

NATIONAL INTEREST ANALYSIS

Kyoto Protocol to the UN Framework Convention on Climate Change

13 February 2002

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Executive summary

New Zealand's national interests and the Kyoto Protocol

More than any other developed nation, New Zealand depends for its prosperity on an equable and stable climate. The New Zealand economy is grounded in primary production. The strength of the primary sector is due in large part to New Zealand's excellent climate for pastoral farming.

Increased climate change is predicted if global emissions of greenhouse gases continue to grow without constraint. These emissions are projected to increase atmospheric greenhouse gas concentrations significantly, producing increases in global mean temperatures over time. The resulting climate change threatens to have significant long-term adverse effects on the global economy, societies and ecosystems.

New Zealand's economic base in primary production means it is particularly vulnerable to climate change. Threats to human health, land and water quality, infrastructure, biosecurity and native ecosystems are also significant. New Zealand has a clear and direct interest in supporting efforts to minimise climate change.

Climate change is a global problem and effective action to counter it is beyond the ability of any single country. The United Nations Framework Convention on Climate Change is the global response to climate change and it has been ratified by almost all countries. The Kyoto Protocol is the next development of this Convention. It will introduce legally binding commitments for countries to limit greenhouse gas emissions, as voluntary commitments agreed under the Framework Convention were not successfully implemented. No viable alternative international approaches to the Kyoto Protocol have been developed or proposed, and any alternative would likely involve many more years of delay in reducing greenhouse gas emissions.

New Zealand has taken an active and constructive role in more than ten years of international negotiations leading to the formulation of the Kyoto Protocol. Continued commitment to the Protocol will maintain New Zealand's standing and influence in future negotiations. Abandoning the Protocol would have the contrary effect, damaging New Zealand's credibility and its reputation as a global citizen – not only in climate change forums but also over a wide range of international issues.

New Zealand's effectiveness in climate change negotiations means it is one of the few developed countries that stands to make a small net economic gain from the first Kyoto Protocol commitment period. This gain arises because the carbon sink credits New Zealand will receive in recognition of the greenhouse gas absorbing properties of its plantation forests will more than offset the emissions reductions required to meet New Zealand's emissions target. Carbon sink credits will be an internationally tradable asset.

Economic benefits of the Kyoto Protocol are also likely to include technology and energy efficiency improvements. Limits on greenhouse gas emissions will create incentives for Protocol countries to develop and adopt new energy technologies less reliant on fossil fuels. Energy efficiency incentives will also be enhanced, producing the double benefit of lower emissions and higher productivity per unit of energy. Rejection of the Protocol would carry

the contrary risk of falling further behind competing nations in energy efficiency and trailing a significant shift in energy technology rather than helping to lead it.

New Zealand's obligations under the Protocol

The Kyoto Protocol would require New Zealand to ensure that total greenhouse gas emissions for the first commitment period (the five years from 2008 to 2012) are no higher than five times New Zealand's 1990 level of emissions, or that we have taken responsibility for any emissions over this level through the flexibility mechanisms and sinks provisions of the Protocol.

Taking responsibility means that, for excess emissions, New Zealand would be required to obtain equivalent credit from domestic forest sink activities or from emissions reductions made elsewhere in the world through the Protocol's trading and project mechanisms.

Other obligations for New Zealand would be to:

- make demonstrable progress, by 2005, toward achieving its commitments under the Protocol
- put in place, by 31 December 2006, a national system for estimating greenhouse gas emissions, and carbon uptake by sinks
- establish a register to record and track changes to New Zealand's assigned amount of emission units under the Protocol
- engage in international cooperation in relation to policies and measures, technology transfer, scientific and technical research, and education and training
- provide financial resources and funding to developing countries to assist them to implement their existing commitments, and
- comply with any future negotiated agreements to further reduce emissions—the nature, costs and benefits of complying with these future commitments is at present unknown.

New Zealand's emissions management task

- Over the first commitment period, it is projected that New Zealand will emit between 415 and 440 million tonnes of carbon dioxide (or the carbon dioxide-equivalent of other gases, mainly methane and nitrous oxide).
- New Zealand's initial assigned amount (translating into a corresponding holding of "emission units") for the commitment period is 365 million tonnes of carbon dioxide equivalent. This is equal to five times the 73 million tonnes that New Zealand emitted in 1990, times 100%, which is New Zealand's target under Annex B of the Protocol.
- New Zealand is projected to gain, during the commitment period, additional assigned amount ("removal units") of 110 million tonnes of carbon dioxide-equivalent due to the growth of trees planted on land that has been converted (or reverted) to forest since 1990.
- Removal units can be counted against first commitment period emissions in New Zealand or sold internationally during that period, but doing so would establish a contingent

liability for emission units if the post-1990 forests from which they were generated were subsequently harvested.

- Excluding removal units, New Zealand's first commitment period emissions are estimated to exceed its assigned amount of emission units by 50 to 75 million tonnes of carbon dioxide-equivalent.
- Counting removal units, New Zealand's commitment period emissions will be less than its total assigned amount of emission units by an estimated 35 to 60 million tonnes. While removal units from sinks are likely to provide a significant benefit to New Zealand, the amount of this benefit will depend on future new planting scenarios, whether forests are replanted, future harvesting scenarios and how much scrub has regenerated since 1990.

Effects of entry-into-force of the Protocol for New Zealand

Economic

- Ratification and entry-into-force of the Protocol would have economic effects on New Zealand. The effects would largely depend on the domestic policy measures chosen by New Zealand to meet its obligations under the Protocol. The effects would not be determined by ratification itself.
- General equilibrium modelling studies suggest that New Zealand's gross national income would increase during the Protocol's first commitment period if removal units (sink credits) from post-1990 forest plantings were sold overseas.
- The studies also suggest that application of emissions pricing measures would lead to a slight contraction of domestic economic activity, equivalent to a small reduction in the growth that would otherwise have occurred.
- Application of an emissions pricing measure could cause contractions in output from emissions-intensive sectors and expansion of output from non-emissions-intensive sectors, depending on policy decisions about the sectoral coverage and application of such a measure.
- There would also be economic effects on New Zealand if the Protocol entered into force without New Zealand having ratified it, as a result of the adjustment of global markets.

Environmental

Direct environmental effects of entry-into-force of the Protocol, in the form of avoided climate change, will be negligible during the first commitment period because of the inertia of the climate system. But the Kyoto Protocol's first commitment period is the initial key step in a long-term process. Longer-term effects depend on future emissions beyond the first commitment period. Modelling studies indicate that:

- There would be a very small reduction in the expected temperature increase by 2100 if emission reductions applied only to the first commitment period and global emissions reverted to business-as-usual afterwards.
- Global temperature increase by 2100 and beyond could be limited, and climate change risks associated with higher rates of warming avoided, if emission limitations gradually become more stringent and incorporate developing countries in subsequent commitment periods. Global emissions will eventually need to decrease substantially below current levels to achieve stabilisation of greenhouse gas concentrations.

A wide range of ancillary (non-target) environmental benefits and damages could occur due to domestic climate change policies. These ancillary effects strongly depend on domestic policy choices, their specific implementation, and interaction with other environmental objectives. Hence they are not determined by entry-into-force of the Protocol itself.

Social and cultural

Like ancillary environmental effects, social and cultural effects are not determined by ratification or entry-into-force of the Protocol, but are an indirect outcome of domestic policies and measures. Because New Zealand can choose its own domestic policies, it is considered that:

- There will be no direct social or cultural effects resulting from ratification of the Protocol itself, but there could be indirect effects as a result of the economic and environmental effects of the Protocol and domestic policies for New Zealand.
- Ratification of the Protocol is consistent with the Treaty of Waitangi, but policy measures to assist in meeting Kyoto obligations will need to be individually assessed in terms of the Treaty.
- Ratification of the Protocol will have no effect on human rights.

Public Consultation

Process

- A two-month public consultation and submission period was held between 18 October and 21 December 2001 regarding ratification and the development of policy options for meeting Kyoto obligations.
- 9,000 information packs and 3,750 supplementary working papers were distributed.
- 79 meetings (including 15 Maori focus meetings and hui) were held, involving around 1,780 people.
- Two major economic studies by ABARE and PA Consulting were released to inform consultation.

Findings

- Around 550 submissions were received.
- The majority of submitters accepted that there was a need to respond to climate change, and in particular to reduce greenhouse gas emissions.
- A significant number of submitters expressed support for a delay in ratifying the Protocol.
- A minority of submitters opposed ratification altogether.
- A minority of submitters supported immediate ratification.
- Reasons for delaying or opposing ratification focused on the possible economic and competitiveness effects of policies under the Protocol, and whether the Protocol was the appropriate framework for achieving the desired outcomes.
- Some submitters supporting a delay in ratification included as reasons:
 - waiting until more information had been gathered, particularly on likely implementation policies and/or economic and competitiveness effects of implementing the Protocol
 - waiting until other Annex I trade partners or competitors had ratified the Protocol
 - waiting until binding emissions limitations were agreed for major developing country emitters or trade competitors.
- Some submitters supporting ratification included as reasons:
 - environmental benefits expected to result from policies under the Protocol
 - economic benefits, particularly the importance of New Zealand maintaining a “clean, green” brand.
- There is a low level of real understanding within the wider community about what the Kyoto obligations entail; in particular, responses in written submissions suggested that a number of smaller stakeholders were not familiar with the issues and concepts on which consultation was based.
- With regard to the wider public, preliminary results from a public survey carried out by UMR from 19-20 January 2002 show:
 - 47% of those surveyed favour the Government "signing up" to the Protocol
 - 6% are opposed
 - 42% "need to know more"

Summary: Advantages and disadvantages to New Zealand of the Protocol entering into force for New Zealand

Advantages

- It establishes an effective and internationally agreed framework for international cooperation that will reduce (but not avoid) future increases in atmospheric greenhouse gas concentrations, and the associated impacts of global warming and climate change.
- It will contribute to reducing the long-term risks of climate change for New Zealand's climate-dependent economy and ecosystems.
- It will avoid further delays in limiting and reducing greenhouse gas emissions, so avoiding committing New Zealand to even greater climate change impacts in the future.
- It will allow New Zealand to influence the future shape of the Protocol, including the extent of, and rules for, future emissions reduction and limitation commitments.
- It enables New Zealand to benefit from removal units generated by post-1990 forest plantings, which could lead to increases in New Zealand's national income during the first commitment period. The amount of this benefit will depend on future new planting scenarios, whether forests are replanted, future harvesting scenarios and how much scrub has regenerated since 1990.
- It will create incentives that will assist New Zealand to make a gradual transition toward becoming a low-emitting economy, rather than causing a sudden adjustment if action is delayed.
- It avoids potential risks to New Zealand's trade and other international relationships that could occur if the Protocol enters into force without New Zealand as a Party.
- It will provide New Zealand businesses with access to Clean Development Mechanism and Joint Implementation projects internationally, and will enhance business opportunities in such areas as energy efficiency, emissions abatement and emissions monitoring domestically.

Disadvantages

- Policy measures to limit future greenhouse gas emissions will re-direct resources within the economy towards emissions limiting or emissions absorbing activities, which is likely to result in adjustment costs within the economy. Under some scenarios, these could be significant enough to negatively influence GNI and GDP.
- Under some policy scenarios, New Zealand's domestic production of goods and services (as measured by GDP) would grow more slowly than under business-as-usual conditions, potentially leading to associated income and/or employment effects. This may be offset by foreign income transfers gained from the international sale of removal units, although as noted above, the net effect of this is not yet clear.

- Depending on domestic policy measures adopted in New Zealand and in other Annex B countries, there could be effects on the competitiveness of New Zealand businesses involved in the tradable goods sector, particularly where principal competitors are based in non-Annex B countries. This could result in costs to New Zealand without any environmental benefits being gained.
- Depending on domestic policy measures adopted in New Zealand and other Annex B countries, some investment that would have occurred in New Zealand may instead be diverted to other countries.
- Ratification could have a negative signalling effect on investment if there is uncertainty as to the domestic policies that New Zealand will use to help meet its commitments under the Protocol.
- A significant proportion of submitters considers that New Zealand should delay ratification until further analysis of potential effects is carried out. Some consider that ratification should be delayed until the positions of trading partners and competitors are better understood with regard to ratification and related policy measures.
- Some submitters are concerned that emission reductions under the Protocol's first commitment period will not themselves make a significant contribution to a reduction in global warming unless they are followed by further reductions in future commitment periods.

Assessment

Climate change has long-term implications and potentially substantial costs for New Zealand. As a climate-dependent, primary producing country with significant concentrations of population and infrastructure in coastal areas, climate change presents a significant risk to our way of life. The Kyoto Protocol provides a means by which, over the long term, those risks can be mitigated.

Implementation of the Protocol itself also has potential for economic and consequent social effects. The Government aims to minimise adverse effects and maximise positive effects through the design of domestic policy measures, and through maintaining a proactive stance at international negotiations for the second and subsequent commitment periods.

Therefore, the Government considers that it is in New Zealand's national interest to ratify the Kyoto Protocol.

Kyoto Protocol to the United Nations Framework Convention on Climate Change

NATIONAL INTEREST ANALYSIS

Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise. Temperatures are, in fact, rising. The changes observed over the last several decades are likely mostly due to human activities, but we cannot rule out that some significant part of these changes are also a reflection of natural variability. Human-induced warming and associated sea level rises are expected to continue through the 21st century. - US National Academy of Sciences, June 2001.

Introduction

This document is a National Interest Analysis (NIA), prepared in accordance with Parliamentary Standing Order 385, in relation to New Zealand's decision on whether to ratify the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

The NIA is set out using the following structure:

- a background on the development of the Kyoto Protocol and the obligations that would be imposed on New Zealand by the Protocol
- a statement of reasons for New Zealand to become a party to the Protocol
- a description of the measures that could be undertaken to implement the Protocol within New Zealand, and the Government's intentions in relation to such measures including legislation
- an indication of likely and possible fiscal costs to the Government of compliance with the Protocol, focusing on the first commitment period
- statements of the economic, environmental, social and cultural effects that are expected as a result of the Protocol's entry-into-force
- a description of the consultation that has been undertaken on ratification of the Protocol, and a summary of the findings of that consultation
- a summary of the advantages and disadvantages for New Zealand of the Protocol entering into force for New Zealand.

