Te Ara Paerangi – Future Pathways Green Paper

Submission from The University of Auckland Waipapa Taumata Rau

to the Ministry of Business, Innovation and Employment

Executive Summary

Building a strong and resilient research ecosystem that embodies Te Tiriti, fosters collaboration, prioritises the next generation of research talent, and rewards excellent, impactful research is critical to Aotearoa's future. Achieving substantial and long-lasting change will require courageous and bold decision making to sharpen and further develop what is working well within the current system and incorporate innovation and evidence-based policies to radically alter what is not.

At The University of Auckland Waipapa Taumata Rau, the views of our research staff, from a wide range of professional and disciplinary backgrounds, reveal high levels of passion and ambition for what our research, science, and innovation (RSI) sector can achieve with the right policies, incentives, and support in place. Importantly, this talent, passion, and commitment to world-class research is a fundamental characteristic of Aotearoa's wider research workforce. Our researchers are driven to carry out ground-breaking research with the potential and demonstrated ability to transform our society and the lives of all New Zealanders. This is the cause for considerable optimism and highlights the huge collective potential of our RSI sector and its critical role in shaping our ability to respond to the major societal challenges affecting not only Aotearoa, but the globe. In our view, this once in a generation review of the RSI sector is an exciting opportunity to bring about transformational change that will help chart Aotearoa's future pathway.

With this in mind, we offer the following high-level recommendations before providing a more comprehensive discussion on issues raised in the Te Ara Paerangi Future Pathways Green paper.

Key points

A national, whole of system approach to reform of the RSI

Like other small, advanced economies (SAEs), consolidating resources in areas of existing or high potential capability makes sense. To successfully address major societal challenges, we need a cohesive research ecosystem, that draws together expertise and resources, and actively encourages and facilitates collaboration. Applying a whole of system approach will enable us to maximise the knowledge, skills, networks, and potential of our researchers while avoiding unhelpful competition. This approach could also accommodate some co-location and integration of CRIs with universities while facilitating greater engagement and researcher mobility between research institutions and a range of external partners. We advocate a hub and spoke model that would allow certain institutions to adopt areas of specialisation while continuing to promote and support high levels of collaboration across the country, and with external stakeholders.

Establishing a high-level governing body

The RSI ecosystem is integral to Aotearoa's future social, economic, and cultural wellbeing. To achieve genuine, long-lasting change, the value of research, science and innovation needs to be championed at the highest level of government. We recommend the establishment of a National Research and Innovation Council with key partners and stakeholders as members (industry, government, Māori, Pacific peoples, community, researchers) to identify priority areas. This would be chaired by the Prime Minister to ensure strong connection to Government and capacity to respond to challenges as they emerge. It would also be charged with engagement with New

Zealanders in terms of defining these challenges. As part of the drive for greater consolidation, the proposed council would contribute to greater streamlining of the RSI, rather than increase the complexity of governance. This model has been adopted successfully in other SAEs.

Retaining and strengthening our international research leadership

The Green Paper seriously understates and underestimates the importance of international collaboration and an internationalised RSI system. International collaboration drives innovation, underpins growth in research and is critical to our future success in addressing local, regional, and global challenges. Notably, lack of emphasis on the internationalisation of our RSI system runs counter to the direction of other key Government policy, including industry policy. As witnessed during the pandemic, enhanced cross-border collaboration and open science facilitates the rapid sharing of data and knowledge and is critical to further empowering research to solve social, environmental, and economic challenges. As a nation, Aotearoa can be a strong performer on the international stage and our leadership is achieving results. We must continue to foster and support our international competitiveness and collaborative linkages. The government can play a key role in strengthening international research. For example, the Horizon Europe Fund has the potential to unleash a cycle of innovation by forging long-term relationships between European and local researchers and high-tech companies. Repatriation schemes would also allow us to draw on a vast pool of talent that exists within the Kiwi diaspora. The Green Paper's lack of international focus is concerning as without strong commitment to developing a globally integrated RSI system, New Zealand leadership across multiple areas of the science system will be seriously limited.

Strengthening the tripartite model

Aotearoa's investment in R&D lags well behind other OECD countries which in part explains our persistent productivity deficit. To achieve real change our RSI sector needs a substantial injection of investment. We have not yet realised the potential for industry to co-invest in our RSI sector. Addressing the lack of industry engagement and investment requires a strong tripartite model which prioritises knowledge rich sectors who engage in research. Barriers such as lack of incentives, training, and workforce development could be addressed via building industry experience into PhDs, commercialisation postdoc/internships, co-funding of campus curricular/extra-curricular opportunities for staff and students. Building these tripartite networks needs to be encouraged and resourced to address the broader lack of knowledge exchange and limited exchange pathways.

Tino rangatiratanga

To ensure our RSI embodies Te Tiriti and genuinely recognises the value of mātauranga Māori as a way of understanding our world, Māori must be in decision making roles if we are to achieve genuine and enduring change. The critical importance of capacity building across the student lifecycle must be addressed if we are to create an RSI ecosystem that reflects our diversity and is equipped to address complex challenges and harness innovation. We note that Te Tiriti centred approaches are strongly supported but require a step change in terms of investment in people and infrastructure to realise major changes in approaches that will be required to foster trusted and mutually beneficial partnerships. Creating a space for tino rangatiratanga to be exercised, thereby promoting Māori community led initiatives with support from partnerships, is one proposed approach.

Building Pacific-led research capacity

The Green Paper fails to recognise the critical role of Pacific research and researchers to our future RSI sector as well as the obligations of the Realm of New Zealand to the Pacific. Pacific communities have an extended history with the settler state with three Pacific nations still part of the Realm of New Zealand (Niue, Cook Islands, Tokelau). We must recognise our commitment to Pacific realm countries and grow opportunities to strengthen these relationships. Driving transformational change in the lives of Pacific peoples both within Aotearoa and beyond is highly dependent on investment in Pacific research in Aotearoa New Zealand. Future Pathways is an opportunity to reconceptualise how Aotearoa works with Pacific peoples and communities. Aotearoa can become the global leader in research that positively impacts the lives of Pacific people and places. To realise our full potential, the RSI ecosystem must invest in Pacific-led research capacity. This will require empowering key partnerships to benefit the lives of Pacific peoples and places, and prioritising research and delivery designed to bring about the best outcomes for Pacific peoples. Pacific representation on governing bodies and in decision-making processes must also be prioritised. We recommend substantial investment in the Pacific research pipeline, to enable stronger retention of our Pacific talent and to build a thriving, culturally appropriate, and relevant workforce.

