



New Zealand's 2020 emissions target negotiations

Impact on the Māori economy

Final report to Ministry for the Environment

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Preface

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Authorship

This report has been prepared at NZIER by John Ballingall and Chris Schilling and reviewed by Jean-Pierre De Raad.

8 Halswell St, Thorndon
P O Box 3479, Wellington
Tel: +64 4 472 1880
Fax: +64 4 472 1211
econ@nzier.org.nz
www.nzier.org.nz

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Key points

The Māori economy

- The Māori economy is different to the New Zealand economy. It revolves more around the primary sector (especially agriculture, forestry and fishing) than the New Zealand economy as a whole. As a result, the Māori economy is more than twice as exposed to global competition as the broader New Zealand economy.

Impacts of a carbon price on the Māori economy

- The **macroeconomic impact on the Māori economy of an emissions trading scheme (ETS) with free allocation is much the same as the impact on the broader New Zealand economy**: the Māori economy would be around 1.0% smaller by 2025 than it would otherwise have been. The largest adjustment costs at an industry level are mitigated by free allocation.
- In the short run, only the fishing sector is likely to experience any significant employment impact in the Māori economy. Overall, **Māori employment is unlikely to change substantially**.
- In the long run, our modelling framework assumes that Māori employment levels will not change. If jobs are lost in parts of the economy that contract under an ETS, we assume that – over time – workers are able to find new jobs in sectors that expand. In this framework, there may be some downward wage pressure for Māori as a result of the economy growing slightly less quickly.
- The **ETS will also have some impacts on Māori asset values**, particularly in the agriculture and forestry sectors, in which Māori have strong ownership interests. These effects are difficult to model, especially for forestry land. However, it would be expected that as the carbon price rises, there would be an incentive for forestry owners to plant new trees and delay harvesting existing forests. The impacts of an ETS on agricultural land prices will vary by land type. Agricultural land that is unable to be converted may see its value fall as agricultural production decreases following the introduction of a carbon price. However, marginal Māori farming land that may be more profitably converted into forestry at a high carbon price will likely see its value increase.

Impacts of changes in AAUs on the Māori economy

- New Zealand is intending to commit to a new 2020 emissions target as part of the next phase of international climate change negotiations. Meeting this target can be achieved through a combination of domestic emissions reductions, forestry sinks and purchasing offshore emissions permits to fund the 'emissions deficit' (the gap between what we reduce onshore and our target).
- The size of New Zealand's emissions deficit will be largely determined by the number of Assigned Amount Units (AAUs) we receive following the negotiations.
- Because AAU allocation does not directly influence the price of carbon that firms and industries face, **there is little direct impact on Māori business activity and income (or GDP) from different emissions targets**.

- However, the purchase of emissions permits to meet our target does come with a cost. More resources are required to generate additional export revenue to pay for the permits. This means that **households have fewer resources for spending, which makes us worse off** as a country (our 'welfare' falls).
- The welfare implications of a more stringent target (or fewer AAUs) are similar across the Māori and New Zealand economies. **Fewer AAUs reduces welfare across both the Māori and New Zealand economy. A more stringent target does not disproportionately impact on Māori.** In all cases the Maori economy is expected to be better off in 2020 than it is at present.

Impact of land use and forestry rule changes on the Māori economy

- Changes in land use and forestry rules resulting from international climate change negotiations are likely to have a larger impact for Māori than changes in New Zealand's AAUs.
- Changes to forestry rules that allow easier conversion to higher value land uses or that delay the emissions liability associated with harvesting forests are likely to have a positive impact on the Māori economy, given the relatively high proportion of Māori assets in the forestry sector.
- Given the potentially large amount of Māori land that could be converted from pre-1990 forest land to higher value uses, **any international climate change rule change that makes conversion more economically feasible could deliver significant increases in the income associated with Māori forestry land.**
- At current prices and productivity levels, each additional hectare of forestry land converted to dairy production (for example) could generate around \$4,500 of additional output per year.
- Such a rule change would also increase the land value of pre-1990 forests, thus improving Māori asset values.

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1. Objective of report

The Māori economy is different to the New Zealand economy as a whole, in terms of its industry composition, the value of its assets, its geographical concentration, its labour market and various other factors. This report examines the potential impacts of New Zealand's 2020 negotiating position on the Māori economy, with a focus on how changes to New Zealand's Assigned Amount Units (AAUs) allocation will impact on Māori industry output, employment and households. It also highlights the importance of land use and forestry rule changes that will be negotiated as part of the successor to the Kyoto Protocol.