Three appendices are included.

- Appendix 1 reproduces the list of countries that appears in Annex 1 of the Framework Convention on Climate Change and, for each of these, the emissions target in Annex B of the Kyoto Protocol.
- Appendix 2 details the obligations that countries will incur if they ratify the Protocol and the Protocol enters into force.
- Appendix 3 looks at the background to the Protocol, discussing the likely effects of climate change, the human contribution, the inertia effect that means human actions now will have impacts over a long period, and the importance of taking immediate action.

A note about the analysis in this report

This analysis faces the considerable challenge that it must account for economic, environmental, social and cultural effects of both:

- climate change itself, which is expected to occur gradually over a timespan of decades to centuries, and
- global actions to stabilise atmospheric greenhouse gas concentrations, which will need to take place with increasing vigour in the relatively near future (a timeframe of years to decades) in order to offset the long-term effects of climate change.

The timeframes and uncertainties involved make it difficult to precisely identify and quantify both the effects of climate change and the benefits of limiting that change. The key difficulties are that:

- the impact of global warming on the earth's ecological and climate systems over a timeframe of decades to centuries cannot be predicted with certainty
- we can estimate the general nature and magnitude of some impacts in some sectors for specific climate change scenarios, but net vulnerability to climate change remains only poorly quantified because of uncertainties in regional climate change scenarios and effects of extreme weather events, and incomplete analysis of adaptation costs and interactions between climate change effects and global trade patterns
- the risks and negative impacts from climate change increase with the magnitude, rate and duration of climate change
- the long timeframe over which negative impacts may occur means that the benefits of avoiding climate change are inter-generational
- the globally-coordinated actions that need to be taken if long-term climate change impacts are to be mitigated will ultimately require an economic transformation to occur, particularly in energy production systems and energy use
- targets for future commitment periods are yet to be set and it is unknown which nations will commit.

This analysis can, therefore, only provide quantitative estimates of economic and environmental effects for the targets to be achieved in the first commitment period from 2008 to 2012, noting that this is only a first step in a long-term process in which both the economic and environmental (and associated social and cultural) effects will change significantly as a result of the second and subsequent commitment periods.

The Kyoto Protocol

Where the Protocol came from

In 1992 at the Rio "Earth Summit", the world community adopted the **United Nations Framework Convention on Climate Change** (also called the UNFCCC or simply the "Framework Convention"). The ultimate objective of the Framework Convention is to achieve:

Stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.

Achieving the Framework Convention's objective will eventually require major reductions in global emissions of greenhouse gases compared with both present-day levels and future projected levels of emissions¹.

New Zealand and virtually all the world's countries have ratified the Framework Convention. Led by the United Nations, it is the global multilateral response to the risks of human caused climate change. By ratifying, the developed countries (listed in Annex 1 to the Framework Convention² – see Appendix 1 for this list) committed themselves to adopting policies and measures to limit greenhouse gas emissions and to protect and enhance carbon sinks, with the aim of reducing emissions to 1990 levels by 2000.

In the mid-1990s, it became clear that the voluntary emissions targets agreed under the Framework Convention were not going to be met. The Conference of the Parties to the Framework Convention agreed, in a decision known as the Berlin Mandate to:

... begin a process to enable it [the Conference of the Parties] to take appropriate action for the period beyond 2000, including the strengthening of the commitments of the Parties included in Annex I to the Convention (Annex I Parties) in Article 4, paragraph 2(a) and (b), through the adoption of a protocol or another legal instrument

In December 1997 at Kyoto, the countries that had ratified the Framework Convention agreed to a first text of a Protocol to the Framework Convention. The key commitment agreed to was that developed countries would take on legally-binding emissions targets for an initial "commitment period" from 2008 to 2012, subject to ratification by individual countries and the Protocol's entry-into-force. New Zealand signed the Protocol on 22 May 1998, but will not be bound to comply with its specific obligations before it has ratified and the Protocol has entered into force.

Objectives and principles underlying the Protocol

The Kyoto Protocol aims to ensure:

- that the climate system should be protected for present and future generations on the basis of equity, and in accordance with common but differentiated responsibilities, with developed countries taking the lead in combating climate change
- that parties should take precautionary measures to anticipate, prevent or minimise the causes of climate change and mitigate its full effects
- that policies and measures to protect the climate system against human-induced change should be appropriate for the specific conditions of each party and should be integrated with national development programmes
- that the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that the per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow as they meet their social and development goals

¹ The Framework Convention does not specify a specific stabilisation level of greenhouse gas concentrations, as this is assumed to depend on further scientific evidence for damages arising from different degrees of climate change, and the cost of taking mitigating actions.

² Annex I of the Framework Convention contains a list of 41 countries that have categorised themselves as developed and have taken on greater responsibility for managing greenhouse gas emissions than less-developed countries. New Zealand is included in Annex I.

- that developed countries will set quantified emission limitation and reduction objectives within specified time-frames
- that the Protocol will not initially introduce any new commitments for developing countries, but will reaffirm those countries' existing commitments and continue to advance the implementation of those commitments in order to achieve sustainable development.

Reservations to the Protocol

Article 26 of the Protocol provides that no reservations³ may be made to the Protocol.

Date of proposed binding treaty action

It is the intention of the Government to ratify the Kyoto Protocol by late-August 2002.

Entry-into-force of the Protocol for New Zealand

The Protocol will enter into force for New Zealand 90 days after New Zealand ratifies the Protocol, or upon the date that the Protocol becomes operative, whichever is the later.

The Protocol will enter into force for all ratifying countries 90 days after the date on which:

- 55 or more countries have deposited their instruments of ratification, acceptance, approval or accession, and
- the ratifying countries include Annex I countries responsible for 55 per cent or more of Annex I countries' 1990 carbon dioxide emissions⁴.

To date, 47 countries have ratified or acceded to the Protocol, two of which are developed (Annex I) countries with binding emissions targets under Annex B⁵ of the Protocol, and 46 of which are non-Annex-I countries without binding targets.

Subsequent amendments to the Protocol, and their likely effects

The text of the Protocol itself anticipates that future amendments will be needed in future in order to make further progress towards the objective of stabilising greenhouse gas concentrations.

Article 3, paragraph 9, of the Protocol states that Parties shall establish commitments for the second commitment period (and later commitment periods) by amending Annex B of the Protocol. Countries that have ratified the Protocol must start negotiations on those future commitments by the end of 2005.

³ A reservation can modify the application of an international treaty. This cannot occur with the Kyoto Protocol; it must be accepted as a whole or not at all.

⁴ New Zealand represents 0.2% of 1990 Annex I carbon dioxide emissions.

⁵ Annex B of the Kyoto Protocol sets out greenhouse gas emissions targets for countries listed in Annex I to the Framework Convention. Two Annex I countries, Turkey and Belarus, have not taken on Annex B targets.

It is difficult to assess precisely what amendments might be made to Annex B. However, it is likely that the amendments to Annex B of the Protocol (along with amendments to Annex I of the Framework Convention) will:

- expand the range of Parties with binding emissions limitation and reduction commitments
- introduce more stringent emissions limitation and reduction commitments in the second and subsequent commitment periods for current Annex B Parties
- alter the carbon accounting rules that apply under Articles 3.3 and 3.4 of the Protocol.

In addition, Article 18 of the Protocol states that the Conference of the Parties to the Protocol shall, at their first meeting after the Protocol enters into force, approve appropriate and effective procedures and mechanisms to determine and address cases of non-compliance with the Protocol. The Article also provides for a means by which these procedures and mechanisms can entail binding consequences, namely by amendment to the Protocol.

It should be noted that amendments to the Protocol cannot enter into force for New Zealand without New Zealand's consent.

Withdrawal or denunciation

New Zealand may formally withdraw from the Kyoto Protocol either by withdrawing from the Protocol itself, or by withdrawing from the Framework Convention. In both cases, notice of withdrawal can be given at any time from three years after the date upon which the relevant agreement enters (or entered) into force, with withdrawal taking effect one year after the date upon which notice was given.⁶

New Zealand's obligations under the Protocol

The most important obligation that would be imposed on New Zealand would be to ensure that New Zealand's total greenhouse gas emissions for the first commitment period (the five years from 2008 to 2012) are no higher than five times New Zealand's 1990 level of emissions, or that we have taken responsibility for any emissions over this level through the emissions trading mechanisms and sinks provisions of the Protocol.

Taking responsibility for excess emissions would require New Zealand to offset those emissions by making use of domestic forest sink activities or emissions reductions made elsewhere in the world (via trading and project mechanisms under the Protocol). The terminology applying to emissions accounting under the Protocol is explained below.

Other obligations for New Zealand would be to:

- make demonstrable progress, by 2005, toward achieving its commitments under the Protocol
- put in place, by 31 December 2006, a national system for estimating greenhouse gas emissions, and carbon uptake by sinks
- establish a register to record and track changes to New Zealand's assigned amount of emission units under the Protocol
- engage in international cooperation in relation to policies and measures, technology transfer, scientific and technical research, and education and training

⁶ The Framework Convention entered into force for New Zealand on 21 March 1994.

- provide financial resources and funding to developing countries to assist them to implement their existing commitments, and
- comply with any future negotiated agreements to further reduce emissions—the nature, costs and benefits of complying with these future commitments is at present unknown.

A more complete list of obligations under the Protocol is attached as Appendix 2.

In order to implement the Protocol’s obligations, a significant body of operational rules is under development by international negotiation. Those rules are now almost completely finalised, and will be adopted at the first Meeting of the Parties to the Protocol after it comes into force. New Zealand has played a significant role in the formulation of these rules, which will not bind New Zealand in the absence of consensus.

These rules will be subject to a rigorous compliance regime administered by international bodies, consisting of both annual reviews of information supplied by Parties under Article 8 of the Protocol, and compliance procedures and mechanisms⁷. These also will be formally adopted at the first Meeting of the Parties to the Protocol. New Zealand has successfully promoted a strong and transparent compliance regime as being in the interests of all Parties.

Emissions accounting under the Protocol

To comply with the Protocol’s accounting system, a country must ensure that its emissions at the end of the 2008-2012 period are matched by an equal quantity of “assigned amount”, which is measured in units of tonnes of carbon dioxide-equivalent⁸ (“emission units”). Upon entry-into-force of the Protocol, each Annex I country is credited with an *initial* assigned amount based on its 1990 level of emissions and its Annex B target. A country’s total quantity of assigned amount, referred to in this report as “emission units”, can be increased by the addition of:

- “removal units” (sink credits) under Article 3.3 of the Protocol, that are generated by afforestation or reforestation of land that was not in forest at the beginning of 1990⁹

⁷ These procedures will be applied by the “Compliance Committee”, an international body comprising an enforcement and a facilitative branch. The enforcement branch will have the power to (among other things) impose a penalty on a Party for allowing emissions to exceed its assigned amount in a commitment period. The penalty will be in the form of a reduction in assigned amount for the following commitment period, at a level equal to 130% of the amount by which the Party is in default..

⁸ As various greenhouse gases warm the atmosphere at different rates, they are generally expressed in terms of carbon dioxide-equivalent emissions. For example, methane is 21 times more effective than carbon dioxide at warming the atmosphere over a 100-year time frame. All references in this NIA are to carbon dioxide equivalent unless otherwise stated.

Measures are also sometimes given in “carbon equivalent” – this is meaningless in a literal sense, as carbon itself does not contribute to global warming, not all greenhouse gases contain carbon, and those that do (such as methane and carbon dioxide) have different warming potentials. When the term “carbon equivalent” is used, it refers to the carbon mass in carbon dioxide, which is 0.27 tonnes of carbon per tonne of carbon dioxide (ie multiply CO₂ mass by 12/44 or 0.27 to get carbon mass). So 1 tonne of methane would be equivalent to 21 tonnes of carbon dioxide or 5.7 tonnes of carbon.

⁹ Removal units can also be obtained, up to a certain limit, under Article 3.4 of the Protocol, by accounting for the changes in a country’s total carbon stock including soil carbon as well as forests. Countries can then gain removal units from management of pre-1990 forests, rangelands and agricultural lands. New Zealand’s Article 3.4 limit is negligible compared with its quantity of Article 3.3 removal units, and scientific estimates suggest that the net effect of pursuing Article 3.4 would be negative for New Zealand in the first commitment period. As such, it is unlikely that this option will be pursued by New Zealand for the first commitment period.

- “certified emission reductions” under Article 12 of the Protocol, by which Annex I countries can gain units by undertaking projects in developing countries that reduce emissions further than would have occurred normally
- “emission reduction units” under Article 6 of the Protocol, by which Annex I countries can obtain units of another Annex I country’s assigned amount by undertaking emissions-reducing projects in that other Annex I country (again, reductions must be additional to what would have occurred anyway)
- assigned amount units and any of the above units by the use of trading mechanisms under Article 17 of the Protocol.

Use of the Protocol’s flexibility mechanisms – Joint Implementation (Article 6), Clean Development Mechanism (Article 12) and international emissions trading (Article 17) - must be supplemental to domestic action.

These different types of unit are all measured in carbon dioxide-equivalent and are collectively referred to here as “emission units”, except where distinction is necessary.

New Zealand’s projected emissions, initial assigned amount and removal units

New Zealand has an initial assigned amount for the first commitment period currently estimated to be 365 million tonnes of carbon dioxide-equivalent.¹⁰ That is, New Zealand is allowed to emit 365 Mt of carbon dioxide (or equivalent in other gases) over the years 2008 to 2012.

At present, around 60% of New Zealand’s greenhouse gas emissions consist of methane and nitrous oxide, mainly from agriculture, with the remaining 40% consisting of carbon dioxide. This emissions profile is unique among developed countries, where carbon dioxide is usually the most common type of greenhouse gas emitted.

New Zealand is expected to emit between 50 and 75 million tonnes over its 365 Mt initial assigned amount during the commitment period. It is expected that around 50 Mt of this will be carbon dioxide emissions from growth in energy use, principally from transport and thermal electricity generation. Growth in agricultural methane and nitrous oxide emission will contribute up to another 25 Mt.

