and the United Kingdom of Great Britain and Northern Ireland. It concluded that the New Zealand communication generally followed the format and requirements of the guidelines, but additional information obtained during the review helped improve the transparency.

2. New Zealand has adopted a net approach to carbon dioxide (CO₂), adding emissions by sources and uptakes by sinks (planted forests). Its target is to stabilize net emissions at 1990 levels by 2000. This is to be achieved with a 20 per cent contribution from reductions of CO₂ emissions relative to a rising baseline, and an 80 per cent contribution from sink enhancement. The team noted that the proportion of the various gases in emissions and the situation with regard to carbon sinks in forests are very different from those of other Annex I Parties, owing to natural circumstances and economic structure. Based on the most recent global warming potentials (GWPs), methane (CH₄) emissions, basically from agriculture, represent 57 per cent of the gross greenhouse gas (GHG) emissions in New Zealand's inventory for 1990, CO₂ 33 per cent and nitrous oxide (N₂O) less than 10 per cent.

3. CO₂ emissions per capita (8 tons) are relatively low compared with the average in countries of the Organisation for Economic Co-operation and Development (OECD) (approximately 12 tons). Energy prices are generally low through a combination of low-cost indigenous energy sources and nil or low taxation levels on liquid, including transport, fuels. Although total taxation on gasoline makes up almost 50 per cent of the final price, gasoline prices, in particular, are low compared with most OECD countries. This may be relevant to the rising level of transport sector emissions, which constitute the largest component of the CO₂ inventory.

4. New Zealand, with 3.5 million inhabitants, has a small economy very dependent on import and export. It has a diverse energy base and relatively high utilization of renewable energy sources, and is self-sufficient in energy except for liquid fuels. The manufacturing industry benefits from that energy base, and is also based to a large extent on the products of agriculture, fisheries, and forestry. New Zealand has been through a major restructuring of the economy which has had and is expected to continue to have consequences for emissions. Important aspects are abolition of subsidies in all sectors including agriculture, deregulation, privatization, enhanced competition and streamlining of the public sector. Deregulation and restructuring in the electricity sector are expected to be particularly important, although the

¹ In accordance with decision 2/CP.1, the full draft of this report was communicated to the Government of New Zealand, which had no further comments.

implications for emissions are not yet clear. As an example, if mitigation was not a condition of the resource consent, adding a 400 MW gas-fired power station could increase national emissions by 5 per cent. The growth rate of gross domestic product (GDP) is now at a record high (6 per cent in 1994) by historical standards, following a period of low growth.

5. There is considerable sequestration of carbon in planted forest, which now covers 5 per cent of the country's area (1.4 million ha). New Zealand sees enhancement of carbon sinks in forests as an important, but nevertheless transitional, way of mitigating climate change, as sequestration of carbon at the present level could take place over a maximum of 50-100 years. These forests are monocultures and particularly well monitored, although estimates of carbon content and annual increment have been significantly revised since the communication was submitted. The high level of present sequestration is due to the fact that the age-class of trees is young and to increased planting on land previously used for sheep and beef farming, stimulated by the economic reforms.

6. The team noted in particular the uncertainties associated with indigenous forest carbon storage levels (in both directions) together with the main influences in any changes in carbon stored. These are pest-induced (notably possums, goats and deer) deforestation (an emission) and regeneration (an absorption). Indigenous forests are largely protected, and at present cover 23 per cent (6.2 million ha) of the country's area and have 3-4 times higher carbon stock per hectare and possibly 10-15 times as high total storage as the planted forest. The Government is seeking to combat the severe threat to parts of the indigenous forest estate, for a range of policy reasons. Any loss of forest or regeneration will have implications for total future carbon balances. No projections are given for natural forests because of the lack of data in this area.

7. CO₂ emissions are projected to grow by 14-17 per cent from 1990 to 2000 with 2-3 per cent growth in GDP if the CO₂ programmes are on track, while sequestration in planted forest is expected to return to approximately 1990 levels by 2000. The revision of the planted forest inventory for 1990 reflects a higher sequestration in the base year, and revised projections based on an improved model with the same assumptions show an absorption of 18.6 Mt CO₂ in 2000 compared to 17.7 Mt in 1990, or a considerably slower acceleration of sequestration than was originally reported (25.5 as against 16.7 Mt CO₂). New Zealand now expects that carbon sequestration will equal CO₂ emissions perhaps by 2010, and that a return to 1990 levels could be achieved sometime after 2000. If the CO₂ programme is not seen as being on track by 1997, the Government has announced its intention to introduce a low level carbon charge by the end of that year.

8. Methane (CH₄) emissions are expected to remain the dominant GHG in New Zealand. They follow development in the agricultural sector and have been slightly declining through the 1990s. Emissions from ruminants could increase from around 1998, but current modelling suggests that CH₄ emissions will be below 1990 levels in 2000. Emissions of N₂O and perfluorocarbons (PFCs) are not expected to increase.