2. Background

In the lead-up to the United Nations' Climate Change Convention Council of the Parties (COP15) meeting in Copenhagen in December 2009, New Zealand will be preparing its negotiating position for the post-2012 international climate change agreement. If an international agreement similar to the Kyoto Protocol is achieved at Copenhagen, New Zealand will be responsible for all emissions above its AAU allocation. It is the level of this AAU allocation (our "2020 emissions target") and the rules associated with this that New Zealand's negotiators will be focusing on.

The 2020 emissions target can be met through a combination of two channels:

- (i) Domestic emissions reduction through changes in production processes and the composition of the economy including changes in forestry.
- (ii) Purchasing emissions permits from overseas to meet any shortfall between our domestic emissions reductions and the target (our "emissions deficit").

The balance between these two channels, and the resultant effect of any given target on the New Zealand economy, will be determined by a number of factors including:

- The number of AAUs that New Zealand is allocated.
- The world price of carbon.
- International rules, particularly around the role of forestry and other land-use issues.
- Domestic policy settings.

Previous work by NZIER and Infometrics has examined these factors for the New Zealand economy as a whole.¹

¹ NZIER and Infometrics. (2009b). *Macroeconomic impacts of climate change policy: Impact of Assigned Amount Units and International Trading*. Report to Ministry for the Environment, July 2009.

Clearly different parts of the New Zealand economy will be affected in different ways by the outcomes of the Copenhagen meeting, both in terms of the 2020 emissions target negotiated and changes to rules around land use. The impacts will not be uniform across all sectors and regions. This report draws out the implications of this for the Māori economy.

Our approach is to interpolate our economy wide results to the Māori economy, based on what we know about the industry composition of the Māori economy relative to the New Zealand economy as a whole, and our existing industry modelling results. This allows us to present some indicative estimates about which parts of the Māori economy are likely to experience substantial impacts from a carbon constrained future.

Our focus then turns to the marginal changes to the Māori economy that might result from the outcomes of the international climate change negotiations.

Note that this report does not purport to be a definitive quantitative assessment of the impacts of domestic climate change policy on the Māori economy. That is, we do not use economic modelling to examine how the implementation of an Emissions Trading Scheme (ETS) would affect the Māori economy. Incorporating the Māori economy into our modelling framework was outside the scope of this research.

Domestic and international climate change policy outcomes can affect the Māori economy in two main ways:

- (i) **Income effects** as the productive capacity of the Māori economy (i.e. the amount of goods and services it produces) changes in response to a carbon price. Other things equal, the introduction of a carbon price will generally make a firm less competitive, which reduces demand and hence incomes (depending on the price elasticity of demand).
- (ii) **Wealth effects**, as the value of Māori assets, and particularly land prices, change following a carbon price and possible land use and forestry rule changes. The introduction of a carbon price will alter the likely future stream of income generated by Māori assets, which will affect the price of these assets.

We discuss both effects in this report.

3. How is the Māori economy different?

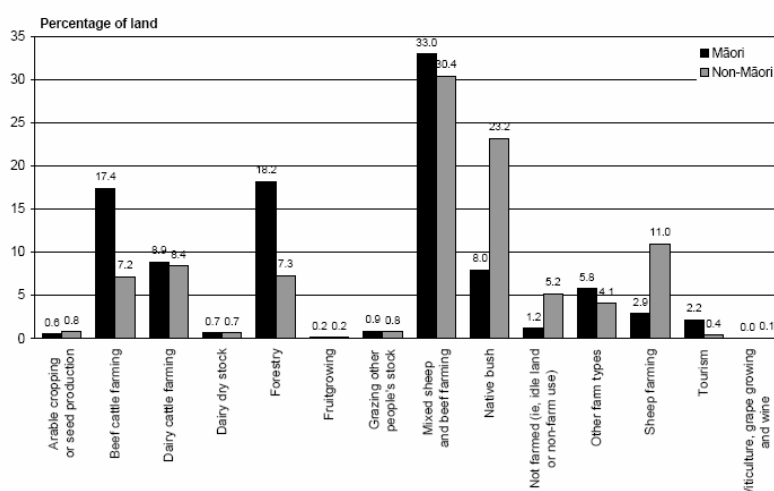
A number of research reports have examined the Māori economy and how it differs from the New Zealand economy as a whole.² There is a dearth of official statistics on this subject, and what is available is often at a fairly aggregated level, particularly in terms of Māori interests in the primary sector.

² NZIER (2003, 2005a, 2005b, 2007), NZIER and TPK (2007), TPK (2008).