New Zealand is permitted to emit beyond its initial assigned amount if it obtains more emission units (and thus increases its assigned amount correspondingly) by purchasing them on the international market, by undertaking emissions-reducing projects in other countries, or through carrying out sink activities. Current estimates are that, during the commitment period:

- New Zealand will emit between 415 million and 440 million tonnes of carbon dioxide equivalent, and
- New Zealand sink activities (derived from forests planted from 1990 onwards) will provide an additional 110 million units of assigned amount, in the form of removal units.

¹⁰ Under the Protocol, New Zealand is required to put in place by 31 December 2006 a national system for estimating greenhouse gas emissions and removals by sinks (Article 5.1). New Zealand’s initial assigned amount will be finalised at that time.

- At a national level, New Zealand is therefore expected to have a surplus of assigned amount over emissions of between 35 and 60 million units over the five years of the first commitment period. While removal units from sinks are likely to provide a significant benefit to New Zealand, the amount of this benefit will depend on future new planting scenarios, whether forests are replanted, future harvesting scenarios and how much scrub has regenerated since 1990.

Reasons for New Zealand to become a party to the Protocol

It is in New Zealand’s long-term environmental and economic interest to maintain a stable climate

Climate change and global warming, and changes in climate extremes, will affect New Zealand. New Zealand has features that make it vulnerable to the effects of climate change, including:

- an economy based on agriculture and global markets
- increasingly significant forestry activity
- reliance on weather-dependent hydro-electricity supplies
- concentration of its population and much of its major infrastructure in coastal areas
- reliance on air and maritime transport services for exports and imports
- native ecosystems that are in many cases already under pressure due to modification as a result of human activities and introduced pests.

In addition, climate change is not solely a domestic issue for New Zealand. Impacts on other countries, including trade partners and competitors, and nations with which New Zealand has strong social, cultural and political links (for example, Pacific Island nations), will have implications for New Zealand. For example, increases in flooding or sea levels in low-lying nations may give rise to “environmental refugees” wishing to re-settle in less affected countries.

Some aspects of climate change could be beneficial for parts of New Zealand, at least in the short term for low levels of warming. Benefits of low-level global warming for New Zealand could include faster plant growth, longer growing seasons, and warmer winters. The balance between positive and negative effects will depend on regions and sectors, and will most likely change over time. It will also depend on adaptive responses to the effects of climate change.

The most recent New Zealand-specific assessment of climate change impacts by the New Zealand Climate Change Programme was not able to determine whether climate change would bring about a net cost or benefit to New Zealand in the short term, or at what point any positive impacts could turn negative. However, the assessment concluded that there would be temporary winners and losers in New Zealand. Long term, the overall effects are expected to become increasingly negative.

Stabilising atmospheric greenhouse gas concentrations at safe levels will require an effective, globally-coordinated response

Action by New Zealand or any other country acting alone, however, will have little significant impact in remedying the problem of global warming. The Kyoto Protocol is an important step because it is a multi-lateral environmental agreement to:

- help achieve commitment period targets at least cost for developed countries and
- provide incentives for emissions reduction or absorption activities in developing countries¹¹.

Clearly, however, stabilising atmospheric concentrations of greenhouse gases at any level would depend upon emissions reductions well beyond those agreed to for the Kyoto Protocol's first commitment period. The expectation is that the Protocol will be further extended and developed over many years in order to achieve its overarching objective of stabilising atmospheric greenhouse gas concentrations. This is likely to include binding obligations on countries that do not take on emissions targets during the first commitment period.

Meanwhile, the agreement reached under the Protocol would:

- reduce the global rate of growth of greenhouse gas emissions
- set in place a framework that allows the subsequent setting of stabilisation targets and global emissions reductions required to achieve that target
- provide signals and incentives for technological change to reduce greenhouse gas emissions, or increase their absorption,
- demonstrate the practicability of the market-based mechanisms and yield experience with their implementation
- demonstrate to the US that other countries are serious about addressing climate change, as a means of encouraging US participation, and
- represent a considerable achievement in its wide international support, with no obvious alternative for addressing greenhouse gas emissions currently on the horizon.

Despite statements by the US, there is no alternative international agreement on the horizon. Furthermore, there is no obvious multilateral forum other than under the United Nations for such negotiations to occur.

Benefits of being a party to the Protocol in negotiating the rules for future commitment periods

To date, the text of the Kyoto Protocol has been negotiated by Parties to the *Framework Convention*. New Zealand has taken part in those negotiations, and has been very influential¹² in achieving favourable outcomes for New Zealand, including a 100% target¹³, largely unrestricted international emissions trading, and the inclusion of sink credits.

These make New Zealand one of a small group of countries, with those in eastern Europe, Russia and the Ukraine, that is projected to have surplus emissions quota. New Zealand would, in a technical sense at least, be able to meet the letter of its commitments under the Protocol, for the first commitment period, without taking further domestic action. New Zealand could be advantaged (at least during the first commitment period) at a macroeconomic level, by being able to:

¹¹ In this regard, developing countries have made it clear at international negotiations that they will not take on emissions targets until Annex I countries have first taken action to reduce emissions. This has been agreed as a principle of both the Framework Convention and the Protocol.

¹² A measure of this influence can be seen in the key role played by New Zealand at critical negotiating sessions – most recently in Marrakech and Bonn in 2001 but also going back to Kyoto in 1997.

¹³ Most countries have targets below 100%; that is, they are expected to reduce their emissions below 1990 levels.

- bank surplus emission units (but not removal units) for use in subsequent commitment periods, under Article 3.13 of the Protocol, or
- sell surplus emission units on the international market during the first commitment period¹⁴.

However, once the Protocol has entered into force, Article 13.2 of the Protocol provides that only countries that are Parties to the *Kyoto Protocol* will be able to take decisions under the Protocol. Countries that are Parties to the Framework Convention but not the Protocol will be able to participate as observers but will not be able to take part in decision-making.

In particular, amendments to Annex B and the emissions limitation and reduction targets under the Protocol will only be able to be made by Parties that have ratified the Protocol.

This means that delaying ratification until, say, just before 2008, would seriously undermine New Zealand's influence and negotiating position without any obvious benefit. The Protocol would still enter into force, and New Zealand would still have binding targets.

Avoided risk to New Zealand's trade and other international relationships

Ratification would maintain New Zealand's credentials in other areas of bilateral and multilateral negotiations and diplomacy. New Zealand, as a small country with little economic weight, relies on leverage created through active and constructive engagement internationally. It is viewed as a country that is honest, constructive and reliable. We play our part and make a credible contribution across a wide range of areas, even where there are not direct gains for us. We cannot therefore pick and choose across significant negotiations.

Advancing New Zealand's interests internationally relies on a multi-lateral approach, whether it is in trade, environmental or other matters. Being seen to attempt to "free ride" on actions by other countries under the Kyoto Protocol would not be in New Zealand's long-term foreign policy interests.

Ratifying the Protocol would also help maintain New Zealand's environmental image in the eyes of overseas markets and consumers. New Zealand markets itself on a "clean, green" image, using marketing slogans such as "100% Pure". Ratifying the Protocol would maintain the credibility and value of such branding.

Ratification by New Zealand would demonstrate commitment to the Protocol

Ratification of the Protocol by New Zealand could help to generate momentum in favour of ratification by other Annex I countries. It would also demonstrate Annex I support for the Protocol outside the European Union and economies-in-transition. In addition, ratification would demonstrate New Zealand's commitment to a coordinated and legally binding international approach to reducing atmospheric greenhouse gas concentrations.

¹⁴ To the extent that this surplus is based on removal units (sink credits), New Zealand may need to surrender emission units at a later date when the Kyoto forests from which the removal units were sourced are harvested. This will depend on the extent of the one-off net benefit to New Zealand from removal units.

In the longer term, commitment by New Zealand could also help to influence the positions of developing countries in the Asia-Pacific region in respect of taking on emissions obligations under the Protocol in subsequent commitment periods.

Measures that could or should be adopted to implement the Protocol, and the intentions of the Government in relation to such measures, including legislation

The implementation of the Kyoto Protocol would require New Zealand to ensure that it could meet its obligations. These obligations, described earlier and in Appendix 2, fall into several broad groupings:

- emissions monitoring, inventory and reporting obligations
- establishing and maintaining a register of assigned amount of emission units
- international cooperation, including financial assistance to developing countries
- developing policies and measures to meet emissions obligations during the first commitment period.

Measures to implement emissions monitoring, inventory and reporting obligations

New Zealand is already required to report national inventory data under the Framework Convention, to the extent that its capacities permit. At present information is collected from a variety of sources, with collection being voluntary in some instances and mandatory in others. However:

- under the Protocol, there needs to be certainty that the information can continue to be collected and used for the purpose of reporting emissions and removals, and
- reporting requirements (including timelines and quality) are stricter under the Protocol than under the Framework Convention.

The Government's intention regarding emissions monitoring and inventory is therefore to formalise the arrangements for collection and collation of information relating to greenhouse gas emissions and removals within a *Climate Change Response Bill*. The Bill will state the functions of the national inventory and will include:

- data collection and monitoring provisions
- powers of an inventory agency, including search and limited power of seizure
- offence provisions and penalties
- confidentiality of information provisions.
- regulation making powers.

Measures to implement a register of assigned amount of emission units

The primary function of the register (or registry agency) is to account for changes in New Zealand's assigned amount (matched by corresponding changes in holdings of emission units), such as those that could accrue through development of forest sinks or through use of the Protocol's flexibility mechanisms. An accurate record of assigned amount is essential for enabling New Zealand to demonstrate, internationally, compliance with its obligations under the Protocol.

The Government's intention is to establish a register of assigned amount and provide for the appointment of a registrar under a *Climate Change Response Bill*. The Bill will set out the features of the register and the functions of the registrar, which will include duties to record the issue, holding, transfer, acquisition, cancellation and retirement of emission units, and the power to carry over emission units to subsequent commitment periods.

Measures for international cooperation including providing assistance to developing countries

New Zealand has existing obligations of this type under the Framework Convention, and can extend its measures under the Framework Convention to include those required under the Protocol.

New Zealand made a commitment at the resumed COP-6 meeting in Bonn to provide financial assistance of US\$2.5 million (NZ\$6.1 million) per year to developing countries by 2005. This represents assistance for commitments in relation to both the Framework Convention and the Kyoto Protocol, and has not been apportioned between them.

Measures to reduce greenhouse gas emissions and meet emissions obligations for the first commitment period

The *Climate Change Response Bill* will provide powers for the Crown to engage in international trade in emission units, as a possible mechanism to ensure that New Zealand is able to comply with its obligations under the Protocol. This mechanism will ensure that the Crown complies with the constitutional convention that New Zealand be placed in a position to meet its international treaty obligations before proceeding to ratification.

However, it is not intended that New Zealand rely on the Crown's trading power under the *Climate Change Response Bill* to meet its obligations. A proposed package of measures that would be used to:

- ensure that New Zealand meets its Kyoto obligations for the first commitment period, and
- position New Zealand to meet emissions obligations that it may accept in subsequent commitment periods

is currently being developed for a further round of public consultation during the first half of 2002. Those measures will provide the principal means by which New Zealand will meet its obligations under the Protocol.

Measures already underway or being developed

New Zealand's emission obligations for the first commitment period are likely to be partially but not fully met by a number of programmes that are already underway or in the process of being developed.

Some programmes that do not have greenhouse gas emissions reduction as their sole or principal purpose, but which will have the effect of reducing New Zealand's greenhouse gas emissions, are already being implemented or planned. These include:

- a National Energy Efficiency and Conservation Strategy that has been adopted under the Energy Efficiency and Conservation Act 2000
- a New Zealand Transport Strategy (in preparation), and
- a National Waste Minimisation and Management Strategy (in preparation).

It is estimated that, if the targets that have been established are met, the National Energy Efficiency and Conservation Strategy will reduce New Zealand's greenhouse gas emissions by between 18 and 22.5 million tonnes of carbon dioxide-equivalent during the commitment period, relative to the emissions that would have otherwise occurred. Estimates of emissions reductions are not yet available for the other strategies.

In addition, the following programmes targeted directly at greenhouse gas emissions reduction are underway or in preparation:

- negotiated greenhouse agreements with major emitting industries
- public good research, particularly into agricultural greenhouse gas emissions
- education on the effects of climate change and the things that individuals can do to make a difference.

Possible further measures to meet Kyoto obligations

Projections of New Zealand's likely emissions between 2008 and 2012 suggest that the measures described above will not be sufficient in themselves to meet New Zealand's emissions obligations.

The balance of New Zealand's emission obligations could be met using a number of different approaches involving domestic greenhouse gas emissions reductions, use of the Protocol's flexibility mechanisms and the use of "removal units" (sink credits) from forest sinks. Criteria for the design of an approach, a range of possible greenhouse gas emissions reduction measures, and options for the use of removal units, were put forward for the public consultation that took place from October to December 2001. (See pages 45 to 48.)

The possible approaches and measures are:

- The Government retains full responsibility for New Zealand's emissions during the first commitment period, holding all of New Zealand's assigned amount, and being the sole decision-maker in buying and selling emission units on the international market with any revenue needed to purchase emission units being raised from general taxation.
- The Government devolves financial responsibility for New Zealand's emissions to businesses or sector bodies and introduces:
 - an emissions charging system with different options for revenue use, to apply to some range of greenhouse gas emitting activities throughout New Zealand,
 - a domestic emissions trading system that would interface with the international emissions trading system under the Protocol, and/or
 - a levy and rebate system for industry sectors, to apply to activities not directly related to emissions in order to raise funds to purchase emission units to cover emissions from those sectorswith the Government applying other measures to greenhouse gas-emitting activities that are not included in the system applied.
- Introduction of a project-based initiative system under which the Government would grant emission units or financial assistance to businesses or groups who reduced emissions or enhanced sinks beyond an agreed baseline.

- Extension of the negotiated greenhouse agreement programme into the commitment period for major emitting businesses.
- Hybrids between the above market-based measures and between market measures and those non-market measures that are already underway or planned.

The possible approaches that were put forward in relation to removal units from forest sinks were:

- the Government retaining all removal units and sectoral emissions obligations in relation to Kyoto forests
- the Government devolving a proportion of the removal units and related obligations to land or forest rights owners and retaining a proportion to hold or sell, and
- land/forest rights owners receiving all removal units and related obligations.

