

## Māori perspectives on the science and innovation system

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### Introduction

Enormous opportunities exist for Māori to be actively involved in the New Zealand science, research, and innovation system both in terms of what Māori can offer the system, and in terms of what the system has to offer Māori. The current system in New Zealand indicates a passive Māori involvement – low participation rates, low educational attainment rates in science, engineering, and technology, and low rates of engagement between the research, science, technology (RS&T) and innovation sector and Māori organisations and enterprises.

There are signs that this is starting to change, and there are small islands of success, but these are limited and Māori remain greatly under-represented in the sector. At the same time, there is an emerging and strengthening Māori economy that is becoming increasingly reliant on science and innovation to realise opportunities – for growth, productivity improvements, competitive advantage, and environmental sustainability. All of this is needed to meet aspirational goals (Harmsworth *et al.* 2002; Durie 2003, 2005) such as higher standards of living, education, health, economic development, prosperity, enterprise, social justice, and equity, as well as strengthen cultural distinctiveness. The current situation provides huge potential for Māori to be engaged and contribute to the RS&T system as a whole. However, to capitalise on Māori participation and input into the New Zealand science and innovation system, a number of key elements and dimensions, pivotal to growing and sustaining the New Zealand and Māori economies, need to be addressed concurrently.

### Background – present and future Māori society

The basic tenets of traditional Māori society – iwi/hapū/whānau – remain strong alongside more contemporary groupings, beliefs and values (Barlow 1993; Harmsworth *et al.* 2002; Mead 2004). Māori values are essential to Māori life and whakapapa links and provide the main basis for Māori cultural identity. Important statistics (Statistics New Zealand 2002, 2006) show that, in 2006 (Statistics New Zealand 2006), 565 329 New

Zealanders identified as having Māori ancestry (~15% of total New Zealand population); at 2010, ~85% of all Māori live in cities and towns, and 22% of students in New Zealand schools are Māori. Demographic future forecasts (Durie 2005) show a rapidly growing Māori population, which, in 2021, will be about 770 000 (17% of total New Zealand population), with ~33% of all children in New Zealand being Māori; there will also be a rapid increase (300% growth) in older Māori, aged over 65. In 2050, Māori will make up ~22% of the total New Zealand population (with about 100 000 living abroad).

### The Māori worldview

Understanding the Māori worldview is crucial for identifying how Māori can more actively participate in science and innovation. One must first understand the key ingredients of Māori culture. The Māori view is a blend of the traditional, the historic, and the modern. It gives a distinct Māori perspective. It strives to make sense and understand the universe, the world, the systems and the components of everything through a Māori cultural lens. This perspective is commonly expressed as holistic (e.g. founded on understanding the interrelationships of all living things to each other, and between all parts of a system). Seeking to find a natural order to the universe, an overarching principle of balance is applied. This promotes interdisciplinary and intradisciplinary skills, uses of Māori values and custom, while reinforcing cultural identity through Māori ancestral connection, language, and knowledge. Māori well-being is often linked to the health of the environment and natural resources.

Traditional concepts and values lie at the heart of Māori culture, and are an integral part of Māori life (Marsden 1988; Barlow 1993; Mead 2004; Harmsworth 2009). The fundamental broad knowledge base from which most Māori distinctiveness or traditional knowledge originates is now referred to as *mātauranga Māori*. Key cultural values integral to the Māori worldview include: whakapapa (central thread, interconnections with the world, ancestral lineage, ancestral rights, e.g. people, land, resources, taonga); tikanga (custom, tradition, protocols, values, right, wrong); rangātiratanga (status, authority, control); mana, mana whenua, mana moana (based on whakapapa, represents power, control, status, leadership); manaakitanga (caring for, looking after, hosting); whānau (relationships, family)

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connections); kotahitanga (unity, consensus, participation); urunga-tu (participation); tohungatanga (the retention and use of knowledge to benefit the tribe or business); kaitiakitanga (environmental guardianship); tau utu utu (reciprocity, giving back what you take); and wairuatanga (spiritual well-being, taking into consideration the spiritual dimension). Other central concepts include mauri (life element or life force), taonga tuku iho (intergenerational guardianship of cultural resources), and tapu (sacredness).

*Vision mātauranga* was a term coined by the Ministry of Research, Science and Technology (MoRST) in about 2006 to recognise the Māori worldview, build relationships with Māori, explain the unique perspectives Māori could contribute to RS&T, target investment, and facilitate the 'unlocking of the creative or innovation potential of Māori' to enable Māori to better participate in RS&T. In spite of this move, such recognition has struggled to date.