The key conclusions from these reports that are salient to this analysis of climate change policy and the Māori economy are:

- The Māori economy (in terms of goods and services produced) accounts for around 2.0% of the New Zealand economy.³ Its structure (at least in employment terms) is different to the New Zealand economy as a whole, as shown in Figure 2.
- The Māori asset base was estimated to be around \$16.5 billion in 2005/06 or around 1.5% of New Zealand's total commercial asset base. The Māori asset base is centred on agriculture, forestry and fishing (around one-third of the total) and property and business services (one quarter of the total).⁴
- Māori account for around 7.4% of New Zealand's total agricultural output and control up to 37% of New Zealand's domestic fishing quota. A relatively high proportion of Māori land is in emissions-intensive beef and mixed sheep/beef farming (see Figure 1). Māori are well engaged in the horticulture sector, particularly in the wine and kiwifruit sectors.

Figure 1 Māori and non-Māori agricultural land use
% of land



Source: 37 Degrees South and Cognitus (2008)

- Māori interests in forestry *production* are not yet significant. Māori are estimated to own around 10% of the land on which New Zealand's forestry estate is situated, but their role in managing that land and generating income streams from their assets is relatively low.⁵ In the future it is likely that Maori interests in forestry production will be more significant.

³ The definition of the Māori economy used in this report covers all those businesses and transactions where 'Māoriness' matters. It includes the activities based on collectively-owned Māori assets, the businesses of the self employed who identify as Māori, commercial transactions involving Māori culture, services oriented to specific Māori needs, as well as the housing owned by Māori (NZIER, 2003, p.2).

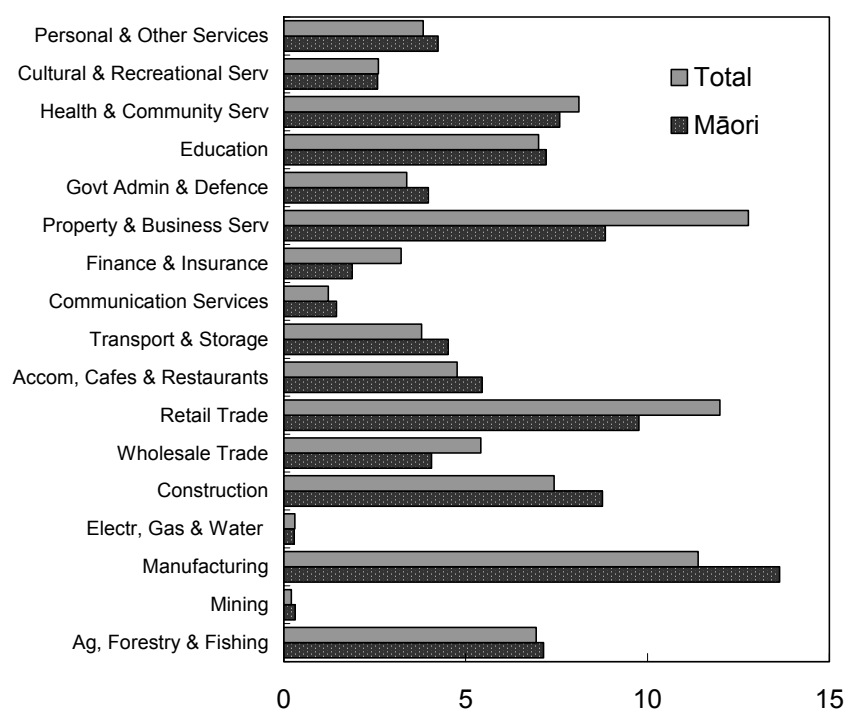
⁴ Asset data is not available at a disaggregated level, so we are unable to determine the split between agriculture, forestry and fishing, even though they are quite distinct sectors.

⁵ This distinction between wealth effects and income effects is important when considering the impacts of climate change policy, as explained later in this report. Note however, that "Only limited, incomplete and sometimes contradictory or obviously deficient data is available on the

- Māori also have important interests in commercial and residential property investment, broadcasting services, tourism, creative and cultural services ('film, fashion and food'), education and health and geothermal energy.
- The growth of the Māori economy is more volatile than the New Zealand economy as a whole, primarily due to its reliance on commodity markets and the inherent fluctuations associated with these markets.
- The Māori economy is more trade-exposed than the New Zealand economy as a whole, for the same reason. The Māori economy accounted for 2.5% of New Zealand's exports, compared to 1.4% of output.
- The industries in which Māori are employed are shown below in Figure 2. The industries in which Māori are over-represented (relative to the total population) include Manufacturing and Construction; and to a lesser extent, Accommodation, Cafés & Restaurants, and Transport & Storage.
- Māori are under-represented in Property & Business Services, Finance & Insurance; and to a lesser extent Wholesale Trade and Retail Trade.

