

Submission on Te Ara Paerangi Future Pathways Green Paper

Thank you for the opportunity to comment on the Te Ara Paerangi Future Pathways paper. My academic research background is in the economics and management of research, science and technological innovation. My relevant career experience has been in strategic policy roles in DSIR, MAF and MED. I was Strategy and Policy manager in the Foundation for Research, Science and Technology (FRST) from 1990 to 2000. These were formative years in the design of our current RS&T system. More recently I was Principal Economist in TEC. Currently, I am an independent consultant working entirely on pro bono issues that interest me and which I see as important. My comments on Te Ara Paerangi Future Pathways are organised under the headings below:

- Relevant history of New Zealand's Research, Science and Innovation (RSI) system
- Setting research priorities
- Te Tiriti and the RS&I system
- Mātauranga Māori, science and the RS&I system
- Improving participation, well-being and productivity of the RS&I workforce

Some specific questions posed in the Future Pathways paper are also addressed in my comments.

Relevant history of New Zealand's Research, Science and Innovation (RSI) system

The science system restructuring from 1989 to 1992 involved the separation of policy (MoRST), purchasing (FRST) and provision (CRIs, universities and other research providers). It was based on FRST "purchasing" (funding) science outputs, and it was up to providers to manage the inputs they needed to deliver these outputs. Inputs included staff salaries and overheads, consumables, capital equipment and infrastructure.

Devolution to providers of decisions on infrastructure investment and related asset management has been an important success factor in the current system. However, it has always been recognised that different arrangements need to be in place for some assets and capabilities such as nationally significant databases and collections and measurement standards.

Full cost pricing and funding of inputs aimed to foster fair competition between providers and to ensure institutional sustainability (and therefore system sustainability). A particular concern when universities entered the competition in the early 1990s was avoiding marginal costing of university bids, and insisting on their full costing. This avoided universities cross-subsiding their bids using Vote: Education resources.

To permit cross-subsidisation would have made university bids for FRST funding artificially cheap compared to CRI bids and would have had negative effects on universities' teaching function. The cumulative effect of this would have been the undermining of infrastructure, balance sheets and workforce security. Full cost funding has helped encourage the good links that currently exist between university and CRI researchers.

In the early 1990s Government research laboratories such as in DSIR and MAF were converted into CRIs, essentially to be run on commercial lines. With hindsight it would probably have been better to establish CRIs with an ethos of getting their science working for New Zealand, with profitability being a condition of staying in operation and on the leading-edge rather than profit being an end

purpose or driver. This might have led to a non-profit organisational form rather than a more commercial business model.

An important decision was made early in the reforms that intellectual property generated through research would be owned by research providers, not by FRST or by other central government agencies. This continues to be the right approach to intellectual property management for publicly-funded research.

Administrative and transaction costs are big issues in our science system. This partly reflects administrators compared to researchers having too much influence in process design and how research overheads are costed. Power and mana need to move from administrators to scientists.

Excessive administrative costs partly reflect funding process design, “product clutter”, and the proportion of funding that is allocated competitively. For example, bids to the Marsden Fund have a low success rate and that means much valuable time of highly capable scientists is wasted on preparing quality bids that are unsuccessful.

Setting research priorities

I was managerially responsible for science priority setting and research strategy development for FRST-funded research from 1990 - 2000. A key lesson is government should set only high-level, outcome-oriented priorities. These need to take a long-term view – in strategic research the future has more rights than the present.

RS&I providers working closely with industry, other users and communities need to translate the government’s high-level priorities into more detailed research strategies.

In developing priorities and research strategies we must recognise New Zealand is a miniscule research player internationally, except in a few fields. We need a strong focus on extending international science and applying it to New Zealand’s needs.

Science is an enabler and cannot, by itself, deliver outcomes. We need strong alignment between researchers and the industry and other capabilities needed to adopt, commercialise and otherwise apply enabling science to the outcomes we want to deliver.

Scientists are adept at reframing their research interests to match the language and key words in government science priority statements. This can at times unhelpfully subvert the government’s intent. However, it generally reflects the fact that scientists are closer than governments to where the science has got to, how it is changing, its generativity, and its innovation potential. Scientists should therefore be given a lot of freedom to operate.

Te Tiriti and the RS&I system

Te Tiriti o Waitangi set the early foundation for the development of New Zealand’s government system, however it was never intended to give detailed direction to operational policy and processes. In New Zealand a zeitgeist has been created that argues that Te Tiriti is both a Māori-Crown equal partnership agreement and a stand-alone constitution that prescribes how New Zealand and its government institutions should function. This zeitgeist is created and sustained by people who in some cases are motivated by power rather than by New Zealanders’ wellbeing.

