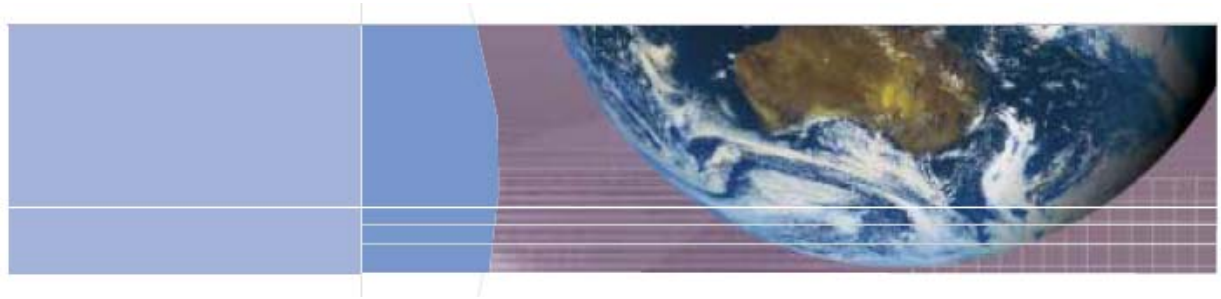
Analysis of the economic impacts of climate change projections in New Zealand 2005



ABARE consultancy report for the
New Zealand Ministry for the Environment

Edwina Heyhoe, Sam Hester and Don Gunasekera

October 2005

abare

abareconomics.com

Analysis of the economic impacts of climate change projections in New Zealand 2005

Introduction

In September 2005, as a result of higher than expected emissions growth in the New Zealand economy, ABARE was commissioned by the New Zealand Ministry for the Environment to undertake an analysis of the economic impacts of different emissions projections for the New Zealand economy on the costs of achieving its emissions target under the Kyoto Protocol under a variety of domestic and international policy scenarios. These scenarios are designed to highlight key policy issues associated with the implementation of the Kyoto Protocol, both internationally and in New Zealand, including:

- Whether the New Zealand government decides to utilise the flexibility mechanisms contained in the Kyoto Protocol, which include international emissions trading and the clean development mechanism, in meeting its target; and,
- Whether emissions from agricultural sources are subject to a carbon tax.

In consultation with the New Zealand Ministry for the Environment, ABARE proposed undertaking three reference case scenarios (low, medium and high emissions growth) and a total of nine policy scenarios (Table 1).

Table 1: Key features of policy scenarios undertaken in this study

Scenario	Reference case	Policy option	Agriculture included	Last year of scenario
1	Low emissions path	International emissions trading	Yes	2010
2	Low emissions path	Unilateral domestic abatement	Yes	2010
3	Medium emissions path	International emissions trading	Yes	2010
4	Medium emissions path	Unilateral domestic abatement	Yes	2010
5	High emissions path	International emissions trading	Yes	2010
6	High emissions path	Unilateral domestic abatement	Yes	2010
7	Medium emissions path	International emissions trading	No	2010
7a	Medium emissions path	International emissions trading	Only in New Zealand	2010
8	Medium emissions path	Unilateral domestic abatement	No	2010

Determining the costs of meeting New Zealand's first commitment period target

Scenarios 1 to 6 are designed to estimate the costs to New Zealand of meeting its Kyoto commitments through either participating in an international emissions trading system or through domestic abatement only under the three reference case emissions projections scenarios.

In the scenarios in which New Zealand participates in the international emissions trading system (Scenarios 1, 3, 5, 7 and 7a), New Zealand incurs the international carbon tax and meets its target through both domestic abatement and the purchase of emissions permits. In

these scenarios, it is assumed that the major sellers of emissions permits set the permit price at a level which maximises their revenue from emission permit sales over the first commitment period, 2008-12.

In the scenarios in which New Zealand does not participate in the international emissions trading system (Scenarios 2, 4, 6 and 8), New Zealand meets its Kyoto target entirely through domestic abatement. The carbon tax needed to achieve New Zealand's target is determined endogenously. In these scenarios, other Kyoto participating countries are assumed to participate in the international emissions trading system.

Scenarios 7 and 7a are designed to test the impact on the New Zealand economy of New Zealand imposing a carbon tax on its agricultural methane and nitrous oxide emissions while other countries participating in the Kyoto Protocol are assumed to exempt their agriculture industries from the carbon tax. Scenario 8 estimates the impacts of New Zealand meeting its target entirely through domestic abatement when agricultural emissions are not subject to the carbon tax.

Reference cases

The reference cases (low, medium and high growth) reflect a forecast of the world economy without any major policy or other changes and differ only in the assumed rates of economic and emissions growth in New Zealand. The medium emissions growth reference case reflects New Zealand's "with measures" projections as presented in New Zealand's draft *Fourth National Communication under the Framework Convention on Climate Change* (Table 2). The low emissions growth reference case has been estimated using the ratio between the "most likely" and "optimistic" scenarios in the New Zealand Climate Change Office's *Annual Report on Climate Change Policy Implementation 2004-05*. The high emissions growth reference case has been estimated using the ratio between the "most likely" and "pessimistic" scenarios. The estimates of sinks credits available to New Zealand at 2010 in each reference case are taken from the *Annual Report on Climate Change Policy Implementation 2004-05*.