Securing our future research workforce

Nurturing and sustaining our research workforce hinges on providing tangible support for the development of our next generation of researchers. This requires expanding the ecosystem of support for ECRs to thrive through targeted initiatives that create genuine career pathways into a diversity of sectors, with a commitment to addressing equity and diversity. We need to rethink how we attract, train, and prepare our doctoral graduates for a range of career paths. We advocate consideration of a 4-year funded PhD with an embedded requirement for universities to expand and strengthen our engagement with industry, government, and community. This model offers significant benefits to both individual students and their future careers, but also the overall strength and potential of the RSI. A 4-year funded PhD would reduce transactional approaches when working with external partners, encouraging reciprocal, enduring relationships with a range of long-term benefits. A national fellowship scheme, along with funds for research institutions to support new early career positions each year, would ensure Aotearoa attracts, nurtures, and retains the future leaders of our research workforce.

Commit to stronger research relationships between universities and hospitals

To ensure connection between research and health delivery, there is an urgent need for career pathways that offer clinicians more opportunity to undertake research. Evidence-based medicine offers the potential to address a multitude of health issues but cannot be achieved without adequate structures and resourcing.

Facilitate and maintain access to research data and associated infrastructure

There is a need to bring Aotearoa research infrastructure and particularly its cyber infrastructure up to world class standards. The fully costed model of research funding has created a major top end research infrastructure deficit that limits capability to carry out leading edge research. However, this also includes maintaining legacy datasets and enabling functional interoperability of digital collections. A seamless interface between research organisations (including CRIs, institutions, and other organisations supported by national funding schemes) allows transparency in access to data sets of national public good, such as those relevant to environment, climate change and public

health. This is an institutional challenge where under current settings such data sets often represent commercial value to the organisations that hold them.

Introduction

A silver lining of the COVID-19 pandemic is that it showed that Aotearoa has among the world's highest levels of trust in science and has a system of Government which recognises the value and role of research in decision making processes. Future Pathways provides an opportunity to build on this trust and confidence and create an RSI system fit for the future. In many ways our current system reflects a post-war linear model based on the idea of fundamental research driving applied research and leading to technological innovation that thus benefits society. However, the world has moved on. There is now growing recognition of the need for holistic and inclusive RSI policies that can tackle complex challenges and deliver broad social, economic, cultural, and environmental benefits.

Fundamental research remains the bedrock of our RSI sector and is critical to discovery and innovation. However, fundamental research also provides the foundation for transdisciplinary research, critical to addressing complex societal challenges. A genuine commitment to transdisciplinary research requires high levels of collaboration across disciplines, institutions, and with external partners within Aotearoa and beyond. It also requires adequate funding. Aotearoa currently stands 44th in the world in percentage of GDP expenditure devoted to research; below other Small Advanced Economies (SAE) such as Sweden, Finland, Iceland, Singapore, Slovenia, and Estonia[1]. An adequately funded, system-wide approach will be critical to tackling societal challenges, strengthening national competitiveness in new or emerging growth areas, and achieving a sustainable and fairer society.

With a view to the future, our research has the potential to address some of Aotearoa's most urgent and seemingly intractable challenges including deepening intergenerational poverty, the housing crisis, health inequity, global ageing, infectious diseases, climate change, loss of biodiversity, sustainable agriculture, and economic diversification, particularly in relation to the COVID-19 recovery. Drawing on the collective views of research staff at the University of Auckland Waipapa Taumata Rau, the following response outlines some of the changes and initiatives needed to build a strong and resilient RSI ecosystem fit for the challenges that lie ahead.

1. NGĀ WHAKAAROTAU RANGAHAU - RESEARCH PRIORITIES

1.2.2 What principles could be used to determine the scope and focus of research priorities

1.3.2 What principles should guide a national research priority-setting process and how can the process best give effect to Te Tiriti?

Given Aotearoa's geographical location, economic profile and size, it makes sense to focus on areas where we have existing or emerging strengths and can achieve critical mass while ensuring our research system is agile and responsive to new and emerging priorities. National research priorities need to address areas of **national significance and/or strengthen Aotearoa's competitive and comparative advantages internationally**[2]. **Getting the balance right between 'top down' government/mission led research, applied research, and basic/fundamental bottom-up research will be critical.** Universities are home to the broad spectrum of research (applied/commercial, discovery/fundamental) across a plethora of domains. The depth and breadth of disciplinary

[1] https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?most_recent_value_desc=true

[2] New Zealand firms: reaching for the frontier (productivity.govt.nz)

domains and research typologies will be critical in building the skills of the future and contributing to economic and social development. So, while it makes sense to prioritise research areas, this cannot be to the exclusion of the breadth of research required to strengthen economic, environmental, and social and physical wellbeing.

Most small, advanced economies strongly prioritise support for research and innovation[3]. The case for focussed innovation policy rests on complementing rather than replacing generic support for innovation. **Focussed RSI policies will not be sustainable unless they closely align with environmental and social objectives, increase wellbeing and embody Te Tiriti by recognising the value of mātauranga Māori as a way of analysing and understanding our world**. A focussed innovation strategy must also be ambitious, experimental, and adaptive, not just business as usual.

1.4.2 How should the strategy for each research priority be set and how do we operationalise them?

Implementing an effective, focused innovation strategy requires political and stakeholder leadership, established and trusted partnerships, and capable leadership. Engagement among government, iwi, Pacific peoples, community groups, industry, research, and educational partners should seek a joint approach. Sector wide high-level commitments will expedite investment and other resources to optimise impact. This requires government arrangements that can cut through the long-established agendas and priorities of individual departments and agencies.

To strengthen the coordination, inclusiveness and effectiveness of RSI governance, some SAEs (for instance, Finland, Sweden, and Singapore) have arrangements for research and innovation policy that are led from the highest level of government and partners. This leadership signals the importance of research and innovation vis a vis national prosperity and wellbeing and helps solidify research priorities. The evidence is that this has served these countries very well[4]. In some jurisdictions, high-level multistakeholder governance is complemented by devolved governance in selected areas of focus[5].

Aotearoa will need to take a system wide approach to building high-level and devolved governance arrangements to underpin an effective and enduring focused innovation policy. Aotearoa must be bold in identifying the most important areas of focus, establishing effective governance institutions and processes, and allocating substantial resources to long term priority sectors. Obtaining consensus across the research and innovation community will be critical in order to demonstrate commitment to a shared vision.

The Government should set up a high-level strategy body (e.g., a National Research and Innovation Council) comprising key partners and stakeholders as members (industry, government, Māori, Pacific Peoples, community, researchers) to establish priority areas. Participation by a senior member of the Government in governance arrangements (ideally the Prime Minister) would help speed the allocation of resources for investments as opportunities emerge. The Government is tackling major policy issues on a number of fronts (e.g., climate change, health reform, intergenerational inequality, housing supply, infrastructure, social cohesion, an aging population) highlighting the importance of connecting with a range of ministries and developing a whole of

[3] https://www.productivity.govt.nz/assets/Documents/focused-innovation-policy/Focused-innovation-policy.pdf

[4] Ibid

[5] Canada's Super Cluster initiative and Singapore's Singapore Together Alliances for Action are two examples

country approach. A key aim of the proposed council must also be to reduce complex governance structures and contribute to greater streamlining of the RSI.