Removal units from forest sinks could be used to meet any residual cost of excess emissions if other policies do not sufficiently reduce New Zealand's emissions during the commitment period.

Following the first round of consultation on possible policy measures, the Government's intention is to develop a preferred policy package informed by the findings of the public consultation, and based on criteria of:

- efficiency
- equity
- feasibility
- environmental integrity, and
- competitiveness.

These criteria have been further interpreted following public consultation and assessment of economic modelling results, and a broad policy direction based on these criteria is discussed in "Economic effects of the Protocol entering into force for New Zealand" (see pages 29 to 30).

The preferred policy package will be put forward for further public consultation in April and May 2002. A decision on the final policy measures to be adopted will be taken following that round of public consultation.

If legislation is required to implement some or all of those policy measures, the Government will implement those policy measures via an amendment to the *Climate Change Response Bill* or other legislation as required.

Direct fiscal costs to New Zealand of compliance with the Protocol

Fiscal costs refer to the direct costs to the Crown to ensure that New Zealand's obligations under the Protocol are met.

There are two types of fiscal cost:

- those that would be incurred regardless of New Zealand's choice of domestic policies, and

- those that are dependent on the policy measures adopted to implement the Protocol's emissions limitation target domestically.

Fiscal costs independent of greenhouse gas emissions management measures

These costs are essentially administration costs associated with meeting the minimum requirements to comply with the Protocol, along with the costs of the commitment New Zealand has made to support developing countries. Specifically, these are the costs of:

- establishing and maintaining a registry of New Zealand's assigned amount
- monitoring emissions and absorption of greenhouse gases at a national level
- maintaining an inventory of greenhouse gas emissions and absorption, and
- meeting commitments made under the Protocol's Article 11 financial mechanism.

The total estimated administrative cost is approximately \$1 million up front, with an ongoing cost of \$1.4 million per year. This is made up of:

- estimated costs of a registry of \$1 million for initial establishment, followed by \$100,000 per year thereafter.
- expected additional costs of monitoring and inventory are estimated at \$1.3 million per year. Almost of all this is expected to occur as costs of implementation of the carbon monitoring system and improvements to monitoring of agricultural emissions and new forest plantings.

However, it should be noted that these costs have not been through a full budgetary process and as such are only estimates, not confirmed costs.

In addition, financial commitments made by New Zealand to developing countries under both the Framework Convention and the Kyoto Protocol are expected to reach US\$2.5 million (NZ\$6.1 million) per year by 2005. This has not been apportioned between the two agreements.

Potential fiscal costs related to greenhouse gas emissions management measures

Fiscal costs related to greenhouse gas emissions measures are heavily dependent on the actual measures adopted within New Zealand. While there are fiscal costs for implementation of strategies that will reduce greenhouse gas emissions, specifically the National Energy Efficiency and Conservation Strategy, the Waste Minimisation Strategy and the New Zealand Transport Strategy, those costs can be attributed to the Protocol only partially (if at all).

Crown purchase of emission units

The largest potential fiscal cost that could be incurred under the Protocol would occur if the domestic policy measures adopted were such that the Crown was required to purchase, at international prices, additional emission units to ensure that New Zealand's assigned amount balanced its emissions at the end of the commitment period.

In such circumstances, the direct fiscal cost of emission unit purchase to the Crown would depend on decisions about the allocation of responsibility for greenhouse gas emissions and sink activities, in particular:

- the proportion of expected emissions for which the Crown took direct responsibility;
- the proportion of New Zealand's assigned amount (including removal units) that was retained by the Crown to cover that responsibility, and
- the effect on total emissions of the policies that the Government chose to put in place to manage greenhouse gas emissions.

The fiscal effect of compliance would therefore depend on whether the Government held a surplus or a deficit of emissions units for those emissions for which it retained responsibility, although in practice this effect could be offset if cost recovery mechanisms were established under the policies chosen. In the longer term, if the Government retained removal units to offset first commitment period emissions, some or all would need to be replaced when Kyoto forests were harvested.

Costs of administering domestic greenhouse gas management policies

Independent of the emission unit costs above, there would also be a cost to the Crown of establishing and administering domestic policy measures. For example, these costs could include the costs of establishing and running a domestic emissions trading system or emissions charging system, preparation and dissemination of information material, negotiating and monitoring the performance of negotiated greenhouse agreements, and so on. These costs are not currently quantified but, in comparative terms, are not expected to be large.

Economic effects of entry-into-force of the Protocol for New Zealand

The economic effects of entry-into-force of the Protocol for New Zealand will not be confined to the first commitment period only, but will be long-term. The choices that New Zealand makes for managing its greenhouse gas emissions during the first commitment period will partly determine the economic effects of the Protocol for New Zealand in subsequent commitment periods.

In particular, the policy choices New Zealand makes ahead of, or during, the first commitment period will determine how well New Zealand is positioned if New Zealand faces more stringent emissions limitation and reduction targets in subsequent commitment periods (that is, doing less now could increase future costs).

Economic effects prior to the first commitment period

If New Zealand ratified the Protocol, there could be a signalling effect on investment. The nature and magnitude of any such effect would depend on two main factors:

- whether there was clarity on the domestic policies that New Zealand would use to meet its commitments, and
- the nature of those domestic policies once they had been chosen.

Uncertainty on policies at the time of ratification could result in investors deferring investments until there is more certainty on policies. As the Government intends to announce the preferred policies that will be used for meeting New Zealand's commitments prior to ratification, this effect should be able to be largely avoided.

Assuming that the Protocol does enter into force, the nature of policies will be the key factor in determining economic effects and therefore investment decisions. The Government has already indicated that economic efficiency and competitiveness will be key dimensions that will be used by the Government to determine its preferred policy approach, along with equity, feasibility and environmental integrity. Accordingly, the impact on investment will be a key consideration when the Government makes decisions on policies for meeting New Zealand's commitments.

Economic effects relating to the first commitment period

The first commitment period commences in 2008 and ends in 2012, during which time participating Annex I countries will be obliged to take actions to meet emissions targets under the Kyoto Protocol.

In that situation, there will be two sources of economic effects on New Zealand:

- first, global markets will adjust as a result of policies being introduced throughout participating Annex I countries to meet their emissions obligations, and this will impact on New Zealand
- second, New Zealand's economy will adjust as a result of the domestic policy measures adopted in this country to meet New Zealand's obligations.

As discussed below:

- The domestic economic effects depend largely on New Zealand's choice of domestic policies for meeting its Kyoto commitments.
- However, there are likely to be some domestic economic effects (for example, in forestry) as a result of the Protocol's entry-into-force affecting international markets, regardless of New Zealand's decision to ratify or not ratify the Protocol.
- National income could be maintained or increased due to the ability to sell New Zealand's likely surplus of emission units (including removal units) over projected emissions.
- Domestic economic activity would be likely to show slower growth in response to a domestic emissions price measure, but (depending on decisions about use of removal units) would not necessarily cause a fall in national income during the commitment period.
- Emissions price measures would cause some contraction in activity in emissions-intensive industries, if those producing tradable goods and facing competition from countries without domestic emissions price measures were exposed to the full price of emissions or some part thereof. The extent of contraction would depend largely on the level of the domestic emissions price faced.

- Emissions price measures would cause expansion in activity in non-emissions-intensive sectors, such as service industries.
- Progress can be made toward meeting New Zealand's Kyoto commitments under the National Energy Efficiency and Conservation Strategy at no net economic cost or better.

Influence of policy directions on economic effects

The results of economic modelling (described below) and public consultation have been used to develop a goal and principles for the choice of policies required to lower greenhouse gas emissions. The goal is:

NZ should have made significant greenhouse gas reductions on business as usual and be set towards a permanent downward path for total gross emissions by 2012.

This goal means:

- New Zealand will be on a path to reshaping its energy use
- increased rate of technology uptake on renewables, energy efficiency, lower emissions production
- all sectors addressing emissions and positioning themselves greenhouse-wise on world markets
- research findings will have been transferred to agricultural practice
- new buildings dwellings, plant, vehicles and machinery at the optimal edge of efficiency
- a population knowledgeable about greenhouse gases and taking responsibility for them.

The principles agreed by the Government are set out below. These are intended to clarify the five criteria set out in the October 2001 consultation document *Kyoto Protocol: Ensuring our Future*, and will guide the selection of a preferred policy response.

Policies must result in permanent reductions in emissions over the long term

- Policies must achieve real and sustainable reductions in emissions across all commitment periods – both to protect New Zealand's international credibility and to ensure that we are prepared for future commitment periods.
- Policies should avoid carbon leakage. This will protect the objectives of the Protocol pending the creation of a truly global emissions regime.
- Policies will aim for long-term permanent changes in behaviour.

Policies need to be responsive to the changing international context

- The policy approach needs to recognise the uncertainty about future changes up to 2012, including changes in our emissions profile, changes in technology, and the international environment.
- Policy development will be incremental, building from low cost policies now to policies that expose emitters to the full emissions price as factors such as knowledge and certainty

increase and as countries currently without emissions targets take on targets and expose their economies to the international price of carbon.

- Policies therefore will be adaptable and flexible, recognising the need for businesses and other stakeholders to be able to accept and respond to policy changes. They should allow for a transitional, staged approach to give affected emitters time to adjust.
- Policies must be simple and comprehensible in order to effect the necessary behavioural changes.
- Policies will be increasingly globally focused as targets under the Kyoto Protocol become increasingly globally based.
- Policies will be developed in close consultation with stakeholders, and will include processes for partnership and cooperation with key affected stakeholders.
- The policy package will include regular reviews of progress with emission reductions and effectiveness of policies, and criteria or milestones for when policy changes or new policy might need to be set in place. This includes periodic review of the goal, having regard to our domestic actions and the evolving international market situation.

Policies need to be consistent with a growing and sustainable economy

- Policies will recognise that competitiveness now and tomorrow is important for all our industries (including new entrants).
- Policies will move progressively to a full cost on emissions when competitiveness issues have been addressed by a full global targets regime.
- Policies should avoid inappropriate distortionary effects on investment.
- Policies will promote economic opportunities in climate change.

Policies will not disadvantage the vulnerable in our society

- Policies should aim to ensure that the lower socioeconomic groups are not disadvantaged as a result of Kyoto Commitments.

In broad terms, the principles suggest that the Government should neither:

- fully shelter domestic emitters from the cost of their emissions, nor to
- fully expose the domestic economy to the international emissions price, particularly sectors exposed to international competition from developing countries (or developed countries that do not ratify).

The effect of implementing this policy direction would be to moderate the potential economic and competitiveness effects associated with the Kyoto Protocol.

Economic modelling of different domestic policy approaches

A major general equilibrium modelling analysis was commissioned from the Australian Bureau of Agricultural and Resource Economics (ABARE) to examine scenarios for New Zealand using different domestic policy options.

Because of the type of modelling technique used by ABARE, the policy options were based on combinations of emissions pricing measures, general taxation and international emissions trading as a means of ensuring that New Zealand met its Kyoto emissions obligations. It should be noted that the following limitations apply:

- The results show a one-year snapshot comparison of possible effects at 2010, but do not show adjustments to the economy that would occur before that time, nor the longer-term savings that might occur as a result of first commitment period policies, or the potential need to replace sold removal units when Kyoto forests are harvested.
- The results show only what might happen, given the assumptions on which the model is based and the techniques that have been used.
- The ABARE modelling is based on the use of emissions pricing and fiscal measures to meet commitments, but does not account for the effects of non-market policies, such as improved public transport.
- The model also does not allow for the effects of other policies that will assist New Zealand to meet its Kyoto obligations, such as the National Energy Efficiency and Conservation Strategy, or other programmes for the reduction of emissions.
- The model, like all general equilibrium models, assumes that the economy is already fully efficient, so assumes away the possibility of “no regrets” measures that deliver both emissions reductions and a net economic benefit.
- The monitoring and compliance costs associated with an emissions pricing system are assumed to be zero; however, in reality they would not be, which would act to worsen GNI and GDP results relative to those reported.
- The model assumes that industry sectors are able to respond to any change in demand by adjusting output volume; however, this may not accurately model industries that are made up of only one or two businesses, where “threshold effects” could occur at different production levels, leading to step changes in output as plants start up or shut down.
- The model does not account for policy-induced changes in technology, the development of new industries, or the full economic effects of New Zealand’s forest sinks (forested areas that absorb and store greenhouse gases).
- The results do not take into account policies that could offset any adverse effects of applying an emissions price, such as different revenue recycling methods or grandparenting of emission units.

- In relation to the above point, the model assumes that emissions pricing measures raise revenue that is returned to households as a direct lump-sum transfer that is independent of household wealth, income, greenhouse gas emissions or any other conditions.

Scenarios modelled

A “business as usual” baseline was projected for the New Zealand economy for the year 2010, and various “with Kyoto” scenarios were compared against that baseline.

Conditions held constant across all scenarios were that:

- the US does not ratify the Kyoto Protocol in any scenario
- all other Annex B countries ratify the Kyoto Protocol
- Russia and the Ukraine are eligible to take part in international emissions trading, and manage their supply of emission units to maximise their first commitment period revenue
- all participating Annex B countries apply an emissions pricing measure within their economies, but (with the exception of New Zealand in Scenario 7 only) exclude agricultural methane and nitrous oxide emissions from the scope of the measure.

The scenarios reported here were:

1. New Zealand applies no domestic emissions price measure to any sector, and accounts for excess emissions over 2008-12 by using removal units from forest sinks, with any surplus removal units sold on the international market
2. New Zealand applies no emissions price measure, and accounts for excess emissions over 2008-12 by purchasing emission units from the international market via an increase in GST, with all removal units sold on the international market
3. As per scenario 1 using removal units to account for excess emissions, but with New Zealand also applying a low-level emissions price measure, at 27% of the international emissions price, to all emissions other than agricultural methane and nitrous oxide
4. As per scenario 2 using GST to fund purchase of emission units, but with New Zealand also applying a low-level emissions price measure, at 27% of the international emissions price, to all emissions other than agricultural methane and nitrous oxide
5. New Zealand applies an emissions price measure at 100% of the international emissions price to all emissions other than methane and nitrous oxide from agriculture, process carbon dioxide from iron and steel manufacture, and process carbon dioxide from non-ferrous metals (principally aluminium), with surplus removal units sold on the international market
6. New Zealand applies an emissions price measure at 100% of the international emissions price to all emissions other than agricultural methane and nitrous oxide, with surplus removal units sold on the international market
7. New Zealand applies an emissions price measure at 100% of the international emissions price to all domestic greenhouse gas emissions, with all removal units sold on the international market.