9. Since the communication was submitted, voluntary agreements have been signed between the Government and major companies in the energy and industry sectors. An energy saver fund of \$NZ 18 million over five years has been set up for residential sector energy efficiency projects, and New Zealand has acquired more experience with its energy efficiency programmes, where the central coordinating body was set up in 1992. The Government has also used the Resource Management Act to intervene in a major project in the electricity sector. In August 1995, the Government set up a new working group on CO₂ policy to analyse the appropriateness of such a case-by-case approach, the impacts of the high economic growth, development of carbon sinks and reservoirs and the efficiency of a carbon charge in comparison with other economic instruments, such as tradable permits, as the next part of the policy response.

10. New Zealand is contributing more than twice its assessed share to the replenishment of the Global Environment Facility (GEF) for 1994-1996. It did not contribute to the pilot phase. The contribution is in addition to its official development assistance (ODA), which in 1993 was 0.25 per cent of GDP according to the OECD Development Assistance Committee statistics. Activities relevant to the UNFCCC are concentrated in the Asia and South Pacific region. The team also noted that substantial technology transfer occurs through overseas activities of New Zealand private companies.

11. New Zealand recognizes that, given its location, it has special responsibilities for monitoring climate change. The scientific community has made a relatively comprehensive assessment of the impacts of climate change on New Zealand and this work continues. Some of New Zealand ecosystems and economic sectors are vulnerable to climate change. Under the Resource Management Act, guidance is given to local communities on adaptation to sealevel rise. A need for a more comprehensive strategy on adaptation is recognized. New Zealand has established regular consultations with non-governmental organizations, some of which participate in the public sector/private sector working group on carbon dioxide policy.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

12. New Zealand ratified the Convention on 16 September 1993. The national communication was received by the UNFCCC secretariat on 21 September 1994. The in-depth review of the national communication was carried out during the period June to November 1995, including a country visit from 3 to 7 July 1995. The team comprised Mr. Janaka Ratnasiri (Sri Lanka), Mr. Ivan Mojik (Slovakia), Mr. John Moss (United Kingdom of Great Britain and Northern Ireland) and Mr. Peer Stiansen (UNFCCC secretariat, Coordinator).

13. New Zealand has a small, open economy with its industry based on natural resources, agriculture and forestry. It is heavily dependent on trade with distant markets. Population in 1990 was 3.5 million, population density is relatively low and growth is approximately 0.7 per cent annually, which is near the OECD average. New Zealand is self-sufficient in energy except for liquid fuels, and has considerable indigenous resources of natural gas, coal

and renewables, most notably hydropower. It has a low rate of CO₂ emissions per capita (8 tons) compared to the OECD average (12 tons), largely thanks to the fact that electric power is approximately 70-75 per cent hydro in origin and 7 per cent geothermal. Contrary to the average trend in OECD countries, energy intensity (energy supply/GDP) in New Zealand grew over the two decades up to 1993 but has fallen in the last two years, mainly because of the expansion of energy-intensive industry. Still, energy use per capita was below the OECD average in 1990. The availability of low-cost indigenous energy sources, particularly hydro, and nil or low rates of taxation, even on liquid and transport fuels, mean energy prices are low compared with the OECD average. It was noted however that total taxation on gasoline makes up almost 50 per cent of the final price, and that although direct taxation on diesel is low, all diesel vehicles are subject to road user charges, which are related directly to weight and distance travelled. Further expansion of electricity supply is likely to be based upon fossil fuels, although a limited contribution from renewables, principally hydro and geothermal and possibly wind, landfill methane and biomass, is expected. There are already small power stations using landfill methane as fuel.

14. New Zealand has a substantial amount of stored carbon in the forests compared to its gross emissions. Most of this is in the indigenous forest, which covers 23 per cent of the land with high amounts of carbon per hectare. The current net sink in planted forests, which covers only 5 per cent of the area, is also considerable. Planted forests are a crop, and the rotation period is relatively low (25-30 years).

15. In its response to climate change, New Zealand takes all greenhouse gases and sectors into account, and it is an advocate for considering emissions and enhancement of sinks (of CO₂) together, what is referred to as the net approach. Pursuant to this, and recognizing the differences in growth rates of gross emissions and sequestration in managed forests, New Zealand has set a target of reducing net CO₂ emissions to 1990 levels in 2000. This is further refined to mean that a 20 per cent reduction in the growth in gross emissions should be achieved compared to a "business as usual" scenario, with 80 per cent of the growth in gross emissions being covered by the enhancement of sinks. Inside this approach, the "gross" emissions could be allowed to show substantial growth combined with an increasing sequestration of carbon in the forests. The target is further specified for various levels of economic growth. There will be a review in 1997 to decide whether New Zealand is on track to meet this goal.

16. The rights of the Maori people in respect to land and natural resources are described in the Treaty of Waitangi which was signed in 1840. Maori consultation is required in connection with many activities related to climate change, including utilization of energy and forest resources and efforts to assess and mitigate emissions and their impacts. Accordingly, the Government has taken care to develop all aspects of the climate change programme in accordance with the treaty.