2. TE TIRITI, MĀTAURANGA MĀORI ME NGĀ WAWATA O TE MĀORI TE TIRITI - MĀTAURANGA MĀORI AND MĀORI ASPIRATIONS

2.2 How would you like to be engaged throughout the Future Pathways programme?

The Green Paper aspires to create a modern research system for Aotearoa that is Te Tiriti led, and that supports and enables the research aspirations of Māori. The paper highlights the importance of embedding Te Tiriti within the research ecosystem, in decision making, in research design, in collecting advice and information, in our workforce, and in research outcomes. However, the current RSI system does not work well for Māori.

The Future Pathways team should ensure University of Auckland Māori and Pacific researchers are actively involved in the Future Pathways programme to ensure the unique contexts of Tāmaki Makaurau (largest Pacific population in the world) and Te Tai Tokerau (largest concentration of Māori in Aotearoa) are given due consideration. COVID-19 restrictions have impeded our ability to meet in person with key decision makers in Wellington and we would welcome further opportunities to meet with senior officials, including ministers, and discuss many of the issue outlined in the Green Paper.

2.3 What are your thoughts on how to enable and protect mātauranga Māori in the research system?

Currently our RSI undervalues Māori knowledge, expertise, and relationships. Achieving widespread recognition and valuing of mātauranga Māori requires Māori to be recognised as partners across our research system. For example, to achieve real change, Māori must not be limited to advisory roles but must rather be appointed to key decision-making roles, as recommended in the WAI 262 Waitangi Tribunal report[6].

As outlined in the previous section, enabling and protecting mātauranga Māori requires a long-term vision and accompanying strategies to increase the number of Māori across the RSI. Our research workforce must reflect the diversity of Aotearoa if we are to address the significant long-term challenges and pursue new opportunities. This requires building a strong and resilient talent pipeline beginning in English-medium schools and Kura Māori and continuing through to our research institutions and into the research workforce. Kura Māori are particularly underserved in terms of RSI-outreach programmes, exacerbating the issues associated with growing the Māori research workforce and inclusion of mātauranga Māori.

Protecting and enabling mātauranga Māori relies on genuine, reciprocal engagement with Māori communities throughout the research lifecycle. Mātauranga Māori is located in communities and the RSI must prioritise investment that enables Māori communities to actively engage at each stage of the research process for reciprocal partnerships to flourish. Māori scholars draw on at least two knowledge traditions: their disciplinary knowledge and mātauranga Māori and/or Indigenous Knowledge. Many Māori researchers are comfortable working with and across disciplines, drawing on and repurposing methods to ensure that new knowledge is generated and works towards

[6] Ko Aotearoa Tēnei: A Report into Claims Concerning New Zealand Law and Policy Affecting Māori Culture and Identity, Te Taumata Tuatahi (justice.govt.nz)

supporting positive, sustainable change[7]. To avoid extractive research practices, there must be a commitment to enduring and reciprocal relationships, co-development of ideas and partnership. By working together and identifying the synergies between mātauranga Māori and other knowledge systems, Aotearoa will be well positioned to show leadership in tackling some of the major inequity challenges confronting Aotearoa and the rest of the world**.**

Currently, there is a lack of Māori scientific advice and a limited pool of Māori expertise informing Government policy. While the COVID-19 pandemic highlighted the need for a Māori led response to the health crisis, all areas of government would benefit from greater Māori knowledge and expertise which not only enriches the science system in and of itself but is necessary if we are to meet our Te Tiriti obligations. A recent examination of the research-policy interface in Aotearoa highlighted significant scope to strengthen and expand opportunities for mātauranga in the RSI and beyond[8]. Options include appointing a separate Māori Chief Science Advisor (CSA) in each ministry and agency or a cluster of Māori CSAs in the social sciences and natural sciences to provide advice to relevant ministries. The cluster model would create a purposeful space to connect Māori researchers, research, mātauranga, and policymakers, as well as promote cross-government department collaboration. In addition to reviewing the role of Māori expertise in science advice and decision-making, Government could provide targeted opportunities for Māori researchers to meet with policymakers, as well as education and training for policy makers on the role of mātauranga Māori in science advice[9].

Critical to embedding Te Tiriti within the research system is addressing low participation and retention among Māori in the research workforce. STEM areas are particularly problematic with the issue having significant economic and social ramifications. Very low entry into and retention in engineering, science, and technology impacts on workforce participation in the broader science and engineering sectors. Māori are underrepresented in our institutions where they make up only 5% of the academic workforce[10]. Interventions must begin in schools. Māori school students are far less likely to enrol in STEM subjects, therefore limiting opportunities to diversify our research capabilities across a range of disciplines across the tertiary sector, government, and business. The issues identified also apply to Pacific students and staff. The interface between TEC, MOE, and MBIE is therefore critical to enable capacity building across the student lifecycle.

Within academia, there are major career progression barriers for Māori and Pacific researchers[11]. **Creating a more diverse research workforce will require targeted initiatives and must address pipeline issues.** A 2020 report by the Royal Society Te Apārangi suggested designing PhD Programmes suited to Te Ao Māori[12]. The Te Whitinga Fellowship, and the use of a stratified ballot system to guarantee more Māori and Pacific candidates in key areas (e.g. medical school) are important steps forward but more needs to be done to sustain the workforce. Moreover, we need a long-term vision and nationally coordinated efforts to address capacity building from the compulsory schooling sector through to tertiary and beyond. There are multiple areas where we see opportunities for this review to bring about the change needed to create a world-class research

[7] http://www.maramatanga.co.nz/sites/default/files/NZ%20Science%20Review_%20Matauranga%20Maori.pdf

[8] https://cpb-ap-se2.wpmucdn.com/blogs.auckland.ac.nz/dist/f/688/files/2020/01/Enhancing-knowledge.pdf

[9] Ibid

[10] https://theconversation.com/maori-and-pasifika-scholars-remain-severely-under-represented-in-new-zealand-universities-122330

[11] Ibid

[12] https://www.royalsociety.org.nz/assets/Research-Workforce-of-Aotearoa-NZ-briefing-paper-and-outcomes-Feb-2021.pdf

system that is unique to Aotearoa, braiding indigenous with a diversity of approaches for maximal benefit for all New Zealanders.

Ensuring a Māori voice is embedded across our RSI system, with Māori in key decision-making roles, is critically important moving forward [13].

2.4 What are your thoughts on regionally based Māori knowledge hubs?

We do not have strong views on the creation of regionally based Māori knowledge hubs, although we can see the potential for such an initiative to enhance regional iwi engagement. Māori knowledge hubs could also be a way to formalise and strengthen relationships with communities. We also see a role for Māori Chief Science Advisors in shaping the regional hub concept. The risk is resource dilution, particularly in areas such as research infrastructure, REANNZ access etc.