Scenario modelling results

As noted above, the policies suggested by the Government's principles for policy development would, if followed, mean that economic effects are more likely to lie within the range suggested by Scenarios 3-5 than outside that range.

The macroeconomic results generated for these scenarios are shown in Table 1.

Table 1: Macroeconomic results under different domestic policy scenarios

Economic effect relative to "business as usual" in 2010 (% change)							
Scenario	1	2	3	4	5	6	7
Approach to meeting emissions obligations	Removal units	GST	Removal units & 27% price (a)	GST & 27% price (a)	100% price & exemptions for metals, ag (b)	100% price & exemption for ag only (c)	100% price
Parameter							
GNI (see footnote 15)	0.39	0.34	0.43	0.38	0.55	0.43	0.05
GDP	0.02	0.00	0.00	-0.02	-0.08	-0.10	-0.26
Exchange rate	0.00	0.71	0.01	0.65	0.25	0.03	-1.22
Exports	-0.55	-0.36	-0.72	-0.55	-1.10	-1.04	-2.60
Imports	0.35	0.26	0.30	0.22	0.28	0.16	-1.72
Savings	0.39	1.05	0.44	1.04	0.81	0.46	-1.15
Investment	0.11	0.09	0.08	0.06	-0.02	-0.05	-0.22
Export cost index	0.04	-0.01	0.06	0.02	0.13	0.08	-0.22
Import cost index	-0.03	-0.04	-0.03	-0.04	-0.03	-0.03	-0.03
Terms of trade	0.07	0.03	0.09	0.05	0.16	0.12	-0.19
Rate of return on capital	0.03	-0.83	-0.36	-1.14	-1.33	-1.85	-2.78
Real wage	0.00	-0.67	-0.39	-0.99	-1.36	-1.36	-2.36
GST rate	12.5%	13.46%	12.5%	13.36%	12.5%	12.5%	12.5%
The carbon market							
Internat'l emissions price (2001 NZ\$/t CO ₂)	71.9	72.1	71.6	71.8	71.1	71.2	70.4
Domestic emissions price (2001 NZ\$/t CO ₂)	0	0	19.5	19.5	71.1	71.2	70.4
Net quota income (2001 NZ\$m)	271.4	268.8	391.0	388.1	665.7	614.8	1,333.8
Net quota sales (Mt CO ₂ equiv)	3.8	3.7	5.5	5.4	9.4	8.6	19.0
Domestic abatement (d) (Mt CO ₂ equiv)	22.3	22.3	24.0	24.0	27.9	26.9	37.2

- (a) Price does not apply to agricultural methane and nitrous oxide emissions
 (b) Exemption is for CO₂ process emissions from iron & steel and aluminium production, and agricultural methane and nitrous oxide emissions
 (c) Exemption is for agricultural methane and nitrous oxide emissions
 (d) Removal units (sink credits) are counted in the domestic abatement total

Discussion of macroeconomic results

It is important to note that these results are relative to what would have occurred in 2010 under "business as usual". They are not relative to the present day. For example, New Zealand's GDP was assumed in the model to grow at an average rate of 2.6% per year from

¹⁵GNI, or gross national income, is a measure of the income derived from New Zealanders' claims on the value of worldwide production of goods and services. It contrasts with GDP, gross domestic product, which is the total value of goods and services produced within New Zealand each year (regardless of ownership). New Zealand's GNI is usually only about 92-95% of GDP because income to overseas owners of New Zealand's domestic production exceeds income to New Zealand owners of foreign production. However, GNI is the more complete measure of New Zealanders' welfare, as it more closely represents the income that New Zealanders have available to spend and save than does GDP.

1995 to 2010. At 2010, New Zealand's GDP would therefore be 147.0% of its 1995 level at that rate of growth. Under Scenarios 5 and 6, where the year 2010 GDP results are projected to be -0.08% and -0.10% lower than under business as usual, year 2010 GDP would instead be 146.8% of its 1995 level. This is approximately the level that would be reached if average annual growth were 2.59% over the 1995-2010 period rather than 2.60%.

The results in Table 1 show that New Zealand's choice of domestic policy measures to meet Kyoto Protocol obligations can have a range of effects on the economic outcomes for New Zealand over the first commitment period.

The results also show that the aggregate macroeconomic effects would be relatively small for most foreseeable policy futures. As described, the rate of growth in gross domestic product (a measure of economic activity within New Zealand) generally remains steady or slows slightly in all scenarios. The decrease between scenarios 1 and 3 and between scenarios 3 and 5 occurs as production in energy intensive sectors, particularly iron and steel and nonferrous metals production, falls as a result of rising electricity costs, which, in turn, are caused by the rising domestic emissions price. This causes both real wages and the rate of return to capital in New Zealand to fall. As real wages and costs of capital fall in New Zealand, less energy intensive sectors, such as light manufacturing and services, are projected to experience small output rises and falling supply prices.

However, the rate of growth in gross national income (a measure of the income available to New Zealanders to spend or save, so a more complete measure of national welfare) rises in all scenarios for the first commitment period. This is because of the assumption that surplus removal units are sold on the international emissions market, with the income returned as a lump sum payment to households. Where scenarios show a domestic emissions price, the additional abatement within New Zealand frees up emission units for sale in the international market, increasing the GNI rise across scenarios. It should be noted that the income from removal unit sales is offsetting a fall in returns to capital and real wages from employment efforts. It should also be noted that if removal units are sold in the first commitment period, emission units might be required to account for harvest of the relevant Kyoto forests in a later period.

Total exports from New Zealand are projected to fall across scenarios 1-5 as rising real GNI leads consumers in New Zealand to demand a greater share of domestic production. This fall is augmented by the reduction in exports of iron and steel and nonferrous metal products across scenarios, which occurs as their supply prices rise above scenario 1 levels because of rising electricity costs, and production in both these sectors is reduced from scenarios 1 to 3 and from scenarios 3 to 5. In scenario 7 the emissions price applies to agricultural methane and nitrous oxide emissions also, which significantly reduces the competitiveness of those industries on world markets. This leads to significant falls in exports and the exchange rate, and hence imports.

Discussion of international emissions price

In these scenarios, the ABARE model generates international emissions prices around NZ\$70 per tonne of carbon dioxide equivalent emissions. The emissions price generated by the ABARE model is the price required to balance the Annex B emissions trading market under the economic and trade assumptions used in this model.

However, comparisons between models have shown that the ABARE model returns an emissions price that is at the high end of such prices returned by global models of this type. Examination of studies that have compared results from global models suggests that, under a set of constant modelling assumptions and ignoring extreme outliers, the emissions price excluding the US could range from NZ\$5 to NZ\$75 per tonne of carbon dioxide-equivalent, with a median around NZ\$35-40¹⁶.

Results also show that domestic policy decisions in New Zealand have a negligible effect on the international emissions price.

Sectoral output effects associated with these scenarios

The ABARE model provides a snapshot of possible sectoral effects under different policies in 2010.

Underlying the relatively small aggregate macroeconomic results are, in some cases, significant sectoral adjustments in some scenarios, as shown in Table 2.

Where there are significant sectoral adjustments, it is likely that they would result in transitional adjustment costs, which would have a negative influence on GNI and GDP, lowering the results relative to those reported. The extent to which this would occur depends on the magnitude of the sectoral changes and the ability of the economy to move to a new cost structure.

Table 2 shows that emissions-intensive sectors of the economy (for example, coal, iron & steel production) generally reduce output in response to a domestic emissions price measure, with the reductions getting larger with increasing price.

Table 2 also suggests that non-emissions-intensive sectors (for example, services, cropping and horticulture) would gain resources at the expense of emissions-intensive sectors. Service industries comprise the largest proportion of the New Zealand economy, accounting for about two-thirds of economic activity. Services show an increase in output under all scenarios.

This analysis suggests that some of the high emitting industries in the tradables sectors will be heavily affected if they are required to pay a high price for emissions and/or face increased costs as a result of a high emissions price on key inputs, to the point where they may become unviable in New Zealand. Any reduction or cessation of supply from New Zealand businesses in those industries would be made up by increases in supply from the developed countries that did not ratify the Protocol, or from developing countries that do not have targets under the Protocol. A decline in competitiveness of this nature could lead to some investment, which would otherwise have occurred in New Zealand, being re-directed to other countries.

¹⁶ IPCC 2001, Weyant and Hill 1999, Nordhaus 2001, Grubb et al. 2001

Table 2: Sectoral effects under different domestic policy scenarios

Effect on sectoral output relative to "business as usual" in 2010 (% change)							
Scenario	1	2	3	4	5	6	7
Approach to meeting emissions obligations	Removal units	GST	Removal units & 27% price	GST & 27% price	100% price & exemptions for metals, ag	100% price & exemption for ag only	100% price
Sector							
Private services	0.0	0.0	0.1	0.1	0.3	0.4	0.8
Public services	0.3	0.2	0.5	0.4	0.9	0.9	1.3
Other services	0.4	0.3	0.6	0.5	1.0	0.9	0.7
Fisheries	0.0	0.0	0.0	0.1	0.1	0.2	0.9
Livestock for meat	-0.3	-0.2	-0.2	-0.2	-0.4	-0.1	-6.8
Meat products	-0.6	-0.5	-0.7	-0.6	-1.5	-1.0	-4.7
Dairy cattle	-0.7	-0.5	-0.6	-0.4	-1.0	-0.3	-20.5
Dairy products	-0.8	-0.6	-0.7	-0.5	-1.2	-0.4	-25.2
Food	-0.3	-0.2	-0.1	0.0	0.0	0.4	2.2
Other animal products	0.4	0.4	0.4	0.4	0.3	0.3	6.2
Wool	-0.2	-0.2	-0.2	-0.1	-0.1	0.0	-28.8
Forestry	-0.1	0.0	0.2	0.2	0.4	0.8	2.7
Pulp, paper and publishing	-0.1	0.0	0.2	0.2	0.3	0.7	2.6
Other wood products	-0.5	-0.4	-0.5	-0.5	-1.2	-0.7	1.6
Coal	-2.8	-2.7	-6.5	-6.4	-14.8	-16.4	-14.7
Oil	-0.9	-0.9	-0.3	-0.2	0.1	0.7	1.6
Gas	0.5	0.6	-1.7	-1.7	-5.6	-6.9	-6.1
Petroleum and coal products	0.1	0.1	-0.7	-0.7	-2.6	-2.5	-2.1
Minerals	0.8	0.9	0.1	0.1	-1.1	-1.6	0.5
Nonmetallic minerals	0.4	0.4	0.2	0.3	-0.3	-0.1	0.8
Electricity	1.1	1.1	-1.3	-1.2	-4.4	-6.2	-5.6
Iron and steel	5.6	5.7	-3.6	-3.4	-12.1	-22.0	-17.6
Nonferrous metals	3.7	4.0	-1.3	-1.1	-2.3	-12.1	-6.9
Chemicals, rubber and plastic	0.2	0.3	0.2	0.3	-0.2	0.2	1.3
Light manufacturing	-0.9	-0.7	-0.9	-0.8	-0.7	-0.9	3.2
Other manufacturing	-1.2	-1.0	-0.8	-0.6	-0.1	0.3	5.9
Construction	0.1	0.1	0.1	0.1	0.0	0.0	-0.3
Trade and transport	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	1.0
Clothing	-0.3	-0.2	0.0	0.0	0.3	0.6	-2.5
Wheat	-0.3	-0.2	-0.2	-0.2	-0.4	0.0	-2.2
Other cereal grains	-0.2	-0.1	-0.1	-0.1	-0.2	0.1	-0.8
Crops and horticulture	0.2	0.2	0.3	0.3	0.6	0.6	12.3

A separate report *Assessment of the likely impacts on selected sectors of a domestic emissions trading regime*, by PA Consulting Ltd, examines the effect of a domestic emissions trading scheme on oil/transport, coal/gas/geothermal (including electricity), industrial processes, agriculture, waste and forestry sectors. The study assumed that there would be an international emissions price of NZ\$20 per tonne CO₂, which would be fully applied to the domestic economy. The findings of the study are expressed in qualitative terms but are broadly consistent with the findings of Scenario 7 in Table 2.

Effects of other countries' participation or non-participation in the Protocol

The ABARE modelling was also used to test the effects of participation or non-participation in the Protocol by Australia, the US and the "economies in transition". The latter are former

communist countries of eastern Europe, Russia and the Ukraine that are currently moving towards becoming market-based economies. Findings were as follows.

- Non-ratification of the Protocol by Australia would result in a very small improvement in economic outcomes for New Zealand, primarily because Australia is New Zealand's largest export market. Under the assumptions modelled here, ratification of the Protocol is projected to be negative for Australian national income. Therefore, non-ratification of the Protocol by Australia would lead to a higher demand for New Zealand's exports to Australia than if Australia ratified the Protocol.
- Ratification of the Protocol by the United States could have the effect of increasing the international emissions price by around 50% to 100% due to US demand for emission units. This would lead to a small reduction in New Zealand's domestic economic activity as measured by GDP (mainly between -0.05% and -0.24%), outweighed by a larger increase in foreign income transfers from the sale internationally of removal units. The net effect is that New Zealand's GNI increase would be around five times larger (~2%) with US ratification than it would be without US ratification (~0.4%).
- Non-participation in the Protocol, or ineligibility to take part in international emissions trading under the Protocol, by countries in transition to a market economy (that is, Russia, Ukraine, and Eastern Europe) would significantly raise the international emissions price. This could be negative for New Zealand's domestic economic activity, depending on New Zealand's choice of domestic policy measures, but could significantly increase New Zealand's national income if New Zealand were to export its surplus removal units.

It should be noted that tests of the effect of Australian and US ratification (or otherwise) of the Protocol assume that in the absence of ratification those countries would impose no domestic policies. This is unlikely to be the case in practice. For example, Australia is currently spending NZ\$1 billion over four years for greenhouse gas management under its National Greenhouse Strategy, with goals that include limiting net emissions, in particular to meet Australia's international obligations.