Table 2: Emission projection paths for New Zealand for the low, medium and high emissions growth scenarios (Mt of CO_2 equivalent)

	Low	**High**	**Medium**
	2010	2010	2010
Energy	37.6	44.1	40.8
Agriculture	39.0	42.4	40.8
Waste	1.4	1.7	1.5
Total emissions	77.9	88.2	83.1
Sinks	18.2	8.4	14.2

In each reference case the following assumptions have been exogenously specified for New Zealand:

- Closure of the Methanex plant;
- Real GDP growth rates over the period to 2020 are assumed to equal those underpinning the scenarios in the *Annual Report on Climate Change Policy Implementation 2004-05*; and,
- Changes to technology shares in the electricity industry.

Given the short timeframe of the analysis, ABARE has not attempted to include detailed forecasts for agricultural output and exports in these reference cases.

Preliminary results for New Zealand - Scenarios 1 to 8

- The costs to New Zealand of meeting its Kyoto commitments will depend on the size of the abatement task and the breadth of abatement opportunities available to emitters. Abatement costs are higher for the high emissions growth scenarios than the medium or low emissions growth scenarios (Table 3). Making use of the Kyoto Protocol flexibility mechanisms, international emissions trading and the clean development mechanism, will lower costs relative to scenarios in which New Zealand achieves its target through domestic abatement alone. Shielding agricultural emissions from the carbon tax will increase abatement costs as low cost abatement options in the agricultural sectors are no longer utilised.

- Implementing the Kyoto Protocol has relatively small impacts on real GDP in New Zealand, ranging from -0.02 per cent relative to the reference case at 2010 in Scenario 1 to -0.24 per cent relative to the reference case at 2010 in Scenario 6. Given these impacts, it should be noted that although abatement costs are higher under the high emissions growth scenarios, these higher costs are not sufficient to offset the positive effects of higher economic growth underpinning these scenarios and, as a result, the level of economic activity in New Zealand remains higher in the high growth scenarios than in the medium or low growth scenarios.

    - In scenarios where agriculture is subject to emissions taxation, the impacts of achieving New Zealand's emission target on its real GNP (which equals real GDP plus net factor income from abroad) are ameliorated to a slight extent by terms of trade effects. These terms of trade effects result from the higher prices of New Zealand's agricultural exports in these scenarios.

- The global carbon tax of $NZ10.4 a tonne of carbon dioxide equivalent (CO_2e) at 2010 imposed in Scenarios 1 to 6 is the level at which the major sellers in the international emissions trading system, including Russia, the Commonwealth of Independent States and non-EU25 Eastern Europe are able to maximise their revenue. It is assumed that changes in reference case emissions projections in New Zealand under the low, medium and high growth scenarios do not affect the global carbon tax.

- The global carbon tax of $NZ13.0 a tonne of CO_2e at 2010 in Scenarios 7, 7a and 8 reflects the higher cost of abatement internationally when agricultural emissions are not subject to emissions taxation. This occurs as low cost abatement opportunities in agriculture are not utilised and more costly abatement opportunities in other sectors are utilised instead.

- Under the low emissions growth reference case, New Zealand emissions at 2010 are below the Kyoto target by 1.1 Mt of carbon dioxide equivalent. As a result, New Zealand is a seller of permits at 2010 if participating in the international trading scheme (Scenario 1). Despite this, economic activity in New Zealand is projected to fall relative to the reference case in Scenario 1 as the international carbon tax is

imposed on New Zealand emitters. Under unilateral abatement New Zealand does not require a carbon tax to achieve its Kyoto target (Scenario 2).

- Under the other scenarios where New Zealand uses only domestic abatement to achieve its Kyoto target (Scenarios 4 and 6), the domestic carbon tax in New Zealand increases from $NZ17.8 a tonne of CO_2e at 2010 under the medium emissions growth scenario to NZ$51.1 a tonne of CO_2e at 2010 under the high emissions growth scenario.

- With the imposition of a carbon tax on all sectors (Scenarios 1 to 6), the largest falls in output relative to the reference case occur in New Zealand's most emissions intensive industries, which include livestock and wool, iron and steel and primary aluminium.

- Less emissions intensive industries such as light manufacturing and services are projected to benefit from reduced demand for resources in the more emissions intensive industries. As a result, output in these less emission intensive sectors is projected to rise slightly relative to the reference case in all scenarios.

- When agriculture is not subject to the carbon tax either in New Zealand or elsewhere (Scenario 7), output and exports of agricultural products are projected to fall by less than when agriculture is taxed (Scenario 3). As a result, New Zealand is projected to undertake less domestic abatement and to rely more on purchasing emission permits to meet its Kyoto target under Scenario 7 than under Scenario 3.