We also note that the proposal for regional research hubs to better serve the needs of Māori must be integrated with the drive for greater consolidation of research capacity. This highlights the tension between simplifying and streamlining the system and addressing concerns around equity and diversity. It is our view that there should be a strong focus on training more Māori scientists to contribute to the development of new scientific knowledge which includes contributing and integrating unique Māori perspectives. As discussed earlier, for this to succeed, we must address STEM education in our schools.

In summary, this review should consider a range of mechanisms to enable and protect mātauranga Māori and elevate Māori aspirations across the RSI. These include:

- Ensure that Māori are in decision-making roles across the RSI and empowered to influence the status quo
- Work with TEC and MOE (and related Chief Science Advisors) to develop a national strategy to attract and retain more Māori into STEM across the New Zealand education system.
- EDI funding to support initiatives within institutions to support and develop Māori researchers and professional staff.
- Resources to support institutions to build capacity of Māori and non- Māori in all aspects of mātauranga Māori
- Dedicated resources to allow Māori located in communities to become equal research partners.

3. TE TUKU PŪTEA - FUNDING

3.2.1 How should we determine what constitutes a core function and how do we fund them?

3.3.2 Do you think a base grant funding model will improve stability and resilience for organisations? How should we go about designing and implementing such a funding model?

The Green Paper proposes supplying research organisations with base operating grants to meet ongoing costs and make research institutions more adaptable and resilient. **It is our view that rather than remedy existing issues with the current RSI system, fully funding overheads through a block grant system could in fact create new uncertainties.** The experience of other countries who have adopted block funding offers insights into potential issues. In Australia, research block grants provide funding to eligible higher education providers for research and research training, established

[13] http://www.maramatanga.co.nz/sites/default/files/CB_TePutahitanga_A4_2021_inner_Digital_final.pdf

under the Higher Education Support Act 2003 (HESA)[14]. In England, higher education institutions receive annual block grant funding from Research England. Most funding is allocated based on research quality, as assessed by the Research Excellence Framework (REF) exercise, commonly referred to as QR (quality related) funding[15].

In England, there have been some benefits stemming from block funding. These include supporting infrastructure, strategic developments in research, building capacity, and capitalising on potential novel ideas by pump-priming areas that are not quite ready for funding. However, there have also been issues. QR funding as a proportion of total research expenditure in universities has dropped from about one-third to about one-quarter over 10 years. This means that universities must find a way to subsidise research from other income streams[16]. Moreover, the implementation of the QR funding in England means that funding is only rarely allocated to new and emerging areas since assessment is based on retrospective assessment of outputs. Such issues would have to be addressed in any Aotearoa application.

In both Australia and England, ensuring sufficient funding to adequately meet the indirect costs of research is a challenge. Block funding's failure to cover the full cost of research leads universities to seek discretionary revenue, such as international student fees, to meet the shortfall in direct and indirect costs. This issue has become more acute over time, as project funding has increased more quickly than block funding.

Australia's dual funding system of competitive research grants and research block grants could be viewed as a model for Aotearoa. However, there are a number of concerns with this approach. Funding allocated under competitive research grants does not cover all project costs. Most competitive grants cannot be used to fund the 'indirect costs' of research that include principal researchers' salaries, power and water, insurance, infrastructure, and capital equipment. In 2009 it was estimated that universities had to find an additional 85 cents from other sources for every dollar of competitive grant funding they received, to cover indirect costs not met by research grants. The situation persists, and Australian universities continue to find additional income to fund research. Universities Australia estimates that in 2014, universities had to cover a gap of $1 billion to conduct the research for which competitive grants had been secured[17].

As a result, universities have sought to meet the shortfall via international student fees revenue. The Grattan Institute estimates that one dollar in five spent on research comes from surpluses on teaching[18]. The fall in international student numbers due to COVID-19 highlights the perils of reliance on international student income to cross-subsidise research. The Australian government is now prioritising the commercialisation of research, encouraging universities to place more emphasis on generating revenue via industry engagement. This has triggered concerns that too much focus on commercialisation, and its short-term benefits, fails to recognise the critical importance of discovery science that forms the long-term building blocks of the RSI system. Moreover, changes in funding for the social sciences and humanities in Australia are leading some universities to reduce the numbers of academic staff in these areas thereby reducing the overall quality of research and impact. Any changes to research funding should be designed to meet the full economic cost of university research to avoid unintended consequences resulting in long term impacts on the research ecosystem.

[14] https://www.dese.gov.au/research-block-grants
[15] https://re.ukri.org/funding/quality-related-research-funding/
[16] https://publications.parliament.uk/pa/ld201719/ldselect/ldsctech/409/40908.htm
[17] University-Financing-Explainer-April-2017.pdf (universitiesaustralia.edu.au)

[18] https://grattan.edu.au/report/the-cash-nexus-how-teaching-funds-research-in-australian-universities/

We therefore advocate caution in relation to decisions around block funding in Aotearoa. Any move to a block funding model must ensure transparency so that what this funding is intended to cover is clearly specified. It is important that this is not expected to cover national deficit areas such as major research infrastructure. The application of base grants would also need to adapt over time, according to shifts in the RSI landscape. **Given the issues identified with block funding in other jurisdictions, an alternative approach would be to maintain the fully costed fully funded model with, for example, the addition of an independent major research infrastructure funding programme where the Government retains ownership of the asset and research institutions are the operators, with national access schemes ensuring effective utilisation**. Base funding is appropriate to fund infrastructure and Aotearoa cannot afford the inefficiencies or risks associated with competitively funding such activities.

4. NGĀ HINONGA – INSTITUTIONS

4.4.3 How should we make decisions on large property and capital investments under a more coordinated approach?

Please refer to section 6: TE HANGANGA RANGAHAU - RESEARCH INFRASTRUCTURE

4.4.5 How do we design Te Tiriti enabled institutions?

It is our strong view that Te Tiriti should underpin all aspects of research institution design and that the fundamental principles of an institution should reflect our foundational relationship with tangata whenua and our commitment to Te Tiriti. Our institutions must become places where mātauranga Māori and Te Tiriti o Waitangi are valued, fostered, protected, and used responsibly. Our research must reflect and be mindful of Te Tiriti and must value mātauranga Māori as a way of understanding our world. Strong and enduring partnerships with iwi and community-led approaches will be vital in ensuring Te Tiriti is reflected in all aspects of the work carried out by our research institutions.

The concept of Te Tiriti enabled institutions requires the active participation and commitment of both treaty partners. Institutions must build the capacity of Māori and non-Māori to work in ways that give effect to Te Tiriti. This means that our institutions must be resourced to educate non-Māori about their role in understanding and upholding mātauranga Māori, Kaupapa Māori, and Rangahau Māori.