## Present issues and inclusion of Māori in the New Zealand science system

Māori are greatly under-represented in the science and innovation system in terms of Māori-led projects, Māori-centric projects, collaborative projects, the use of mātauranga Māori in projects, Māori staff numbers – all of which culminate in very low capacity in the RS&T sector to engage with Māori. A number of disparities exist between Māori and non-Māori in education, and this is reflected in low numbers of Māori undertaking science, engineering, and technology at university (Ministry of Education (MoE) 2005). Accurate statistics on Māori and non-Māori achievement in science and mathematics subjects are difficult to find, and few records are kept. There are some significant differences between Māori and non-Māori achievement in schools (Education Review Office (ERO) 2010): 2002: 43.9% of Māori NCEA1,<sup>1</sup> compared with 67% national average; 2008: 70.4% Māori compared with 84.7% national average; 2008: only 20.8% Māori achieved University Entrance compared with 43.6% national average (MoE 2010; ERO 2010). Low numbers of Māori are entering science careers in New Zealand (MoE 2005) and there are disproportionately low numbers of Māori studying science (NCEA2, NCEA3) at high school after NCEA1: ~<40% (chemistry, biology, physics, maths, physical geography, health). Very few Māori (~20% of those enrolled at university) study and complete science courses/degrees at university level, and there are few Māori staff in CRIs and universities with a science background (~<5% of total staff). Within the total pool of science projects funded by the Foundation for Research, Science and Technology (FRST) Public Good Science Fund, Māori-centric projects have made up ~<2% total dollars since 2004, and Māori-led projects ~<0.5%. This very low base inevitably results in low participation rates of Māori actively engaged in the New Zealand science and innovation system.

## The Māori economy

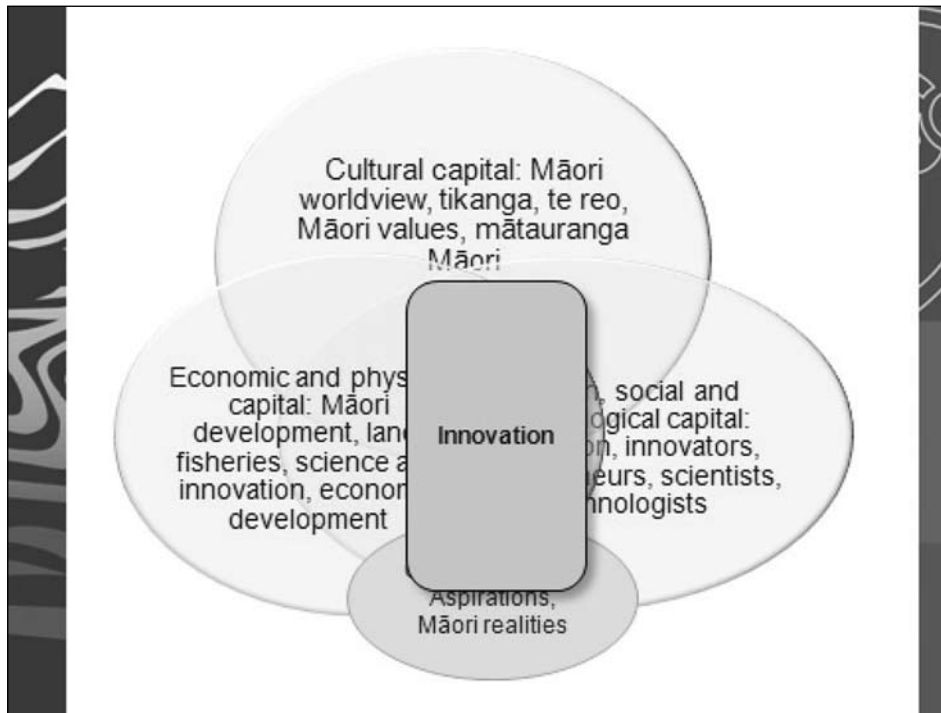
Māori have collective status and authority (i.e. mana, tangata whenua, rangatiratanga, mana motuhake), over vast tracts of land, natural resources, (e.g. land, fisheries forests, coastal,

marine) other assets and taonga. Individually owned land, assets and family-owned assets are also common. Many of these natural resource assets underpin economic development and are pivotal for achieving Māori aspirations, prosperity, and well-being. The Māori economy is a subset of the New Zealand economy, where Māori well-being is linked to the health of the New Zealand economy (Whitehead & Annesley 2005).

Although the Māori economy is difficult to distinguish and quantify (New Zealand Institute of Economic Research (NZIER) 2003), it is generally defined by quantifying all Māori assets owned and income earned by collectives such as Māori-owned trusts and incorporations, Māori-owned businesses, and service providers (Te Puni Kōkiri (TPK) & Federation of Māori Authorities (FOMA) 2007; Whitehead & Annesley 2005). The Māori economy tends to be driven by Māori collective aspirations and development, and represents a space where cultural and economic aspirations combine (Durie 2003; NZIER 2003, 2007; Business and Economic Research Ltd (BERL) & FOMA 1997; Whitehead & Annesley 2005; TPK 2007a; Harmsworth 2009). This economy has been influenced by a series of complex historical events that have shaped Māori participation in the New Zealand economy and produced a strong and vibrant Māori economy that is evident today (Gillies *et al.* 2006; TPK 2007b). Recent evidence shows that this Māori economy is steadily expanding (Smith 2004; Whitehead & Annesley 2005; NZIER 2007; TPK 2007a). As the Māori asset-base grows, so does its contribution to local, regional and national economies. The estimated value of Māori exports in 1999/2000 was about \$650 million (NZIER 2003) and in 2001 the total annual tax contribution from the Māori economy was \$2.4 billion (NZIER 2003). If the Māori economy does well, the New Zealand economy does well.