17. New Zealand has been through a major restructuring of the economy and the system of government, during the past decade. Subsidies have largely been eliminated in all sectors. This is the case even in the agricultural sector, which is the most important source of

emissions. Developments in agriculture also influence sequestration in forests. The Government's role is limited to policy formation and the creation of a level playing-field for the market to operate. The scale of government has been dramatically reduced, following elimination of interventionist policies. Most remaining executive and operational functions are now performed by independent agencies and non-government bodies. It has pursued a strategy of deregulation and to some extent privatization. Following this process, New Zealand has experienced high economic growth (6 per cent in 1994) after years in recession, but GDP per capita is still lower than the OECD average.

18. New Zealand has simplified, modernized and consolidated the environmental legislation in the Resource Management Act of 1991, which replaced numerous pieces of earlier legislation, integrating land, air and water issues for the first time. The Act is the major legislative instrument governing the integration of climate change concerns in activities in the energy, industry, agriculture and forestry sectors. Similar modernization has also taken place in other sectors, notably the energy sector, leading to changes in domestic energy (electricity and gas) markets.

19. New Zealand's response to climate change is organized through an interdepartmental effort coordinated by the Ministry of the Environment, which started its Climate Change Programme in 1988 with an assessment of impacts. There is widespread division of responsibilities for the development of policies and measures and for technical information. For example, basic inventory data are supplied from sector authorities. The Officials Committee on Energy Policy, which brings together representatives of the most relevant ministries, also plays an important role in decisions affecting GHG emissions.

20. Following the government reforms, the Ministry of the Environment's role is to provide environmental policy advice, with limited operational responsibilities. The Department of Conservation is responsible for management of the "protected estate", which includes the natural forest, while the Ministry of Commerce provides energy policy advice and has led the way in developing voluntary agreements with industry. There is also a parliamentary Commissioner for the Environment who acts as an independent "ombudsman".

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

21. The communication contains inventories for CO₂, CH₄, N₂O, PFCs, hydrofluorocarbons (HFCs) and the precursor nitrogen oxides (NO_x) for the calendar year 1990. Work is now under way to produce inventories also for the other precursors carbon monoxide (CO) and non-methane volatile organic compound (NMVOC). These have traditionally not been monitored since acidification and local air pollution problems are considered to be minor in New Zealand, given its location and natural conditions. Estimates have been carried out for the actual stock of carbon in vegetation and soils, but only for the subset "managed forest" has the contribution as sources and/or sinks been estimated. Responsibilities for producing inventories are divided among several ministries; inventories for energy-related emissions, for example, are established by the Ministry of Commerce. Based on the Intergovernmental

Panel on Climate Change (IPCC) global warming potentials (GWPs) from 1994, methane represented 57 per cent of total gross GHG emissions, CO₂ 33 per cent and nitrous oxide less than 10 per cent.

22. A subsectoral demand approach was used for the "all energy" sector, except for gas flaring and own use by gas producers. New Zealand also used country-specific emission factors for each sector. The communication itself did not include the IPCC standard data tables and it required additional information to be fully transparent. Ample supporting data were given to the team during the visit, though not always in the IPCC format, documenting activity levels, conversion factors, and areas of uncertainty and further work. New Zealand has so far given priority to the major emission sources, and none of these were omitted. All these are included in the annual *Energy Greenhouse Gas Emissions Report* prepared by the Ministry of Commerce. However, emissions from the minor sources waste water and agricultural waste burning were not estimated.

23. The 1990 data were revised and updated after the submission, but the new figures are close to those reported. New Zealand is trying to reduce the remaining uncertainties and further revisions may be expected, especially for emissions of gases other than CO₂. A comparison of CO₂ emissions from fuel combustion estimated using IPCC methodology and its own, which was based on the IPCC but further developed, was provided and no significant difference was found. For the CO₂ emissions, uncertainties are estimated at around 5 per cent; for the other gases it is considerably higher, but similar to uncertainties in other countries.

24. The principal source of CO₂ is transport (34 per cent). Process emissions of CO₂ from industry are relatively high (10 per cent) compared to other countries, reflecting the high proportion of heavy industry in New Zealand. The chief source of methane is enteric fermentation in ruminants and animal wastes, which accounts for around 77 per cent, while the waste sector is estimated to account for 21 per cent, with one third of that coming from landfills. The N₂O estimates of 9.3-45.3 Gg in total are based on calculated emissions from combustion activities and a limited number of actual measurements from agricultural soils. These actual measurements have been extrapolated to cover the whole country, hence the range given (1-37 Gg) which reflects the uncertainties regarding emissions from soils. As agricultural practices involve only small amounts of artificial fertilizers, these emissions are relatively low compared to other countries.