4.4.1 How do we design collaborative, adaptive and agile research institutions that will serve our current and future needs?

A focus of Future Pathways is boosting collaboration, reducing unhelpful competition, and addressing issues of fragmentation and duplication to improve efficiency. The Green Paper, along with the CRI review, points to a desire to co-locate new forms of CRIs within universities as a way of building close links between government and business, sharing infrastructure, encouraging movement of staff between organisations, and addressing concerns over unnecessary competition and replication.

Co-locating CRIs with universities would bring together the depth and breadth of knowledge and skills needed to tackle the complex challenges facing Aotearoa and improve career pathways,

especially among ECRs. As a generalisation, larger and more diverse teams are required to address current problems facing Aotearoa and the world, compared to those needed in the past. The pandemic has highlighted the value of universities and CRIs working together rather than in competition. Together, universities and CRIs achieved significantly more as collectives, rather than individually, in areas such as epidemiology, data modelling, genomics and immunology. Importantly, staff and students with co-appointments or co-supervision across universities and CRIs were central to this collaborative approach.

Changing the shape of institutions is not a short-term exercise but needs to be more fundamental, aiming to shift the organisational culture and ways of working of research organisations. By setting expectations and developing mechanisms to deliver on these, change is likely to follow. An identified issue with the current RSI system is that we have too many institutes and quasi-institutes (e.g., NSCs) that have unnecessarily burdensome governance systems and overlapping mandates/priority areas. The result is duplication, underinvestment, and poor allocation of capital, which limits our agility to translate research into impact and deliver on Te Tiriti obligations. **Co-location and integration of CRIs and similar onto university campuses, and vice versa, would lead to successful sharing of resources and contribute to nurturing and growing a vibrant human resource pool**. Expansion of this approach could improve collaboration and reduce ownership costs.

4.4.2 How can institutions be designed to better support capability, skills and workforce development?

In a country the size of Aotearoa, it makes little sense for all institutions to develop research capabilities across all fields and disciplines. However, by integrating efforts across our universities, institutes, and research centres, we can concentrate sufficient capabilities and achieve the scale and capability of top tier international universities via a whole-country approach. In many cases specialisation is already occurring. **We advocate a hub and spoke model that would allow certain institutions to adopt areas of specialisation while continuing to promote and support high levels of collaboration across the country, and with external stakeholders.** In Australia, such collaboration is supported through the creation of themed virtual laboratories/virtual research environments (VL/VRE) that span institutions and help to coalesce researchers around research priorities[19].

Adopting an 'Open Innovation' model is an important step towards creating a more collaborative and impactful RSI sector. **An open innovation model would promote joint appointments, secondments, co-supervision, and sabbaticals as standard practice across public research organisations.** This is partly reflected in the successful "Joint Graduate Schools" between the CRIs and universities such as Auckland. This free movement of people is critical to creating a highly collaborative RSI system. We should also strive for greater movement between research institutions and industry, hospitals, iwi, communities, NGOs and government. By way of example, health research is driving clinical translation of research and innovation, improving health outcomes for New Zealanders and ensuring innovation moves from the lab into hospitals. However, currently clinical researchers face significant barriers to full participation in the RSI system highlighting the importance of aligning health reforms with the RSI reforms.

[19] https://ardc.edu.au/services/research-platforms/

Knowledge Mobilisation

4.6 How do we better support knowledge exchange and impact generation? What should be the role of research institutions in transferring knowledge into operational environments and technologies?

University research leads to the creation of new knowledge disseminated through our highly skilled graduates, diversity of research outputs, collaborations with external partners, and a raft of other activities. Strengthening the translation of our research into tangible outcomes is critical to harnessing the broad benefits of publicly funded research, driving economic growth, realising our ambitious climate change goals, delivering on Te Tiriti obligations, and improving the health and wellbeing for all. This requires strengthening and diversifying our knowledge mobilisation efforts.

Knowledge mobilisation[20] is the transfer of ideas, research, expertise, or skills between universities and business, communities, iwi, NGOs, and government. Knowledge mobilisation spans translational research, commercialisation, social and creative enterprises, community engagement, and research informed policy. Knowledge mobilisation is critical to finding solutions to the major challenges facing our society such as climate change, health inequity, social cohesion, mis/disinformation, or preparing for the next pandemic.

Engagement with Māori and Pacific communities is vital to reducing inequities and building a better Aotearoa. Sadly, inequities have not reduced in the past three decades highlighting the need to identify new approaches that encourages Pacific and Māori led research to emerge and flourish. This is best achieved via research partnerships built on co-production and knowledge-sharing, in an adaptive and collaborative framework.

One of the challenges ahead for the Government will be ensuring alignment between the National Research Priorities and the research being carried out across the RSI system. Our future RSI sector must promote and resource greater knowledge exchange, ensuring the potential gains and practical benefits of New Zealand research are fully realised. Options for strengthening knowledge mobilisation and maximising the potential of our world-class fall broadly into categories:

1. Incentivising research that responds to our defined national research priorities.
2. Boosting collaboration and the two-way flow of people between institutions, industry, iwi, Pacific peoples, community, and government, including internationally, to increase research impact.
3. Valuing co-creation with lay stakeholders by developing values and principles of involvement[21]
4. Broader system recognition of knowledge exchange and impact generation activities.

[20] Internationally, the term knowledge mobilisation is more common than knowledge exchange. Knowledge exchange can be considered a subset of knowledge mobilisation strategies, along with co-creation, creative dissemination techniques, decolonizing knowledge and practicing open science. See: https://research-groups.usask.ca/unesco-biocultural/images/imaginingfutureofknowledgemobilization.pdf

[21] The National Institute of Health Research (NIHR) provides one example: Values-Principles-framework-Jan2016.pdf (invo.org.uk)

Incentivising research that responds to our defined national research priorities and lifts end-user engagement