Consistency with other New Zealand-specific general equilibrium studies

The ABARE results show patterns of sectoral and aggregate macroeconomic results that are broadly consistent with those identified in earlier general equilibrium modelling exercises specific to New Zealand¹⁷.

A study prepared by the New Zealand Institute of Economic Research (NZIER) on behalf of the Petroleum Exploration Association of New Zealand and the Greenhouse Policy Coalition (a group of large companies with energy-intensive businesses) also showed, where their scenarios are broadly comparable, a similar pattern of macroeconomic and sectoral output effects for different mixes of emissions-pricing measures. Examination of the differing results and their magnitude by external consultants suggests that these are largely due to differences in modelling assumptions.

¹⁷ such as McKibbin and Pearce (2000) and Infometrics (2001)

Business Opportunities

The adjustment of global and domestic markets during the commitment period in response to the policies of Annex B countries will also have implications for business opportunities. Business opportunities could arise from increased domestic and international demand for climate-friendly products and services and demand for methods to implement the Kyoto Protocol (e.g. improved means of monitoring emissions).

Potential opportunities identified include:

- the expansion of the market for a New Zealand developed gasifier that generates electricity from animal manure (currently being marketed in the United Kingdom, France and the United States).
- the development of a domestic and international market for a New Zealand designed wind turbine (a prototype is currently being completed and will be built on the Port Hills in Christchurch within the next year)
- the development of products to reduce methane emissions from agriculture (some products already on the market for improving dairy productivity could also reduce methane emissions by 20 per cent).

Some business opportunities will not depend on the Kyoto Protocol. These include opportunities arising from the demand for products and services to prepare for and/or mitigate the impact of climate change itself.

The Government and the New Zealand Business Council for Sustainable Development are cooperating on a climate change project to identify business opportunities from the Kyoto Protocol. Stage one of the project, to be completed by July 2002, will identify the business opportunities that will be created from the ratification of the Kyoto Protocol. In stage two, beginning in August 2002, the business opportunities will be promoted and participating companies will begin reporting against emission reduction targets.

Economic effects of other strategies that will also reduce emissions

As described in the “Measures” section, the rate of increase in New Zealand’s greenhouse gas emissions is likely to be reduced by the National Energy Efficiency and Conservation Strategy, the New Zealand Transport Strategy, and the Waste Minimisation Strategy.

The Transport and Waste Strategies are still under development, and quantitative analyses are planned or under way to estimate the economic effects of those strategies and the emissions reductions that could be expected from them.

The National Energy Efficiency and Conservation Strategy was completed and launched in September 2001. The Strategy is expected to reduce New Zealand’s projected greenhouse gas emissions over the first commitment period by between 18 and 22.5 Mt relative to “business as usual” conditions. The Strategy is projected to have a net economic benefit, even without giving a value to avoided greenhouse gas emissions. Estimates have indicated that the Strategy's benefit cost ratio is between 1 and 2, and that the net national economic benefit over the period to 2012 could approach \$1 billion. This indicates that between 24% and 45% of New Zealand's projected excess emissions between 2008 and 2012 could be avoided at no net economic cost or better.

Economic effects relating to subsequent commitment periods

The economic effects of subsequent commitment periods for New Zealand cannot be estimated at present. Factors that would influence the economic effects of subsequent commitment periods include:

- the extent of emissions reductions accepted by Annex B countries
- extension of Annex I of the Framework Convention to include additional countries with Annex B emissions reduction and limitation commitments
- changes in technology, particularly emissions intensity of energy, industrial and agricultural production systems
- changes in economic structures over time as economies adjust to emissions limitations; and
- possible changes in rules for subsequent commitment periods, including rules in relation to sink activities.

These factors cannot be forecast with any certainty at present, but it is likely that the dynamic effect of first commitment period policies will affect the rate of change of all factors.

Environmental effects of entry-into-force of the Protocol for New Zealand

Entry-into-force of the Kyoto Protocol could lead to two types of environmental effect:

- effects on atmospheric greenhouse gas concentrations and hence climate change and global warming, and
- effects on local environments as a result of reductions in greenhouse gas emissions affecting emissions of other types of pollutants or altering patterns of use of natural resources.

Again, these two types of effect are likely to occur on different timescales. Effects on climate change and global warming are likely to take place over a long period of time as a result of actions over a series of commitment periods. Effects on local environments are much more policy-specific and some effects will begin to occur as soon as policies are implemented.

Effects on climate change and global warming

There is a clear distinction between the effects on climate change and global warming that will be attributable to the Kyoto Protocol's first commitment period, and those attributable to the Protocol over its full lifespan encompassing multiple commitment periods.

Effects of greenhouse gas emission reductions during the first commitment period

The effect of implementing the Kyoto Protocol on global atmospheric temperatures and sea level has been the subject of international scientific research. There is general agreement that the effect on temperatures and sea-level rise would be very small if only the Protocol's first commitment period was implemented and greenhouse gas emissions reverted to business-as-usual levels afterwards.

Studies with one widely used climate model show that implementing only the first commitment period of the Protocol would reduce the expected temperature increase by 2100

by only 0.08 degrees Celsius.¹⁸ Under this scenario, the temperature expected under “business-as-usual” in 2100 would be reached in about 2105.

Without actions by the United States during the Kyoto Protocol’s first commitment period, the effect of the required emissions reductions is likely to be even smaller, but quantitative results strongly depend on assumptions about future emissions from developed and developing countries.

Longer-term effects from greenhouse gas emissions reductions beyond the first commitment period

The Kyoto Protocol’s first commitment period is the initial key step in a long-term process. Much more substantial reductions in greenhouse gas *emissions* beyond those in the first commitment period will be required to achieve the ultimate objective of the Framework Convention on Climate Change, which is the stabilisation of greenhouse gas *concentrations*.

IPCC projections show that a sustained reduction in global emissions would be required to achieve stabilisation of atmospheric CO₂ concentrations at any level. For stabilisation at concentrations up to twice the pre-industrial revolution level (450-550 ppm¹⁹), global emissions would need to fall below current levels within the next 20 to 70 years. Stabilisation at higher concentrations (750–1000 ppm) would require emissions to drop below current levels within the next one to two centuries.

Stabilisation at higher levels would allow more time for emissions reductions, but would also lead to a greater temperature rise and greater and more sustained impacts of climate change than stabilisation at lower levels.

Eventually, global emissions will need to fall to very low levels, substantially below current emissions, to prevent further growth of CO₂ concentrations and associated climate change.

Scientific climate models cannot apportion the required emission reductions between developed and developing countries, since only global emissions determine the rise in global temperatures. The global distribution of emissions reductions is therefore a social and political choice. Nonetheless, the current distribution of per-capita emissions and economic wealth between developed and developing countries suggests that a larger burden for reducing emissions may have to be carried by developed countries. That is, most or all countries will have to accept emissions obligations, but developed countries can expect to continue to lead in this regard.

Ancillary environmental effects

Ancillary environmental effects are incidental effects on the environment of reducing greenhouse gas emissions. The extent to which ancillary benefits or costs occur will be highly dependent on the choice of domestic policies used to meet obligations under the Protocol.

¹⁸ Wigley, T. (1998). The Kyoto Protocol: CO₂, CH₄ and climate implications. *Geophysical Research Letters* 25, 2285-2288.

¹⁹ ppm (parts-per-million) is a measure of concentration commonly used in atmospheric science. The atmospheric concentration of carbon dioxide in 1750 at the start of the industrial revolution was about 280 ppm, and it is presently close to 370ppm.

The most obvious possible benefit is improved human health as a result of air quality improvements, because burning fossil fuels often results in emissions of other air pollutants (such as volatile organic compounds, sulphur and nitrogen oxides, and particulates) apart from greenhouse gases. Such benefits may occur because reducing greenhouse gas emissions can also reduce emissions of other pollutants at the same time. While these benefits are dependent on domestic policy choices, the avoided health costs due to a reduction in greenhouse gas emissions have been shown in several overseas studies to be not insignificant.

Other possible environmental benefits include:

- reductions in erosion and improvements in water quality as a result of afforestation to create carbon sinks
- improvements in native ecosystems as a result of protection and restoration of regenerating indigenous forests
- improvements in building design and insulation, and associated health benefits, due to the need to improve energy efficiency and conservation
- less environmental impact from fossil fuel mining activities
- less congestion and noise from transport pattern changes and improvements to urban design and infrastructure.

An ancillary environmental benefit of global action with particular relevance to New Zealand is that the ozone layer is expected to recover earlier under reduced climate change, and that the extension of the Antarctic ozone hole is reduced by reduced global warming.

Ancillary environmental costs could also occur. For example, some of New Zealand's modern sewage treatment plants avoid discharging high nitrogen levels into waterways by "stirring" the sewage mix to create nitrous oxide. This prevents the receiving waters from being overloaded with nutrients, but emits a nitrous oxide (N₂O), which is a powerful greenhouse gas. Certain policy measures, such as application of an emissions price to nitrous oxide emissions, could conceivably create an incentive to reduce greenhouse gas emissions at the expense of receiving water quality. In such a case, both issues would need to be addressed concurrently.

Other possible ancillary environmental damages include:

- reduced aquatic habitat and water availability as a result of forest plantations reducing runoff volumes in water catchment areas
- increased risk and potential incidence of pest species from creation of additional forest habitat
- reduced indigenous biodiversity and nutrient balances if valuable ecosystems were replaced by exotic forests and crops for bio-fuel generation and the new systems were developed and managed improperly
- increased use of wood for home heating which could lead to increased emission of particulate matter with associated health risks.

Changes in land-use and farming systems to reduce greenhouse gas emissions could have both ancillary environmental benefits and risks.. Scientific and technical solutions to reduce methane emissions from livestock may or may not be compatible with organic farming principles.

In general, adopting environmentally sound technologies and practices can exploit synergies between greenhouse and environmental policies, while contributing to sustainable growth and

resource use. However the degree to which individual policies make use of such synergies and avoid trade-offs depends on their specific implementation and links with other domestic environmental or socio-economic policies.

Ancillary environmental effects in the first commitment period and beyond

Without knowing the detail of measures that would be used to manage greenhouse gas emissions under the Protocol, and consequently the local environmental outcomes of specific policy measures, it is not possible to quantify the ancillary effects that would arise from measures for managing greenhouse gas emissions during the first commitment period or in future periods. However, in the medium term it is expected that more of the ancillary benefits described above would occur as economic structures transition to a lower emissions future.

Social and cultural effects of entry-into-force of the Protocol for New Zealand

Because the Kyoto Protocol does not require New Zealand to take any specific policy measures, there would not be any direct social and cultural effects as a result of the entry-into-force of the Protocol for New Zealand.

However, there may be indirect social and cultural effects that result from the primary economic and environmental effects of the Kyoto Protocol, and policy measures introduced to meet the Protocol's obligations, in both the short and long term.

Consistency with the Treaty of Waitangi

The Crown has a moral obligation to act in accordance with the principles of the Treaty of Waitangi. The Treaty does not create any formal or legal limit on the ability of the Crown to ratify an international agreement, but its principles do affect the context in which the Crown takes such a decision and are relevant to the ongoing development of the domestic policies. The key Treaty concepts and principles relevant to the current discussion about the Kyoto Protocol are:

- *Kawanatanga*: The concept of kawanatanga describes the responsibility of the Crown to provide laws and make related decisions for the community as a whole. The actions that the executive takes for New Zealand in the international domain, including the ratification of international agreements, fall within the concept of kawanatanga.
- *Rangatiratanga and taonga*: The Treaty assured Maori that their rights, including rangatiratanga and taonga, would be protected. The effect of any regulatory regime on Maori land, forests and other interests will be a key issue as the domestic policy regime is developed.
- *Partnership*: The Treaty has been described as establishing a relationship akin to a partnership, in that the two parties have duties to act reasonably, honourably and in good faith towards one another.
- *Duty of active protection*: The Crown is required to take positive steps to recognise and protect Maori interests, and to ensure that it takes informed decisions on matters that affect Maori interests.

Over recent years, there has been a substantial amount of general debate and analysis on the Kyoto Protocol and of general consultation by government agencies with key groups, including Maori. A Maori working party was first formed on this issue in 1990. The Ministry for the Environment undertook two series of regional hui in November 2000 and November 2001, to inform Maori about the science of climate change and the implications of the Protocol, and to give an overview of the range of possible policy responses.

The text of the Kyoto Protocol was finalised at the end of 2001. During November and December the Government also undertook a substantial process of consultation on the implications of ratification and on the directions that domestic policy might take in the future. As discussed in the section on consultation, below, this consultation process included consultation with Maori.

That consultation and initial analysis means that the Government is now able to identify key options and issues for New Zealand, as well as some key issues that are specific to Maori. These key issues include environmental and cultural issues that stem from the cultural significance of the natural environment for Maori, economic effects, the effect of any new regulatory mechanisms on Maori land and on Maori forests that were planted before 1990, and more general social and health effects.

There will be a further round of consultation on the proposed policy directions later this year, and the Government will be looking for comment on whether the policies as a whole adequately manage the key issues for Maori. This consultative and staged approach to policy development will enable the Government to ensure that the domestic policy mix that New Zealand eventually adopts is developed with full awareness of its implications for Maori, and that it is consistent with the principles of the Treaty of Waitangi.

The Government considers that the staged and consultative approach that has been taken means that it now has sufficient general understanding of the issues for Maori and how they might be managed. It is reasonable, and consistent with the Treaty of Waitangi, for the Government to proceed to ratification.

Effects on human rights

Entry-into-force of the Kyoto Protocol for New Zealand will have no effect on human rights.

Other social and cultural effects

Short-term

Because the degree of avoided climate change is expected to be small in the short term, there are not expected to be significant social and cultural effects in this regard (either as a result of climate change itself or as a result of climate change avoided).

However, there may be some social and cultural effects as a result of domestic policy measures and global economic changes resulting from the Kyoto Protocol's first commitment period. These may include:

- possible effects on employment, particularly in regions outside major urban areas, which will be taken into account in the design of policies

- alterations to patterns of transport use and resulting changes in patterns of leisure and social activities
- changes in social acceptability and views on basic day-to-day behaviours such as energy use, disposal of organic waste and transport mode choice
- changes in the types of housing constructed and purchased and possible changes in urban form, leading to different patterns of interaction and patterns of social relationships within communities

Longer-term

In the longer term, successful implementation of the Kyoto Protocol, including its extension through further commitment periods, will slow the rate and mitigate the effects of global climate change. This will reduce the risks to social and cultural systems that may be posed by the adverse environmental impacts of climate change, particularly impacts from sea level rise, establishment of new disease-carrying pest species and changes in agricultural viability and native ecosystems.