25. New Zealand provided the team with information on inventories for energy-related emissions for the period 1990-1993. These show a 6-7 per cent increase in CO₂ emissions, mainly explained by a growing transport sector, but it should also be noted that the hydro power shortage in 1992 led to a peak, since the shortfall was partly compensated by higher thermal production. This illustrates the fluctuations in emissions that the mainly renewables-based electricity system creates.

26. The team notes that the indigenous forests represent a massive carbon reservoir. They cover 23 per cent of the land and are largely protected in national parks, only 2 to 3 per cent being managed for wood production. The communication did not provide an estimate of the size of this reservoir, and there are great uncertainties as to whether it is a net sink or source. Additional information was given on the indigenous forest situation, including information on carbon released through logging, which is now limited in quantity and is expected to be eliminated within a few years. According to the material provided indigenous forests have 3-4 times higher actual storage per hectare (above ground) than planted forest (1836 Mt C for forest in total, of which 125 Mt C was planted forest in 1992), and the amount of carbon stored there at present could be 10-15 times higher than in the planted forest. Given the high stock of carbon in this reservoir, the uncertainty about the development of this sector constitutes a major uncertainty in compiling a comprehensive inventory for New Zealand.

27. The existing planted forest covers 5 per cent of the land (1.4 million ha in 1994), 90 per cent of which is a monoculture of *Pinus radiata* normally harvested after 25-30 years. This is a considerable net sink due to a relatively young age class of trees, and conversion of shrub, abandoned land and pastureland to forest. The carbon storage in these forests is monitored through 20 000 sample plots annually. The team was provided with documentation on measurement methods but noted that, although New Zealand's monitoring and modelling of this sector is among the most sophisticated in the world, estimates of storage and sink capacity have been substantially revised since the country visit. The new figures, building on better estimates of planting in the 1990s and of the age structure, give an estimate of 17.7 Mt CO₂ in 1990 (the year ending 31 March 1991), or 1.0 Mt more than was reported in the national communication. The development of soil carbon is discussed in an annex to the communication and work is going on to improve the understanding of the situation.

28. Emissions from international marine and aviation transport (bunker fuels) are reported separately. These correspond to 9 per cent of national emissions, which is high in an international context and is due to New Zealand's location and trade patterns.

III. POLICIES AND MEASURES

29. In May 1993, the Government announced its intention to develop a comprehensive strategy on climate change covering sources and sinks of all greenhouse gases. It also announced its domestic CO₂ target described in chapter I. There are no specified targets for other gases.

30. Greenhouse gases are considered contaminants under the Resource Management Act, which applies to all sectors, including energy, industry, agriculture and forestry. It requires "sustainable management" of natural and physical resources, and provides the basis for local and regional governments' responses to climate change through control of emissions by a

system of consents and planning measures. In the view of the team, continued application of the provisions of the Act can be an important option in the fulfillment of New Zealand's strategies.

31. The team noted that the Act encourages local authorities to:

- urge consent applicants to use best practicable means to limit emissions
- base decisions on emission reductions on a "no regrets" approach
- consider greenhouse gas emissions and sinks in preparing regional policies and plans.

32. In the event that the package of measures relating to CO₂, including the new voluntary agreements, fails to achieve the desired result by 1997, the Government has announced its intention to introduce a low-level carbon charge. The design of this tax has not been decided, but it is expected that it could cover all sources of CO₂ emissions. The team noted that the full effects of introducing a tax or most other measures by late 1997 are unlikely to be achieved before the turn of the century. However, announcing the tax in this way will encourage decision makers to plan for such an event now, which could in itself reduce emissions.

33. Since the present marginal electricity capacity is based on fossil fuels, and further development of the electricity system is also expected largely to utilize these energy sources, there is a direct link between measures to improve energy efficiency and CO₂ savings, despite the high proportion of renewables in New Zealand's energy system.

34. Acting in accordance with the Resource Management Act, the Ministry of the Environment has made submissions to several consent hearings with implications for greenhouse gas emissions. A recent example was the decision on the 400 MW Stratford/Taranaki gas-fired power plant, which alone and seen in isolation would increase national emissions by 5 per cent (emissions of a maximum of 1.5 Mt CO₂). The effect it would have through the system would lead to lower emission growth than seen in isolation, for example if it replaces coal use. The Minister, acting as consent authority and in response to the recommendations of a Board of Inquiry, decided that the CO₂ added by the plant to the total power sector emissions would have to be offset by mitigation actions such as energy efficiency improvements or enhancement of sinks. It is unclear how the Act will be applied in similar cases in the future, and whether decisions on consents will be left to regional councils.

35. New Zealand is in the process of implementing important reforms in the energy sector, aimed at facilitating the development of competitive gas and electricity markets. A stated objective is to improve the sector's efficiency in both production and use of energy for the overall benefit of the economy. Significant changes include:

- separate accounting of energy distribution and retailing functions;
- a requirement that energy companies disclose information about transmission and energy costs and charges;

- removal of franchise areas for electricity gas retailers;
- removal of price controls on gas.