- **Innovation vouchers:** The Netherlands, Ireland, and the UK use these vouchers to improve the competitiveness and growth of small and medium-sized enterprises[22]. Governments provide a credit to firms to purchase R&D services from universities in support of innovation.
- **Building a robust and thriving start-up ecosystem:** Programmes like the Pre-Seed Accelerator Fund (PSAF) and the Commercialisation Partner Network (CPN) have enabled universities to develop an emerging start-up ecosystem. However, achieving scale and building clusters is a major challenge in a relatively weak, although improving, pre-seed, seed, and venture capital market and a thin talent pool environment. To address this challenge, Government should increase the amount available for PSAF, CPN and should continue to encourage funds that support the "valley of death" investments linked to research institutes. There also needs to be recognition that launching and growing a successful start-up requires particular skills and capabilities highlighting the need for training, mentoring, etc.
- **Larger investments in strategic areas:** Larger, targeted investment has greater impact. This approach also aligns with the broader economic argument of a structured approach to strategic prioritisation of policy and resource investment, centred on areas that are critical to Aotearoa's future.
- **Scaled up investment in strategic research 'clusters'**: Government could support the establishment of innovation hubs that bring together universities, industry, and public sector organisations to advance social innovations. MedTech-IQ is a good example as a national medical technology innovation quarter which aims to sustainably grow and propel NZ MedTech innovation and translational research onto the global stage. MedTech-IQ is also about first in human studies assessing the safety and efficacy of novel devices and new surgical approaches, forming a bench-to-bedside bridge. MedTech-IQ brings together the Ministry of Health, universities, and DHBs to generate new high value industries and create a joined up, revitalised healthcare system.
- **Revisit Government sponsored industry partnership model**: Currently flagship Government and Industry research partnerships require a 60% investment threshold from industry in order to obtain a government contribution (i.e., Ministry of Primary Industry's Sustainable Food & Fibre futures fund). In the current economic climate, such industry contributions will be increasingly difficult to obtain and progress. Uptake of the R&D tax credit option is also likely to be affected. Placing greater emphasis on commercial outcomes and less on the percentage of the industry contribution is an alternative to boost collaboration. There is also a need consider how we can maximise engagement with smaller companies particularly those who can't commit to longer research timeframes that are typically the norm. There are also other more knowledge rich sectors which are not supported by such specialised funds at all. This is especially the case in rapidly evolving sectors such as digital and IT. Engaging with smaller, high potential industries will help expand our economic base away from a traditional reliance on primary industries.
- **Consider the research lifecycle when funding research** beginning with initial funding required to grow and sustain early engagement and relationship building, through to ramp down funding towards the project completion and beyond to maximise user engagement, outcomes and impact.

[22] https://www.innovationgrowthlab.org/sites/default/files/IGL%20Working%20Paper%2020.4.pdf

Boosting collaboration and the two-way flow of people between institutions, industry, iwi, community, and government to increase research impact

- **Building industry/policy/community experience into PhDs:** 3-year PhD scholarships are not sufficient in many disciplines. While government SAC funding for PhDs covers up to four years, government could consider matching scholarship support for an extra year to enable certain disciplines to build in an experiential and broader skills component to encourage work ready graduates. This could include placements with industry, government, iwi, or community. An example is the US National Science Foundation Partnerships for Innovation, and similar sub programs in that agency, that allows PhD students to undertake research embedded with an industry partner as a supplement/complement to academic study[23].
- **Secondments:** Funding to support opportunities for two-way secondments across government, industry, iwi, and research entities.
- **Commercialisation postdoc/internship**: Incentivise industry to co-fund a PhD graduate to spend six months working on the commercialisation of an idea in collaboration with an industry partner. This concept can be extended to collaboration with a range of external partners including government, iwi, and community.
- **Strengthen the research-policy interface:** The review of the RSI also provides opportunity to strengthen research informed policy. This requires government and universities to support initiatives that promise to make a demonstrable difference. These include: providing ministries/agencies with the ability to fund strategic research to support policy, greater opportunities for academics to connect and contribute to the policy agenda, direct partnership via secondments, internship, advisory groups, panels, etc. and reviewing the Chief Science Advisor operating model[24].

5. TE HUNGA MAHI RANGAHAU - RESEARCH WORKFORCE

5.2 How should we include workforce considerations in the design of research Priorities?

The proposed a high-level governing body (see section 1.4.2 Research Priorities) would need to consider Aotearoa's workforce capabilities in any decisions around research priorities. Training highly skilled researchers takes many years, beginning in primary and secondary school, highlighting the importance of a whole of system approach to skill development. While we recognise the importance of targeting priority research areas, as well as the need for agility to respond to new and emerging issues as they arise, we must also prioritise developing and maintaining a strong skill base across the full spectrum of research if we are to have the talent available to address changing research priorities.

5.3.1 What impact would a base grant have on the research workforce?

The Green Paper identifies growing, supporting, and retaining the ECR workforce, tackling academic precarity and addressing the lack of diversity as key challenges. Universities are central to developing a strong research pipeline and will be instrumental in bringing about necessary changes needed to grow, support, and retain a diverse research workforce.

[23] https://www.nsf.gov/eng/iip/pfi/apply.jsp

[24] https://cpb-ap-se2.wpmucdn.com/blogs.auckland.ac.nz/dist/f/688/files/2020/01/Enhancing-knowledge.pdf

Workforce Precarity

The growth of the academic precariat – tenuously employed researchers who move from short term contract to short term contract – is a serious challenge in Aotearoa and other national contexts. It is exacerbated by the very low R&D spend and subsequent lack of diversity in career pathways for researchers. Like many other issues, it has been amplified by COVID-19, with the risk that the most vulnerable members of the international research workforce are unduly disadvantaged. There are wide economic and social benefits to doctoral study - at the individual, community, and national level. However, our doctoral training needs to prepare graduates for a diversity of career paths spanning universities, research institutes, government, and the private sector.

Universities are responsible for training and preparing the bulk of our future research workforce. In Aotearoa, there is a significantly sized research precariat seeking to build a track record via temporary employment to win a permanent research role. Women, Māori, and Pacific researchers are strongly represented in the precariat. Creation of more temporary roles increases the number of people in precarious employment and may also increase the time spent in the precariat to build a sufficient track record to win longer term employment.

Funding solutions must focus on training and preparing our ECRs for a diversity of research careers and expand opportunities for researchers at all stages to engage with a range of research partners both within and external to academia. A substantial number of PhD graduates can expect to make careers outside of academia and the wider research sector. However, low research absorptivity in the Aotearoa private sector highlights the importance of Government and research institutions working together to identify strategies that will boost the number of PhD graduates working outside of academia. This could include increasing the number of "pioneers" whose successful integration into the private sector, as well as Government agencies, NGOs, etc, will lead to shifting attitudes towards employing PhD graduates.

What can be done?

Prepare PhD graduates and post doctorate fellows for a diversity of career paths via:

- **Transdisciplinary training**: provide students with a unique but wider set of transferable skills that can be applied in a range of job settings, hence the four-year PhD scheme proposed above where PhD students engage in a year with industry, government, or other employer pathways.
- Expand access to **Māori scholarship and understanding and application of Kaupapa Māori and Mātauranga Māori** in PhD training
- Expand opportunities to harness and strengthen understanding of **Pacific knowledges, practices, and ways of working with Pacific peoples and communities.**
- **Mechanisms to link doctoral students with other institutions and sectors.** For example: Joint Graduate School (partnerships between universities and CRIs), public sector internships/postdoctoral programmes[25], commercialisation postdoc/internships, cross universities – multiple supervisor model, joint initiatives with iwi and Pacific research organisations.
- **PhD programs that bring together government, industry, philanthropic organisations/NGOs, and academia** at the highest level of academic training to find solutions to society's most pressing problems. The University of British Columbia's Public Scholars Initiative and The

[25] The Australian Science Policy Fellowship Program is one example https://www.chiefscientist.gov.au/australian-science-policy-fellowship-program

Swedish Institute of International Affairs, Global Policy Challenges programme are such examples.

