



# Climate change business opportunities for Māori land and Māori organisations

MPI Technical Paper No: 2012/43

Prepared for the Ministry for Primary Industries  
by Landcare Research (Contract C09X0901)  
June 2010

ISBN No: 978-0-478-40460-9 (online)  
ISSN No: 2253-3923 (online)

November 2012

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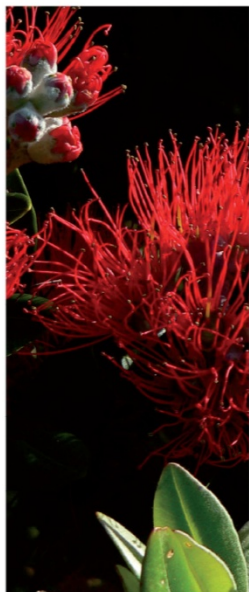
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## Sustainable Land Management Mitigation and Adaptation to Climate Change (SLMACC)

FRST Contract: C09X0901



**Landcare Research**  
Manaaki Whenua



# **Climate change business opportunities for Māori land and Māori organisations**

## **Sustainable Land Management Mitigation and Adaptation to Climate Change (SLMACC)**

**FRST Contract: C09X0901**

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LC0910/157

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# Contents

Summary .....	v
1 Introduction .....	1
1.1 Background .....	1
1.2 This project.....	1
2 Climate change adaptation and mitigation .....	3
2.1 Climate change – what is it? .....	3
2.2 Adaptation and mitigation .....	4
2.3 International and domestic trends .....	5
3 Methods.....	9
4 Findings.....	12
4.1 Understanding Māori land .....	12
4.2 Māori land characteristics – GIS analyses.....	19
4.3 Key business opportunities for Māori land.....	32
4.4 Critical success factors for uptake of business opportunities .....	33
4.5 Māori landowner views, preferences and priorities.....	35
4.6 Key climate change business opportunity themes .....	36
5 Discussion .....	41
6 Conclusions .....	44
7 Māori recommendations .....	48
8 Acknowledgements .....	50
9 References .....	51
10 Appendices .....	57
Appendix 1 Table of climate change opportunities and principal group to benefit .....	57

## List of Tables and Figures

Table 1 Databases, information/data sets/types and sources used in this SLMACC project .....	11
Table 2 Type of Māori organisation who participated in survey and questionnaire.....	11
Table 3 Governance structures for Māori Land (under Te Ture Whenua Act) for New Zealand (Durie 1998).....	13
Table 4 Māori Land Court Districts: Areas and % of Māori land (based on TPK MLIB 1998 data) .....	15
Table 5 Increasing limitations to use and decreasing versatility of use from LUC class 1 to LUC class 8 .....	20
Table 6 Land Use Capability (LUC) 1–8 area and % for Māori land (MLIB) in New Zealand compared with national averages (MLIB 2002 & NZLRI – Landcare Research New Zealand Ltd 2010)..	21
Table 7 New Zealand Māori land (MLIB 2002) and New Zealand vegetative cover types (LCDBv2 2002).....	22
Table 8 New Zealand Māori land eligible or ineligible for Kyoto forest .....	24
Table 9 Gisborne–East Coast Māori land (GEC NZLRI region) eligible or ineligible for Kyoto forest....	24
Table 10 Ranking the priority and preference for climate change opportunities 2009/2010 from highest to lowest .....	35
Figure 1 Māori Land Court districts in New Zealand.....	16
Figure 2 Māori land in New Zealand registered under the Māori Land Court at 2010 (Landcare Research GIS).....	17
Figure 3 Kyoto eligible versus ineligible Māori land in the Gisborne–East Coast region (Landcare Research GIS).....	27
Figure 4 Climate change scenarios (annual temperature change) on Māori land (grey) expected between 1980–1999 and 2030–2049 based on the AR4 NIWA model (Landcare Research GIS). .....	28
Figure 5 Climate change scenarios (annual temperature change) on Māori land (grey) expected between 1980–1999 and 2080–2099 based on the AR4 NIWA model (Landcare Research GIS). .....	29
Figure 6 Climate change scenarios (annual mean rainfall change) on Māori land (grey) expected between 1980–1999 and 2030–2049 based on the AR4 NIWA model (Landcare Research GIS). .....	30
Figure 7 Climate change scenarios (annual mean rainfall change) on Māori land (grey) expected between 1980–1999 and 2080–2099 based on the AR4 NIWA model (Landcare Research GIS). .....	31



## Summary

This project “identifying the unique features of climate change adaptation, mitigation, and business opportunities as it affects Māori owned land” follows a MAF SLMACC Request for Proposal (RFP) of the same title. Manaaki Whenua and 37 Degrees South Aotearoa, Gisborne, collaborated to carry out this work by developing a research approach for collecting and collating information, analysing data, interpreting findings, and publishing results. From July 2009 to June 2010, we worked with a number of Māori stakeholder groups including: Māori landowners, iwi/hapū, Māori businesses and organisations, Māori networks, and central Government to identify climate change opportunities for Māori owned land.

### Outcome

The intermediate outcome of the project was to: “identify the unique features of climate change opportunities, and explored and marketed opportunities, for Māori owned land” (C09X0901 contract). The contract stated, “Māori landowners will be able to use the findings of this research to understand and capitalise on unique business opportunities arising from climate change adaptation and mitigation. The research will improve the utilisation of Māori land and uptake of climate change knowledge for the benefit of Māori landowners with potential for a major contribution to regional and New Zealand economies” (C09X0901 contract). A step-by-step method was used to achieve this outcome.

### Methods

The key research question developed was: “What are the business opportunities arising from climate change mitigation and adaptation that are particularly or uniquely suitable for Māori organisations and respective business models?” To answer this question, in partnership with Māori organisations and landowners, we used an assessment framework (matrix) that guided our discussion, hui, and interview process. This was made up of four key questions:

- What are the unique features of Māori land and Māori governance?
- What level of awareness and interest is there of the emerging climate change business opportunities and, where are the perceived risks associated with these new options?
- What may be the critical success factors for uptake of the climate change business opportunities on Māori land?
- What are the preferences and priorities for these climate change opportunities from a Māori perspective, and therefore what are the priorities in terms of government action and implementation if Māori are to participate in these opportunities?

### Findings

A large number of climate change opportunities were identified in this study and all are of high interest to Māori. These were prioritised and grouped by theme. Factors used by Māori groups for prioritisation included: present knowledge, level of interest, expected economic return, perceived level of risk, degree of certainty. Highest priority was (1) carbon-forestry sinks, followed by, (2) land-use change and land-use flexibility, (3) sustainable wood products energy and renewable energy, (4) energy efficiency, biodiversity and environmental services and the lowest, (5) nutrient use and budgets, measurement technologies, anaerobic digestion, methane, and nitrous oxide abatement. Critical success factors (CSFs) for the

uptake of these business opportunities are given. The opportunities apply to all 1 515 071 ha of Māori land. Of this total, 558 000 ha (37%) were eligible for Kyoto forest, and a further 15% (230 442 ha) had potential for reversion to scrub and forest. About 46% of this Kyoto eligible land was considered marginal. Understanding Māori land characteristics and governance, building Māori capacity, and equitable access to research and innovation are critical to the participation, uptake and implementation of all these opportunities.

The study suggests that successful uptake of a number of these key climate-related business opportunities, such as new carbon afforestation and biofuels projects, could generate \$100's of millions into the rural and Māori economy and into the national economy (Insley 2010). This would provide the added advantage of creating much needed new jobs, and in the case of new projects such as afforestation and reforestation on marginal lands in the Gisborne-East Coast of the North Island, a large number of environmental and economic benefits. The climate change business opportunities presented in this study could also provide greater resilience for landscapes and communities to adapt to any increased incidence of extreme weather events.

Māori organisations and iwi with whom we worked in this study felt strongly that action should be taken in the following areas:

- There was a desire for Government to hold firm to its ETS policy platform. This was critical in the study, which identified a strong risk-aversion theme, understandable given the shifting goal post on policy in recent years. Any shift on domestic policy will create uncertainty for Māori and investors, driving them elsewhere to wherever policy certainty is more assured.
- A need to strive for binding targets by all developed and developing countries on the international stage. Until this is achieved there will continue to be a level of risk that will hinder new investment in the uptake of these new technologies.
- The unique characteristics of Māori land under Te Ture Whenua Act (e.g., collectivity) mean Government policy and initiatives should be specifically tailored to a different process and timeframe in order for Māori business to equitably engage and take up opportunities.
- To facilitate adoption and application of opportunities Government policy would need to address the capability gap between Māori and non-Māori business.
- A need to undertake a more targeted campaign – with detailed information – to inform Māori organisations of the climate change business opportunities outlined in this report (in a summarised easily understandable form)
- A coordinated and resourced approach to improving understanding Māori land potential in the context of climate change opportunities needs to be carried out.
- Māori business and iwi/hapū should have much greater access to research, technology and innovation funding required to take full advantage of climate change opportunities.
- Increased uptake of new climate change business opportunities it is essential to highlight and pay special attention to central Governments funding sources for Māori business such as TechNZ funding. Anecdotal evidence suggests a very low awareness among Māori businesses to the existence and purpose of these funds.
- To enable faster uptake by Māori of the various business opportunities emerging from climate change, central Government should consider setting up several regional pilot studies with targeted Māori businesses. Such projects would diffuse many of the risks

identified by Māori business in this study and promote collaboration across different Māori and industry sectors to create large scale collective opportunities. This would facilitate and implement new technologies and climate change business from the ground up. Individual Māori businesses would benefit greatly, as would Māori and Government across New Zealand.



# 1 Introduction

## 1.1 Background

Māori own a significant amount of land in New Zealand, an amount that is increasing markedly with the rise of Māori land holding as a result of post-Treaty settlements and commercial redress for historic Treaty claims (Waitangi Tribunal). These ongoing settlements are greatly adding to the Māori land asset base (Hui Taumata 2006; Office of Māori Affairs 2006). In 2002, the Māori economy contributed around \$700 million or 7.5% of total agricultural outputs, while the Māori commercial asset base in 2005/2006 was conservatively estimated to be worth ~\$16.5 billion (with 52% of assets concentrated in the primary sector, i.e. farming forestry, fishing, tourism) (TPK 2002, 2008 p.1, 2009; NZIER 2003; Whitehead & Annesley 2005). Climate change impacts will be a challenge for Māori, given the economic concentration of business in the primary sector and its reliance on the agricultural-biological economy (TPK 2008, 2009). There needs to be a shift in perception of climate change as a business burden to climate change as a business opportunity (SKM 2008).

The term ‘opportunity’ was defined in the IPCC 4<sup>th</sup> assessment report as: “Circumstances to decrease the gap between the market potential of any technology or practice and the economic potential or technical potential”. It was also defined by Sinclair Knight Merz (SKM 2008) as “an activity that has the potential to generate competitive rates of return on investment from commercial activities”.

## 1.2 This project

The aim of this SLMACC project was to “identify the unique features of climate change opportunities, and explored and marketed opportunities, for Māori owned land” (C09X0901 contract). The intention is that the findings from this research will help Māori land owners to identify more clearly what these climate change opportunities might be, to seek more information, and to capitalise on unique land use and business opportunities arising from climate change adaptation and mitigation. This has the potential to make a major contribution to regional and New Zealand economies.

*Objective:* “Climate change opportunities on Māori land: Working in partnership with a number of Māori organisations, through case studies and general hui, a number of climate change adaptation and mitigation opportunities for Māori land are identified and business opportunities explored”. “These opportunities will be discussed with Māori land owners and other interested Māori organisations to determine their level of interest, views, preferences and priorities”. In this study, alongside interviews and surveys, Māori land was spatially analysed nationally to provide an understanding of land characteristics and potential that could be matched to climate change opportunities, and an indication of how Māori land may be affected by climate change scenarios in the next 100 years. The three main milestones in the project were:

*Milestone 1.1* – Participatory research with Māori landowners and case studies

*Milestone 1.2 – Defining climate change opportunities*

*Milestone 1.3 – Disseminate results of climate opportunities for Māori land*

A step-by-step process and method was used to achieve the objective and milestones.

The current framework for identifying and prioritising climate change opportunities includes a number of central drivers:

- Moves to a low carbon economy (nationally and internationally) with less reliance on fossil fuels and carbon-based products
- International obligations (e.g., Kyoto) and resulting New Zealand policy responses
- Emission trading scheme (ETS) and New Zealand emissions targets (to be confirmed)
- Changing consumer preferences
- Emerging markets
- Demand for new technologies, products, and services.

A high proportion of Māori land (under Te Ture Whenua Māori 1993) is regarded by many commentators as under-utilised or undeveloped (~50%) and producing below its productive potential (TPK 2002, 2007). Māori land already in production will need to adapt systems and land-use practice to climate change, and plan for the future climate change scenarios (MAF 2008) to optimise land use. Identifying development opportunities and unlocking the potential of this land will therefore help economic transformation, building capability and confidence among Māori landowners to realise significant increases in economic performance, sustainable resource utilisation and productivity (TPK 2007, 2009). This will lead to a major contribution to New Zealand's social, cultural and economic well-being and fabric. Realising the potential of the Māori asset base in a sustainable manner will depend on effective integrated decision-making in the context of Māori values and distinctive governance approaches, taking into account the collective and perpetual ownership and nature of Māori land at the iwi/hapū and whānau level.

## 2 Climate change adaptation and mitigation

### 2.1 Climate change – what is it?

Global emissions of greenhouse gases are rising at a rapid rate – largely since the industrial revolution of the 1850s (Intergovernmental Panel on Climate Change (IPCC) 2000, 2001, 2007; MfE 2007). The latest IPCC report confirms that it is highly likely that the warming of the earth's atmosphere is attributable to increased atmospheric concentrations of greenhouse gases resulting from human activity (vehicle emissions, urbanisation, industrialisation, modern intensive agriculture, clearance of forest, etc.) and that this is resulting in global climate change (IPCC 2000, 2001, 2007; MfE 2007, 2004; Packman et al. 2001). There are six major greenhouse gases:

- CO<sub>2</sub> (carbon dioxide), generated largely from fossil fuels, industrialisation, vehicles, and deforestation
- N<sub>2</sub>O (nitrous oxide), arising largely from soils and oceans, agricultural sources, farming practices, nitrogen fertilisers, livestock urine, etc.
- CH<sub>4</sub> (methane), from wetlands, flooded rice fields, natural gas fields, oceans, melting permafrost areas, and in New Zealand mainly from ruminant livestock
- H<sub>2</sub>O (water vapour), derived from oceans, lakes, rivers, precipitation, etc., variable in atmospheric, warming, wetting and drying cycles
- Chlorofluorocarbons (CFCs), from manufacturing, industrialisation
- O<sub>3</sub> (ozone), naturally occurring, filters the sun's rays, levels are rising and falling.

Water vapour is by far the most active greenhouse gas and this provides the warming needed to support life on Earth. Water vapour concentration in the atmosphere has not changed substantially during the last two centuries so is not considered to contribute to recent warming trends. More importantly global emissions of carbon dioxide (CO<sub>2</sub>) have increased since the industrial revolution and are continuing to increase dramatically. However, the rate of warming is dependent on global circulation of air and water currents and may vary for different countries. Climate change poses serious environmental, social and economic consequences (IPCC 2000, 2001, 2007; MAF 2008) for all countries and there are various predictions for changing climate patterns, including rising temperature, increases in storm frequency and magnitude, changes in precipitation, the melting of ice caps, and the rising of ocean temperatures and sea level (IPCC 2001, 2007; MfE 2007, 2004).