36. All these measures are aimed at promoting competition in electricity and gas markets and facilitating the entry of new firms. The team notes that the achievement of effective competition, taken with other measures, including the requirements of the Resource Management Act, could stimulate substantial efficiency improvements and the use of new renewable energy sources. At present, wind power is seen as particularly promising on a commercial basis. For example, consent was announced for the Wairarapa wind farm during the team's visit. The plant is expected to produce 3-3.5 MW at a cost close to prices already paid for electricity from other sources, and will be one of the first commercial wind power plants to be set up in New Zealand by a small independent producer. Consequently, this reform could prove to have considerable effects in a sector that is projected to have the highest annual growth (4.8 per cent) in emissions in the present decade.

37. The team noted that energy sector deregulation is still in an early phase, and that close monitoring is needed to ensure that a really competitive market is achieved, especially in areas where there are natural monopolies (for example in transmission) or dominant producers in the market. At the time of the team's visit the Electricity Corporation New Zealand produced 96 per cent of the electricity. The team thus notes the importance of the Government's efforts to encourage new players to enter into the market by, for example, ensuring them access to the grid on reasonable terms and limiting the influence of major existing companies. At the time of the team's visit, there were negotiations on splitting the Corporation into two entities which has since been accomplished, to improve the competitiveness of the market and to ease the entry of other producers. The introduction of a genuinely competitive market can be expected to stimulate greater efficiency at all points of the fuel cycle, eventually leading to prices reflecting long-run marginal costs, accompanied by energy savings, but without consumer prices necessarily rising in real terms. The position will need to be monitored, and the team noted that the changing regime in the electricity sector may require a revision of the types of policies and measures to mitigate climate change that would be appropriate for this sector. The inclusion of electricity producers in the voluntary agreements can be seen in this perspective.

38. The New Zealand Government has taken several energy efficiency initiatives, which are coordinated by the Energy Efficiency and Conservation Authority (EECA). This independent body was established in 1992, and has a major role in developing and implementing New Zealand's energy efficiency strategy. It gives policy advice and carries out operational activities, and is actively seeking to benefit from the experience of similar institutions in other countries. After examining these activities, the team found them well described in the national communication. It noted as examples of potentially important initiatives the voluntary programmes "Energy Wise Companies", which had passed a preliminary milestone of 300 participating private sector entities by December 1995, and "Government Leadership" which involves public sector agencies and institutions. EECA has developed a proposal for minimum energy performance standards for a range of end-use applications, which is under

consideration by the Government. EECA has also led the technical development of a proposal for revising and expanding the energy efficiency requirements in the New Zealand Building Code, which also requires Government consideration before it can be adopted. Pending the outcome, full effects are not expected until after the turn of the century. EECA is a relatively new body for which monitoring and evaluation of the programmes is crucial. At the time of the team's visit it was too early to provide empirical documentation of results from the various initiatives. The team noted that EECA will have the challenge of operating in an energy sector undergoing major reforms in the coming years. Finally, the team noted that the electricity shortage of 1992 seems to have led to greater awareness of how to save energy, particularly in the residential sector, which may have a lasting effect.

39. As part of the electricity reform, the Government in June 1995 announced the creation of a new, \$NZ 18 million five-year transitional Energy Saver Fund. It will be targeted at the residential sector, since that sector uses 35 per cent of the total electricity supply and there are considerable potentials for cost-effective savings. Unlike the case in the energy, industry and commercial sectors, the incentives to improve energy efficiency are not seen as strong, and consequently there is a need to enhance them. This initiative is only in its embryonic phase, and was not reported in the communication.

40. In the industry and energy transformation sectors, which together accounted for approximately 55 per cent of CO₂ emissions in 1990, the Government has concluded a number of voluntary agreements to obtain CO₂ savings. At the time of the team's visit, the Government (Ministry of Commerce) was in the process of negotiating agreements with a broad range of business sector groups to reduce their CO₂ emissions. The process originally targeted 12 industries which accounted for over 50 per cent of industrial CO₂ emissions, but smaller industries have also opted to join. The first nine agreements were signed on 6 September 1995, a further six were signed on 17 October 1995 and others are under negotiation. Updated material on this was made available to the team. The commitments are not legally binding but must be seen in the light of the contingent introduction of a low-level carbon charge and the possibility of using other instruments derived from the Resource Management Act. The agreements vary in nature, reflecting differences in the industries' situations and options, but typically they specify an improvement in CO₂ emissions per unit of production by 2000. They are likely to be renegotiated if annual reporting shows a major diversion from original expectations. Voluntary agreements do not at present include gases other than CO₂ or possibilities for offsetting emissions, either domestically or abroad.