- When agricultural emissions are subject to a carbon tax in New Zealand but not subject to a carbon tax elsewhere (Scenario 7a), output and exports of agricultural products in New Zealand are projected to fall by more than when agriculture is not subject to the carbon tax in any country (Scenario 7). This largely reflects reduced competitiveness of New Zealand agricultural exporters relative to other agricultural exporters, which are not taxing agricultural emissions.

- At an economywide level, the costs to New Zealand of achieving its target by taxing agriculture (Scenario 7a) when other countries do not tax agriculture are projected to be lower than the costs incurred when agriculture is not taxed in New Zealand or elsewhere (Scenario 7). This reflects the utilisation of low cost abatement opportunities in agriculture leading to reduced purchases of emission permits.

- When agricultural emissions are not subject to the carbon tax either in New Zealand or elsewhere, and New Zealand chooses to meet its Kyoto target through domestic abatement alone (Scenario 8), the output of other emission intensive sectors, such as iron and steel and aluminium, is projected to fall by more than when New Zealand achieves its target unilaterally but applies the domestic carbon tax to agricultural emissions (Scenario 4).

Table 3: Summary of key results for New Zealand at 2010 under Scenarios 1 to 8

Scenarios	1	3	4	5	6	7	7a	8
Emissions results (Mt of CO_2e)								
Reference case emissions	77.9	83.1	83.1	88.2	88.2	83.1	83.1	83.1
Sink credits	18.2	14.2	14.2	8.4	8.4	14.2	14.2	14.2
Emissions target	60.9	60.9	60.9	60.9	60.9	60.9	60.9	60.9
Required abatement	-1.1	8.0	8.0	18.9	18.9	8.0	8.0	8.0
- Abatement undertaken	4.8	5.1	8.0	5.5	18.9	2.6	6.4	8.0
- Quota purchases	-5.9	2.7	0.0	12.9	0.0	5.2	1.4	0.0
- CDM credits	0.0	0.2	0.0	0.6	0.0	0.2	0.2	0.0
Macroeconomic variables (per cent difference relative to the reference case at 2010 - unless otherwise stated)								
GDP	-0.02	-0.02	-0.05	-0.03	-0.24	-0.04	-0.04	-0.19
GNP	0.05	-0.03	-0.04	-0.11	-0.25	-0.09	-0.07	-0.16
Exports	-0.52	-0.40	-0.78	-0.24	-2.20	0.05	-0.54	-0.26
Imports	-0.34	-0.39	-0.71	-0.45	-2.15	-0.12	-0.60	-0.37
Emissions reduction	-6.1	-6.2	-9.7	-6.2	-21.5	-3.1	-7.7	-9.7
Carbon tax ($NZ / t of CO_2e)	10.4	10.4	17.8	10.4	51.1	13.0	13.0	67.1
Quota income ($NZ million)	61.0	-27.9	0.0	-134.5	0.0	-68.2	-18.1	0.0
Output (per cent difference relative to the reference case at 2010)								
Dairy products	-2.6	-2.5	-4.3	-2.3	-13.4	0.0	-2.9	-0.8
Meat products	-1.1	-1.1	-2.4	-0.9	-9.0	0.2	-2.0	0.7
Cattle	-1.5	-1.5	-2.9	-1.4	-9.1	0.2	-2.3	0.6
Raw milk	-2.2	-2.1	-3.7	-1.9	-11.5	0.0	-2.6	-0.4
Wool	-6.4	-6.6	-12.6	-6.6	-30.0	0.2	-11.5	0.9
Electricity	-0.7	-0.6	-0.9	-0.5	-1.8	-0.9	-0.6	-2.9
Iron and steel	-2.9	-2.7	-4.5	-2.5	-10.0	-4.4	-2.9	-18.4
Primary aluminium	-3.6	-3.5	-6.2	-3.6	-17.5	-4.3	-4.3	-21.9
Light manufacturing	0.3	0.4	0.7	0.5	2.4	0.3	0.8	1.0
Services	0.2	0.1	0.2	0.1	0.6	0.0	0.2	0.3
Exports (per cent difference relative to the reference case at 2010)								
Dairy products	-3.1	-2.9	-5.1	-2.7	-15.7	0.0	-3.5	-0.8
Meat products	-1.8	-1.7	-3.7	-1.4	-13.7	0.4	-3.2	1.2
Wool	-16.8	-17.4	-33.2	-17.7	-76.2	0.3	-30.7	1.3
Iron and steel	-6.5	-6.5	-11.1	-6.5	-26.3	-9.6	-7.6	-37.5
Primary aluminium	-3.6	-3.5	-6.2	-3.6	-17.5	-4.3	-4.3	-21.9
Light manufacturing	0.5	0.8	1.5	1.0	5.0	0.5	1.5	2.1

Note: Scenario 2 is not reported as New Zealand does not require a carbon tax in this scenario.