For New Zealand, predictions are for changing “climate patterns”, “less predictable climate patterns”, “more frequent extreme weather events”, “less seasonal weather”, a higher likelihood of wetter conditions in the west of New Zealand, and drier conditions in the east (Kenny 2001; Pittock & Wratt 2001; Mullan et al. 2001, 2005, 2008; MfE 2004; MAF 2006b, 2008; Guldberg et al. 2007; IPCC 2007; Mullan & Dean 2008). Serious consequences for New Zealand include increased extremes: it is likely the probability of high frequency intense rainstorms and associated floods will increase, with the current 50-, 100-, 150-, and 200-year storm events becoming more likely in any year. In contrast, an increased occurrence of drought in many regions, particularly in eastern New Zealand, may occur in any year. Increasing rainfall will lead to increased soil erosion rates, flooding, and widespread damage in many parts of the country (ICNZ 2005) while drier conditions with higher than average

temperatures (e.g., prolonged drought or more intense drought) will lead, for example, to longer term soil moisture deficits, lack of available water for irrigation and agricultural use, declining crop yields, increased fire risk, etc. (Kenny 2001; MfE 2004; MAF 2006b; 2007c, 2008).

The latest climate modelling data (Mullan et al. 2001, 2005, 2008; IPCC 2007; MAF 2008; Mullan & Dean 2008) predict changing temperature and rainfalls from present averages in the next 100 years across many part so of New Zealand. Between 1980–1999 and 2030–2049 annual mean temperature levels are expected to rise by 1.0°C in many areas, and between 1980–1999 and 2080–2099 to rise by 2.2 °C. Between 1980–1999 and 2030–2049 annual mean precipitation (e.g., rainfall) is expected to increase and change from present averages by up to 7.5% largely in the west and south, and decrease by up to 5% in the east and northern regions of New Zealand. Between 1980–1999 and 2080–2099 precipitation is expected to increase by up to 15% largely in the south and west and decrease by up to 8.0% in the east and northern regions of New Zealand. The frequency of drought in the east and north of New Zealand is projected to become more common and for longer periods. Many catchments will experience drier and prolonged drought conditions with less available water. Any increase in mean annual temperature up to 2°C in many parts of New Zealand by 2090 would have a marked impact on pasture growth rates and cropping, an increase in biosecurity risks (e.g., establishment of exotic insect pests), increased fire risk in drier areas, and lead to other associated problems. Land use and management strategies should be adopted now to plan for these future changes and transform landscapes in New Zealand to a more resilient and sustainable state, a process often called “future proofing”. Issues such as climate change demand integrated and approaches at international, national, regional, and local community level (MAF 2007c; Carswell et al. 2007, 2008).

## 2.2 Adaptation and mitigation

For the purposes of this report, climate change includes all changes and impacts directly resulting from, or indirectly as a consequence of, changing global, regional and local climate patterns (IPCC 2007; Fischlin et al. 2007; Guldberg et al. 2007; Kundzewicz et al. 2007). Adaptation and mitigation are human responses and interventions to climate change, where adaptation usually results in a modified change of behaviour or activity in response to that change, to ensure long-term survival and well-being, and to cope with and benefit from change. The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as the “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC 2007). Mitigation includes those responses, actions and interventions that reduce the impact of climate change, and has been defined in the IPCC report as: “Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce GHG emissions and enhance sinks” (IPCC 2007).

The extent of climate change impacts on different ecosystems, regions and sectors of the economy will depend not only on the sensitivity of those systems to climate change, but also on the systems’ ability to adapt to climate change (Fischlin et al. 2007; Guldberg et al. 2007; Kundzewicz et al. 2007; Stroombergen et al. 2008). For the purposes of this study therefore



climate change adaptation and mitigation include any combinations of physical, social, cultural, economic impact associated with climate change, for example:

- Physical: changes in rainfall, rainfall patterns, drought, frosts, storms, flooding, that deviates from some normal or expected baseline, etc.
- Social: both deleterious and beneficial impacts on social factors, such as community, community resilience, infrastructure, social fabric and cohesion, social capital
- Cultural: both deleterious and beneficial impacts on culture and cultural aspirations
- Economic: both deleterious and beneficial impacts on the New Zealand and Māori economy.

Consequences of climate change are likely to manifest in many ways, including: changing land-use patterns, changing management practices, market prices, uptake of new technology, increases or decreases in productivity, increased hazard and risk to life, well-being, and infrastructure, changes in global markets, changes in consumer behaviour, changes in lifestyle (Kenny 2001; MfE 2004; King & Penny 2006; MAF 2006b, 2007c; Kundzewicz et al. 2007).

New Zealand has to adapt constantly to a rapidly changing world. The MAF strategic foresight project (MAF 2007d) identified six global drivers of change over the next 20 years:

- Global warming
- Energy cost and supply
- Geopolitical power shifts
- Ecosystem degradation – particularly of water quality and availability
- Demographic shifts
- Technological advances

Adapting to climate change will therefore require (Kenny 2001; MAF 2007c,d, 2008; TPK 2009):

- The uptake of new technologies to mitigate and withstand potential climate related shocks
- The positioning of products/exports as environmental and climate friendly strategies to respond to world markets and consumer demand where business gains competitive advantage by limiting or reducing the carbon footprint (e.g., carbon neutrality, carbon friendly)
- Diversifying existing productive land uses into alternative production systems (retiring marginal land, forestry, biofuels) (Te Puni Kōkiri 2009).

## 2.3 International and domestic trends

In line with many international agreements, a large range of policy and initiatives are being developed and implemented to change human behaviour and set a pathway towards the reduction of greenhouse gases. These are seen as drivers (SKM 2008; Insley 2010) for change. Whatever New Zealand does, most opportunities are becoming abundantly apparent in a global low carbon future (MAF 2007c; SKM 2008; NZBCSD 2009).

In December 2009 New Zealand passed amendments to the country's domestic climate change policy (Emissions Trading Scheme or, ETS) that now provides much needed legislative certainty to business to consider in new commercial opportunities arising particularly from a formal and systematic shift towards a low carbon economy. This shift for New Zealand is consistent with similar moves by other developed economies of the world, especially those who are introducing similar policy instruments striving towards a world based on a low carbon economy.

The 2009 United Nations negotiations in Copenhagen, while not delivering absolute binding targets for individual countries worldwide or commitments to financing, did result in the 'Copenhagen Accord' to which the New Zealand government has committed, albeit a qualified commitment subject to similar commitments by other developed countries and especially to the commitments of New Zealand's major trading partners. It must be noted, however, that while there have been important gains in terms of policy certainty, until binding targets are achieved on the international stage for all major developed and developing countries, and especially by those countries who produce competing products to New Zealand's own products, a level of risk remains, creating a continued level of uncertainty for new investment.

The Global Research Alliance (GRA) is a particular initiative championed by New Zealand with commitments of scientific capability and financial resources to developing technologies specifically targeted at products that reduce emissions from agriculture or at new low carbon products derived from agriculture. Along with 30 other countries New Zealand has committed \$NZ45 million to the GRA, which includes the major developed and developing countries of the world.

Māori collectively have a very large and growing footprint in the New Zealand economy estimated at more than \$NZ16 billion (BERL & FOMA 1997; TPK 2002, 2008). Many of these interests are concentrated in the primary sector and as such Māori organisations have a very high interest in any related business opportunities that may arise through the development of new climate change response technologies.

The introduction of new and complex rules by government will see relatively rapid growth in the exploration space for these new technologies. While this rapid pace of activity will create new opportunity for Māori business, related risks will likely be amplified over and above normal business risk as Māori businesses step into this new territory.

We provide a brief overview of examples listing the range of negotiations, agreements, policy, and activities that have taken place over the last 15 years, both internationally and in New Zealand, and set the context and tone for Māori business opportunities investigated in this report.

*International context (adapted from SKM 2008):*

- United Nations Framework Convention on Climate change (UNFCCC) ratified 1992 (non-binding targets)
- Kyoto Protocol: This agreement was ratified by New Zealand in 2005. New Zealand agreed to a legally binding target to reduce greenhouse gas emissions to reach 1990 levels by the end of the first commitment period (2008–2012). Emissions trading is one mechanism being introduced to reduce greenhouse gas emissions. Under present rules,

if countries fail to meet their emissions target by the end of the first commitment period (2012) they are required to make up the difference, as well as 30% in the second commitment period. Their ability to sell credits under emissions trading will also be suspended. Article 3.3 of the Protocol allows for additional activities such as offsetting emissions by carbon sequestration through forestry

- European Union Emissions Trading Scheme
- Clean Development Mechanism market (CDM)
- Joint Implementation (JI) Market
- European Union Agricultural policy
- The proposed Australian Emissions Trading Scheme (supported by the Australian National Carbon Accounting System)
- Other countries are exploring GHG policy responses with particular emphasis on carbon trading, including the United States (Americas Securities Act S.2191), Canada (Turning the Corner, An action plan to reduce greenhouse gas and air pollution), and Japan (Keidanren Voluntary Action Plan on the Environment)
- Voluntary Carbon Markets (including the Chicago Climate Exchange(CCX) and the more disaggregated “over the counter” (OTC) market
- Trading partners are changing (USA, Asia, Australia, European countries)
- Trading barriers, subsidies, tariffs, levies
- Distance to market, life-cycle analyses, carbon footprints, branding, buy local
- Global taxes (e.g., carbon)
- Costs to business (e.g., travel, manufacturing, energy, labour)
- Price fluctuations (e.g., commodity prices, future carbon prices).

What we do in New Zealand in terms of business is often constructed not only in response to the international/global environment, but also accordingly to New Zealand drivers of change. These are some of the main drivers that Māori business will have to understand to realise business opportunities related to climate change.

#### *New Zealand context (adapted from SKM 2008)*

- Government leadership and direction
- New Zealand policy, Government policies and actions
- New Zealand’s taxation and land rating system
- ETS (ETS targets and goals)
- Schemes, programmes (e.g., ETS, PFSI, AGS, carbon credits, etc.) to reduce carbon from 2009
- The Government has decided to bring all agricultural gases into the ETS on 1 January 2013;
- Sustainable energy and sustainable building strategy
- New technology to reduce greenhouse gases
- Changing consumer behaviour and preferences.

Trends at the international level will have a huge impact on New Zealand’s future economy and on that of Māori. These international drivers cannot be ignored and provide many

business opportunities – but only if the response is strategic. We begin this study with many of the climate change business opportunities presented in the report by Sinclair Knight Merz (2008). Additional opportunities have been added during the course of this research, which also provides Māori perspectives of these opportunities.

### 3 Methods

The intermediate outcome of the project was to “identify the unique features of climate change opportunities, and explored and marketed opportunities, for Māori owned land” (C09X0901 contract). The phases of research from July 2009 to June 2010 were:

- Identify the unique features of Māori land and governance structures
- Identify and define a range of business opportunities arising from climate change adaptation and mitigation
- Identify and determine critical success factors for the uptake of business opportunities in relation to climate change on Māori land
- The last phase of the research was to analyse, synthesise, collate and then disseminate findings back to a wide audience of end-users, including iwi and hapū authorities, landowners, Government departments, regional councils, and the Ministry for Agriculture and Forestry (MAF).

A step-by-step process and method(s) through each of these phases was used to achieve the objective and milestones.

The following methods were employed:

- Use of previous literature, including the key report “Business Opportunities Arising from Climate Change” by Sinclair Knight Merz (SKM, 2008)
- Use of various data layers (Table 1), GIS analyses and climate change scenarios of Māori land (understanding the potential and future climate scenario impacts on Māori land)
- Hui, workshops and discussion with a large number of Māori organisations on business opportunities and climate change
- Contact made and an ongoing relationship with members of the national Māori reference group and iwi leadership group, and other key networks
- An assessment framework (matrix) was developed to answer key questions
- Fifteen structured interview-sessions were carried out nationwide with key individuals and organisations, Table 2
- 6 case studies were carried out with selected groups in the Gisborne–East Coast–Eastern Bay of Plenty (Tairāwhiti–Wairariki districts), Rotorua–Taupō, Waikato, Hawke’s Bay and Northland. A main case study, interviews, and GIS analyses focussed on the Gisborne–East Coast
- Analyses of data and interpretation of findings
- Synthesis, evaluation and key messages

The methodology applied in the project is as follows:

1. **Literature review and summary.** Identifying and summarising what has been done in the past in relation to climate change business opportunities and marketed opportunities
2. **Scoping the project.** The project was scoped and a project plan and method was developed. A number of Māori organisations and individuals were contacted in regards to participation and support and protocols and sub-contracts for the project were developed

3. **Primary data capture.** A standardised questionnaire was developed and used with interviews with selected Māori organisations (sections 4.3, 4.4, 4.5, 4.6)
4. **Secondary data sources.** Where appropriate a number of secondary and external data sets and information have been linked and referenced where such data and information is useful to further illustrate key points and/or link findings of the study to external national and international climate change policy and development
5. **Analyses and interpretation of data.** A number of analytical tools have been applied to especially identify important themes and patterns in response from Māori business and other organisations
6. **Synthesis and conclusions.** A number of themes, conclusions and recommendations were identified during analyses and synthesis of data, and the findings have been reported to inform government make deliberations regarding future opportunities on Māori owned land.

We used an assessment framework to capture response and comment from a large number of Māori organisations and individuals throughout the country with an interest in climate change and Government policy and define key climate change opportunities for Māori owned land.

The assessment framework (matrix) that guided our discussion, hui, and interview-survey process was made up of four key questions:

1. What are the unique characteristics and features of Māori land? What is the unique nature of Māori land governance? (i.e. what Māori land characteristics will be used to capture these climate change opportunities?)
2. What are the key climate change opportunities? What is the level of awareness and interest of emerging climate change business opportunities? What are the perceived risks associated with each option/opportunity?
3. What are the critical success factors for uptake of these climate change business opportunities on Māori land?
4. What are the preferences and priorities for climate change opportunities from a Māori perspective? How would Māori organisations rank the opportunities in terms of preference, priority or choice? Therefore, what are the priorities in terms of government action and implementation if Māori are to participate in these opportunities?

## Databases used for GIS analyses of Māori land

**Table 1** Databases, information/data sets/types and sources used in this SLMACC project

Database/information/data	Source and agreements to use data
Māori Land Information Base (MLIB) – version 2002	Te Puni Kōkiri (TPK)
New Zealand Land Resource Inventory (NZLRI), Land Use Capability (LUC) classes for New Zealand	Landcare Research GIS analyses 2010
Land Cover database (LCDB) version 2 2002	Landcare Research New Zealand Ltd
IPCC climate scenarios for New Zealand	Ministry for the Environment (MfE)
NIWA climate modelling data	Dr Andrew Tait, NIWA (24th March 2010)
(ESRI ACII grids – NZGD 1949 projection)	(references: Mullan et al. 2008, 2005, 2001)
Change in annual temperature (°C) and change in rainfall % for 2040 and 2090 (four grids) mid-range A1B scenario and averaged GCMs	
EcoSat layer of vegetation:	MfE & Landcare Research
– Basic land cover	
– Woody vegetation	
– Indigenous forest	
Land Use and Carbon Analysis System (LUCAS) – 2008/2009	Ministry for the Environment (MfE)
Kyoto eligible layers (1990, 2002, 2008)	Steve Botica & Nelson Gapare (7 Sept 2009)

## Selected Māori organisations

A deliberate effort was made to select and interview a cross-section of Māori groups and types of organisations to assess whether different types of Māori organisations perceive climate change opportunities arising out of government policy and initiatives differently in terms of opportunities attractiveness, ranking, risks, priorities, and other considerations, e.g., whether some opportunities are more accessible to certain types of organisation? A confidentiality, IP, and research protocol-ethics (kaupapa, tikanga) agreement was signed with a number of groups before any interviews and survey. Table 2 below shows the mix of Māori businesses with the total number of groups and individuals who participated.