41. The volume of transport services (which accounted for 34 per cent of CO₂ emissions in 1990) has grown strongly, especially in the commercial sector, largely in response to an upturn of economic activity. Alternative transport fuels such as compressed natural gas and liquified petroleum gas have been available in New Zealand for some time, but their use is now in decline. The Government started drawing up strategies to limit emissions around 1992, and some studies on options could be finished shortly. As part of the restructuring of the economy, public transport has been deregulated in the 1980s and 1990s. In 1992 the central Government reduced direct involvement in public transport funding. To partially compensate for lost revenue, five regional councils were authorized to levy a regional petrol

tax of up to two cents per litre, to raise additional funds for public transit. Central Government has recently discontinued the regional petrol tax and returned to a central system of funding to maintain existing levels of public transit service. The team noted that strategy development has not yet led to the implementation of new measures that could be considered as having major impacts, although there has been a stronger enforcement of speed limits and the investigation of education schemes for drivers as part of the energy efficiency campaigns run by EECA. However, at the time of the team's visit, legislation was before the House of Representatives to reform the administration of road funding and develop a national land transport strategy.

42. New Zealand's planted forests, composed of non-native trees and occupying approximately 5 per cent of the land area (1.4 million ha in 1994), is a crop rather than a product of natural ecosystems. The rotation period is typically only 25-30 years. Reforms in taxation, removal of agricultural subsidies and world timber demand have led to increased forest planting. By 1994 the annual planting rate had reached almost 100,000 ha.

43. Indigenous forests occupy 23 per cent of the land area, or 6.2 million ha. They are mainly protected from all harvesting. Some 164,000 ha of Crown forest is potentially available for wood production although this is occurring in only a few areas. New legislation has been passed that requires indigenous forest harvesting to be on a sustainable basis. Under transitional arrangements specified levels of sustainable harvesting can continue until July 1996. The legislation does not apply to most Crown forest managed for wood production but a separate arrangement requires sustainability of these with a small single exception which expires in 2005. Some 20,000 ha of Maori land is also exempt from the legislation. Government is currently negotiating with the owners regarding its future inclusion. These forests are under stress which in some areas is severe, from introduced animals such as possums, goats and deer, so there is potentially a major carbon loss from this reservoir. The Government is actively trying to minimize the damage caused by animals through systematic programmes of poisoning, hunting etc. Given the large amount of carbon stored in these forests (approximately 1700 Mt C or 6200 Mt CO₂), the emissions that would result from a possible massive degradation could dominate the carbon budget of New Zealand. Consequently, the team recognized the measures to mitigate such a development as being of the utmost importance. The team also took note of the New Zealand Forest Accord by which industrial and environmental non-governmental organizations agree to protect indigenous forests from being converted to managed ones.

44. In August 1995, the Government set up a new working group on CO₂ policy. The group's task is to analyse the conflict between a case-by-case approach rooted in the Resource Management Act and the Government's more economy-wide approach, the impacts of higher-than-expected levels of economic growth, the need for further analysis relating to New Zealand's carbon sink and reservoirs, and whether a carbon charge is the most efficient economic instrument to use, should that be necessary, when progress under the current policy is revised in 1997. The group includes representatives from some non-governmental organizations, notably forest, electricity and environmental interests.

45. New Zealand is carrying out research into the feasibility of measures to limit CH₄ emissions from agriculture, for example, ways of modifying enteric ecology to reduce emissions from each ruminant. The emissions from this source, which is the main source of GHGs in New Zealand, are expected to be below 1990 levels by 2000 owing to structural change in the agricultural sector caused by the abolition of subsidies and the conditions on the world market. Further, waste management policies could reduce emissions from landfills.

46. New Zealand has not implemented specific policies to reduce emissions of N₂O, PFCs and HFCs. However, there is a dialogue with the relevant industry and the provisions of the Resource Management Act could be enforced, if this is seen as the right approach.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

47. New Zealand provided projections for CO₂, CH₄, N₂O and PFCs. For the last mentioned, the communication merely stated that they are expected in 2000 to be below 1990 levels. The team was given projections of energy-related N₂O emissions, which show a slight growth. The methodologies for projecting energy-related emissions appear to be generally sound and well documented in the supplementary material. The team found that economic assumptions were in line with international sources at the time the projections were made. The oil price chosen was high compared to assumptions in other countries, while the GDP growth rate was relatively low compared to actual development. New Zealand has enjoyed much faster growth than expected, reaching a historical high of 6 per cent in 1994, but this rate is not expected to last.

48. Given the major uncertainties involved, New Zealand presented the projection data for CO₂ as intervals, on the basis of sensitivity analysis with different GDP assumptions. It is estimated that with 2-3 per cent growth in GDP till 2000 there could be an 18-22 per cent increase in CO₂ emissions in a "business as usual" scenario, mainly because of expansion in thermal power and transport. With measures, including a conditional carbon tax from 1997, the increase is estimated at 14-17 per cent with the same assumptions. The reduced figures are based on a rough assessment of effects, where the programmes in general are assumed to increase the rate of energy efficiency improvements by 0.5 per cent over and above the historic rate. Since 1990 GDP and actual CO₂ emissions have grown faster than the projections.