The other social changes described for “short-term effects” would almost certainly be gradual changes, but in the longer term would become more pronounced.

Effects if the Protocol does not enter into force for New Zealand

The Protocol does not receive sufficient ratifications to enter into force

If the Protocol did not enter into force, neither New Zealand nor any other Annex B country would face binding emissions targets, and each would remain bound by the articles of the Framework Convention²⁰.

In the short term, it is unlikely that additional global policies would be implemented to limit or reduce greenhouse gas emissions, beyond those currently in place. This would avoid the economic adjustments described above, but would also mean a delay in action and would allow for continued emissions of greenhouse gases and increases in atmospheric concentrations, as described under the IPCC scenarios discussed in Appendix 3. This delay, until an agreement providing for effective action were negotiated, would commit New Zealand and other countries to additional future impacts of global warming and climate change.

In the longer term, if no further international agreement were made, greenhouse gas emissions and atmospheric concentrations would almost certainly increase. The effects of this cannot be predicted with certainty but increasing rates of climate change will incur increasing costs for adaptation and residual damage. The effects are likely to pose a substantial risk to the global economy and human welfare in the longer term.

²⁰ However, it should be noted that under Article 18 of the Vienna Convention on the Law of Treaties, New Zealand is obliged to refrain from acts which would defeat the object and purpose of the Protocol when (a) New Zealand has signed it and until it makes its intention clear not to become a Party or (b) has ratified the Protocol pending entry into force and providing this is not unduly delayed. New Zealand signed in May 1998.

New Zealand does not ratify the Protocol but the Protocol enters into force

If New Zealand does not ratify the Protocol but the Protocol receives sufficient ratifications to enter into force for the ratifying countries, New Zealand will not take on any obligations under the Protocol²¹ but other ratifying Annex B countries will do so.

The effects for New Zealand would depend on:

- what measures, if any, New Zealand undertook to address its greenhouse gas emissions in order to comply with obligations under the Framework Convention
- the effects of New Zealand's exclusion from the Clean Development Mechanism, Joint Implementation and from being able to access removal units for its post-1990 forests
- the effects on New Zealand's rate of uptake of lower-emitting technologies in the possible absence of incentives to do so
- the response of other countries in terms of New Zealand's trade and international relations, and
- the damage to New Zealand's negotiating position and the relative loss of influence New Zealand has over future commitment periods if and when New Zealand does eventually join the Protocol.

As described above, New Zealand's economy would still be affected by economic adjustments occurring in Annex B economies. In some cases, this may give New Zealand a competitive advantage; in other cases, such as the forestry industry, it may have a negative effect on industry export prices without any corresponding benefit of access to removal units.

As described earlier, New Zealand could also run the risk of a decrease in its effectiveness and current level of influence in trade and other international negotiations.

Consultations that have been undertaken or are proposed with the community and interested parties in respect of the Protocol

Consultation undertaken on ratification

Public consultation on ratification was carried out from 18 October to 21 December 2001. The consultation included presentation of information and public feedback on the science of climate change, possible effects on New Zealand of global warming, New Zealand's greenhouse gas emissions profile, the history of the UN Framework Convention and the Kyoto Protocol, and the ways in which New Zealand could meet its obligations under the Protocol if it chose to ratify and the Protocol entered into force.

Initial public consultation was also carried out at the same time on policy objectives, existing/proposed measures in the areas of energy efficiency, transport and waste and research in agriculture, and the options for comprehensive market-based economic incentive policy measures.

The public consultation process included:

²¹ But would continue to be bound by its current obligation to refrain from acts which would defeat the object and purpose of the Protocol until New Zealand had made clear its intention not to become a Party.

- Production and mail-out of the main consultation document, *Kyoto Protocol: Ensuring our Future*, of which 5,900 were initially mailed out and a further 3,250 handed out at public meetings.
- Production of seven working papers to support the consultation document, 3,750 of which were sent out.
- Release of two major economic studies by ABARE and PA Consulting Ltd into the possible effects on New Zealand of different domestic policies.
- An initial Climate Change Forum in Wellington for all stakeholders.
- 24 two-hour public meetings and 22 three-hour focus group meetings in urban centres around New Zealand, which were attended by 764 people.
- Nine industry/stakeholder meetings, attended by 193 people.
- 14 Maori focus forums in urban centres, attended by 136 people.
- One national hui, attended by 20 people.
- Six breakfast/lunch meetings attended by the Convenor of the Ministerial Group on Climate Change in each of Auckland, Hamilton, Rotorua, Wellington, Christchurch and Dunedin, which were attended by 500 people.
- Three one-day climate change summits in Wellington, Auckland and Christchurch, attended by 170 people, at which interested parties made presentations to the chief executives or directors of the Treasury, Department of Prime Minister and Cabinet, Ministries of Transport and Environment, and the New Zealand Climate Change Project.
- Calling for public submissions by 21 December 2001.

Findings of public consultation

Preliminary consultation findings are available from an analysis of the raw data entered into the public submissions database.

Very preliminary figures suggest that approximately one-third of the submissions received expressed support for ratification, with around two-thirds opposed.

This may be compared with preliminary results from a public survey carried out by UMR from 19-20 January 2002, which showed:

- 47% of those surveyed favour the Government "signing up" to the Protocol
- 6% are opposed
- 42% "need to know more"

Views on the Government's case for ratification

Submissions opposing ratification

- Many submitters opposing ratification of the Protocol expressed a view that climate change merited action.
- An important issue for many submitters was whether the Protocol was the appropriate framework for action.
- Some submitters suggested action to reduce greenhouse gas emissions could be taken outside the Protocol and therefore opposed it being ratified at any time.
- A significant number, however, accepted that the Protocol should be ratified, but opposed ratification in September 2002, preferring the decision to be delayed.

Reasons for opposing ratification

- The reasons for opposing ratification focused on concerns about the economic outcomes of ratifying.
- The view mainly expressed by those who opposed ratification was that the Government should take time to assess the consequences of ratification, before committing to the Protocol.

Concerns about economic outcomes

- Concerns about the economic outcomes centred mainly on perceived consequences for New Zealand's international trade, particularly if trade partners and competitors were not bound by the Protocol and were therefore not subject to a regime that would lead to production cost or price increases.
- Mention was also made of the ability of some countries to offset increases in production costs through government subsidies or subsidy equivalents. New Zealand was described as being particularly "vulnerable" in the international trade arena.
- A number of submitters expressed strong concern about the effects that policies implemented as a *consequence* of ratification would have on their particular businesses or industries.
- Farmers in particular were concerned that emission charges should not be imposed on agricultural emissions, particularly methane and nitrous oxide.
- Local authorities, particularly those responsible for areas heavily dependent on agriculture, were concerned about the impact that climate change policies would have on rural industries and hence on regional employment.
- A number of submitters, mostly from the agriculture sector, expressed the view that the measurement and monitoring of emissions was not practical.

Delay in ratifying the Protocol

- A number of submitters expressed the view that ratification should wait until countries which competed with New Zealand had also ratified the Protocol.
- A significant number of submitters who did not refer to international trade nevertheless also expressed a view that New Zealand should wait until other countries ratified the Protocol. The submitters specified countries such as India, China, Australia and the United States.
- A significant number of submitters suggested ratification should be delayed until greenhouse gas emissions management policies had been developed.
- A number of submitters also suggested that the need to obtain more information on climate change was a reason for delaying ratification. Doubts were expressed about the scientific conclusions supporting climate change, but more submitters saw a need for further information to be obtained on the consequences of climate change than expressed doubts about the science.

Submissions supporting ratification

- A minority of submitters supported ratification.
- These submitters focused on the environmental benefits expected to result from ratification of the Protocol and subsequent policy initiatives.
- A few also mentioned economic benefits, particularly the importance of New Zealand maintaining a 'clean, green' brand image.
- A number of submissions supporting ratification indicated their support without providing any outline of their views.

Other consultation matters

- A very small minority of submitters indicating support for ratification, however, also suggested there was a need to take time to assess the consequences of ratification, to develop policies and to gather more information on climate change.

Planned future consultation on policy measures

A second round of public consultation is expected to occur in April to June 2002 on the preferred mix of policies for meeting New Zealand's obligations under the Protocol.

Summary: Advantages and disadvantages to New Zealand of the Protocol entering into force for New Zealand

Advantages

- It establishes an effective and internationally agreed framework for international cooperation that will reduce (but not avoid) future increases in atmospheric greenhouse gas concentrations, and the associated impacts of global warming and climate change.
- It will contribute to reducing the long-term risks of climate change for New Zealand's climate-dependent economy and ecosystems.
- It will avoid further delays in limiting and reducing greenhouse gas emissions, so avoiding committing New Zealand to even greater climate change impacts in the future.
- It will allow New Zealand to influence the future shape of the Protocol, including the extent of, and rules for, future emissions reduction and limitation commitments.
- It enables New Zealand to benefit from removal units generated by post-1990 forest plantings, which could lead to increases in New Zealand's national income during the first commitment period. However, the amount of this benefit will depend on future new planting scenarios, whether forests are replanted, future harvesting scenarios and how much scrub has regenerated since 1990.
- It will create incentives that will assist New Zealand to make a gradual transition toward becoming a low-emitting economy, rather than causing a sudden adjustment if action is delayed.
- It avoids potential risks to New Zealand's trade and other international relationships that could occur if the Protocol enters into force without New Zealand as a Party.
- It will provide New Zealand businesses with access to Clean Development Mechanism and Joint Implementation projects internationally, and will enhance business opportunities in such areas as energy efficiency, emissions abatement and emissions monitoring domestically.

Disadvantages

- Policy measures to limit future greenhouse gas emissions will re-direct resources within the economy towards emissions limiting or emissions absorbing activities, which is likely to result in adjustment costs within the economy. Under some scenarios, these could be significant enough to negatively influence GNI and GDP.
- Under some policy scenarios, New Zealand's domestic production of goods and services (as measured by GDP) would grow more slowly than under business-as-usual conditions, potentially leading to associated income and/or employment effects. This may be offset by foreign income transfers gained from the international sale of removal units, although as noted above, the net effect of this is not yet clear.

- Depending on domestic policy measures adopted in New Zealand and in other Annex B countries, there could be effects on the competitiveness of New Zealand businesses involved in the tradable goods sector, particularly where principal competitors are based in non-Annex B countries. This could result in costs to New Zealand without any environmental benefits being gained.
- Depending on domestic policy measures adopted in New Zealand and other Annex B countries, some investment that would have occurred in New Zealand may instead be diverted to other countries.
- Ratification could have a negative signalling effect on investment if there is uncertainty as to the domestic policies that New Zealand will use to help meet its commitments under the Protocol.
- A significant proportion of submitters consider that New Zealand should delay ratification until further analysis of potential effects is carried out. Some consider that ratification should be delayed until the positions of trading partners and competitors are better understood with regard to ratification and related policy measures.
- Some submitters are concerned that emissions reductions under the Protocol's first commitment period will not themselves make a significant contribution to a reduction in global warming unless they are followed by further reductions in future commitment periods.

Assessment

Climate change has long-term implications and potentially substantial costs for New Zealand. As a climate-dependent, primary producing country with significant concentrations of population and infrastructure in coastal areas, climate change presents a significant risk to our way of life. The Kyoto Protocol provides a means by which, over the long term, those risks can be mitigated.

Implementation of the Protocol itself also has potential for economic and consequent social effects, which appear to be dependent on domestic policy choices. A majority of submitters have expressed concern about potential adverse effects, particularly on international competitiveness, and have submitted that ratification of the Protocol should be delayed.

The Government aims to minimise adverse effects and maximise positive effects through the design of domestic policy measures, and through maintaining a proactive stance at international negotiations for the second and subsequent commitment periods.

The Protocol will not enter into force for New Zealand until a large body of developed country emitters has ratified it, and binding emissions management commitments will not commence until 2008. Ratification by New Zealand would build momentum for international action to address greenhouse gas emissions and would enable New Zealand to take part in shaping the emerging international instrument under which the action would be taken.

Therefore, the Government considers that it is in New Zealand's national interest to ratify the Kyoto Protocol.

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Appendix 1: Annex I and Annex B

Annex I of the Framework Convention	Emissions target in Annex B of the Kyoto Protocol (Percentage of base year or period)
Australia	108
Austria	92
Belarus a/	Not included in Annex B
Belgium	92
Bulgaria a/	92
Canada	94
Croatia*	95
Czech Republic a/ *	92
Denmark	92
Estonia a/	92
European Union	92
Finland	92
France	92
Germany	92
Greece	92
Hungary a/	94
Iceland	110
Ireland	92
Italy	92
Japan	94
Latvia a/	92
Liechtenstein*	92
Lithuania a/	92
Luxembourg	92
Monaco*	92
Netherlands	92
New Zealand	100
Norway	101
Poland a/	94
Portugal	92
Romania a/	92
Russian Federation a/	100
Slovakia a/*	92
Slovenia a/*	92
Spain	92
Sweden	92
Switzerland	92
Turkey	Not included in Annex B
Ukraine a/	100
United Kingdom of Great Britain and Northern Ireland	92
United States of America	93

a/ Countries that are undergoing the process of transition to a market economy.

Appendix 2: Obligations under the Kyoto Protocol

Binding emissions targets for developed countries

The most important obligation under the Protocol will be for the developed country Parties (that is countries listed in Annex I to the Framework Convention, including New Zealand) to meet targets for their emissions of greenhouse gases over the first commitment period, which extends from 2008 to 2012.

Each country's target is specified in Annex B of the Protocol as a percentage of its 1990 level of emissions. Because the first commitment period is five years in duration, the target for each country is five times its 1990 level of emissions, multiplied by the Annex B percentage for that country.