**Table 2** Type of Māori organisation who participated in survey and questionnaire

Type of Māori organisation	Total
Trust	3
Incorporation	2
Individual	2
Business	4
Māori network	2
Iwi	2
Total	15

## 4 Findings

We used the assessment framework to guide the research on Māori land and developed a set of questions with Māori business throughout New Zealand. Findings are given in this section as outlined in the assessment framework under the headings:

1. What are the unique characteristics and features of Māori land? What is the unique nature of Māori land governance?
2. What are the key climate change opportunities? What is the level of awareness and interest of emerging climate change business opportunities? What are the perceived risks associated with each option?
3. What are the critical success factors for uptake of these climate change business opportunities on Māori land?
4. What are the preferences and priorities for climate change opportunities from a Māori perspective? How would Māori organisations rank the opportunities in terms of preference, priority or choice?

### 4.1 Understanding Māori land

Māori own a significant proportion of land in New Zealand, which is increasing progressively due to factors such as, post-Treaty settlements, commercial redress for historic Treaty claims (Waitangi Tribunal), and through business entrepreneurship of resources and property. Ongoing settlements and economic advancement are greatly adding to the Māori land and resource asset base. In 2002, the Māori economy contributed around \$700 million or 7.5% of total agricultural outputs, while the Māori commercial asset base is presently worth at least \$16.5 billion (with 52% of assets concentrated in primary industry) (TPK 2002, 2008).

For example, the Central North Island Iwi (CNI) collective received 161 000 hectares of land in settlement and plans to create business opportunities around carbon credits from reforestation and marginally productive land. It is estimated that the more effective use of Māori land would result in an increase of 5% per annum on current returns, and equate to an increase of around \$300–500 million per annum to the New Zealand economy.

#### *Te Ture Whenua Act – Māori land tenure*

Māori land is defined under Te Ture Whenua Act 1993, and definitions are used by the Māori Land Court whenever it is required to determine the status of Māori land (Figures 1 & 2). The purpose of *Te Ture Whenua* was to ensure control of Māori land remained with the owners so it could be passed onto future generations (Kawharu 1977). Under the Act Māori land is therefore very difficult to alienate (Durie 1998), and while there is provision to allow its conversion to general land this can only happen under very special circumstances. It has become easier for Māori owners to change general land back to Māori freehold land. The Act gives focus to Māori land development, identifying land potential, better use, opportunities, and commercial use.



There are three main types of Māori land:

1. Māori freehold land: Land that, with very few exceptions, has not been out of Māori ownership. This land is generally ‘collectively owned, multiple ownership’. The Māori Land Court determines whether land is Māori freehold land
2. Māori customary land: Land held by Māori in accordance with tikanga Māori. It has not been transferred into freehold title by the Māori Land Court, or been ceded to the Crown. Before 1840, all land was Māori customary land (Table 1). Today, the exact amount is unknown but is believed to be extremely small
3. General land owned by Māori: Land owned by five or more people, where the majority of the owners are Māori.

Under Māori freehold land, there are five main types of Trust:

- Ahu Whenua Trusts: Most common Māori land trust, similar to the section 438 trusts in the old Māori Affairs Act. They are intended to promote and facilitate the use and administration of the land in the interests of the owners
- Whānau Trusts: Preserve family links to particular land, but without expectation of individual interests or dividends
- Kaitiaki Trusts: Available for persons who are minors, or are suffering a disability and are unable to manage their own affairs and land
- Whenua Topu Trusts: Tribal trusts. Designed to facilitate the use and administration of land in the interest of iwi or hapū. This type of trust is used for receiving Crown land as part of any Treaty settlement
- Putea Trusts: Small uneconomic interests pooled for the common benefit without individual dividends.

Table 3 shows the number of different types of Māori trust in New Zealand.

**Table 3** Governance structures for Māori Land (under Te Ture Whenua Act) for New Zealand (Durie 1998)

Governance Structure	Number of Land Blocks	% Total Area
Ahu Whenua Trusts (old 438 trusts)	6303	52
Whānau Trusts	108	6
Kaitiaki Trusts	8	0.01
Whenua Topu Trusts	10	2
Putea Trusts	1	0
Incorporations	259	14
Trust Boards	106	6
No Clear Structure	16 405	15
Other	1129	2
Not Described	1307	4
Total	25 636	100

Ahu Whenua Trusts are by far the most common type of trust. Te Ture Whenua Act (1993) also encourages the formation of incorporations, where shareholders remain owners, while day-to-day management activities remain in the hands of an elected committee of management or of a Māori trustee. Much Māori land is managed and administered by trustees who manage land on behalf of Māori landowners. A Māori Trustee is given either legal

responsibility to look after assets and liabilities for the benefit of the owner, or “equitable obligation”.

## **Māori Land Court**

The Māori Land Court (Te Kooti Whenua Māori) is the New Zealand court that hears matters relating to all Māori freehold land. The special bond between Māori people and land is recognised by the Court, and the land records form an invaluable part of the whakapapa for all Māori (Durie 1998; Kawharu 1977). The Māori Land Court is the only Māori court of its type, and its operation is unique, as summarised in Parliament’s directive to the Court, contained in section 2(2) of Te Ture Whenua Māori Act 1993:

...it is the intention of Parliament that powers, duties, and discretions conferred by this Act shall be exercised, as far as possible, in a manner that facilitates and promotes the retention, use,

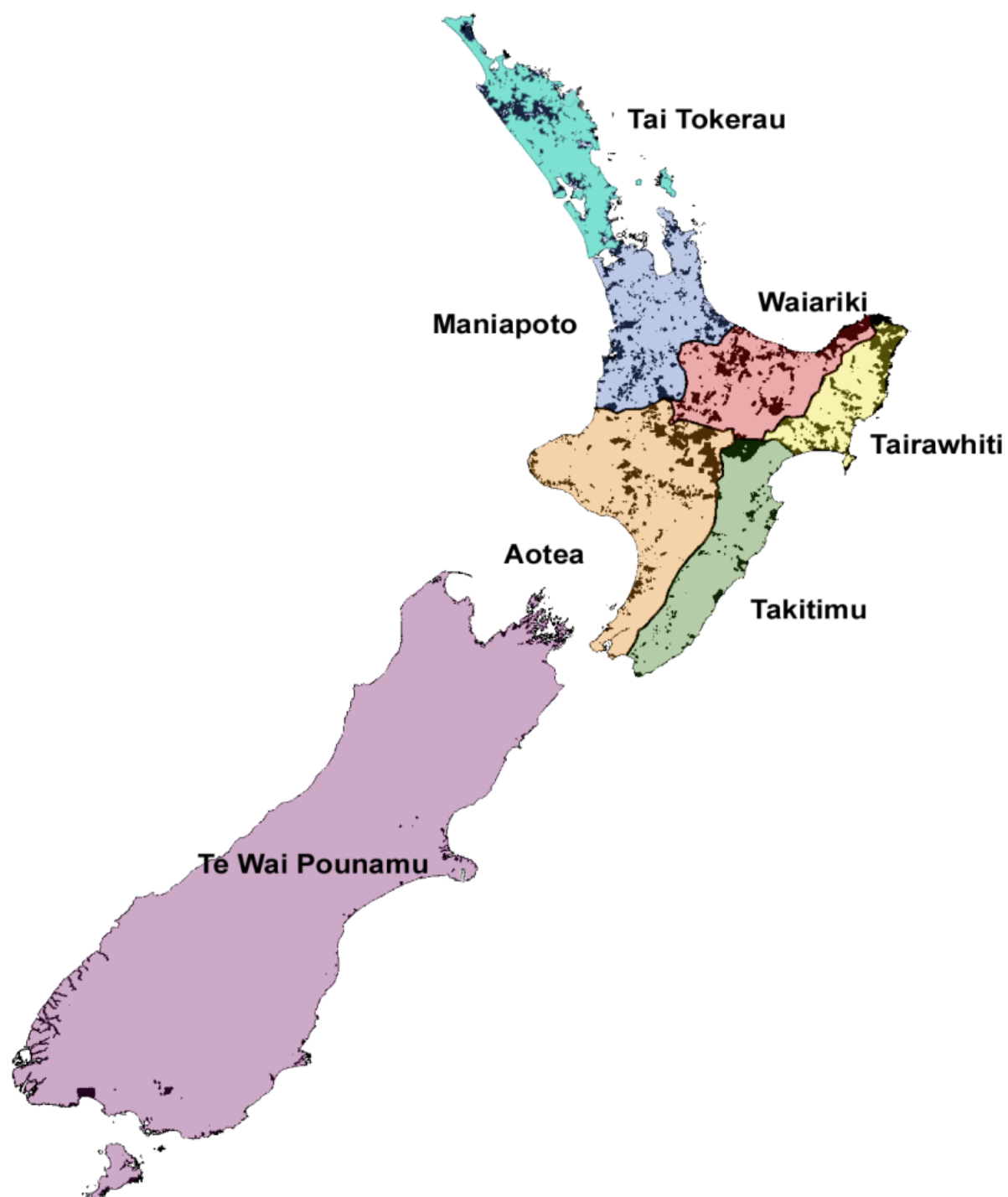
development and control of Māori land as taonga tuku iho by Māori owners, their whānau, their hapū, and their descendants.

Issues relating to multiple-ownership of land, and the law relating to succession of ownership, mean Māori land transactions can be complex. Through the Māori Land Court transactions and successions are dealt with in a traditional and culturally appropriate manner. While the [Department for Courts](#) administers the Māori Land Court, the Minister of Māori Affairs deals with all legislative matters.

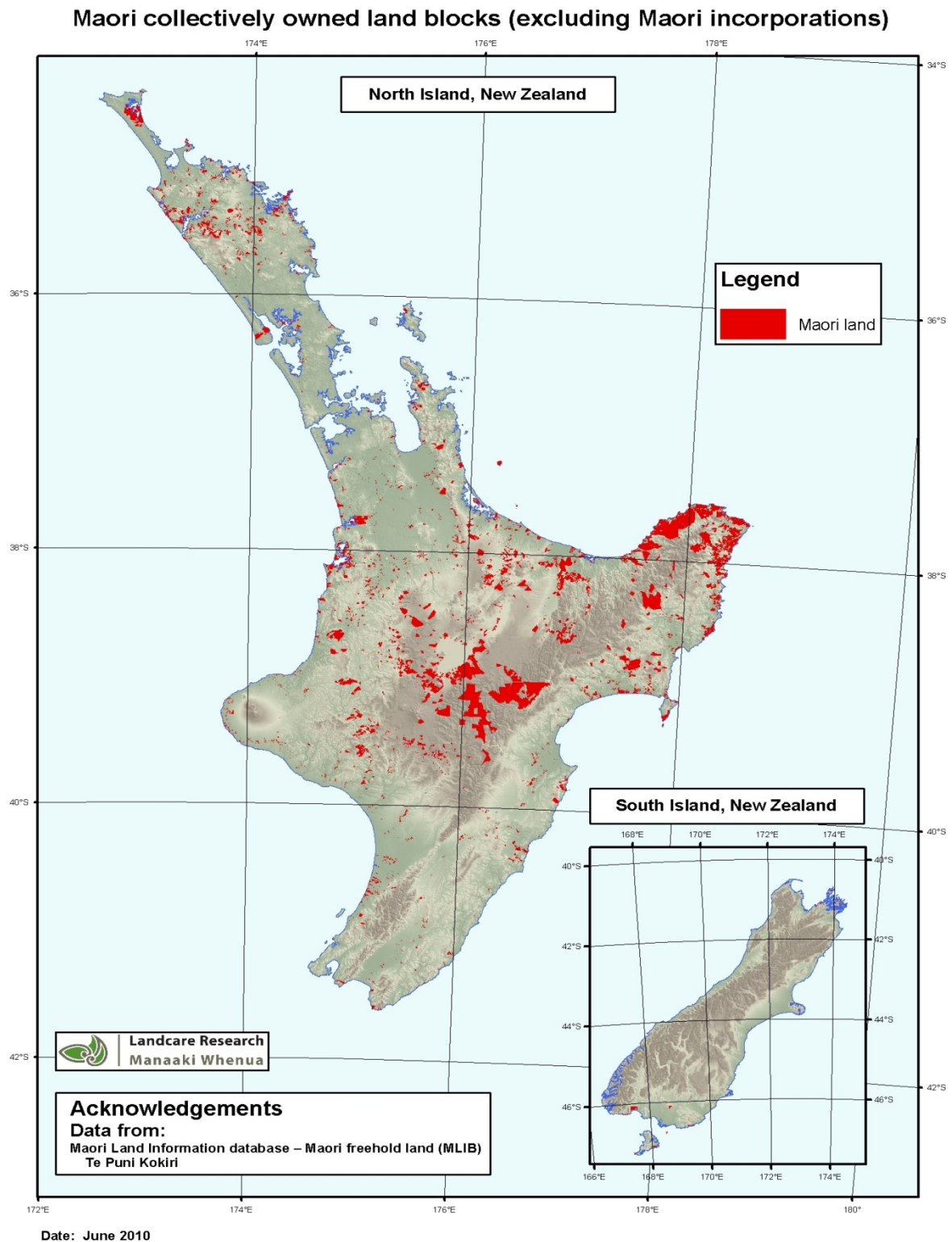
Māori land records and information are administered by the Māori Land Court within New Zealand Māori Land Court districts (see Table 4, Figure 1). Māori freehold land is in 26 480 separate titles under Māori ownership (Hui Taumata 2006). Owners can have multiple interests in more than one block of land, resulting in more than two million in 2008, and an annual increase of 185 000 per year with successions (Te Ara ‘Ahuwhenua – Māori land and agriculture’). In 2008 there were 26 480 Māori land certificates of title, with an average size of 59 hectares and an average number of owner interests of 73 per title (up to 425 maximum). Table 4 shows the % of Māori land, number of Māori land blocks, and the average area of Māori land blocks by MLC district for each of the seven Māori land districts (Figure 1).

**Table 4** Māori Land Court Districts: Areas and % of Māori land (based on TPK MLIB 1998 data)

<b>New Zealand Māori Land Court Districts</b>	<b>Total Land Area per Māori Land District (ha)</b>	<b>Māori Land Area (ha)</b>	<b>% of Māori Land by Land District</b>	<b>Number of Land Blocks</b>	<b>Average Area of Block (ha)</b>
Tai Tokerau	1 732 192	139 873	8.07%	4889	29
Waikato–Maniapoto	2 156 583	143 388	6.65%	3,594	40
Waiariki	1 936 270	426 595	22.03%	5,074	84
Tairāwhiti	1 169 091	310 631	26.57%	5,320	48
Takitimu	1 936 492	88 608	4.58%	1,254	71
Aotea	1 284 284	334 207	26.02%	3,710	90
Te Wai Pounamu	16 715 185	71 769	0.43%	1,795	40
<b>TOTAL</b>	<b>26 930 100</b>	<b>1 515 071</b>	<b>5.63%</b>	<b>25,636</b>	<b>59</b>



**Figure 1** Māori Land Court districts in New Zealand.



**Figure 2** Māori land in New Zealand registered under the Māori Land Court at 2010 (Landcare Research GIS).

## **Māori Trustee**

When owners elect a trustee to manage and administer their Māori land assets this comes under the Te Ture Whenua Act 1993 and the Māori Trustee Amendment Act 2009. The Māori Trustee can be appointed to administer land through the Māori Land Court or at the request of owners or Trustees.