- **Tailored programs that prepare ECRs for success in diverse career paths**, both within and outside of academic research. The Research and Entrepreneurial Development Immersion (REDI) program an initiative of the US National Institute for Aging is one such example[26].
- **Stronger linkages to international opportunities and collaborations**, including bilateral arrangements with single countries (e.g., Australia, Singapore), or formal engagement within larger bodies, such as the Horizon Europe Fund[27]. There may be opportunities in other regions.
- **Ensure PBRF and other government funding reward and incentivise transdisciplinary postgraduate training** including PhD and postdoctoral training.

Post-doctoral researchers

Currently there is no permanent post-doctoral fellowship scheme or institutional funding to address the lack of career pathways for postdoctoral fellows. We concur with the New Zealand Association of Scientists Council (NZAS) which has called for a national fellowship scheme[28]. While we welcome the recent Whitinga Fellowships and their emphasis on equity, diversity, and inclusion, this one-off funding of 30 postdoctoral fellowships is not sufficient to address the severity of situation. The Future Pathways review could consider a similar scheme to Australia's Discovery Early Career Research Award which funds 200 postdoctoral fellows annually. The Australian Science Policy Fellowship program, which provides a pathway for PhD graduates into government, is another option which could be adapted to the Aotearoa context. In addition, allocating funds for research institutions to support a set number of new early career researcher positions each year would be an important step towards securing Aotearoa's future research workforce. As stated earlier, our future RSI sector must prioritise providing a broad range of career pathways for postdoctoral fellows.

Through our internal consultation, we received a significant amount of feedback on the early career workforce highlighting both the complexity of issues and the critical importance to the future of our RSI system. **We recommend that MBIE and TEC establish a discrete taskforce to carry out a comprehensive examination of the issues and potential solutions.**

5.3.2 How do we design new funding mechanisms that strongly focus on workforce outcomes?

Equity, Diversity, and Inclusion

Our workforce must reflect the diversity of Aotearoa with a strong commitment to growing Māori and Pacific participation. **To achieve greater diversity, we need to consider a range of different mechanisms to support key cohorts (ECRs, Māori, Pacific, and Women in STEM) including targeted funding schemes or block grants for research institutions to build capability and capacity.**

Early Career Researchers and equity, diversity, and inclusion in research are high priority issues across national contexts. In the UK, a 2021 Inquiry into Equity in the STEM Workforce calls for a

[26] REDI at the US National Institute of Ageing aims to expose ECRs to non-traditional career pathways, thus paving the road to diverse professional opportunities. ECRs gain skills in science communications, intellectual property, regulatory affairs, science policy and education, consulting, drug discovery, approval, and production, the business of science, and health care. https://www.nia.nih.gov/research/osbr/nia-research-and-entrepreneurial-development-immersion-redi

[27] https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

[28] https://scientists.org.nz/resources/Documents/PressReleases/NZAS-Statement-RespondingToECRissues2020.pdf

'STEM Diversity Decade of Action' to tackle the historic and systemic underrepresentation of minority groups at all levels in the sector[29]. This stems from frustration that initiatives to date have not achieved sufficient change. Importantly, achieving real change will require adopting a life course approach to develop strategies, curriculum transformation and supported pathways through primary, secondary, into tertiary education and beyond.

The UK's Athena SWAN Charter (Scientific Women's Academic Network), which was originally established in 2005 to improve the career progression of women working in STEM within Higher Education, is to be streamlined after a review revealed concerns about the administrative burden on staff, particularly women. While Athena SWAN was applauded for supporting cultural and behavioural change, it was also criticised for disproportionately benefitting white middle-class women and failing to address systemic racial inequities[30].

Adapting programs such as Athena SWAN to meet the Aotearoa context may be a solution. Australia is building a sustainable and adaptable Athena SWAN model via Science in Australia Gender Equity (SAGE)[31]. SAGE is a not-for-profit public company which administers the unique Athena SWAN gender equity and diversity national accreditation framework. Another Australian initiative is the Women in STEM and Entrepreneurship (WISE) program which supports investment in gender equity initiatives that aim for lasting systemic change by eliminating barriers for women's participation in STEM education and careers, and entrepreneurship[32]. A focus is increasing awareness and participation of women in other parts of the innovation ecosystem including innovative businesses, start-ups, and entrepreneurial activities and careers.

Canada is piloting EDI Institutional Capacity-Building Grants. The grants are designed to support the federal government's commitment to tackling challenges encountered by underrepresented and/or disadvantaged groups in Canadian research institutions. Institutions can request up to $200,000 per year for up to two years, for projects to develop and implement policies, plans, resources, and training. Institutions are required to contribute their own resources toward achieving the goals of the project.

The Canada Research Coordinating Committee (CRCC) is also working with the three main federal research funding agencies and the Canada Foundation for Innovation (CFI) to support early career researchers in a number of ways. These include:

1. Adoption of a tri-agency definition for early career researchers.
2. Harmonized data collection and reporting to provide transparency and measure progress over time.
3. Balanced funding for ECRs: The agencies are dedicating a portion of appropriate flagship research programs' funding toward early career researcher-led projects, relative to the number of applications received.
4. Increased parental benefits.
5. Allocation of 250 Tier 2 Canada Research Chairs to emerging researchers.
6. Ensuring ECR development is built into all grants.

How the broader higher education community responds to issues of equity, diversity, and inclusion can be shaped by the institutional arrangements and Government policy. In Australia,

[29] https://www.britishscienceassociation.org/news/report-on-equity-in-stem-workforce-published

[30] https://www.tandfonline.com/doi/abs/10.1080/00131911.2019.1642305

[31] https://www.sciencegenderequity.org.au/the-athena-swan-accreditation-framework/

[32] https://business.gov.au/grants-and-programs/women-in-stem-and-entrepreneurship

the ARC and NHMRC requires funders to adhere to Australian laws and have policies and procedures that support the progression and retention of women in research. For example, NHMRC requires all institutions administering its funding to have an institutional strategy to address the underrepresentation of women in senior positions, have working arrangements that cater for individuals with carer responsibilities and employment strategies that encourage the recruitment, retention, and progression of women in health and medical research, as well as strategies to address the need for the provision of support for childcare[33]. In Europe, Horizon 2020 has introduced changes aimed at addressing gender equity[34]. All institutions awarded grants must have published gender equality plans which include concrete measures and targets on work-life balance and organisational culture; gender balance in leadership and decision making; gender equality in recruitment and career progression; integration of the gender dimension into research and teaching content; measures against gender-based violence, including sexual harassment. In 2018, the New Zealand government committed to addressing the gender and ethnic pay gap in the Public Service[35].