Te Tiriti was not a partnership agreement between Māori and the Crown. It was an international treaty that became the starting point for New Zealand's constitutional evolution as a democratic, rights-based country and society.

International treaties are enforceable domestically when they are translated into domestic law and regulation. The New Zealand Constitution Act 1852 established representative government in New Zealand and created one of the world's oldest continuously operating Parliaments.

The New Zealand Constitution Act 1986 is now our key constitutional document. It recognises the Queen as head of state. However, in practice the 1986 Act marks the point where the elected Parliament became fully sovereign, with the Crown's roles being symbolic and procedural. It is now Parliament not the Crown that makes laws. It is the elected government and its executive that has relationships with its citizens, not Queen Victoria, Queen Elizabeth the Second or an ill-defined "Crown".

The Treaty/Tiriti marks New Zealand becoming a British colony and the 1986 Act marks New Zealand becoming an independent democracy.

There are issues with "scope creep" in Tiriti discourse and advocacy. Routinely, claims are made about putative Tiriti "obligations" that are simply not stated in the Tiriti document itself and could not have been in the signatories' minds. For example, Te Pūtahitanga states that "Article 3 of Te Tiriti means Māori must have access to resources to support levelling across the science system." It effectively argues for mātauranga Māori or kaupapa Māori research, knowledge and "ways of knowing" to be funded at the same levels as the rest of New Zealand's science system, plus additional funding to compensate for alleged under-funding in the past that supposedly breached Te Tiriti Article 3. There is no basis in Te Tiriti even metaphorically for such claims.

It is not possible to base RS&I policies, priorities and funding processes on Te Tiriti. However, Anne Salmond's [Kiwis versus Iwi: Beyond the Binary](#) gives deep insights into Te Tiriti as a relational, colour-blind and equal rights document that is inclusive of all New Zealanders. It may be possible at a philosophical level to infer that Te Tiriti would support an RS&I system that caters for diversity and individuality, and which works for all New Zealanders - 'nga tangata maori katoa o Nu Tirani.'

Q 12 s4.5 in the paper asks "How do we design Tiriti-enabled institutions?"

Some see Te Tiriti as foundational for New Zealand's constitution, public services delivery, property rights regimes, water and other natural resources management and our institutions more generally. Te Pūtahitanga proposes Tiriti-based guidelines for RS&I funding, appointment of Māori Chief Science Advisors to key government departments, establishment of a Mātauranga Māori Commission, and regionally-based mātauranga Māori policy hubs.

However, Te Tiriti itself provides no guidance for how we design and manage our RS&I institutions. Te Pūtahitanga does not articulate what problems it is trying to solve and what Te Tiriti has got to do with solving them.

Mātauranga Māori, science, and the RS&I system

Te Pūtahitangi argues that “mātauranga Māori” or “kaupapa Māori science” should have equal status with “Western science” and “Western knowledge systems”. The He Puapua report also recommends that mātauranga Māori be valued and resourced equally to “western science” (Charters et al, 2019, p. 74).

However, science does not arise from or belong to the “West”. It is the creation of many cultures over centuries. Currently, three of the world’s five biggest investors in science are Asian not “Western”. China’s investment is second only to the United States, Japan is in third and South Korea in fifth place. India is the seventh largest investor. The term “western science” should not be used – “science” or “universal science” is the right language.

Universal science is broad enough to encompass holistic, inductive and action research, and ways in which science can be held accountable to the community. It can encompass how people work together, including in respectful, collegial and mana-enhancing ways.

Mātauranga Māori is made up of cultural, religious and spiritual beliefs, and of knowledge built up through observation and through trial and error that can be classified as science.

Mātauranga Māori and science are in counterpoise. Leading Māori thinkers in indigenous knowledge and belief systems and in science education seem to agree that mātauranga Māori complements science rather than being a substitute for it.

For example, Mason Durie (2005) argued that “indigenous knowledge cannot be verified by scientific criteria, nor can science be adequately assessed according to the tenets of indigenous knowledge”. Rather, “Each is built on distinctive philosophies, methodologies and criteria.” Arguments about the validities between the two systems distract from “explorations of the interface”, and the “subsequent opportunities for creating new knowledge that reflects the dual persuasions.”

Georgina Stewart, a leader in Māori science education, in addressing whether there is such a thing as ‘Māori science’ wrote that it “depends on what is meant by ‘science’...it is not the case, for example, that there is a base of traditional Māori knowledge that can replace the standard school science curriculum... The idea that scientific data can be swapped for oral texts and so forth is clearly ridiculous.” (Stewart, 2019).

Stewart also argues “against equating mātauranga Māori with science, since I think it is better conceived as a form of philosophy of science, rather than as a form of ‘science’ itself. This approach possibly allows ideas from mātauranga Māori to inform science at a values level, below the level of the empirical knowledge base, without needing to claim that mātauranga Māori is the same as science or uses scientific methods.” (Stewart, 2022).