The Māori Trustee provides the following range of services to Māori land owners to protect and enhance assets and interests, and collects and distributes income for landowners:

- Acts as a trustee or agent for owners of Māori land, usually in leasing the land
- Collects and pays rent and other income to owners
- Invests trust monies
- Keeps landowners informed about how their land is managed
- Regularly publishes an unclaimed monies list.

From 2009 the Māori Trustee became a corporate entity independent of the Crown and accountable to Māori landowner clients. The Māori Trustee administers or manages:

- Over 105 000 hectares of Māori freehold land
- Land and assets on behalf of 126 000 owners
- About 2000 properties
- At 31 March 2009, 2300 tenancies
- Around \$12 million each year is collected by the trustee in rent and other income for owners.

## **Gisborne–East Coast and eastern Bay of Plenty**

A major part of this research focussed on the Gisborne–East Coast and eastern Bay of Plenty (Tairāwhiti and Waiariki Māori land districts; Insley 2010). The Māori organisations involved in this study were from Ngāi Tai, Te Whānau ā Apanui and Ngāti Porou. Collectively they represent the interests of more than 70 000 Māori shareholders with assets concentrated in the primary sectors with an estimated value of \$NZ38 million. The successful uptake of a number of key new technologies and climate change business opportunities arising from new and emerging domestic and international policies and rules could grow the economic interests of these Māori organisations alone by \$NZ100 millions in the next five to ten years. This new economic activity will create many new Māori jobs for the Tairāwhiti and Waiariki communities, with related spin-off benefits that include stabilising erodible east coast lands, improving water quality, and bringing marginal lands into higher and better land use.

## Summary

Summary of key characteristics of Māori land:

- Only one quarter of all Māori land is “managed” – management structures in place – (5882 land entities) accounts for 80% of total Māori land area (~1.5 million ha)
- 159 Incorporations (~374 787 ha) – constitutes a third by area of managed Māori land
- 5700 Māori Trusts (~730 800 ha) – over two-thirds by area of managed land
- 40 incorporations are more than 2500 ha (80% of total Inc land);
- 100 trusts are >1500 ha (make up 62% of all trust land), or 30% of all Māori land (455 467 ha)
- 41% of trusts are 6–50 ha; 35% of trusts (1989) manage less than 5 ha
- 20% of total Māori land area is not managed
- Just over 1500 entities (>100 ha) account for 85% of all Māori land
- Majority of “titles” (61%) are under 5 hectares
- Over two-thirds of “titles” (16 557 titles; total of 282, 215 ha) have no management structure and this equates to just under one-fifth of total Māori land area. Many titles are under 5 ha
- Fewer than 1000 non-managed titles are more than 50 ha.

## 4.2 Māori land characteristics – GIS analyses

### Capability and potential of Māori land

Māori land is now made up of hundreds of discrete blocks throughout New Zealand (Figures 1 & 2) but less than 6% of New Zealand is classified as Māori land (Durie 1998; TPK 2002, 2008 Te Ara Encyclopaedia 2010). Most of this land (95%) is registered under the Māori Land Court, under the Te Ture Whenua Act 1993.

All Māori land has been mapped and classified according to the New Zealand Land Resource Inventory (NZLRI) (NWASCO 1975–1979; NZLRI GIS database 2010) and the Land Use Capability (LUC) mapping system at a scale of 1:50 000. The LUC system of mapping and classification is fully explained in Lynn et al. (2009). It provides an overview of the capabilities/potential of Māori land and therefore can direct and match climate change opportunities to certain types of Māori land. The NZLRI classifies all map units according to New Zealand LUC mapping standards and assesses all land in New Zealand using one of LUC Classes 1–8 (Lynn et al. 2009). The LUC Class definitions are shown in Tables 5 and 6. The MLIB and NZLRI database were combined to give figures of LUC and Māori land potential (Table 5).

**Table 5** Increasing limitations to use and decreasing versatility of use from LUC class 1 to LUC class 8

<div>↓</div> <div>Increasing limitations to use</div> <div>↓</div>	LUC Class	Arable cropping suitability†	Pastoral grazing suitability	Production forestry suitability *	General suitability	<div>↓</div> <div>Decreasing versatility of use</div> <div>↓</div>
	1	High <div>↓</div>	High <div>↓</div>	High <div>↓</div>	Multiple use land	
	2					
	3					
	4					
	5	Unsuitable	Low	Low	Pastoral or forestry land	
	6					
	7		Unsuitable	Unsuitable	Conservation land	
	8					

† Includes vegetable cropping, (2009 LUC Hand book section 4.6 “explanatory notes”).

\* Land use capability classes 1–4 which have wetness as a major limitation, and those units in low rainfall areas (<500 mm/yr), or those occurring on shallow soils (<45 cm)



**Table 6** Land Use Capability (LUC) 1–8 area and % for Māori land (MLIB) in New Zealand compared with national averages (MLIB 2002 & NZLRI – Landcare Research New Zealand Ltd 2010)

Potential of Māori Land by Land Use Capability (LUC) – Landcare Research GIS 2010				
Land Use Capability Class	% of Total New Zealand Land	Māori Land area (ha)	% of Māori Land	Description of Land Use Capability
1	0.7%	7514.76	0.50%	Most versatile multiple-use land – virtually no limitations to arable use
2	4.55%	43 733.59	2.89%	Good land with slight limitations to arable use
3	9.22%	85 534.33	5.65%	Moderate limitations to arable use restricting crops able to be grown
4	10.5%	153 972.29	10.16%	Severe limitations to arable use. More suitable to pastoral and forestry
5	0.8%	6883.47	0.45%	Unsuitable for cropping – pastoral or forestry
6	28.1%	507 706.36	33.51%	Non-arable land. Moderate limitations and hazards when under a perennial vegetation cover.
7	21.4%	469 830.47	31.01%	With few exceptions can only support extensive grazing or erosion control forestry
8	21.8%	230 142.75	15.19%	Very severe limitations or hazards for any agricultural use
Other	2.97%	9752.96	0.64%	Non-arable land. Moderate limitations and hazards when under a perennial vegetation cover.
TOTAL	100.00% (26 930 100 ha)	1 515 071.00	100.00%	

Table 6 shows that:

- Less than 4% of Māori land is LUC class 1 and 2, the most highly versatile land classes in New Zealand
- Only around 9% of Māori land can be used for horticulture
- Only ~19% of Māori land is available for cropping
- Approximately 10% of Māori land is arable but has extreme limitations for arable use such as cropping
- Almost 80% of all Māori land is suited to non-arable use, LUC Class 6, 7, 8 (mostly steep hill country)
- ~34% is non-arable but productive land, generally relatively stable hill country or alluvial flats suited to pastoral farming and forestry
- ~46% is marginal land (LUC Class 7, 8) and needs to stay under trees/vegetative cover to protect soils, limit erosion, maintain water quality
- However, large areas of Māori land (even undeveloped and under-utilised) have development potential, particularly under ETS, carbon farming and forestry, biofuels, wood energy, sustainable forestry, tourism and cultural uses.

## Present vegetative cover/land use

By combining the MLIB and the vegetative cover database (LCDBv2) in Table 7 we can generate figures on vegetative cover and present land use for Māori land.

**Table 7** New Zealand Māori land (MLIB 2002) and New Zealand vegetative cover types (LCDBv2 2002)

Land Cover database 2 class-code	Description	Area (ha)	Area (%)
1	Built-up Area	1501.45	0.10
2	Urban Parkland/ Open Space	596.47	0.04
3	Surface Mine	385.69	0.03
4	Dump	0.39	0.00
5	Transport Infrastructure	820.16	0.05
10	Coastal Sand and Gravel	6233.03	0.41
11	River and Lakeshore Gravel and Rock	4208.17	0.28
12	Landslide	1820.74	0.12
13	Alpine Gravel and Rock	3921.27	0.26
15	Alpine Grass/Herbfield	101.21	0.01
20	Lake and Pond	8047.63	0.53
21	River	2064.70	0.14
22	Estuarine Open Water	790.75	0.05
30	Short-rotation Cropland	12 011.58	0.79
31	Vineyard	378.28	0.02
32	Orchard and Other Perennial Crops	2185.85	0.14
40	High Producing Exotic Grassland	392 822.34	25.93
41	Low Producing Grassland	30 240.76	2.00
43	Tall Tussock Grassland	37 192.60	2.45
44	Depleted Tussock Grassland	1158.48	0.08
45	Herbaceous Freshwater Vegetation	6973.71	0.46
46	Herbaceous Saline Vegetation	2298.75	0.15
47	Flaxland	308.59	0.02
50	Fernland	978.79	0.06
51	Gorse and Broom	13 756.74	0.91
52	Manuka and or Kanuka	192 253.14	12.69
53	Matagouri	9.56	0.00
54	Broadleaved Indigenous Hardwoods	64 590.03	4.26
55	Sub Alpine Shrubland	9572.78	0.63
56	Mixed Exotic Shrubland	2061.28	0.14
57	Grey Scrub	1245.16	0.08
61	Major Shelterbelts	242.90	0.02

62	Afforestation (not imaged)	1699.97	0.11
63	Afforestation (imaged, post LCDB 1)	3143.03	0.21
64	Forest Harvested	20 658.22	1.36
65	Pine Forest – Open Canopy	29 078.13	1.92
66	Pine Forest – Closed Canopy	137 624.67	9.08
67	Other Exotic Forest	7698.72	0.51
68	Deciduous Hardwoods	3479.11	0.23
69	Indigenous Forest	510 362.69	33.69
70	Mangrove	553.48	0.04
<b>Total</b>		<b>1 515 071.00</b>	<b>100.00</b>

Results and summary from Table 7 by combining MLIB with LCBDB v2 show that for Māori land:

- About 38% of all Māori land in New Zealand is in indigenous forest
- Roughly a third 30% is under grassland or pasture
- Approx 20% is presently in scrub
- Approx 13% is manuka/kanuka
- Exotic or planted forest accounts for about 12.7%.

### Kyoto eligible Māori land

Under the present Kyoto definitions, land not in trees at 1990 – mainly pastoral and limited scattered scrub areas – especially on marginal land, is likely to be most eligible for Kyoto forest and therefore has a potential for carbon farming. Results (Table 8) from combining the MLIB with data from the MfE 2008/2009 project Land Use and Carbon Analysis System (LUCAS) show that almost 37% (558 000.6 ha of Māori land) was not forest in 1990 and is therefore eligible for Kyoto forest and carbon farming, while a further 15.2 % has the potential for regeneration (Trotter et al. 2005) and likely to have been in scrub that was not classified as forest. The remaining 48% (~726 628.0 ha) of total Māori land was technically mature ‘natural’ forest and scrub at 1990 and ineligible.

LUC figures from Table 6 show that about 80% of all Māori land is hilly to mountainous with about 46% classified as marginal. However, a large proportion of Māori marginal land (e.g., steep erosion prone land) has remained covered in mature indigenous forest and scrub (pre-1990) and is classified as ‘undeveloped’. Combining LUC GIS with LUCAS shows that around 150 000 to 200 000 ha of Māori land is hilly, erosion prone, or marginal, was not in trees at 1990, and has the opportunity to be used for carbon farming (i.e. carbon sequestration, available for afforestation/reforestation) through planting forest or allowing regeneration of scrub and low forest, which makes it eligible for carbon credits. Most of these Kyoto eligible Māori land blocks are, in Northland, central, and eastern regions of the North Island (see Figure 2).

**Table 8** New Zealand Māori land eligible or ineligible for Kyoto forest

New Zealand Māori land eligible or ineligible for Kyoto forest		
<b>Kyoto Eligible/ineligible</b>	<b>Area (ha)</b>	<b>Area (%)</b>
Eligible for Kyoto forest (no forest at 1990)	558 000.6	36.83
Potential for reversion	230 442.2	15.21
Ineligible (pre 1990 forest)	726 628.0	47.96
Uncertain of eligibility	25.96	0.00
	<b>1 515 071.00</b>	<b>100.00</b>

### Māori land in the Gisborne East Coast

From the above national overview of Māori land a regional case area study was carried out. A case study area of 885, 200 ha of the Gisborne-East Coast, based on the NZLRI survey and Gisborne District Council boundary was defined (Figure 3). We combined the MLIB with data from the land cover database and data from the MfE 2008/2009 project 'Land Use and Carbon Analysis System (LUCAS)' (Table 9). This shows that from a total of 154 136 ha of Māori land identified within the case study area, 51.1% (78,773.2 ha) was not in forest in 1990 and is therefore eligible for Kyoto forest and carbon farming, while a further 22.7 % (34, 993 ha) has the potential for regeneration (Trotter et al. 2005) and is likely to have been in scrub that was not classified as forest. The remainder 26.2% (~40 367 ha) was technically mature 'natural' forest and scrub at 1990 and therefore is ineligible.

By combining NZLRI LUC data (LUC Classes Tables 6 & 9) with MLIB, land-cover data, and LUCAS data we are able to estimate Māori land on the Gisborne–East Coast with a potential for carbon farming to be around 73.7% (113 766 ha), of which around 70% is classified as hilly to steep land, erosion prone and may be considered marginal. That would indicate close to 100 000 ha of Māori land on the East Coast has potential for carbon farming opportunities or other climate change opportunities (e.g., wood energy, biofuels) investigated and summarised in this SLMACC study.

**Table 9** Gisborne–East Coast Māori land (GEC NZLRI region) eligible or ineligible for Kyoto forest

Gisborne-East Coast Māori land (GEC NZLRI region) eligible or ineligible for Kyoto forest		
<b>Kyoto Eligible/not eligible</b>	<b>Area (ha)</b>	<b>Area (%)</b>
Eligible for Kyoto forest (no forest at 1990)	78 773.2	51.1
Potential for reversion	34 993.1	22.7
Not eligible (pre 1990 forest)	40 367.1	26.2
Uncertain of eligibility	2.74	0.0
	<b>154 136.1</b>	<b>100.00</b>