Figure 2 Māori employment by industry 2006

Percent of total employment



Source: NZIER calculations from Statistics New Zealand 2006 Census

Based on the statistics presented above, and 37 Degrees South and Cognitus (2008), the sectors of the Māori economy that we focus on in this report are summarised in Table 1.

nature and extent of Māori asset ownership. Of particular note is the understatement of Māori forest land ownership in certain key data sources, as well as the absence of published data detailing Māori and non-Māori interests in pre-1990 and post-1989 forests. The absence of such data weakens the conclusions that this analysis can reach regarding the ETS's impacts on different Māori forestry interests" (37 Degrees South and Cognitus, 2008).

Table 1 Sectors of Māori economy to consider

Sector	Likely channels through which affected by domestic and international climate change policy
Forestry	Asset values; harvesting income; conversion possibilities
Agriculture	Land prices; trade exposure
Fishing	Fuel prices; trade exposure
Primary processing	Trade exposure
Geothermal energy	Energy substitution
Property	Wealth effects
Health and education	Energy prices
Households	Energy prices

Source: NZIER

4. Domestic climate change policy

This section summarises the potential impacts of domestic climate change policy (an ETS with free allocation) on the New Zealand economy and the Māori economy, and highlights any key areas of difference.

Section 5 then examines how international climate change policy negotiations (New Zealand's emissions target, AAUs and land use and forestry rule changes) might affect the Māori economy.

4.1 Key results from New Zealand research

In NZIER and Infometrics (2009a), we investigated the macroeconomic impacts of domestic climate change policy on the New Zealand economy. We found that in the long run:

- The New Zealand economy will continue to grow after adopting domestic climate change policy. However any policy will reduce the level of growth: under a business-as-usual scenario with no domestic climate change policy, we expect welfare⁶ to grow from \$38,500 per capita to around \$56,000 by 2025. With a policy that imposes a price on carbon of \$100/tonne this would fall to about \$54,000 per capita.⁷
- Because of New Zealand's unique emissions profile, where almost half of domestic emissions are generated in the production of agricultural goods that are traded internationally, action by the rest of the world is particularly important. The domestic impact of a price on carbon on the New Zealand economy is reduced by around a half if our international competitors face the same carbon pricing.

⁶ Welfare in an economics sense is a measure of household living standards.

⁷ In NZIER and Infometrics (2009b), the BAU welfare figures are estimated for 2020 (\$49,000) instead of 2025. Equivalent figures for Māori RGNDI are not available.

- Free allocation to competitive-at-risk industries can reduce New Zealand's welfare losses by protecting industries from unequal international playing fields (i.e. when our competitors don't price carbon to the same extent that we do). RGNDI⁸ improves marginally from -2.3% without free allocation to -2.2%. GDP improves significantly from -2.4% to -1.1%.

We concluded that in the short run there is little significant difference between the government meeting its international obligations through general taxation, imposing a price on carbon on all sectors, or via a narrow scheme that excludes some sectors. In the long run, when the rest of the world also takes action to price carbon and technological change reduces the cost of abatement, a broad emissions pricing scheme such as an ETS is the most efficient way of meeting our obligations. At higher carbon prices, taking domestic action in the form of a price on carbon is worthwhile in any circumstance. Given the likelihood of global moves towards carbon pricing, and the importance for firms of having a clear price signal on which to base investments, it also makes sense for a carbon price to be introduced in the New Zealand economy, with appropriate flexibility to shield competitive-at-risk sectors.

4.2 Implications for the Māori economy from a carbon price

The Māori economy as a whole

Under an emissions trading scheme with a carbon price of \$100 and free allocation to competitive-at-risk industries, we find the New Zealand economy suffers a 2.2% decrease in welfare (measured by RGNDI) and a 1.1% loss in GDP by 2025, relative to a Business As Usual (BAU) scenario with no carbon pricing.

Interpolating out these results to the Māori economy, using the industry composition of the Māori economy relative to the New Zealand economy, we find that the Māori economy will be impacted at much the same rate as the New Zealand economy as a whole, with GDP contracting by 1.0%.

⁸ See appendix for a discussion on the differences between RGNDI and GDP.