Much mātauranga Māori discussion focuses on how science can be made more inclusive, more respectful of indigenous knowledge, and more responsive to community aspirations. Māori who have felt alienated from science want it to serve their needs and be mandated by and accountable to the community. This can involve the people in a community being active agents in research rather than passive research objects. These Māori perspectives should be supported.

It is important that Māori are engaged in research at earliest inception stage, that they can articulate how they see their interests being served, and that they can be well-placed to adopt and apply the

results. A mātauranga Māori approach might involve scientists working with local communities on co-design of research proposals before they proceed. It may involve reframing science as “here to serve” and “here to listen”. Such approaches to research are not limited to indigenous communities and are a big part of the international science policy and research planning scene – see Sarewitz (2016).

It is argued that mātauranga Māori can complement science’s reductionist strength with more holistic thinking. However, science often has to be reductionist given the complexity of the challenges it faces. Furthermore, multi-disciplinary research and integrative and holistic approaches have been part of universal science for hundreds of years. Astrophysics, plate tectonics, evolutionary biology and ecology do not commend themselves to the small or the narrow minded. Great scientists such as Kepler, Newton, and Darwin were in awe of the natural world and its interconnections and drew deep insights from them. They saw beyond simplifying reductionism.

Some eminent Māori scientists have expressed concerns that too much focus on mātauranga Māori can have negative unintended consequences. In a prescient 2007 paper G Raumati Hook critiqued the Vote RS&T-wide policy framework *Vision Mātauranga* and saw its risks:

While the idea of Vision Mātauranga is culturally attractive, and indeed respectful and embracing, the reality may be something quite different. It’s a bit like saying to Māori, “Listen up. We’re building this technology thing over here and you can help, but you’re going to have to use only the knowledge you have that comes under the heading of philosophy, religion, art, language, and culture to achieve it...Vision Mātauranga while culturally flattering might not give Māori the keys to the technological world of tomorrow. The only way that Māori will achieve economic parity is through technological parity, and the only way they will achieve that is through science and math education. Māori must look to their academic performance (Hook 2007).

Similar concerns arose in the wake of the media storm triggered in July 2021 by seven Auckland University professors who wrote a public letter responding to MoE proposals relating to mātauranga Māori in the Māori school curriculum. These proposals included the NCEA addressing “the ways in which science has supported the dominance of Eurocentric views, including science’s use as a rationale for colonisation of Māori and the suppression of Māori knowledge.” Also included was discussion of “the notion that science is a Western European invention and itself evidence of European dominance over Māori and other indigenous peoples.”

One of the public letter’s signatories was the esteemed biological scientist and medical researcher Garth Cooper, who is himself Māori and who has done a great deal for Māori health and to enhance young Māori student achievement in science. Professor Cooper was concerned that teaching “Māori kids about the colonising effects of science [would] lead to loss of opportunity.” He observed that Ross Ihaka who co-created the R open-source programme language can be credited with “the most important thing that’s come out of New Zealand in the last 100 years. I think of young Māori scholars that would be the next Ross Ihaka basically missing out because they were told that science was a colonising influence of no interest to them.” Cooper considered that the proposed NCEA changes would “disenfranchise” young Māori from pursuing STEM subjects (see Ross 2021).

New Zealand science must be outward-looking and meet international publication, quality assurance, epistemological, professional and regulatory expectations and practices. Our science must be recognised overseas and be delivered in the language and style appropriate to an

international audience. There are indications that some mātauranga Māori science may struggle to meet international standards.

Lillis & Schwerdtfeger (2021) note that a search through the Web of Science for evidence of world-leading research in the science-oriented part of mātauranga Māori reveals a modest increase in numbers of publications over the last five years, but none in mainstream, high-impact-factor journals, and none in chemistry, physics or mathematics.

Some mātauranga Māori-related research has triggered ridicule in international science circles. An example is Wehi et al (2021) claiming, on the basis of unsubstantiated oral “evidence”, that Māori may have been first to discover the Antarctica (in fact a Russian ship did so in 1820).

Furthermore, the “Listener letter” controversy over inclusion of “indigenous knowledge” and “ways of knowing” in our science education, and the Royal Society’s investigation of two of the professorial signatories has triggered sharp criticism from such international luminaries as Richard Dawkins and Jerry Coyne. This puts New Zealand’s science system “on notice.” However some of the criticism may be ill-informed. For example, Professor Dawkins seems to believe that we are actively teaching Māori creationist myths in our science classes. While such mythology is part of mātauranga Māori I have so far seen no evidence of it being taught in science classes.