At present, 52% of the Māori economy is concentrated in the primary sector such as farming, forestry, fisheries, while 40% is in the tertiary (service) sector, representing the growing number of Māori who are self-employed and entrepreneurs (TPK 2007a). The Māori commercial asset base was in 2005/2006 estimated to be worth \$16.5 billion (TPK 2007a), with hundreds of businesses/enterprises that identify as Māori (Harmsworth 2009). In 2010, Māori are moving beyond the primary sector of the economy into secondary (manufacturing), tertiary (services), quaternary (intellectual), and quinary (political decision-making) sectors. About 6% of the land area in New Zealand (1.5 million hectares) is classified as Māori freehold or collectively owned land (Durie 1998; Kingi 2008). It is in about 26 000 titles, each land block having large numbers of shareholders, typically 10–1000. Most Māori land is managed by a large number of Trusts and Incorporations (Durie 1998; Hui Taumata 2006; there are ~159 incorporations and over 300 trusts). Present land uses are mainly agriculture, pastoralism, forestry, and horticulture. At 2010, these represent about \$1b of commercial assets. About 10% of New Zealand farming exports are from Māori land (NZIER 2003), and Māori at 2009 own \$100m of shares in Fonterra (i.e. Māori are the largest shareholder). Fisheries resources are estimated collectively at about \$1–2b and are managed through enterprises such as Te Ohu Kaimoana, Aotearoa, Sealords, and Moana Pacific. Māori are also active in the energy sector (joint projects), with geothermal enterprises (e.g. Ngā Awa Purua – Rotokawa, Mokai, Taupō-Rotorua), wind, solar, hydro, sea, etc., and Māori are becoming active in joint ventures in mineral resources, e.g. petroleum. Since 1975

<sup>1</sup> NCEA: New Zealand's National Certificates of Educational Achievement at levels 1, 2, 3 are national qualifications for senior secondary school students. In general, students work through levels 1 to 3 in years 11 to 13 at school.



**Figure 1. The strengthening of core capital dimensions will actively grow Māori and cultural distinctiveness in the science innovation space.**

there have been many (over 1000) Treaty claims lodged in New Zealand, negotiations with the Crown continue in most regions, and some iwi are now moving towards a post-Treaty settlement phase. Māori businesses in 2001–2006 were collectively worth \$4.8 b, and 29% of all Māori were self-employed. Māori innovation is demonstrated and highlighted in a range of involvements and partnerships in new technology, engineering, manufacturing, telecommunications (e.g. major shareholding in 2 Degrees Mobile Ltd). Māori TV, radio, creative industries, fashion, art, indigenous branding (Harmsworth & Tahi 2008; Harmsworth *et al.* 2009), foods, beverages, and new foods are all growing areas that unlock the creative potential of Māori, advance Māori as Māori, and build innovation and distinctiveness.

### Māori and the New Zealand science and innovation system

Innovation, by my definition, is ‘at the crest of a wave, encapsulating new ideas and creativity, invention, discovery, science and technology’. A convergence of the key dimensions at a certain point in space and time – e.g. having the right people, the right ideas, western science, and mātauranga Māori come together – would greatly stimulate innovation in many forms (e.g. new products, tools, services, knowledge, research teams, joint ventures, partnerships).

For Māori to adequately participate in and contribute to the New Zealand science and innovation system there must be a concurrent strengthening of capacity in a number of core dimensions. Figure 1 shows the four critical cornerstones for Māori advancement, inclusion and contribution to the New Zealand science and innovation system:

- Cultural capital: The Māori worldview, te reo Māori, Māori values/tikanga, mātauranga Māori
- Human, social and technological capital: Māori communities, education, organisations, scientists, technologists,

entrepreneurship, innovation, productivity, exploring the creative potential, social networks and partnerships, joint ventures.

- Physical and economic capital: the Māori resource asset base, Māori development, natural resources, science and innovation, economic development, the Māori economy
- Alignment to Māori aspirational needs, priorities, Māori futures

### Conclusions

Innovation would be stimulated by the convergence in space and time of those key dimensions that allow Māori to be at the crest of a wave in terms of creativity, distinctiveness, discovery, science, and technology. Science policy must allow Māori to participate equitably in the New Zealand science and innovation system – and address the current and past low participation rates of inclusion. In the next 20 years it will be vital to meet the aspirational needs of Māori (economic, social, and cultural development and well-being) and New Zealand society as a whole, through the convergence and strengthening of Māori cultural, human, social, physical, and economic capital (Figure 1). Without strengthening in each capital dimension, the creative and innovative potential of Māori will remain limited and in many cases untapped. For New Zealand to reap the rewards of the Māori worldview, multiple areas need to be addressed simultaneously to allow the full participation of Māori in science and innovation and to untap their creative potential and cultural distinctiveness.

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