49. New Zealand has made a relatively thorough study of the supply options as a basis for the projections. The team noted that the projections documented in the supplementary material show a shift from the historic trend of growing energy intensity to a situation where GDP grows faster (3 per cent) than energy consumption (1.4 per cent). This development reflects the fact that the starting point and development of energy-intensive industry in New Zealand over the past decades has been different to that in other OECD countries, but it may now follow a more similar growth path. It is recognized that there is significant untapped

potential for improved energy efficiency; in the electricity sector the growth and penetration of unconventional renewables represents a significant uncertainty, especially after 2000. This is well illustrated in the documentation.

50. An additional uncertainty is the effect of the reforms in the electricity market. If the market becomes completely competitive, new capacity in this sector will in general be added to the system when the price at least covers the long-term marginal costs. Despite the shortage in 1992, the market is expected to have excess supply until after the turn of the century, with the result that expected prices are below long-term marginal costs. The team noted that there will be little economic incentive to add new capacity to the system, be it based on fossil fuels or renewables, until a balance is established. Further, the reforms may change behaviour in the sector, adding an additional uncertainty.

51. In the longer term, CO₂ emissions could grow significantly in the absence of further measures, owing to an increased energy demand. Major uncertainties are to what extent coal will be used for electricity generation, which could happen after the turn of the century, and whether or not new discoveries of natural gas will be made. Further, some of the existing energy-intensive industry (petrochemicals) will reach the end of its expected life by the end of the next decade with the prospect of reduced emissions if plants are closed down.

52. The team noted that methane emissions, stemming largely from ruminants (77 per cent of the total), are projected to follow the anticipated development in the agricultural sector. The implementation of the Uruguay Round is expected to be a driving force in this sector, offering greater opportunities for New Zealand production, and consequently increased emissions, from around 1998. The estimated 2000 figures would still be lower than those for 1990, and the development of the sector could be influenced by the planting of forest. No reductions from measures based on ongoing research on ruminants are expected in the short term. Emissions from animal wastes and landfills are not expected to grow. The team was provided with background material on projections for emissions from landfills (7 per cent of total emissions) and for methane emissions from energy sources (3 per cent of total emissions), which show little or no growth in a "business as usual" scenario. Actual energy-related emissions have declined compared to projections.

53. The team noted the considerable uncertainty as to how sequestration of carbon in planted forests will develop, depending on planting and cutting rates and the fact that they represent only a small sector in terms of land use but one which is changing rapidly. Consequently, it would like to underline the uncertainties in the projections. Given its outstanding, but still uncertain, inventory data seen from an international perspective, New Zealand has an excellent database for making projections in this sector. Without changes in management practices, carbon sequestration in these forests is expected to increase up to 2000 due to a relatively young age class of trees. The projections of this sequestration are highly dependent on the rate of planting of new areas, the fertility of these lands and the management practices. This is especially true for figures after 2000, but impacts could also be significant before then. With no new planting, sequestration could decrease after the turn of the century. However, there is sufficient plantable land (shrub, pasture and arable land at

present makes up more than 50 per cent of the area) in New Zealand to maintain the present high rate of sequestration for 50 to 100 years. If planting is accelerated, sequestration could be increased in a shorter period than this.

54. The assumption of 100,000 ha for new area planted reflects higher planting rates than those seen before 1994, but the rationale is that the economic feasibility of planting has shifted drastically. The revision of the inventory for 1990 reflects a higher sequestration in the base year, and revised projections based on an improved model with the same assumptions show an absorption equivalent to 18.6 Mt CO₂ in 2000 compared to 17.7 Mt in 1990, or a considerably slower acceleration of sequestration than was presented in the communication (25.5 as against 16.7 Mt CO₂). Therefore New Zealand does not now expect to achieve its stabilization target until sometime after 2000.

55. New Zealand did not give projections for development of the carbon stock in the indigenous forest (23 per cent of the land area), which the team finds reasonable because of the lack of quantitative understanding of the present contribution and the huge uncertainties of future development. The development of this sector was the subject of considerable attention during the review. In addition to covering a much bigger area than the planted forest, the indigenous forest has much higher carbon storage per hectare. The range of development paths could go from a reasonable increase in the carbon stock due to natural regeneration of forest on abandoned marginal pasture land and reduced wood harvesting, to a major decrease if wild animal control is not maintained and successful. It can still be questioned whether the main causes for the present degradation - the introduction of animals which go a century and more back - can be regarded as anthropogenic in relation to the UNFCCC. Still the team wants to emphasize that the natural forest may become a major negative contributor to the overall carbon budget for New Zealand, unless effective animal control is maintained. There is a tension between a decline in storage due to wild animal impacts, and an increase due to natural forest expansion onto abandoned land. There is both a significant potential upside and downside risk for this carbon store. Efforts to control the degradation therefore appear crucial.