There are concerns with the focus of Ngā Pae o te Māramatanga, the Māori Centre of Research Excellence (CoRE). Its top-level governance and leadership is dominated by law and indigenous studies academics and is not strong in the natural sciences.

The CoRE should be commended for the energy it is putting into encouraging Māori engagement in research, and it has made progress with this. However, the research supported seems disproportionately focused on cultural, indigenous and sociological studies rather than on natural sciences that are more connected to New Zealand’s socio-economic and sustainability challenges.

The CoRE’s research is valuable culturally to Māori and to some other New Zealanders. However, it is unclear whether the research outputs and the skills developed through delivering them will be valued in private or public sector markets or internationally. This raises concerns about the post-study outcomes for Māori graduates whose study and research choices have not been well connected to industry and to international demand.

Q 5, s2.3 in the paper asks: “What are your thoughts on how to enable and protect mātauranga Māori in the research system?”

There are two concepts here: enablement and protection. Enabling mātauranga Māori is best done through inclusiveness of Māori within the research system, with Māori researchers within our institutions deciding the extent to which mātauranga Māori can add value to institutional research programmes. Māori researchers may make this call, or Māori in local communities can bring their knowledge to bear on, for example, natural environment and resource management research.

In relation to protecting mātauranga Māori in the research system, science treats knowledge as incomplete and open to challenge, not “protected” from it.

What needs to be safeguarded are links between our researchers and the leading international science in important fields, and the ability to apply what is learnt in the New Zealand context. Protecting mātauranga Māori means ensuring our science institutions have researchers who are both on the international leading edge and have the capacity to link this to our domestic context and knowledge bases, including mātauranga Māori.

Some argue that research about one culture by people from another culture can be “colonising” and domineering. Indigenous knowledge should, it is contended, be a property owned and controlled by indigenous people. This argument is articulated in Linda Tuhiwai Smith’s 1999 book *Decolonising Methodologies: Research and Indigenous Peoples*. [Peter Munz's review of Decolonising Methodologies](#) is a devastating response to Smith’s arguments.

There is a tension between “protecting” mātauranga Māori knowledge or belief and making it available to others. Te Pūtahitangi argues that elders fear that by sharing knowledge that can be commercialised they risk knowledge losing “sacredness” and “fertility.” “Knowledge that is profane has lost its life, its tapu.” It states that mātauranga must always retain the mauri of tangata whenua, and indeed of the whenua itself. These fears, feelings and convictions are powerful, common among many cultures, and must be respected. However, they are not part of science any more than morality plays are part of economics.

Mātauranga Māori’s value can only be established when it is open to scrutiny, falsification or validation. To be productive, knowledge must be disseminated beyond she/he who holds it. Without this, knowledge cannot be scaled to achieve diminishing marginal costs in adoption, thereby delivering the rising output from less input that drives productivity growth and therefore wider wellbeing.

We do not need new funding for mātauranga Māori itself, however we do need many more Māori researchers in the natural sciences, many of whom may apply a cultural (“mātauranga Māori”) perspective in their work and in their relationships with colleagues and with the communities they serve. In my view, a stronger (and merit-based) Māori presence in our research institutions would enhance inclusiveness and respect for individuals and upholding of their mana. It would make work environments more collegial, team-based, and grounded in New Zealand’s needs. It would also open up people’s thinking about how others “cut up the world.”

Improving participation, wellbeing and productivity of the RS&I workforce

A fundamental long-term problem we face in RS&I is our school sector’s performance decline over the last two decades, including in maths, science and literacy. This is well-documented in international studies such as PISA, PIRLS and TIMSS. Our school system must improve. We must also do better in facilitating young people’s engagement in STEM at secondary school level and managing transitions to tertiary education STEM qualifications and high skill employment.

It is agreed that Māori are underrepresented in STEM disciplines and in the university scientific workforce. However, we know a lot about what works in addressing this underrepresentation and we should build on what we know. FRST’s Tūāpapa Pūtaiao Māori Fellowships scheme operated effectively from 1997 to 2006 (see Hook 2007).

Otago and Auckland Universities' pathways for Māori to study medicine have effectively "closed the gap" in Māori representation in medical degree graduations.

In 2016 Massey University initiated the Pūhoro STEM Academy to encourage young Māori school students to excel in science, technology, engineering and maths. Te Pūtahitangi states that Pūhoro STEM Academy has faced funding challenges. In fact, Pūhoro had 1000 students in 2021 and has received three years of new funding to boost numbers to 5000. An agreement has been signed with Waikato University to extend the Academy to the Waikato region, and this model can be rolled out more widely.

We need to ensure a welcoming and enabling institutional environment for Māori researchers. Māori kawa, tikanga and culture in general can help ensure that research institutions are grounded in our communities rather than functioning as "ivory towers".

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