COVID-19 has highlighted broader issues of equity, diversity, and inclusion by illustrating how life events can affect a researcher's productivity, shape opportunities, and influence research careers over a lifetime. The pandemic is just one example of disruption. Others include caring responsibilities, major illness, combining research with other duties (e.g., teaching, clinical work), time invested in building relationships of trust with Indigenous communities, and the impact of switching between different academic systems and/or language acquisition. Internationally this issue is being taken very seriously with countries implementing policy and practices aimed at ensuring fairness is fully reflected in funding processes. These include assessment criteria to enable evaluation of researcher's productivity in the context of career and life opportunities, factoring in significant career interruptions, standardised narrative CV formats, training in reducing unconscious bias, and publishing diversity data on peer review process, including reviewers and panel members[36].

The Government must ensure that the initiatives it supports are appropriately evaluated so that we understand what works and can implement successful initiatives more broadly. This requires high quality data for measuring institutional change (including baseline data before intervention benchmarking). Data should include both quantitative and qualitative metrics. Achieving lasting change also depends on the university senior leadership being invested and holding a leadership role in any initiative (e.g., Athena SWAN).

In summary, this review should consider a range of mechanisms to strengthen equity and diversity in our research workforce. These include:

- An adaptation of the Athena SWAN initiative or similar to support underrepresented groups in STEM
- Institutional Capacity-Building Grants
- Dedicated funding to strengthen diversity among ECRs
- Strengthening funder requirement around EDI, including policies and procedures that support the progression and retention of underrepresented groups in research.

[33] https://www.nhmrc.gov.au/research-policy/women-health-science/administering-institutions-consideration-gender-equality

[34] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/promoting-gender-equality-research-and-innovation

[35] https://www.publicservice.govt.nz/our-work/pay-gaps-and-pay-equity/progress-report-the-public-service-gender-pay-gap-action-plan?e6283=action_viewall

[36] Examples include: The Australian Research Council: Research Opportunity and Performance Evidence (ROPE); National Health and Medical Research Council: Relative to Opportunity policy; UKRI Principles of Assessment and Decision Making

- High quality data (quantitative and qualitative) for measuring institutional change (including baseline data before intervention benchmarking).

6. TE HANGANGA RANGAHAU - RESEARCH INFRASTRUCTURE

6.2.2 How do we support sustainable, efficient and enabling investment in research infrastructure?

The Green Paper defines research infrastructure as labs, equipment, collections, and databases that support research activities and services. We would add specialist expertise with an enabling or supporting function, that includes enduring and mutually beneficial connections and collaborations with community knowledge holders and experts – a team of bioinformaticians, for example, has the same enabling relationship with research activity as does a biomedical imaging facility or other instrument-based capability, and the same challenges apply regarding effective funding, governance, and ownership arrangements. Data has *mana* – it can build reputation, and its treatment therefore needs sensitivity, and it has *gravity* – it helps to form communities within its orbit potentially aligning with the hub and spoke model in Section 4.4.2. Ongoing stewardship of data is currently neglected in the research landscape with the useful lifespan of data often exceeding the lifetime of the funded research projects that generate it.

Arguably, insufficient funding is the fundamental problem which disincentivises or constrains effective governance and ownership arrangements. Insufficient funding (to meet initial establishment costs, and perhaps even more so to meet ongoing ownership costs) that leads to insufficient resource plans, to access models that are overly competitive or place excessive cost burdens on researchers, and to an inability to renew or extend infrastructure portfolios effectively.

While there is a strong and understandable focus on national-scale infrastructure in the Green Paper, the challenges of funding, governance, and ownership must be addressed at all scales if research institutions are to thrive. Even in areas where national infrastructure is essential for competitive research, a broader portfolio of local research infrastructure, with accompanying technical expertise, will be essential as well.

For TEOs, the breadth and scale of the local research infrastructure portfolio is primarily determined by the breadth and scale of post-graduate research training activity, because in infrastructure-intensive disciplines, post-graduate research programmes constitute front-line research activity, and indeed generate most of the research activity in those disciplines. Regardless of the scale of external research income secured or of prevailing research priorities, because they aspire to be comprehensive universities, TEOs are obliged to maintain research infrastructure portfolios of sufficient quality to deliver competitive post-graduate training programmes to students across all the disciplines they offer.

The role of Government

We believe that institutions and research groups are indeed best placed to determine the research infrastructure capabilities needed by local researchers and research clients. These needs are usually defined by international discipline trends and expectations and are easily identified.

The best role for Government is firstly to provide a base funding mechanism to enable institutions to build and maintain the local infrastructure portfolios they need, and secondly to facilitate

processes to identify the need for national or regional infrastructure initiatives, and then to support the creation of, and engagement in, those initiatives.

The Green Paper correctly identifies factors which will likely contribute to the identification of needs requiring a national or regional response.

Typically, these factors include:

- Scale, cost or complexity (cases where individual institutions are unable to maintain complete portfolios alone, or where there are substantial gains to be made from a higher level of sharing of infrastructure);
- the desire to align higher levels of investment with emerging research priorities; and opportunities for international cooperation that require national coordination or advocacy for effective engagement.

Enabling investment

Each research institution needs to maintain a portfolio of research infrastructure of sufficient scale and quality to support its portfolio of research activity, continually investing to support, renew, or extend the portfolio. This pattern of investment is entirely unsuited to a competitive funding model. As the Green Paper notes, current funding mechanisms do not provide institutions with a level of funding commensurate with the scale of investment needed for competitive research activity. Research institutions are not lacking in incentives to ensure researchers and research clients have access to the right infrastructure with the right cost of access – but they have lacked a stable funding mechanism enabling them to respond effectively.

A future funding model for research infrastructure needs to provide stable base funding to support the establishment and ongoing costs of at least a minimum institution-level research infrastructure portfolio; one which responds to international discipline norms and where the access model does not place excessive cost burdens on researchers.

Ideally, the base funding level would provide institutions sufficient flexibility to engage in co-investment opportunities – with research partners or with Government agencies. Government can best encourage investment in priority areas through offering co-investment opportunities (either through partnering in national infrastructure initiatives, or through co-investment in institution-level infrastructure).

In general, we believe local ownership of centrally-(co)funded infrastructure is always preferred over the creation of standalone research infrastructure entities, which tend to have insufficient connection with the needs of the discipline communities they are intended to support. There may be exceptions where national-level infrastructure is best concentrated in a single location, and where there may therefore be considerable advantages in creating a dedicated entity with a bespoke operating model. Where national infrastructure initiatives involve distributed capability that is embedded in partner institutions however, local ownership combined with a national-level governance structure is likely to be preferable.