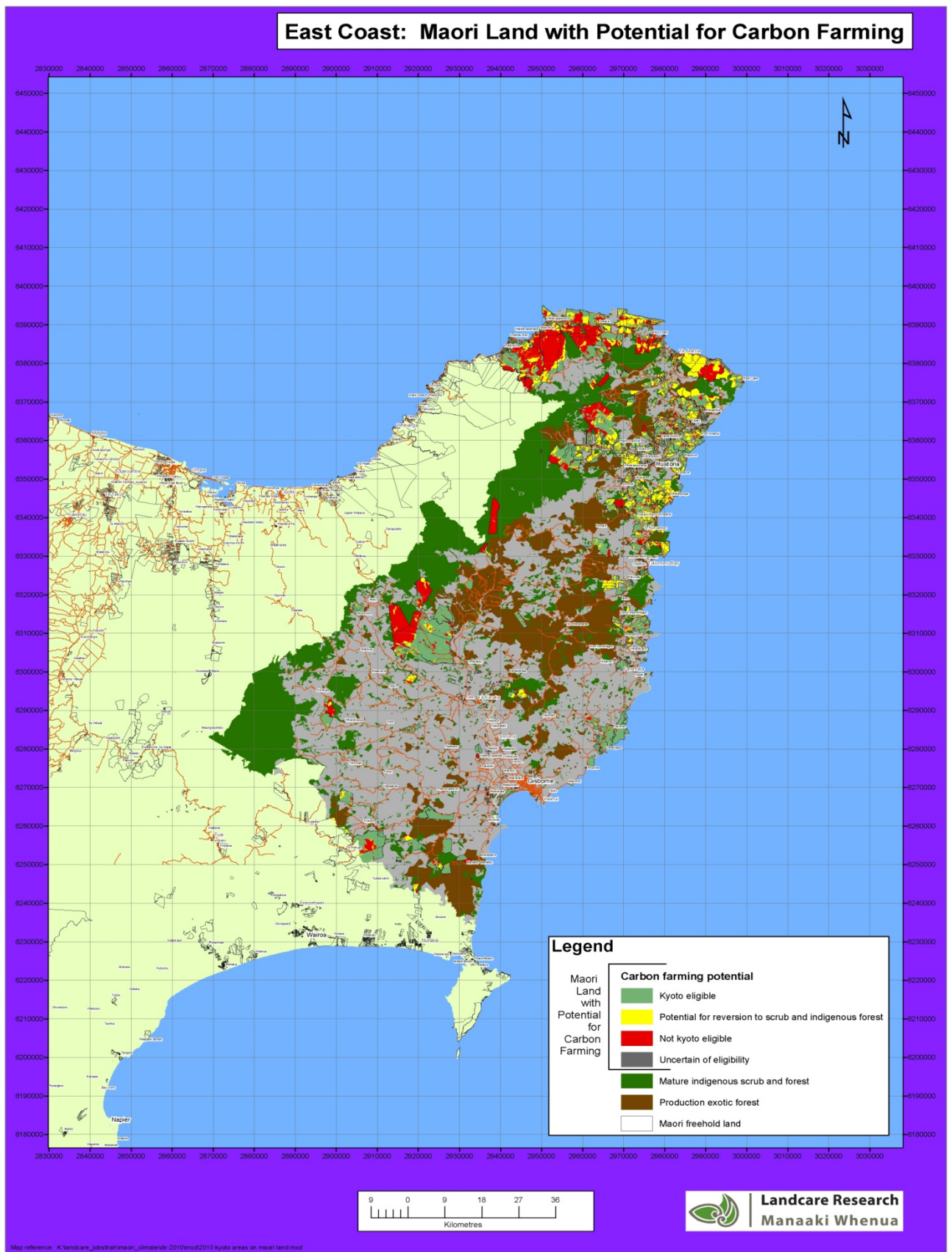
## Analyses – Climate change models

The MLIB (TPK 2002) was intersected with IPCC climate scenarios – NIWA AR4 climate modelling data (Mullan et al. 2001, 2005, 2008; Mullan & Dean 2008; MAF 2008) (Figures 4, 5, 6, 7) to predict changing temperature and rainfalls in the next 90 years from present averages on Māori land blocks. This information can be used to plan and adapt Māori land for predicted climate changes. Most Māori land blocks in the MLIB are located in the North Island. Findings included:

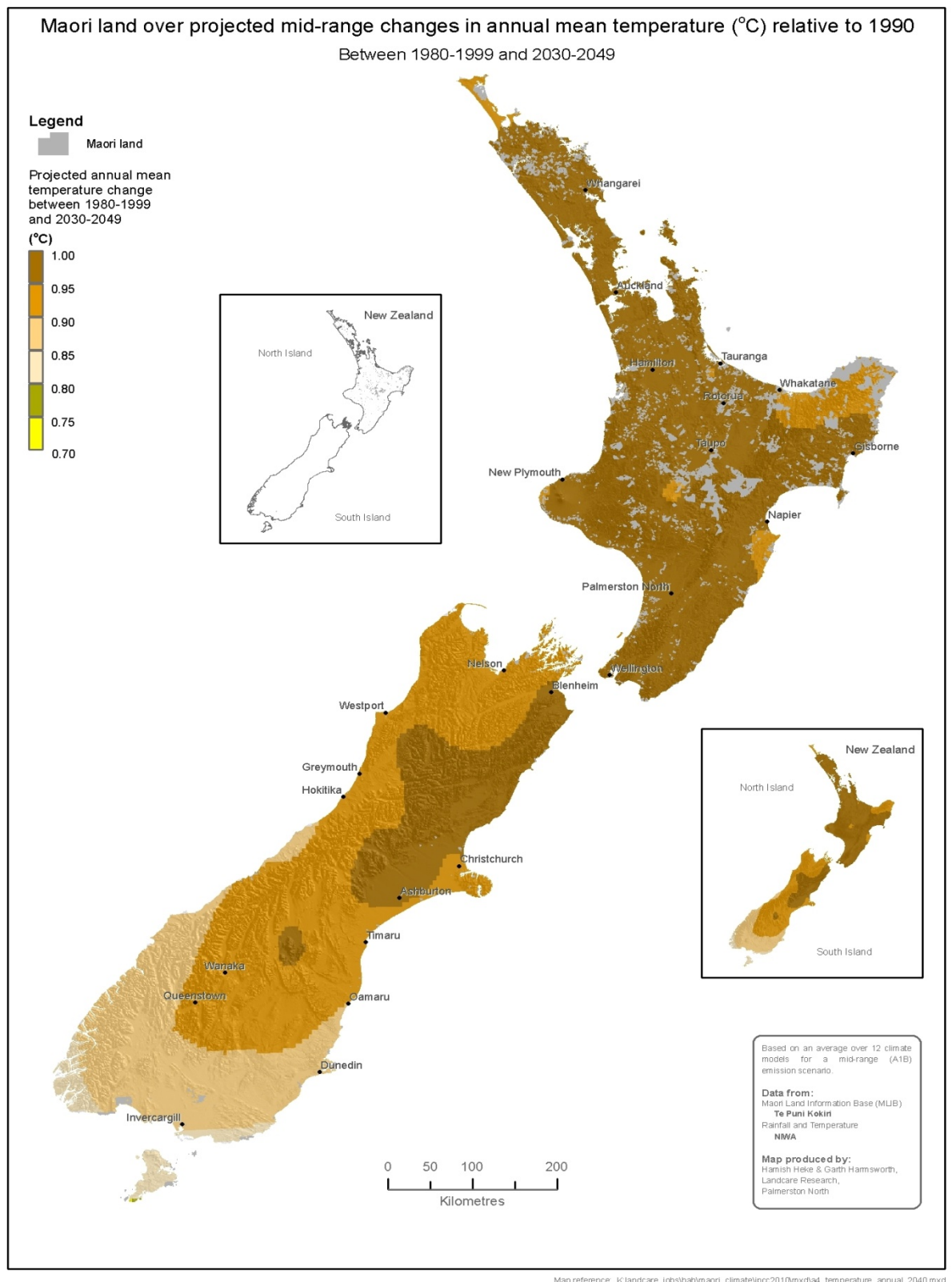
- Between 1980–1999 and 2030–2049, 90% of Māori land blocks in the North Island will experience annual mean temperature rises of 1.0°C
- Between 1980–1999 and 2080–2099, 90% Māori land blocks in the North Island will experience annual mean temperature rises of 2.2°C
- Between 1980–1999 and 2030–2049, Māori land blocks in the South Island, especially north-eastern South Island (e.g., mid-Canterbury–Kaikoura–Nelson–Wairau), will experience annual mean temperature rises up to 1.0°C; while Southland, Otago, West Coast will have < 1.0°C increase
- Between 1980–1999 and 2080–2099, Māori land blocks in the South Island, especially north-eastern South Island (e.g., mid-Canterbury–Kaikoura–Nelson–Wairau) will experience annual mean temperature rises up to 2.2°C; while Southland, Otago, West Coast will experience < 2.0°C increase
- Between 1980–1999 and 2030–2049 Māori land blocks in the North Island, eastern North Island (East Coast), Bay of Plenty, Waikato, Auckland–Northland are expected to experience annual precipitation decreases of up to 5.0% mean annual rainfall leading to increasingly drier conditions and drought
- Between 1980–1999 and 2080–2099 Māori land blocks on the eastern North Island (East Coast), Bay of Plenty, Waikato, Auckland–Northland are expected to experience annual precipitation decreases of up to 7.5% mean annual rainfall leading to increasingly drier conditions and drought
- Between 1980–1999 and 2030–2049 Māori land blocks in the western and lower North Island, are expected to experience annual precipitation increases of up to 7.5% mean annual rainfall
- Between 1980–1999 and 2080–2099 Māori land blocks in the western and lower North Island, are expected to experience annual precipitation increases of up to 7.5% mean annual rainfall
- Between 1980–1999 and 2030–2049, Māori land blocks in the South Island, especially north-eastern South Island (e.g., Kaikoura–Nelson–Wairau) are expected to experience annual precipitation decreases of up to 5% mean annual rainfall
- Between 1980–1999 and 2080–2099, Māori land blocks in the South Island, especially north-eastern South Island (e.g., Kaikoura–Nelson–Wairau) are expected to experience annual precipitation decreases of up to 7.5% mean annual rainfall.

These findings indicate a need to plan for increased incidence of drought in eastern and northern regions of New Zealand and promote sustainable land management practices on steep North Island hill country (MAF 2006b) in response to predictions of increasing high frequency intense rainfalls. With the occurrence of future drier conditions in the east of the North and South Islands it will be prudent to introduce more drought tolerant grasses and tree types to adapt to drier conditions and prolonged water deficits. The climate change scenarios

shown in Figures 4–7 may also require different farming systems (MAF 2006b). This also opens up many climate change opportunities for land-use change on Māori land.

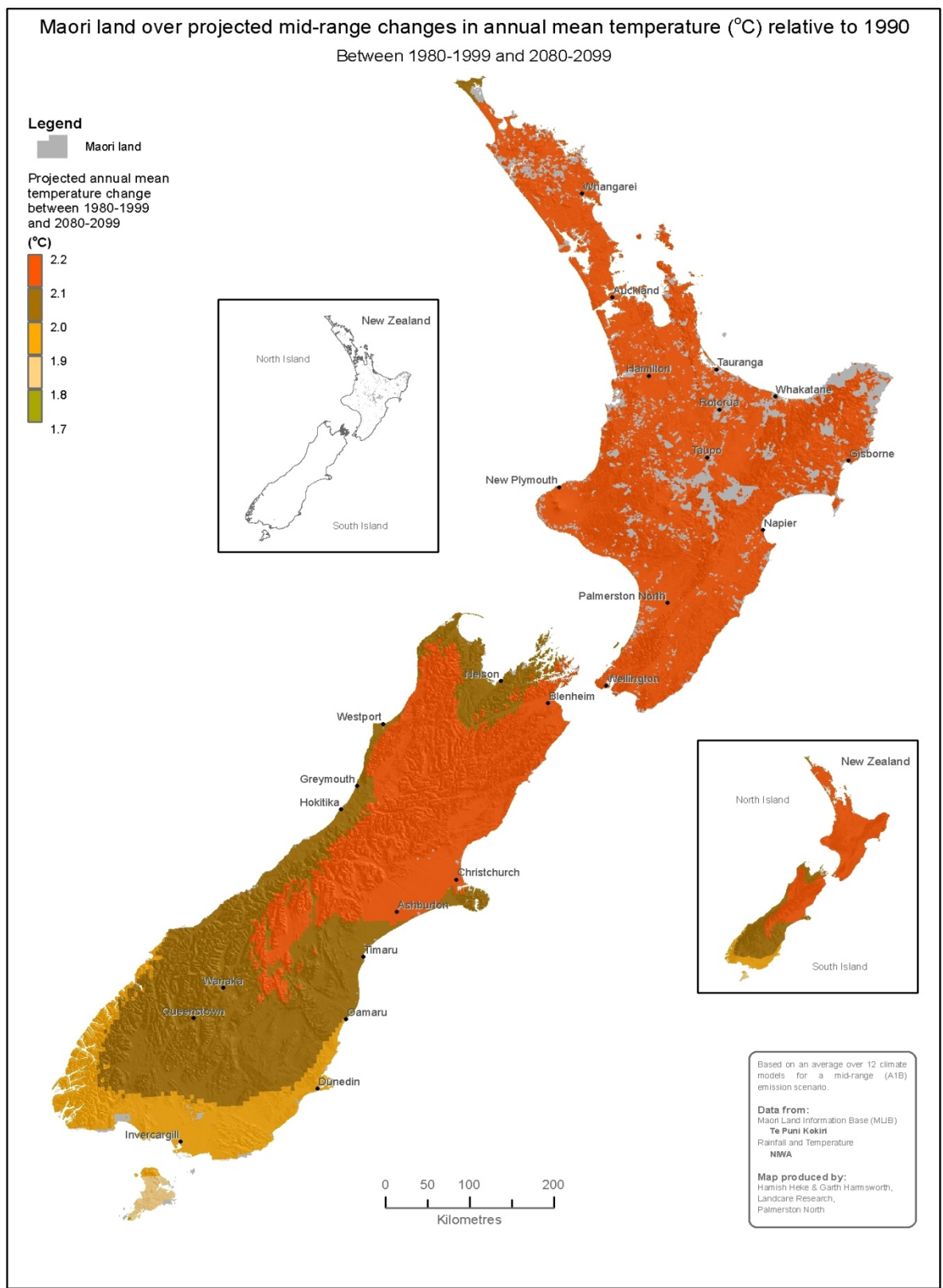


**Figure 3** Kyoto eligible versus ineligible Māori land in the Gisborne–East Coast region (Landcare Research GIS).

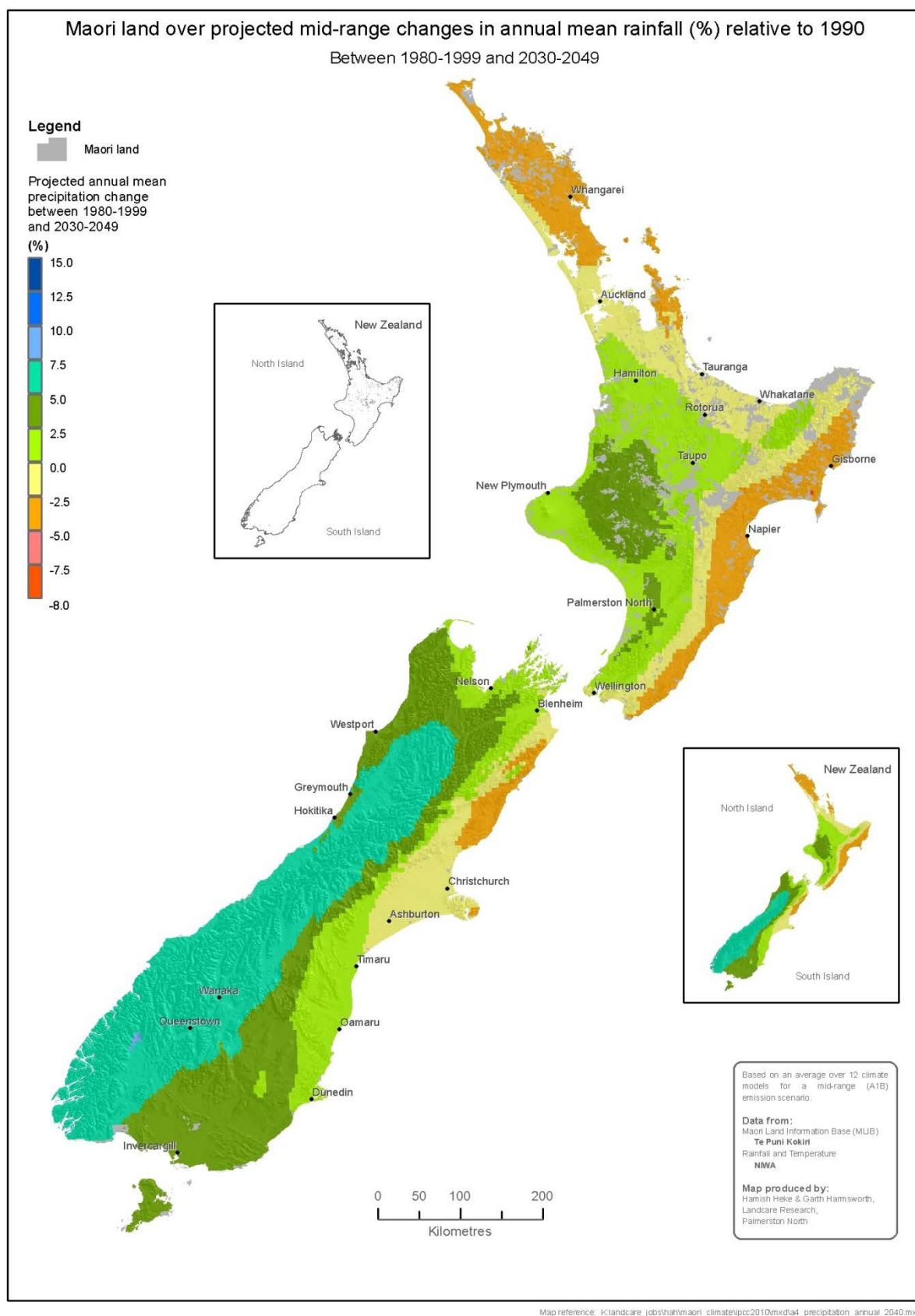


**Figure 4** Climate change scenarios (annual temperature change) on Māori land (grey) expected between 1980–1999 and 2030–2049 based on the AR4 NIWA model (Landcare Research GIS).