Table 2 Industry impacts on GDP

Industry	Industry impact (% change on BAU)	Contribution to GDP	
		Māori Economy	NZ Economy
Agriculture	-0.7	16%	6%
Forestry	0.5	1%	1%
Fishing	-0.6	5%	0%
Comm. Property	-1.0	27%	3%
Education	-1.2	13%	4%
Health	-2.1	8%	6%
Cultural and Rec services	-0.5	2%	2%
Other	-0.9	27%	78%
Weighted Total GDP		-1.0%	-1.1%

Source: NZIER

Previous modelling work (NZIER, 2008, page 28) of an ETS based on a \$40 carbon price with free allocation indicates that in the short run to 2012, employment would be around 1% lower than in the BAU scenario. There would be around 22,000 fewer jobs across the economy. In the sectors of most interest to Māori, the modelled employment changes in the short run are as follows:

- Sheep and beef farming: -0.8%
- Dairy farming: -0.5%
- Forestry and logging: -0.3%
- Fishing: -3.5%
- Meat processing: -0.4%
- Dairy processing: -0.1%
- Timber and wood products: 0.0%
- Paper and paper products manufacturing: +0.6%
- Property and construction services: -0.3%

Of these sectors, only fishing is expected to experience any significant drop in employment in the short run. The rest of the industry employment changes are smaller than the average across the economy as a whole, which suggest that providing free allocation is in place, the aggregate impact of an ETS on Māori employment in the short run is unlikely to be significant, and will not be disproportionate to the rest of the New Zealand economy.

In our modelling framework, we assume full employment across the economy in the long run. Employment can shift between industries as they contract or expand, but the overall level of employment does not change. This is a standard 'closure' for long run general equilibrium modelling: we essentially assume that if workers lose their jobs in one sector, once they have time to adjust, they can find jobs elsewhere in the

economy. This assumption may be appropriate over a long period of time, but there may be adjustment costs in the interim. Our model does not pick up these costs.

If the size of the economy shrinks relative to what would otherwise have been the case, as in the modelling results presented above, the lower demand for labour is reflected through lower wages. Across the economy as a whole, an ETS with free allocation and a \$100 carbon price is expected to result in the average wage being around 5% lower in 2025 than would otherwise have been the case (NZIER and Infometrics, 2009b). We would expect a similar outcome for Māori workers.

Drawing on our previous modelling results extrapolated to the Māori economy and examining previous research such as 37 Degrees South and Cognitus (2008), we now look at the impact of domestic climate change policy on the important industries to the Māori economy, as per Table 1.

Forestry

Approximately 439,000 hectares (36% of all pre-1990 exotic forest land) is estimated to be currently owned by Māori (including the exotic forest land transferred under the recent Central North Island settlement). This could potentially increase to over 750,000 hectares (62.5% of all pre-1990 forest land) as Treaty claims on the remaining land under Crown Forestry Licences are settled and the land transferred to Māori (MfE, 2009).

For pre-1990 land, any deforestation (removing trees and shifting to another land use) will result in the surrender of carbon credits (New Zealand Units), unless the land is replanted or left to regenerate back into forest.⁹ The ETS will not apply to pre-1990 indigenous forestry. Pre-1990 forestry land values may be reduced after the introduction of the ETS, relative to a scenario with no carbon pricing, as conversion options are made less valuable 37 Degrees South and Cognitus (2008). However, this impact depends crucially on what alternative options are available for this pre-1990 forestry land. If forestry is on marginal land that is unlikely to have higher value alternatives the impact of the ETS is likely to be minimal.

Māori also own about 260,000 hectares of land that could be used as Kyoto compliant forestry (post-1989 forest land). The owners of forests planted post-1989, including Māori, can voluntarily choose to enter the ETS. Owners will earn carbon credits as these trees grow, but will surrender them when they are harvested or burnt down. This is likely to create opportunities for value-enhancing sequestration activities if Māori choose to enter their forests into the ETS. Partially offsetting this potential benefit is the potential for log prices to fall in the medium term as the supply of timber increases due to less deforestation and increased planting, and the potentially high transaction costs and land use constraints related to Māori forestry land (37 Degrees South and Cognitus, 2008).

⁹ There are some exceptions for pre-1990 exotic forests in the ETS, as outlined in MfE (2008).

Around 60,000 hectares of post-1989 Māori forest land is already planted in exotic forest (approximately 10% of all post-1989 forest land). The remaining 200,000 hectares of Māori land is currently marginal farm land which could be used for carbon farming (MfE, 2009).