Percentage targets for Annex B countries range from 92% of 1990 emissions for European Union countries, up to 110% of 1990 emissions for Iceland. New Zealand's target is 100% of 1990 emissions. (This is described further below.) New Zealand is one of six countries for which targets of 100% or more were agreed at the negotiations; the others are Australia (108%), Norway (101%), Russia and Ukraine (100% each), and Iceland.

A list of Annex I countries, and their Annex B percentage targets where applicable (none is set for Belarus and Turkey), is shown at Appendix I of this NIA. The key rules outlining emissions accounting have already been outlined.

Further obligations and commitments applying to Annex I countries

Each Annex I country for which the Protocol enters into force will be required to:

- make “demonstrable progress”, by 2005, toward achieving its commitments under the Protocol (Article 3.2)
- implement and/or further elaborate certain types of policies and measures in accordance with its national circumstances (Article 2.1(a))
- cooperate with other Annex I Parties to enhance the effectiveness of their policies and measures adopted under Article 2 (Article 2.1(b))
- pursue (through the International Civil Aviation Organisation and the International Maritime Organisation) limitation or reduction of emissions of greenhouse gases from aviation and marine bunker fuels, other than gases controlled by the Montreal Protocol on Substances that Deplete the Ozone Layer (Article 2.2)
- strive to implement policies and measures under Article 2 in a way that minimises certain adverse effects on other Parties, especially developing country parties (Article 2.3)
- provide data relating to its level of carbon stocks in 1990, for consideration by the Subsidiary Body for Scientific and Technological Advice (Article 3.4)
- strive to implement its Article 3.1 commitments in a way that minimises adverse effects on developing country Parties (Article 3.14)
- put in place, by 31 December 2006, a national system for estimating greenhouse gas emissions, and removals by sinks (Article 5.1)
- incorporate in its annual inventory of human-induced emissions and sources and removals by sinks supplementary information as necessary to ensure compliance with Article 3 of the Protocol and as determined under Article 7.4, with that inventory to be submitted annually once the Protocol has entered into force for New Zealand (Articles 7.1 and 7.3)

- incorporate in its national communication under Article 12 of the Framework Convention the supplementary information necessary to demonstrate compliance with its commitments under the Protocol, to be submitted as frequently as determined by the Conference of the Parties (Articles 7.2, 7.3 and 7.4)
- comply with review and compliance procedures developed under Articles 8 and 18
- together with other developed country Parties, in implementing their obligations under Article 4.1 of the Framework Convention (relating to the financial mechanism):
 - provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in advancing the implementation of certain existing commitments (Article 11.2(a)); and
 - provide such financial resources, including the transfer of technology, needed by developing country Parties to meet the agreed full incremental costs of advancing the implementation of certain existing commitments (Article 11.2(b)).

These obligations also mean that Parties would be required to comply with rules agreed for the Protocol's implementation. These would, in part, require each developed country Party to set up a register of assigned amount of emission units, which would keep a record of initial assigned amount and any additions and deductions that occurred through sink activities and use of flexibility mechanisms such as international emissions trading. The full text of the rules can be found on the UNFCCC and IPCC websites (www.unfccc.org and www.ipcc.org).

Obligations and commitments applying to all Parties

All Parties, Annex I or otherwise, will have to:

- formulate certain cost-effective national and regional programs to improve the quality of local emissions factors and activity data and/or models for the preparation and periodic updating of national inventories (Article 10(a))
- formulate, implement, publish and regularly update certain national and regional programmes containing measures to mitigate, and facilitate adequate adaptation to, climate change (Article 10(b))
- cooperate in the promotion and facilitation of the development and transfer of certain climate change technologies, in particular with respect to developing countries (Article 10(c))
- cooperate with other Parties in scientific and technical research and in the development of observation systems and data archives to reduce uncertainties related to the climate system (Article 10(d))
- cooperate in, and promote at the international level, the development and implementation of certain education and training programmes relating to climate change (Article 10(e))
- include in their national communications certain information on programmes and activities under Article 10 (Article 10(f)).

Appendix 3: What is climate change and why is it a problem?

Human activities are contributing to global warming and climate change

The Intergovernmental Panel on Climate Change (IPCC), the authoritative world scientific body established under the United Nations, has provided increasingly stronger and clearer messages about the need for global action to address atmospheric greenhouse gas concentrations. In its Third Assessment Report, released in January 2001, the IPCC stated that:

There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities ... [and that] Anthropogenic [human-induced] climate change will persist for many centuries.²²

The IPCC has estimated that the result of future greenhouse gas emissions will be an increase in globally averaged surface temperature of between 1.4 and 5.8°C over the period 1990 to 2100²³.

The projected warming range under the IPCC scenarios is about two to ten times larger than the central value of observed warming over the 20th century. The IPCC considers that the projected rate of warming would very likely be without precedent during the last 10,000 years, even for the lower end of the range. Along with a change in average climate conditions, climate models also project changes in the frequency, intensity, and duration of extreme events such as more hot days, heat waves and droughts, heavy precipitation events, and fewer cold days.

The global effects of climate change are likely to be negative

The IPCC considers that, at a global level, projected climate change will have both beneficial and adverse environmental and socio-economic effects, but the larger the changes and the higher the rate of climate change, the more the adverse effects will predominate. The IPCC has produced detailed reports of the likely physical, biological and social impacts of climate change at a global and regional level.

The few studies available of the potential economic impacts of climate change represent the best estimates available, but are still subject to significant uncertainty and their results depend on many modelling assumptions. From the studies available, aggregated market sector effects, measured as changes in gross domestic product (GDP), are estimated to be:

- mixed for developed countries for up to a few degrees of warming
- negative for developed countries for warming beyond a few degrees
- negative for many developing countries for all magnitudes of warming studied.

²² IPCC 2001(a)

²³ The wide range of projected warming is driven by uncertainty about the sensitivity of the world's climate to future greenhouse gas emissions, and by uncertainty about future greenhouse gas emissions themselves. The underlying scenarios of future world development and associated greenhouse gas emissions assume that no specific climate policies are introduced, but the scenarios leading to the lower end of the warming range assume that clean energy technology will be developed and implemented on a global scale even for non-climate benefits.

More people are projected to be harmed than benefited by climate change, even for global mean temperature increases of less than a few degrees.

At a global scale, world GDP would change by plus or minus a few percent for global mean temperature increases of up to a few degrees, with increasing net losses for larger increases in temperature. However, these estimates generally:

- exclude the effects of changes in climate variability and extremes
- do not account for the effects of different rates of climate change
- only partially account for impacts on goods and services that are not traded in markets.

Confidence in estimates of market effects for individual countries is generally low, and the omissions described above are likely to result in under-estimates of economic losses and over-estimates of economic gains.

Apart from economic losses arising from climate change and extreme events, a rapid change in climate poses risks to unique and threatened ecosystems, and an increasing potential for large-scale and possibly irreversible changes in Earth systems (such as major ice sheets, large terrestrial ecosystems, ocean circulation, and permafrost regions). The likelihood of major disruptions to such large-scale Earth systems, which would have widespread and sustained impacts, is not well known at present, but is probably very low. However, the likelihood of such disruptions occurring is expected to increase with increases in the rate, magnitude and duration of climate change.

Climate inertia means that past and present emissions will still have effects centuries from now

Climate inertia means that some impacts of human-induced climate change may be slow to become apparent, and some could be irreversible if climate change is not limited in both rate and magnitude before critical thresholds, whose positions may be poorly known, are crossed. As a result, climate and climate-impacted systems (for example, temperature, sea level, ice sheets, rainfall patterns) will continue to change long after human-induced emissions of greenhouse gases have been reduced and atmospheric concentrations of greenhouse gases have stabilised.

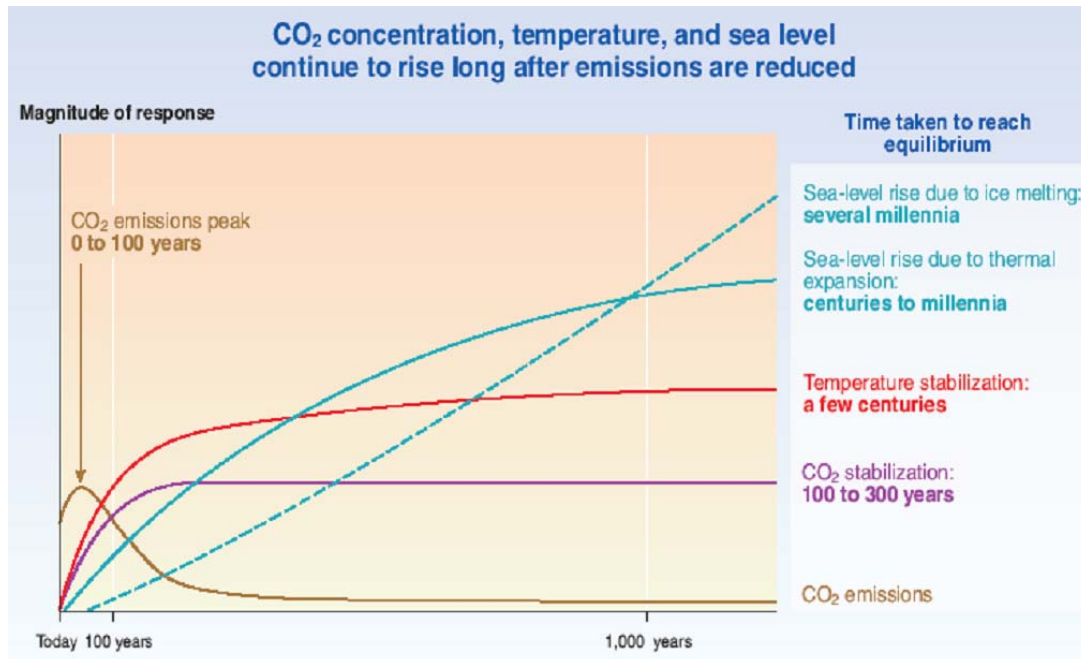
For example, the effects on the oceans and atmosphere of carbon dioxide *already emitted* from human activities since 1750 will persist for centuries, because of the slow redistribution of carbon between large ocean and terrestrial reservoirs with slow turnover.

Although uptake by the biosphere and oceans moderates the effect of continued carbon dioxide emissions, even if emissions were to be kept constant the carbon dioxide concentration in the atmosphere would continue to increase for a long time. Continued emissions at today's rates would lead to carbon dioxide increasing to more than three times today's levels. Long term reduction of atmospheric carbon dioxide occurs only very slowly through geological processes.²⁴

To illustrate these points, Figure 1 qualitatively illustrates that even if global greenhouse gas emissions were to peak in 2050 and then fall steadily towards a very low level:

²⁴ By contrast, stabilisation of emissions of shorter-lived greenhouse gases such as methane leads, within decades, to stabilisation of atmospheric concentrations.

- atmospheric greenhouse gas concentrations would not stabilise for 100 to 300 years
- temperatures would continue to increase slowly for several centuries beyond that before stabilising
- sea levels would continue to rise due to both thermal expansion and the melting of icecaps for hundreds or even thousands of years.



Source: IPCC *Climate Change 2001 Synthesis Report*. It is important to note that the vertical axis on this graph is qualitative and separate lines cannot be compared with each other as they relate to different units (changes in CO₂ emissions, CO₂ concentration, temperature, and sea level).

The US National Academy of Sciences concluded that:

Even in the more conservative [IPCC] scenarios, the models project temperatures and sea levels that continue to increase well beyond the end of this century, suggesting that assessments that examine only the next 100 years may well underestimate the magnitude of the eventual impacts.

The IPCC believes that the magnitude and rate of unmitigated climate change over the next centuries will pose a major challenge for humanity, as:

- the time needed for socio-economic adaptation varies from years to decades, depending on the sector and the resources available to assist the transition, and
- there is inertia in decision making in the areas of adaptation and mitigation, and in implementing those decisions, in the order of decades.

The IPCC has concluded that the pervasiveness of inertia and the possibility of irreversibility in the interacting climate, ecological, and socio-economic systems are major reasons why anticipatory adaptation and mitigation actions are beneficial. A number of opportunities to exercise adaptation and mitigation options may be lost if action is delayed.

Taking a wait-and-see approach commits us to even greater climate change effects downstream, even for very small time delays

The IPCC has concluded that:

- the projected rate and magnitude of warming and sea-level rise can be lessened by reducing greenhouse gas emissions
- the greater the reductions in emissions and the earlier they begin, the smaller and slower the warming and rise in sea levels are projected to be, and
- actions taken now would have a greater effect at the year 2100 than the same actions taken later.

For example, a modelling analysis of the hypothetical effects on 21st century sea level rise of reducing greenhouse gas emissions showed that the sea-level rise that would inevitably occur due to human-induced warming would be:

- 5 to 12 cm if global greenhouse gas emissions arising from human activities had been (hypothetically) reduced to zero in 1995, but
- 14 to 32 cm if the same reduction were to occur in 2020, showing a two to three-fold increase after a delay of 25 years.²⁵

In addition to inertia in physical systems, there is also inertia in the socio-economic systems that interact with them, as mentioned above. The IPCC notes that there is typically a delay of years to decades between perceiving a need to respond to a major challenge, planning, researching and developing a solution, and implementing it.

Adaptation is a necessary but insufficient response to climate change

Humans have shown a capacity to adapt to long-term changes in average climate conditions, but have had less success in adapting to rapid change, climate extremes and year-to-year variations in climatic conditions (such as severe droughts). Climatic changes in the next 100 years are expected to exceed any experienced by human societies over at least the past five millennia.

In this regard, rapid technological development has provided adaptation possibilities for developed countries that are considerably greater than those available in the past. Their implementation can reduce risks from climate change and increase benefits, and contribute to a more sustainable use of resources. However, adaptation will still impose costs and cannot avoid all damages, and it requires information and foresight to be implemented in the most cost-effective manner. Greater and more rapid climate change, in particular large-scale and abrupt changes to ecosystems, would pose greater challenges for adaptation and greater risks of damages than would lesser and slower change.

Because financial, political, social and technological resources are required to cope with rapid environmental change, the negative effects of climate change are also likely to be concentrated on developing countries, which have significantly less capacity to adapt. Regional differences in actual climate change and its impacts on temperate, subtropical and tropical regions further contribute to differences in how various regions and countries are expected to cope with the projected changes.

²⁵ (IPCC), 2001(a).