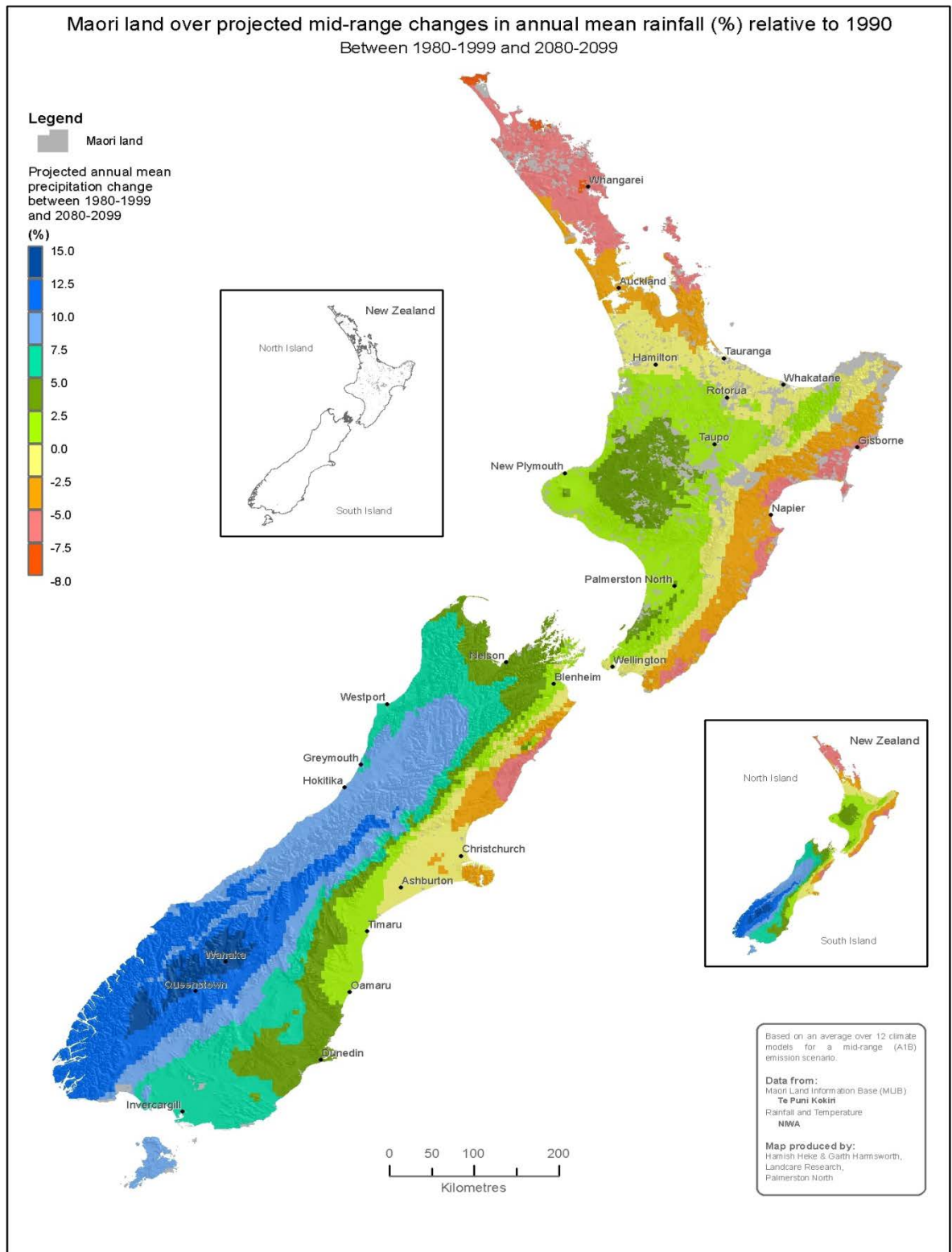




**Figure 5** Climate change scenarios (annual temperature change) on Māori land (grey) expected between 1980–1999 and 2080–2099 based on the AR4 NIWA model (Landcare Research GIS).



**Figure 6** Climate change scenarios (annual mean rainfall change) on Māori land (grey) expected between 1980–1999 and 2030–2049 based on the AR4 NIWA model (Landcare Research GIS).



**Figure 7** Climate change scenarios (annual mean rainfall change) on Māori land (grey) expected between 1980–1999 and 2080–2099 based on the AR4 NIWA model (Landcare Research GIS).

### 4.3 Key business opportunities for Māori land

Climate change presents a large range of new business, commercial, and technology innovation opportunities for Māori land (MAF 2001, 2006a, 2007a; Carswell et al. 2002; Harmsworth 2003a, b, 2004, 2007, 2008; Giltrap et al. 2005; Harmsworth & Funk 2006; Carswell & Harmsworth 2007; TPK 2007; Insley 2007, 2008; SKM 2008; Hall & Jack 2008, 2009).

In this project we built on the previous work by SKM that identified a large range of generic climate change business opportunities (SKM 2008). From hui, interviews, and workshop discussion of the current list of climate change opportunities this study determined the level of interest and awareness for each. New opportunities raised at hui were added. The first set of questions and discussion in hui were basically to find out what Māori business knew and understood about climate change opportunities, followed by questions on preference and priority. Findings are presented below from a sample size of 15 Māori business organisations (see section 3 under methods).

The following business opportunities for Māori land were identified with selected Māori groups across New Zealand (in no particular order) and presented to participant groups for comment:

1. Emerging carbon markets – forestry sinks
2. Biochar
3. Methane reduction (methane emissions reduction technology)
4. Anaerobic digestion/reduction
5. Improved nutrient use and budgeting (e.g., better use of fertilisers)
6. Nitrous oxide abatement technologies (e.g., nitrification inhibitors)
7. Emission measurement services (soil carbon capture measurement technologies);
8. Local and regional renewable energy (bioenergy, alternative sustainable energy production (including biofuels)
9. Wood energy
10. Liquid biofuels
11. Energy efficiency
12. Carbon neutral products (low carbon brands)
13. Sustainable wood production
14. Land-use change/sustainable land use/improved efficient land management practices
15. Environmental services (ecosystem services)\*
16. Biodiversity credits\*
17. Ecotourism\*
18. Cultural tourism and indigeneity\*('being able to tell our stories', 'expressing a distinct unique indigenous brand', 'keeping integrity in the brand through control of a culturally based opportunity')

We also confirmed with Māori business that these were key business opportunities in which they were interested. The last four – asterisked \*– were added to the SKM (2008) list by Māori participants during this study.

*Awareness – have you heard about this opportunity?*

Māori business from the Gisborne–East Coast–eastern Bay of Plenty (Insley 2010) showed a high degree of awareness of most of the climate change business opportunities 1–18. In other parts of the country there was generally a low awareness and understanding, with the highest awareness for (1) carbon credits and carbon farming schemes, (9) wood energy, (11) energy efficiency, (13) sustainable wood production, (14) land-use change/sustainable land use/improved efficient land management practices, and to a lesser extent (8) local and regional renewable energy (bioenergy, alternative sustainable energy production (including biofuels). A low level of awareness and understanding was shown nationally for (2) biochar, (3) methane reduction (methane emissions reduction technology), (4) anaerobic digestion/reduction, (5) improved nutrient use and budgeting (e.g., better use of fertilisers), (6) nitrous oxide abatement technologies (e.g., nitrification inhibitors), (7) emission measurement services (soil carbon capture measurement technologies).

*Do you want to know more about this opportunity?*

All groups wanted more information – in easily digestible, understandable form – presented on each business opportunity.

*Is this a business opportunity you are interested in?*

All groups were interested in all the opportunities outlined.

*Is there a risk associated with any of the climate change opportunities? Rate 1 for low, 5 for high.*

There was general consistency across all Māori businesses that participated in giving the majority of climate change opportunities (1–18) a moderate risk value. None of the Māori businesses considered any opportunity to have no risk, and all businesses were uncertain on how to assess this correctly without knowing more about the opportunity. The moderate assessment values seem to indicate a majority of Māori businesses do not yet have the knowledge base to adequately assess climate change opportunities in terms of risk.

#### **4.4 Critical success factors for uptake of business opportunities**

The second key question was to find out what businesses considered to be the most important critical success factors (CSFs) towards advancing and potentially implementing climate change opportunities. Again these were measured on a scale of 1–5: 1 being not important, while 5 being very important. To begin with a large range of CSFs were confirmed as necessary for successful uptake and implementation of climate change business opportunities. These are given below (in no particular order):

1. Eliminating uncertainties (e.g., carbon pricing, whether schemes are going ahead or not? Government indecisiveness on projects and policy, having Government leadership)
2. Having more information on the climate change opportunity
3. Having someone explain it to us more fully
4. Understanding the liabilities, i.e. having no liabilities/penalties, having no fish hooks!

5. Having it Government backed; having it industry backed; having it backed/supported by an iwi/hapū collective
6. Doing it as a collective (not a single Māori land block or on your own)
7. Going into this business as a joint venture – looking for a partner, partnership arrangements
8. Carrying out a feasibility study
9. Having capital to invest (having access to banks)
10. Having good financial information to work from
11. Understanding our land, its resource potential, to seize this opportunity (on a Māori land block)
12. Knowing what the risks are (what risks are you taking)
13. Understanding and knowing what the benefits are
14. Having appropriate or good governance on your land block to make the right decisions
15. Having the right people to guide us
16. Having the right people making decisions for us – as much is at stake (e.g., need people we can trust, having the right skills, professionalism)
17. Having access to and help from: Government agencies (e.g., MAF); research centres (e.g., CRI's, universities); iwi/hapū authorities; Māori organisations/consultants; private consultants; other land blocks, incorporations, trusts; other land owners
18. Identifying whether this business opportunity is up and running in some other part of the country (other models? has it been tested elsewhere?)
19. “The market has to exist first (need to understand the end market)” “Who do you sell to?” “How do we capitalise on and distribute the end product or service?”
20. “The infrastructure has to exist before we grasp the opportunity”
21. Having a collective vision
22. The need to foster internal innovative capabilities and capacities
23. Having strong leadership
24. Having enough time to devote to work
25. Ability to make effective decisions.

*Which critical success factors are most important?*

All the CSFs (1–18) were regarded as either important or very important. Risk factors 19 and 20 were added by three Māori businesses as the project progressed; and CSFs 21–25 by the Gisborne–East Coast Māori businesses participating in this study (Insley 2010). All additional CSFs were regarded as very important by all businesses concerned. None of the CSFs were regarded as being low or not important.

*Some of the CSFs that scored the highest included:*

- Eliminating uncertainties
- Having an opportunity (scheme or initiative) backed/supported by an iwi/hapū collective
- Having an opportunity (scheme or initiative) backed by Government
- Having an opportunity (scheme or initiative) backed by industry
- Exploring or implementing an opportunity (scheme or initiative) as a collective (not a single Māori land block or on your own)

- Having the right people making decisions
- Having the right information.

#### 4.5 Māori landowner views, preferences and priorities

The last set of questions related to how Māori organisations would rank the opportunities in terms of preference, priority or choice. Rankings are given in Table 10.

**Table 10** Ranking the priority and preference for climate change opportunities 2009/2010 from highest to lowest

Climate change opportunity	Ranking
Emerging carbon markets – forestry sinks	1
Land-use change/sustainable land use/improved efficient land management practices	2
Local and regional renewable energy (bioenergy, alternative sustainable energy production (including biofuels)	3
Wood energy	4
Sustainable wood production	5
Liquid biofuels	6
Biochar	7
Ecotourism	8
Energy efficiency	9
Carbon neutral products (low carbon brands)	10
Environmental services (ecosystem services)	11
Biodiversity credits	12
Improved nutrient use and budgeting (e.g. better use of fertilisers)	13
Emission measurement services (soil carbon capture measurement technologies)	14
Anaerobic digestion/reduction	15
Methane reduction (methane emissions reduction technology)	16
Nitrous oxide abatement technologies (e.g., nitrification inhibitors)	17

All the opportunities listed were of interest to the Māori organisations surveyed, and through interview and discussion. From highest (1) to lowest importance (5), a number of key ‘opportunity’ themes emerged:

1. Carbon – forestry sinks
2. Land-use change and land-use flexibility
3. Sustainable wood products, energy, renewable energy, biochar
4. Energy efficiency, biodiversity, ecotourism, and environmental services
5. Nutrient use and budgets, emission measurement technology, anaerobic digestion, methane reduction, and nitrous oxide abatement.

The reasons for ranking opportunities in this order were related to a number of key factors, including the level of knowledge and understanding, level of interest, perceived level of risk, degree of certainty, expected economic return, and the relationship between the opportunity and climate change as an issue. Some of this related to key drivers.

*Business opportunities can be broadly grouped under key drivers:*

- Opportunities that align to, or reflect, Māori values and aspirations
- Policy and regulatory drivers – opportunities in response to current, emerging and likely climate change policy and regulations (International and New Zealand, including the ETS) excluding price effects of climate policies
- Consumer preference and perception. There are opportunities arising from specific changing consumer preferences, such as, for low carbon products associated with reduced carbon (mitigated greenhouse gas) footprints, ecologically sustainable, clean and green products, climate change friendly products. Consumer behaviour will dictate to the market (e.g., through supermarkets, product/food preference, goods and services) and the market needs to respond (i.e. opportunities)
- Indigenous branding (aligned to Māori values, Māori organisational philosophy, and clean and green products and services);
- Carbon, energy efficient and other input prices – opportunities in response to higher energy prices and input costs such as those related to energy price, oil, fertiliser, etc.

Other key factors that strongly affecting the ranking were related to how and who Māori saw as the main beneficiaries from each opportunity/technology and who were the central players in each opportunity (see Appendix 1).

#### **4.6 Key climate change business opportunity themes**

A number of key theme areas emerged from this study and each is described in terms of level of awareness, understanding and priority from 4.6.1 (highest awareness and priority) to 4.6.5 (lowest awareness and priority):



#### 4.6.1 Carbon-Forestry sinks

Most Māori organisations knew most about this opportunity and had been adequately informed about it. This was particularly the case with Gisborne–East Coast/eastern Bay of Plenty businesses (Insley 2010) and East Coast Māori businesses Wairarapa–Hawke’s Bay–Wairoa. Interest in establishing new forest was high on the agenda for many Māori groups, particularly those in the Gisborne–East Coast area. Ngati Porou Forests is actively exploring options to establish new multiple use-carbon and energy forests on highly erodible and marginal farmland. The New Zealand Government has introduced a number of initiatives and schemes through policy to reduce carbon emissions and create carbon sinks at least in the short term (MAF 2006a, 2007a, c).