With the ability to sequester carbon, forestry is likely to be significantly impacted by a price on carbon. However there are difficulties in modelling forestry's response to a carbon price. The Ministry for Agriculture and Forestry (MAF, 2009a) suggest that, assuming long term policy certainty, a \$20 carbon price could theoretically induce up to 100,000 hectares of new planting per year up to 2020, and prolong rotation lengths. Collectively, this would increase New Zealand's emissions sequestration by up to 30Mt in 2020 (although emissions would increase at a later date if/when the forests are harvested).

Agriculture

Table 2 shows that agriculture contributes 16% of the Māori economy, compared to 6% for New Zealand as whole. Agriculture contributes almost half of New Zealand's domestic emissions and is therefore likely to be impacted by any domestic climate change policy. We expect agricultural production to decrease.

However in 2020 we assume that agriculture will be receiving some level of compensation in the form of free allocation of emissions units. Our modelling shows that such free allocation will largely protect agricultural industries from competitiveness-at-risk issues on the international market. As a result, agriculture contracts by *less* than the wider economy under an ETS with free allocation.

In this case, Māori are not disadvantaged by having a large dependence on agriculture.¹⁰ Our previous modelling indicates that agricultural output will fall by around 0.7% under an ETS with free allocation and a \$100 carbon price. We would expect emissions-intensive agricultural sectors such as beef farming, in which Māori have a relatively high proportion of their agricultural land, to experience larger production decreases.

The impacts of an ETS on agricultural land prices will vary by land type. Agricultural land that is unable to be converted may see its value fall as agricultural production decreases following the introduction of a carbon price. However, marginal Māori farming land that may be more profitably converted into forestry at a high carbon price will likely see its value increase.

Fishing

Fishing is negatively impacted by a domestic emissions trading scheme, primarily through increased fuel prices. We expect GDP in the fishing sector to fall by 0.6%, relative to a scenario with no emissions price. This is less likely to affect deepwater

¹⁰ The level of aggregation in the Maori economy data prevents us from making more definitive comments.

fishing as vessels may be able to source fuel from countries without a carbon price (37 Degrees South and Cognitus, 2008). As with agriculture, the fishing sector actually contracts by less than the economy as a whole under an ETS with free allocation. Since the Māori economy is more reliant on fishing than the New Zealand economy as a whole, this delivers a relatively positive outcome for the Māori economy.

Primary processing

Dairy and meat processing are particularly negatively impacted by the ETS as modelled: GDP falls by around 2.5% and 1.0% respectively. This is due to both increased energy costs and increased agricultural primary input costs (as dairy and sheep and beef farmers are impacted by the ETS). Note that without free allocation, the impacts would be significantly worse.

In contrast, the wood processing and pulp and paper sectors should expand under an ETS due to an increased supply of timber as lower deforestation and higher rates of new planting take place.

Geothermal energy

Māori interests in geothermal electricity generation are likely to benefit from an ETS. They will enjoy windfall profits once electricity prices rise following the introduction of a carbon price (37 Degrees South and Cognitus, 2008). They may also benefit from firms switching from non-renewable energy source to renewables such as geothermal.

Property

Māori have strong interests in commercial and residential property. In our modelling framework, the fortunes of the property sector generally follow trends in the wider economy. A growing economy means more investment and therefore growth in property and construction. Under the ETS, the economy grows slightly less rapidly. This results in a mild slow down in investment and therefore property and construction. The industry also faces higher energy costs and costs of emissions-intensive inputs such as concrete. Overall though, the property sector is not expected to be any more negatively affected by an ETS than the economy as a whole. Consequently Māori are not disadvantaged by the high contribution that property makes to the Māori economy.

Health, education and cultural services

Education and cultural services are also significant contributors to the Māori economy. These sectors are not directly impacted by climate change policy because they are not significant emitters. However they are affected by government and private spending, which in turn is impacted by climate change policy. Under an ETS the government diverts revenue away from providing public services to purchasing emissions permits. Lower household wages result in slightly less consumer demand

for education and cultural services. As such, these industries largely follow the economy-wide trends.

As the health industry is relatively energy-intensive, it is more negatively impacted than education and cultural services, due to rises in the price of electricity. This is likely to be a net negative for Māori, as health is a relatively large sector of the Māori economy.

Households

The ETS is likely to lead to higher electricity and energy costs for households once the stationary energy sector enters the scheme in 2010 and the transport sector enters in 2011. The average household electricity bill will increase by around 5% and fuel prices may rise by 7% (MfE, 2008). Given that – on average – Māori households have lower incomes than non-Māori households, and tend to spend a greater share of their income on electricity and fuel (37 Degrees South and Cognitus, 2008); their impact may be felt more acutely by Māori.