V. EXPECTED IMPACTS OF CLIMATE CHANGE

56. A broad assessment of possible impacts of climate change was made when New Zealand started to develop its climate change strategy in 1988. This assessment, published in 1990, is still valid and is based on scenarios describing sealevel rise and changes in weather patterns. Types of possible impacts are presented in the communication, but are described as highly uncertain at this disaggregated level of geography. The team noted that New Zealand is a country that already has a variable climate, yet there are ecosystems and groups in society that are particularly vulnerable to a change in their conditions. The initial assessment has led to follow-up research and development projects in various areas.

VI. ADAPTATION MEASURES

57. The team noted that New Zealand has an established tradition of ready adaptation to strong variations in natural and economic conditions. The New Zealand Coastal Policy Statement prepared under the Resource Management Act has provisions for adaptation to sealevel rise to be implemented at the local level. The Government recognizes the need to look more closely at adaptation and possibly develop a national strategy.

VII. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

58. New Zealand did not contribute to the pilot phase of GEF, but sought to integrate climate change concerns in its ODA. For the GEF replenishment for 1994-1996, New Zealand is paying its assessed share, plus a supplementary contribution of a similar size. This is in addition to ODA, which in 1994 was 0.24 per cent of GDP, according to Development Assistance Committee/OECD statistics.

59. New Zealand supports consideration by multilateral development agencies of the environmental, including climate change, implications of their funding policies. A unit in the Ministry of Foreign Affairs and Trade's Development Cooperation Division considers the environmental (including climate change) implications of New Zealand's ODA programme.

60. New Zealand institutions have a tradition of close cooperation with developing countries and regional organizations such as the South Pacific Regional Environment Programme (SPREP) in the Asia and South Pacific region, for example between the meteorological services and in coastal planning. These activities appear important for monitoring and capacity-building. Some of the cooperation is on a commercial basis, and the team noted that both the Government and the private sector recognized the central role of the latter in technology transfer. Substantial parts of industry have strong ownership and activity links to other countries, and technical know-how in such areas as forestry is spread through them. The team also took note of New Zealand's participation in the recently established Group of Temperate Southern Hemisphere Countries on Environment (Valdivia Group) which aims to facilitate information exchange and cooperation on international environment and related science issues.

61. New Zealand is positive towards the concept of joint implementation/activities implemented jointly (AIJ), but at the time of the team's visit it had not established any programmes to explore this area.

VIII. RESEARCH AND SYSTEMATIC OBSERVATION

62. New Zealand recognizes that, because of its location (southern hemisphere, mid latitude, mid-ocean) and since it has unique natural conditions regarding land, flora and

fauna, it has a special responsibility for monitoring and researching climate change. The team noted that New Zealand has collected unique data sets on climatic conditions in the region.

63. The team noted that the Minister for the Environment is also the Minister of Research, Science and Technology. The response to climate change through public R and D efforts appears well organized, with an independent committee (the National Science Strategy Committee for Climate Change) formed in 1991 providing advice to the Minister of Research, Science and Technology, as well as science agencies and users of science. The Committee has representatives from the R and D community and the private sector. The Committee has no funding role. The public sector, however, provides the bulk of funding for climate change research. It gives advice on R and D needs in all areas, including climate science, related social sciences and economics, and technological R and D on mitigation options. The Government has committed itself to increasing the proportion of R and D to GDP from 0.6 to 0.8 per cent by 2010, and it is envisaged that the proportion of climate change-related R and D will not decline. To date, the priority has been given to understanding the fundamental processes of climate change, particularly as they relate to the southern hemisphere. The need for a better understanding of mitigation options and the effects of particular measures is recognized.

64. The Committee's advice is given in the light of the special responsibility mentioned above and the strengths of national institutions, and it also seeks to utilize in an optimal way the efforts made by international society. New Zealand considers cooperation in the southern hemisphere important, and recognizes that a better understanding of climate change in that hemisphere will also increase understanding in the northern hemisphere.

IX. EDUCATION, TRAINING AND PUBLIC AWARENESS

65. The team noted that increasing public awareness is an integral part of the policy initiatives. Education, training and public awareness in the area of climate change are the responsibility of the Ministry of the Environment, which does not limit the participation of other bodies and levels of government in this effort. The Ministry's activities are well documented in the communication. The Energy Efficiency and Conservation Authority, together with its partners, is promoting efficiency and renewables through the media, publications, seminars and demonstrations, and is working on school curricula as well. The team noted the initiatives of local and regional authorities, the emphasis on communication of results from scientific programmes, and the important role of non-governmental organizations in increasing public awareness.

66. The Resource Management Act provides members of the public with the right to propose changes to plans and enforcement procedures. New Zealand also has a particularly strong law (the Official Information Act) ensuring public access to internal ministry documents, including those relating to policy development for climate change. This legislation should ensure openness in most governmental operations, and it goes hand in hand

with the considerable stakeholder involvement, including regular consultations with both business and environmental non-governmental organizations, that is sought from the Government's side in its climate change-related activities. Recently, the Minister for the Environment set up a private sector/public sector working group on carbon dioxide policy.

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