#### Schemes

A number of ‘climate change’ Government schemes are now operational in New Zealand and administered by MAF (e.g., MAF 2006a, 2007a). These schemes suit Māori landowners who are committed to allowing some of their land to be planted in trees or allow areas to naturally regenerate into native forest in perpetuity (Carswell et al. 2002; Harmsworth 2003a, b; Carswell & Harmsworth 2007; Insley 2007). A **Kyoto-compliant credit** is called an Assigned Amount Unit or AAU. The main Kyoto schemes are:

- Emissions Trading Scheme (ETS) – indigenous forest after 1990. Land use can be changed if the carbon credits are bought back (at market price). No covenant required. Areas must be greater than 50 ha and require field assessment. Administration costs are factored in at beginning of process.
- Permanent Forests sinks initiative (PFSI) – only option for Kyoto compliant carbon credits with better returns. **Compliant credits have higher monetary value; however, a covenant is required for 50 years. The MAF default sequestration rate for indigenous forests of three tonnes CO<sub>2</sub>e per hectare per year.** Administration costs are factored in at beginning of process.
- Afforestation Grants Scheme (AGS) – tender-based (contestable) scheme. Suited to landowners with less than 50 ha. “To encourage the establishment of new forest land in NZ”, “to stabilise greenhouse gas concentrations” in the atmosphere. Administration costs are factored in at beginning of process.

In addition to these climate change schemes is the separate East Coast Forestry Project (ECFP) managed by MAF. The ECFP was set up in the early 1990s to mitigate soil erosion on the Gisborne East Coast through fencing and planting of the most erodible land. This scheme only applies to target land (severely eroding) with specific criteria.

#### *Criteria for Kyoto forest*

Criteria for eligibility of a Kyoto forest are:

- Exceeding 1 ha
- Area must be at least 30 m wide
- Contains species capable of reaching 5 m height at maturity, and/or achieving >30% complete vegetation or crown (mature) cover of the site

- Land should have been actively farmed (i.e. have supported at least 1 stock unit) before 31 December 1989.

The process (key steps) for obtaining carbon credits is:

- A preliminary map (on an aerial photo) of the area being considered is necessary and must show property boundaries, fenceline boundaries, and an estimate of the sink area given (e.g., 100 ha)
- A New Zealand emissions unit register (NZEUR) account number must be obtained (see <http://www.eur.govt.nz/>)
- Registration with the NZEUR must be completed
- Determine the area precisely for forestry in hectares and show on a map with the application
- Obtain covenant if required (a contract – especially with Kyoto credits)
- Calculate carbon accumulation (for the area applied for) – may use the MAF default sequestration rate
- File a return
- Gain credits and gross return (at a carbon market price).

These carbon farming areas could also be used for other low-impact forest uses (canopy has to stay complete) to supplement carbon revenues, such as (Harmsworth 2003a; Insley 2008):

- Tourism, ecotourism, cultural tourism, bush walks, horse riding, hunting, fishing, etc.
- Customary use, e.g., plant materials for weaving, and plants and organisms for medicine (rongoa)
- Following a stocktake of all native plants and other flora and fauna, potential for extraction of pharmaceuticals and nutraceuticals
- Firewood
- In mature forest areas, some restricted and well-managed selective logging of native trees.

#### **4.6.2 Land-use change and land-use flexibility**

Land-use change ranked very strongly with many Māori businesses especially in the Gisborne–East Coast and eastern Bay of Plenty area and was seen as critical to iwi leaders and Māori landowners when considering any new land-based opportunity climate change opportunity (Insley 2010). For example, where the dominant land use in the district is farming, land owners are now signalling a need to use detailed land-use modelling methods to help make the right decisions in terms of their land characteristics and the need to change land use on both marginal land and on high value, high versatile land in line with both economics, sustainability and land owner values and aspirations (Insley 2010).

#### **4.6.3 Sustainable wood products, energy, and renewable energy**

A strong interest in wood products, energy, especially renewable energy, and wood fibre technologies ranked as the next set of opportunities. New purpose-grown forests present an array of new opportunities that include (Hall & Jack 2008):

- Job creation
- Regional development
- Carbon sequestration
- Improved land use management
- Erosion control
- Improved water quality
- A significant long-term (~10 year) energy store
- Less exposure to international oil prices (New Zealand has the third highest oil consumption per GDP).

The Scion 2008 (Hall & Jack 2008) study suggests the East Coast has a critical role to play in that an estimated 244 381 ha of highly erodible land, much of which is currently in pastoral farming, is highly suited to some form of energy-crop farming. Much of this land is Māori land, reinforcing the findings and views of this study that many climate change opportunities for forest carbon sinks, sustainable wood products, energy and renewable energy will be of major interest to Māori landowners. More broadly across the Bay of Plenty, Gisborne, Hawke's Bay region/s, an estimated 664 931 hectares of land (much of it Māori) is suitable for such land-use change and the Scion study suggested this land could produce 1341.86 (billion) litres of wood derived biofuels per annum (Insley 2010).

#### **4.6.4 Energy efficiency, biodiversity and environmental services**

The next set of ranked options included those concerned with energy efficiency, biodiversity and environmental services. These opportunities were still of high interest to Māori business but ranked lower relative to the other opportunities. Some of this lower ranking is due to the complexity of the opportunities presented, little information being available on biodiversity and environmental services, although large amounts of information are available on energy efficiency, and more uncertainty prevailing regarding biodiversity and environmental services.

#### **4.6.5 Nutrient use and budgets, emission measurement technology, anaerobic digestion, methane reduction, and nitrous oxide abatement**

These included: nutrient use and budgets, emission measurement technology, anaerobic digestion/reduction, methane reduction, and nitrous oxide abatement. Very few Māori businesses nationally knew much about these technologies as opportunities. Most Māori businesses viewed them as very research/technology centred, requiring a high degree of research/technology capacity and knowledge, and many had difficulty seeing the role of Māori as part of these. The same general level of understanding was not indicated about these climate change opportunities and they ranked the lowest by most Māori businesses. This was particularly the case with the Gisborne–East Coast, eastern BOP, and Wairarapa–Hawke's

Bay Māori businesses to whom we talked. These opportunities also contain a high degree of research and innovation investment, some have high risk, and many require skillsets outside Māori groups (e.g., emission measurement technology). As seen in Appendix 1, Māori are not the main beneficiaries in these opportunities, but could work in, and benefit from the opportunity through joint ventures/partnerships.

Māori businesses and individuals who knew most about nutrient use and accounting/budgets and nutrient credits were those in the central North Island, Taupo and Rotorua lakes catchments, and Waikato river.

## 5 Discussion

There was a high level of interest by Māori landowners and businesses on all the climate change opportunities presented in this study, and a general consensus on which ones were of high priority. Māori organisations tend to see opportunities presented in a much wider context than just business revenues and profits, and typically follow agendas, decisions, and mandates representing large constituent populations of shareholders and landowners across many goal and strategic portfolio areas, including, employment, health, environment, social, cultural, economic, and political.

Although commonly there was a high level of interest, there was also a lack of both fundamental and specific knowledge about the climate change opportunities to take these further, especially the ability to make and implement informed decisions on preferred opportunities for Māori land. There was also an obvious air of caution in relation to the uncertainty of policy and rules surrounding many of these opportunities. Some groups expressed a distrust of central Government led policy and initiatives. However, climate change was seen as a central driver for a broad range of clean green technologies. The move away from the reliance on fossil fuels towards more sustainable low carbon industries was widely supported by Māori.

There were minimal differences in the views expressed by different types of Māori organisations (e.g., iwi, trusts, networks, private), but regional differences were noted. One regional difference was groups and individuals in the central North Island had a higher degree of knowledge, than the other groups interviewed, of nutrient use, nutrient budgets and accounts because of their connection to pastoral farming, forestry and poor water quality in the region, mainly around lake and river issues. Gisborne–East Coast–eastern Bay of Plenty iwi and trust groups had a high degree of knowledge on carbon farming, forestry and carbon credits (Harmsworth 2003b; Insley 2010) with a long history in forestry initiatives and sustainable land management planning on erosion prone hill country.

The hui and interviews in this study were difficult to carry out in such an air of uncertainty, criticism, and sometimes pessimism regarding the Emission Trading Scheme (ETS) and its implications. This was noted especially when talking to groups where climate change issues were perceived to impact on Māori land or land under Treaty claims. For example, when talking to Central North Iwi (CNI) groups and various farmer and forestry groups involved in Treaty settlements, all raised specific issues about the ETS and its implications. Issues related to land-use change and deforestation, together with new ETS rules, were seen to diminish land-use options on some types of land through penalties/liabilities. Another issue was concern about land being negotiated under settlement where any future land-use change would incur liabilities for conversion of an existing forestry land use into a non-forested land use such as pastoral farming. Other issues related to local government land-use rules such as nutrient caps. Many Māori saw these as deliberate attempts by central and local Government to control and limit Māori land-use options and impose financial constraints on Māori land. This would also be the case if land was used for carbon credits it would technically move from an ‘undeveloped’ to ‘developed’ state and therefore be ‘Māori land generating revenue’ and consequently incur higher local and regional rates and taxes.

## **Key requirements**

A number of key requirements emerged from the study and must be addressed before any climate change opportunity is adopted and implemented.

### *Need for meaningful information and dialogue*

There was generally a keen desire among Māori to have access to reliable information and to learn more about each of the emergent opportunities given in this study. With most opportunities presented, the policy and technologies are new, there is little infrastructure for each opportunity, and proven track records are lacking; as a result there is a high degree of caution. There is a need for more dialogue with Government agencies, scientists, relevant industry groups, and other Māori practitioners, on preferred opportunities. Access to high quality information and meaningful dialogue is essential for informed decision-making and to reduce risk.

### *Building capability*

1. There is an urgent need to build research and development capability within Māori organisations
2. There is an urgent need to build both business and industry skills in selected climate change business areas to take full advantage of these

Very few Māori organisations at present have the capability or dedicated resources to seriously take on these business opportunities on their own. There was an urgent need to build their own core capabilities and capacity to both engage and partner with organisations with appropriate skills and knowledge. Some of the groups (e.g., Gisborne–East Coast iwi) are currently developing research, innovation and technology strategies to enhance iwi/hapū capability.

### *Understanding the Māori asset base*

It is essential for Māori business to understand the resource characteristics and potential of their land(s), and have good access to high quality technical information in easy to understand formats. This is imperative for decision-making and to match opportunities to land characteristics.

### *The need for Māori businesses to have greater access to research, technology and innovation*

This was highlighted by many groups, and in particular emerged as an urgent priority for Gisborne–East Coast–eastern Bay of Plenty landowners (Insley 2010), and many Māori organisations throughout New Zealand are asset rich but cash poor. Greater access to R&D could be progressed and fulfilled through partnerships and collaboration between research organisations (e.g., CRIs, universities) and Māori organisations (e.g., iwi/hapū/whānau, business groups). Funding needs to be specifically targeted to Māori organisations to engage with CRIs and universities, in order for Māori organisations to understand the potential of their land resources and the opportunities available to them. There are many issues with funding, including: lack of awareness, high compliance costs, difficult process to access funding, too much competition with mainstream funds. Māori organisations also need incentives (e.g. tax incentives, 50/50 partnerships with Government) to invest in their own R&D.

## Key factors

In summary a number of key factors will be necessary to take advantage of climate change opportunities, including:

- The necessary and adequate capacity of each Māori organisation to make informed decisions
- A collective vision, aligning opportunities to aspirations
- A high level of interest in research and innovation
- Having enough useful information on each of the opportunities of interest – enough to make an informed decision on the technology and application, rate of return, and managed risk
- Making informed decisions that take into account a complete risk profile (of each opportunity)
- Having necessary leadership
- Being able to make effective decisions in the context of Māori values, markets, consumers
- Understanding the perpetual ownership-governance of Māori land
- Understanding the land resource potential of Māori land
- Good governance structures and stability
- A desire to form partnerships and joint ventures
- Forming effective relationships and partnerships (e.g., iwi collectives, with central Government, with industry)
- Using distinctive governance approaches and business models to capture the full range of opportunities
- Having capital to invest in the opportunity – having a reasonably good capital base and equity.

## 6 Conclusions

### General conclusions

This work presented a list of 18 climate change business opportunities for Māori land and Māori organisations (e.g., trusts, incorporations, businesses, networks, iwi/hapū) that were prioritised into 5 key theme areas based on preference, priority and understanding. Theme areas coincided to a degree with those who were expected to be the main beneficiaries for each opportunity, as shown in Appendix 1. However, the strong possibility of joint ventures/partnerships between Māori, industry, CRIs/universities, and Government could change this order in future. Climate change opportunities presented in this study can be considered for all 1 515 071 hectares of Māori land but need to be matched to specific land characteristics in future. Approximately 558 000 ha (36.8%) of Māori land nationally was identified as eligible for Kyoto forest (e.g., carbon farming, carbon credits), a further 230 442 (15%) ha with potential for scrub reversion/native regeneration. It was estimated that about 60% of this Kyoto eligible 558 000 ha was marginal land, about 334 800 ha nationally. In a defined Gisborne–East Coast case study area 78 773 ha (51%) of Māori land was identified suitable for Kyoto forest and 34 993 ha (22.7%) with potential for scrub reversion/native regeneration. About 80% (i.e. ~ 63 018 ha) of this Gisborne–East Coast Māori land is marginal, suited to carbon farming and Kyoto forest. Twenty-five ‘critical success factors’ (CSFs) were presented for the successful uptake and implementation of climate change opportunities of which seven CSFs scored the highest with the groups interviewed. No CSFs were considered unimportant.

Findings across New Zealand show considerable interest by Māori in all climate change opportunities, and this study generally identified what was of most interest and what was of least. Although there was high interest in most opportunities there was also a general low awareness and understanding of the majority of the climate change opportunities. All need to be explored further and this study has only just tapped the surface. This study also provided specific background information on Māori land to identify whether or not some of these opportunities are feasible, and what changes on Māori land need to occur in response to climate change both in terms of adaptation/mitigation especially to capture business opportunities. Across New Zealand Māori submitters have made it quite clear that there was a keen interest for iwi/hapū and Māori organisations to be involved in all new business opportunities (Willie Te Aho for iwi leadership group).

### Gisborne–East Coast–eastern BOP findings

For those Māori organisations from the iwi of Ngai Tai, Te Whānau a Apanui and Ngati Porou (Tairāwhiti and Waiariki Māori land districts) involved in this study (Insley 2010), the successful uptake of a number of key technologies and climate change business opportunities arising from new and emerging domestic and international policies could grow the economic interests of these Māori organisations alone by \$NZ100s millions in the next 5–10 years. Along the way, this new economic activity will create many new Māori jobs for the Tairāwhiti and Waiariki communities with related spin-off benefits such as stabilising erodible east coast lands, improving water quality, and bringing marginal lands into more sustainable, productive, and economic land uses.

In the Gisborne–East Coast–eastern Bay of Plenty interviews (Insley 2010) there was a high degree of awareness of the many opportunities presented. This was attributed to the amount



of publicity in the region on domestic climate change policy and a higher level of exposure over the years to a number of Government Schemes (e.g., AGS, East Coast Forestry). Many Māori organisations in the region have been involved in making submissions on climate change policy and the Emissions Trading Scheme (ETS) and through the select committee process.

Māori businesses are overwhelmingly signalling their need for more information not only on policy certainty but also about final regulations on individual business opportunities (Insley 2010).