Financial assistance could be provided for low-income households to help them adjust to these higher costs. Other programmes such as the Household Insulation Fund will assist with improving the energy efficiency (and thus reducing energy costs) of households. Higher energy and fuel prices will also filter through to the general price level of goods and services in the economy. The effects of this inflation can be mitigated by the inflation indexation of wages and benefits (37 Degrees South and Cognitus, 2008).

5. International negotiations and 2020 targets

The section above considered the impacts of domestic climate change policy on the Māori economy, and found that in aggregate the Māori economy is unlikely to be more negatively affected than the economy as a whole.

However, we also need to consider how international climate change agreements, and the rules contained within such agreements, might affect the Māori economy. The key elements that we consider are changes to New Zealand's AAUs (its 2020 emissions target) and – more importantly for the Māori economy – possible changes to land use and forestry rules.

5.1 Key results from New Zealand research into AAUs

In NZIER and Infometrics (2009b), we investigated the marginal impact on the New Zealand economy of greater or fewer AAUs. We found:

- AAUs impact the welfare of New Zealand: a larger number of AAUs increases our welfare, while fewer reduces our welfare.¹¹

¹¹ 'Welfare' in this context is a measure of how well off we are as a nation.

- But AAUs do not directly impact domestic emissions reductions. Instead, a more stringent allocation of AAUs means that we must purchase more emissions permits from other countries.
- It is the domestic policy framework and the price of carbon that directly determines the impact of climate change policy on domestic emissions and domestic firms, rather than the level of AAUs.
- The channel through which changes in AAUs affect the New Zealand economy is through a change in offshore payments for permits.
- Buying these permits to fund our emissions deficit comes at a cost. Additional resources are directed towards exporting, making fewer available for household spending. This changes the composition of New Zealand's GDP, but affects its level to a lesser degree.
- The main economic cost is on national economic welfare (living standards): lower household consumption equates to lower welfare.

5.2 Implications for the Māori economy from AAUs

The key results from the New Zealand research flow logically to the Māori economy. A more stringent 2020 target (or fewer 2020 AAUs) will impact on the *welfare* of the Māori economy. However because AAU allocation does not directly influence the price of carbon that firms and industries face, there is little direct impact on Māori business activity and income (or GDP).

Somewhat counter-intuitively, fewer AAUs results in more exporting activity, as resources are diverted away from household consumption in order to generate more export revenue to fund our emissions deficit through purchasing offshore permits. The Māori economy is heavily represented in New Zealand's exporting industries such as agriculture, and so benefits from this shift.

However the resources required to generate additional exports must come from elsewhere in the economy. There is a substitution away from household spending as a result. This reduces welfare, as households can buy fewer goods and services. The overall welfare losses outweigh any gains from additional exports, meaning that a stricter target makes the Māori economy worse off. In all cases however, the Maori economy is expected to be better off in 2020 than it is at present.

Our analysis therefore suggests that the welfare implications of a more stringent target (or fewer AAUs) are likely to be similar across the Māori and New Zealand economies. That is, fewer AAUs reduce welfare consistently across both the Māori and New Zealand economy.

There is an important caveat. We have noted that marginal AAUs do not impact directly on the productive side of the economy. However with fewer AAUs, the government must raise more revenue to purchase extra emissions permits from other countries. We have assumed, in line with previous modelling exercises, that this revenue is generated from increases in income tax rates. Our conclusions would be altered if the burden of such taxation fell disproportionately on Māori.

5.3 Changes in other land use and forestry rules

New Zealand's 2020 emissions target will not be negotiated in isolation. Other aspects of the next stage of an international climate change agreement will also be negotiated at the same time, including possible changes to international rules on land use and forestry. These rules have the potential to significantly impact the Māori economy, and in particular the Māori forestry sector.

At the time of writing, the likely negotiating outcomes on land use and forestry rules are unclear. However, some potential changes include the following.

Land Use Flexibility

Under current rules, pre-1990 forests carry a liability if they are removed and converted to another purpose, such as dairy farming. A potential rule change will allow the liability for deforesting to be avoided if equivalent new planting to what was deforested takes place somewhere else. If the new planting is on marginal land that would otherwise be put to low value uses, and the deforested land is put to a higher value use, this will deliver an economic benefit (in terms of more production of goods and services – and hence income generation) for forestry owners, including Māori.