The Gisborne–East Coast–eastern BOP part of this study (Insley 2010) confirmed that “while there is very strong interest in the emergent business opportunities that may arise out of new climate change policy, it would be fair to say that none of the organisations interviewed actually have the capability to seriously take on these new business opportunities directly. Across each of the organisations interviewed, none had dedicated personnel or capabilities to directly take on any new innovation investigation or related business case for each new business opportunity... no business has a current dedicated resource to formally follow up on each or any of the new business opportunities... for these new business opportunities to be more formally developed and applied there will have to be ongoing, deliberate and systematic building up of capabilities within Māori organisations in order to determine how to practically turn the current strong interest identified in this study into real projects on the ground” (Insley 2010, pp 26).

### **Critical success factors**

From this study five key CSF themes have emerged:

- Access to reliable technical and expert people, and to financial information about each opportunity is essential; and related to this is the need to create an appropriate scale of implementation of projects that is likely to minimise risk (whaka whānaungatanga)
- Access to key information about land and other resources, and the need for practical and active engagement with key government agencies like MAF and MfE, and key members of the New Zealand research, technology and innovation system are imperative
- Good governance (e.g., appropriate management and governance structures in place to capture and implement business opportunities)
- Access to investment and development capital such as investment capital (e.g., banks, finance companies) and Government funding (e.g., TechNZ)
- The role and importance of strong commercial vehicles and joint ventures, especially with players that have key skill sets or assets that Māori businesses lack, with some form of government and industry backing was the final theme.

Most Māori organisations with interests in these five CSF themes were also interested in learning about the emergent business opportunities presented in this study. Most also had capabilities to adapt and cope with risk and uncertainty. There is a need to look for unique opportunities and to respond positively to climate change and special demands to obtain the correct information/knowledge to help capture these opportunities.

## **What are the key climate change business opportunities for Māori land?**

It is likely that as policy and rules become more defined over the next few years and more information becomes available Māori organisations will be able to refine their interest to particular business opportunities (Insley 2010). Potential business opportunities include certain key areas:

- The uptake of new technologies to mitigate and withstand potential climate related shocks
- The positioning of products/exports as environmental and climate friendly strategies to respond to world markets and consumer demand where business gains competitive advantage by limiting or reducing the carbon footprint (e.g., carbon zero, carbon friendly)
- Diversifying existing productive land uses into alternative production systems (retiring marginal land, forestry, biofuels) (MAF 2006b; TPK 2007, 2009).

## **Iwi innovation strategy development**

From the Gisborne–East Coast–eastern Bay of Plenty study (Insley 2010) it was shown that iwi authorities in the larger region were currently developing a medium- to long-term (20-year) holistic innovation and technology strategy across a range of sectors, aimed at tapping into the New Zealand innovation system. This type of planning is required to develop an array of new products and technologies matched to the iwi and Māori landowner resource assets. Many Māori assets are concentrated in the primary sector, but Māori are often referred to as ‘asset rich and cash poor’.

Within this study, climate change has been identified as a key driver of new green technologies. For Māori such as in the Gisborne–East Coast–eastern Bay of Plenty, iwi/hapū strategic planning has already identified many of the technologies discussed in this study as definite targets for further investigation as their strategy development work progresses.

## **Advancement of new knowledge:**

If Māori are to participate fully in climate change opportunities specific research projects and business strategies are required. In conclusion, there are many gaps in the literature on climate change opportunities and technologies and they have to be communicated more precisely to target audiences so that constraints and barriers for Māori are reduced. A greater research effort needs to be given to bringing together existing research strands on understanding climate change issues with business opportunities.

Understanding how the distinctive features of Māori organisations create a unique set of business opportunities based on climate change adaptation and mitigation will be a major advance. Due to the nature of Māori land (governance complexity in combination with Māori aspirations, values and knowledge), the development and prioritisation of business opportunities will differ from that of the mainstream population.

It is hoped this study will help increase awareness and understanding of climate change issues and business opportunities for Māori and lead to increasing uptake of new, clean, green technologies that will benefit the environment, Māori, and the New Zealand economy. Attention must be paid to critical success factors for effective uptake and implementation.

The advancement of knowledge will be seen in Māori values (Harmsworth 2005), understanding Māori resource assets, business entrepreneurship, innovation, and commercial application in line with Māori aspirations for achieving a balance between economic, cultural, social and environmental goals.

## 7 Māori recommendations

Māori organisations and individuals participating in this study provided many statements and conditions that would facilitate successful uptake and implementation of climate change business opportunities. These are seen as ‘enabling factors’. One of the strongest conditions that came from this work was the need for strong commitment and partnership between Government and Māori organisations and increased certainty about policy and rules aligned to the international rules and conventions on climate change: “There is a desperate need for practical policy options by Government to enable the uptake of these and other emerging business opportunities. Central and local Government should therefore consider policy options that target and stimulate uptake of new schemes and green technologies by Māori business”; such as carbon forest sinks, land-use change modelling, energy options, and renewable energy options. The development of policy, rules, tools, schemes, and initiatives needs to recognise many of the Critical Success Factors presented in this study. First, it is imperative to understand the unique governance and collective ownership of Māori land and its characteristics, and second to take into account Māori aspirations, cultural values and rights under the Treaty of Waitangi to facilitate the adoption and implementation of climate change opportunities.

Collectively, the opportunities presented in this study could make a major and unique contribution to Māori economic, cultural, and social development (BERL & FOMA 1997; NZIER 2003; TPK 2002, 2009; Insley 2010), and achieve additional environmental benefits (e.g., biodiversity and water quality) and many cultural benefits (enhance Māori values and customary use). The climate change business opportunities presented in this study could also provide greater resilience for landscapes and communities to adapt to any increased incidence of extreme weather events. The economic impact of adopting climate change business opportunities for Māori organisations could be significant. For example, the carbon and energy option just on the East Coast alone could yield an NPV back to Māori landowners, in the vicinity of \$NZ100’s of millions, assuming a conservative establishment of just 30 000 hectares of new forests from the total 244 000 hectares identified in the East Coast–eastern Bay of Plenty case study area (Insley 2010). The successful uptake and implementation of many of these new ‘green technologies’ by Māori organisations in a region such as Gisborne–East Coast could significantly transform Māori business, iwi/hapū, marae communities, and wider regional economies.

If Māori business is to play a greater role in gaining access to new climate change business opportunities, and fully participate, benefit, and critically evaluate these, a number of key areas will need to be addressed. A major priority will be to build the internal capabilities of Māori organisations. Another key priority is to have equitable full access to the New Zealand research, technology, and innovation system (Insley 2010). Enabling effective access by Māori organisations to the New Zealand innovation system will be critical for Māori business to capture benefit from climate change opportunities. Institutional barriers, lack of research and development funding, lack of internal research capability, and access difficulties to information have to date remained major barriers to the uptake of research, technology and innovation for Māori business. The Government’s review of the New Zealand research, technology, and innovation system needs to address some of these issues of access for Māori.

Māori organisations and iwi with whom we worked felt strongly that action should be taken in the following areas:

- There was a desire for Government to hold firm to its ETS policy platform. This was critical in the study, which identified a strong risk-aversion theme, understandable given the shifting goal post on policy in recent years. Any shift on domestic policy will create uncertainty for Māori and investors, driving them elsewhere to wherever policy certainty is more assured.
- A need to strive for binding targets by all developed and developing countries on the international stage. Until this is achieved there will continue to be a level of risk that will hinder new investment in the uptake of these new technologies.
- The unique characteristics of Māori land under Te Ture Whenua Act (e.g., collectivity) mean Government policy and initiatives should be specifically tailored to a different process and timeframe in order for Māori business to equitably engage and take up opportunities.
- To facilitate adoption and application of opportunities Government policy would need to address the capability gap between Māori and non-Māori business.
- A need to undertake a more targeted campaign – with detailed information – to inform Māori organisations of the climate change business opportunities outlined in this report (in a summarised easily understandable form)
- A coordinated and resourced approach to improving understanding Māori land potential in the context of climate change opportunities needs to be carried out.
- Māori business and iwi/hapū should have much greater access to research, technology and innovation funding required to take full advantage of climate change opportunities.
- Increased uptake of new climate change business opportunities it is essential to highlight and pay special attention to central Governments funding sources for Māori business such as TechNZ funding. Anecdotal evidence suggests a very low awareness among Māori businesses to the existence and purpose of these funds.
- To enable faster uptake by Māori of the various business opportunities emerging from climate change, central Government should consider setting up several regional pilot studies with targeted Māori businesses. Such projects would diffuse many of the risks identified by Māori business in this study and promote collaboration across different Māori and industry sectors to create large scale collective opportunities. This would facilitate and implement new technologies and climate change business from the ground up. Individual Māori businesses would benefit greatly, as would Māori and Government across New Zealand.

A broad range of climate change opportunities were presented to Māori, and these have been prioritised by the selected groups we worked with. Critical success factors for the uptake and implementation of these opportunities and emergent green technologies are provided as well as a key set of recommendations. This 2009/2010 work is seen as preliminary, and each opportunity needs to be explored further through detailed analysis of Māori land with key Māori organisations or through pilot studies.

## 8 Acknowledgements

We thank all those Māori businesses, organisations and individuals who participated in and were part of hui, provided information and ideas, and supported this work. We also thank all the Māori landowner groups with whom we worked for sharing their ideas, thoughts, aspirations and information, and for supporting the project, especially those that gave up time for interviews and/or provided valuable information to the project. The following are particularly acknowledged: The Māori Trustee, Wellington, Whangarei, Gisborne; Te Arawa/Ngāti Tuwharetoa land owners and CNI members; Te Rūnanga O Te Whānau; Ngaitai iwi authority; Te Rūnanga O Ngāti Porou; Houpoto Te Pua Trust; Mangaroa Trust; owners of Ohotu land blocks, owners of Te Karaka land blocks, Ngāti Porou land owners and Ngāti Porou iwi members; Ngāti Porou Forests Limited; Aohanga Incorporation; Paehinahina Incorporation; Ngāti Hine Health Trust and Ngati Hine land owners; 37 Degrees South Aotearoa; Federation of Māori Authorities; Ministry of Agriculture and Forestry (MAF); Te Puni Kōkiri; Māori Land Court; National Māori reference group and networks; Carbon Market Solutions.

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and further reading on Māori land-climate change can be found at:

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## 10 Appendices

### Appendix 1 Table of climate change opportunities and principal group to benefit

Climate change opportunity	Description of business	Principal groups to benefit
Emerging carbon markets – forestry sinks	Additional income for land owners for ‘additional’ post-1990 forestry through carbon credits Regenerating scrub and planted forest Under the NZ ETS, PFSI, AGS, and East Coast Forestry	Māori landowners Forestry companies Carbon services/consultants
Biochar	Biochar and bio-oil from pyrolysis. Income from forester/landowners from production of bio-oil (renewable energy) of forest residues and as a soil conditioner Could be used in future as offsets under standards for voluntary market	Forest and land owners utilise biochar production and carbon sequestration New technology: form partnerships with companies with R&D knowhow
Methane reduction (methane emissions reduction technology)	Cost savings through reduction in GHG emissions under the ETS. New Zealand trade ‘clean green image’ – branding	Mainly dairy farmers and livestock farmers, agri-business and R&D companies. New technology: income with agri-business R&D
Anaerobic digestion/reduction	Savings on energy costs for dairy, poultry, pig farmers, through on-farm production of energy from animal wastes. Income generation from extra energy. Reduced GHG liability costs, emission reduction, on-farm manure digestion, converting methane to carbon dioxide	Dairy farmers Piggeries Agri-business and agricultural engineering businesses Export new technologies
Improved nutrient use and budgeting	Cost savings for farmers from reduction in fertiliser costs, increased production, reduced nutrients Reduce GHG emissions and nutrient runoff (under ETS, lakes strategies, nutrient caps) Reduce offsite impacts of nutrients (e.g., leaching/runoff) – nutrient budgets/credits/better land management	Farmers (dairy) Arable, sheep, livestock, beef farmers Horticultural – (e.g., kiwifruit) Consultants – advice and tools to enable better nutrient management, nutrient credits
Nitrous oxide abatement technologies (e.g., nitrification inhibitors)	Income generation/reduction of nitrous oxides, nitrification inhibitor technologies Farmers, reduced nutrients, better compliance, reduce GHG emissions and nutrient runoff (under ETS, lakes strategies, nutrient caps) maintain/increase production. Reduce offsite impacts of nutrients (e.g., leaching/runoff) – nutrient budgets/credits/better land management	Fertiliser companies Farmers (principally dairy and livestock) Agri-business consultants – Advice and tools to enable better nutrient management
Emission measurement (soil carbon capture)	Measurement technologies services/new tools	Agri-business service industry Universities, research organisations,

measurement technologies)	Standards to meet international and New Zealand compliance (ETS) Income generation from measuring/quantifying GHG change from carbon capture (e.g., carbon reductions) and monitoring and audits	agri-business advice agencies, environmental consultants
Local and regional renewable energy (bioenergy, alternative sustainable energy production (including biofuels)	Income generation from low value forest products and forest residues (conversion to bio-fuels, alternative energies)	Forest owners Electricity generators/retail Consumers/retail/service industry – e.g., dairy processors/schools/hospitals who use coal-fired boilers for heat/power
Wood energy	Income generation from low value forest products and forest residues (conversion to woodchips/pellets/ alternative energies)	Forest owners Electricity generators/retail Consumers/retail/service industry – e.g., dairy processors/schools/hospitals who use coal-fired boilers for heat/power
Liquid biofuels	Reduce dependence on fossil fuels, reduce GHG emissions Alternative energies Production of liquid biofuel from wood (e.g., wood to ethanol and methanol) and using a range of feedstocks. Second generation biofuels are being designed, e.g., converting sustainable food crops to biofuels	Forest owners Biofuel investors Electricity generators/retail Investors/Māori landowners
Energy efficiency	Cost savings through the value chain Reduce wasted energy – streamline costs for business Energy efficiency, e.g., lighting, heating, insulation, processing, recycling	Māori businesses Industry sectors Farmers Processors/distributors
Carbon neutral products	Less dependence on fossil fuels, towards a low carbon economy. Cost savings, carbon neutral Low carbon products and brands, New Zealand brand (reliant on quantifying/measuring carbon reductions (e.g., carboNZero)	Māori businesses Exporters Industry sectors Farmers/landowners Processors/distributors
Sustainable wood production	Income generation through increasing value of New Zealand wood production and product range. Promote wood in world markets as a sustainable product Strengthens New Zealand brand	Forest owners Exporters
Land-use change/sustainable land use/improved efficient land management practices	Cost savings through reduction of GHG liability. Reduce GHG emissions on a per hectare basis. Towards more sustainable land uses. Mitigate soil loss, erosion, improve soil carbon, reduce nutrient loss, best practice land management practices/use latest	Māori landowners Sector industry groups

	technologies (e.g., sustainable livestock/dairy production, retire marginal land, reduce sediment, riparian planting, reduce nutrient runoff through best practice)	
Environmental services (ecosystem services)	Income from environmental services (from ecosystems) such as offsets and credits (sustaining resources) Water catchments, improved water resource management, soil quality and health, other, e.g., pollination	Māori landowners Māori business Māori industry sectors
Biodiversity credits	Discussed under international agreements. Not part of Kyoto or ETS yet. Additionally: relates to carbon credits for carbon sequestration programmes and improves ecosystem function, water quality, meets biodiversity goals and outcomes (actions that contribute to kaitiakitanga)	Māori landowners Kaitiaki groups Māori business
Ecotourism	Income from being “Clean and Green” and presenting an image to the world for tourism that is robust, has integrity, meets environmental standards. Supports Māori values. New Zealand brand and contributes to goals for kaitiakitanga and Māori land development.	Māori landowners Iwi/hapū groups Māori business/entrepreneurial groups