By way of illustration, forestry land could be converted into dairy farming. The average dairy farm produces 873 kg of milk solids per hectare (Dairy New Zealand, 2008). At a price of \$5 per kg, each additional hectare of dairy land would generate around \$4,500 of additional income.¹²

There is little information about what Māori land currently under forest could be economically converted to agriculture. The CNI Iwi Collective has advised that it intends to convert about 30% of its 176,000 hectares to agriculture. Ngai Tahu has indicated in a submission to the select committee which considered the Climate Change Response (Emissions Trading) Amendment Bill 2008 that up to 41,000 ha could be converted to a higher land use over time (MfE, 2009).

Overall MAF estimates that about 38% of pre-1990 forest land owned by Māori has sufficient carrying capacity to be converted to a higher best use such as agriculture. However the actual proportion converted may be much lower than this and will be dependent on a range of factors such as the location, access to water and conversion and infrastructure costs.

Given the potentially large amount of land that could potentially be converted from pre-1990 forest land to higher value uses, any international climate change rule change that makes conversion more economically feasible could deliver significant increases in income associated with Māori forestry land. Such a rule change would also increase the land value of pre-1990 forests, thus improving Māori asset values.

¹² The net benefit would need to take into account the cost of conversion and replanting, although this is likely to be low, relative to the additional income generated by the conversion.

The Emissions to Atmosphere (ETA) Proposal for harvested wood products

This rule change (proposed by New Zealand) would spread the liability for emissions from harvesting post-1989 plantation forests more evenly through time. When manufactured wood products are derived from harvested forestry, their emissions enter the atmosphere with a lag – they don't enter immediately upon harvest. For some uses of harvested wood products, this delay can be decades after the date of harvest.

If successfully negotiated, this rule change would provide a net benefit to Māori forest owners. While the total liability associated with post-1989 forests would not change, its time profile would. The liability will be lower in the short term, while harvested wood products are being manufactured and distributed. In the longer term, the emissions will still enter the atmosphere and the liability will be realised.¹³ Because the liability is pushed out for a number of years, its net present value decreases, which decreases the burden on Māori forestry owners.

6. Conclusions

On aggregate, the impact of an emissions trading scheme with free allocation to competitive-at-risk industries on the Māori economy is much the same as on the New Zealand economy. The Māori economy would be around 1.0% smaller by 2025 than would otherwise have been the case, but will be significantly larger than at present.

The Māori economy is twice as exposed to global forces as the broader New Zealand economy. Free allocation is thus more important to Māori than to the New Zealand economy as a whole.

Our analysis indicates that changes to New Zealand's 2020 emissions target are unlikely to have any material impact on the productive side of the Māori economy. This is because the number of AAUs allocated to New Zealand will have no discernable impact on the domestic price of carbon. It is the domestic price which drives domestic emissions reductions (and hence changes in production behaviour and income).

However, a more stringent target *is* likely to have some impacts on the aggregated welfare of the Māori economy and hence the living standards of Māori households. A tougher target results in the New Zealand economy (and hence the Māori economy) having to generate more export revenue to pay for offshore emissions permits. The resources required to generate this additional income are then unavailable for household consumption, which makes households 'worse off'. We would not expect Māori households to be significantly more worse off than non-Māori households.

¹³ Assuming a 28 year harvest cycle this rule change is estimated to reduce New Zealand's emissions by about 8.8 Mt in 2020. At a carbon price of \$100, this is an initial 'saving' of \$880 million. Between about 2018 and 2030 the average annual reduction in New Zealand's emissions is estimated to be about 8.3 Mt, although emissions are estimated to subsequently increase from the early 2030's until the mid 2040's as a result of this rule change.

Potentially more significant impacts may result from changes in international land use and forestry rules. If these rules are negotiated successfully from New Zealand's perspective, they are likely to deliver a net economic benefit to Māori, through improved opportunities for converting forestry to higher value uses, and a delay in the realisation of liabilities associated with harvested wood products.

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Appendix A Real gross national disposable income (RGNDI)

In our view, the most appropriate economic welfare measure for analysing the impacts of an ETS is Real Gross National Disposable Income (RGNDI). RGNDI measures the total incomes New Zealand residents receive from both domestic production and net income flows from the rest of the world (Statistics New Zealand, 1999), and adjusts for changes in the terms of trade.

This is particularly pertinent for the analysis of policies to meet our Kyoto obligation, which will include a lump-sum offshore payment for excess emissions over our Kyoto allowance. RGNDI includes these effects in contrast to the GDP metric which provides an indicator of domestic production but does not capture the impact of international transfers and investment income.