Science System Review (SSR): Phase 1
Key messages from Universities New Zealand – Te Pōkai Tara to the Science System Advisory Group
Due by 11.59pm, Friday 17 May 2024

This submission is from Universities New Zealand – Te Pōkai Tara (UNZ[1]) – the peak body for New Zealand's eight universities. The submission has been developed through UNZ's Research and Vice-Chancellors' Committees and university research offices.

This submission answers the questions posed by the Science System Advisory Group (SSAG, Appendix 1) by listing the key high-level points and potential solutions under each of the relevant SSAG headings. Most of these key messages have been formally communicated to government agencies via public submissions and reflect our current collective view.

For further information, please contact Dr Bronwen Kelly, Deputy Chief Executive & Portfolio Manager for Research and Planning Systems, bronwen.kelly@universitiesnz.ac.nz

Executive summary

The university system is a major player in the New Zealand's science, innovation and technology (SI&T) system – it is home to approximately 50% of all NZ's researchers (including postgraduate research students) and drives 52% of all of New Zealand's basic research, and 21% of applied research spending.[2] Universities play a critical and distinct role in the SI&T system, building research capability by providing research-led higher education and direct researcher training. A successful future SI&T system needs to recognise and support universities to continue to fulfil this critical role and reduce the administration burden to universities and other research organisations.

The future SI&T system

We support the establishment of an independent research council[3], like the UK, which should replace many of the functions currently performed by MBIE.

- The council should be comprised of leading researchers and big-picture thinkers who understand New Zealand's social, health, economic and environmental context. The council should be supported by professional management so members can focus on critical thinking, horizon scanning, and analysis and priority setting. This process should be informed by a robust regular evaluation of the science system's strategy, implementation, and performance to continuously improve the efficacy of investment processes and identify opportunities for investment.
- This council could support and guide research in New Zealand as an independent body to ensure the needs of all parts of the system (including government) are considered in an objective way while being sufficiently agile to address emerging research priorities.
- The council could be required to articulate the national research strategy, manage a continuous

[1] Universities New Zealand is the operating name of the New Zealand Vice-Chancellors' Committee, a body established under Part 19 of the Education Act 1989. It has statutory responsibilities for university quality assurance, the approval and accreditation of university academic programmes, entrance to universities, and scholarships. It also represents the interests of the universities on a wide range of other matters, such as education and research policies.

[2] Stats NZ 2023 R&D survey

[3] https://www.universitiesnz.ac.nz/latest-news-and-publications/universities-call-independent-national-research-council

process of national engagement that will identify and publicise emerging research areas of importance, and develop and regularly update a national research strategy to reflect this new thinking.

- The council could have oversight of the research system including capability development, setting research priorities (similar to the UK's 'Areas of Research Interest'[4]) and providing oversight of national infrastructure that aligns with research priorities.
- The council should also:
  - Recommend efficient resource allocation processes with reduced governance and compliance requirements.
  - Address current workforce issues such as early career researcher precarity and succession planning for critical areas of expertise.
  - Be at arm's length from the Government to enable a focus on priorities extending beyond political cycles, although with effective mechanisms for the council to ensure engagement with political decision-making.
  - Be separate from the research advancement, promotion and academy functions of the Royal Society Te Apārangi, as research councils are in other key countries.
  - Design and manage a more simplified/streamlined research funding system that replaces the current complex system where public research funding is divided into multiple small short-term funds. And in doing so, the council can ensure a reduction in the associated administration burden to universities and other research organisations.
  - Encourage excellence and international engagement as critical components of research capacity.
  - Incentivise and effectively support domestic *and* international collaborations.[5] International partnerships could be much better supported through a more strategic and long-term approach. The current Catalyst Fund is insufficient in quantum and funding opportunities are often announced with as little as 6 weeks' advanced notice. Furthermore, universities would welcome government assistance to attract international research income. Overseas funding systems are complex and the rules are different for different funds. The strategic approach to Horizon Europe is to be commended and the future system should consider where a similar national approach can again be supported by government.
- The future research system should not be just about 'science' but should be inclusive of all disciplines:
  - Science and research are not synonymous. While the SSR review terms of reference and website make it clear that 'science' is an umbrella term for the purposes of the review, reference only to 'science' risks alienating research in the social sciences, humanities and creative arts, all of which are an integral part of the research system as a whole. And, further to the SSAG Question 4, research across the spectrum including applied, investigator-led and mission-led research should be supported, as should trans- and inter-disciplinary research.
  - The distinctive contributions of Mātauranga Māori should also be recognised in any future research system.[6]
  - Across all disciplines there are opportunities with increased investment and suitable policy settings to increase universities' contribution to economic development and transformation through research translation, entrepreneurship, and innovation. This concept has been formally recognised in several other jurisdictions.[7] The German Fraunhofer model[8] provides an excellent template for effective translational research, aspects of which could be emulated by any future New Zealand SI&T system.
  - The future research system should be based on principles of excellence, adaptability to change in the economy and society (without introducing instability that can be associated

[4] https://www.gov.uk/government/collections/areas-of-research-interest
[5] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[6] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[7] Breznitz, S. M. (2014) The Fountain of Knowledge: The Role of Universities in Economic Development 1st ed. Stanford University Press. https://doi.org/10.2307/j.ctvqsdqxm.
[8] https://www.fraunhofer.de/en.html

with economic volatility), diversity, inclusion, transparency, and national approaches to investment where those are most effective.[9]
    - A long-term vision should inform the design of a future research system that provides stability and resilience to future unanticipated shocks. A long-term vision which also includes long-term thematic priorities would in turn enable research organisations to align their own research strategies as appropriate. As a result, tracking investment and outcomes that align with these priorities would be much easier.
- Government investment should be highly responsive to areas of rapid technological advancement or social/environmental change to ensure New Zealand's competitive advantage. Currently this may include AI/VR, robotics, medical technologies, biology and health, gaming, resilience to natural disasters, climate change mitigations, sustainable agricultural practice, urban environments, and space [10] but these areas will evolve rapidly. Many of New Zealand's major cities are on the coast which highlights the importance of our research to better understand the links between urban environments, climate change mitigation, oceans and biodiversity.
- We support a stronger research-policy interface in NZ to better inform policy development, implementation, and evaluation in NZ's public service.[11] This could involve the establishment of initiatives such as the 'Evidence for Policy' initiative run by the Irish Universities Association (IUA) which brings policy-makers and experts together.
- The future system should also allow greater research agility by avoiding over-reach and over-governance by those funding it.
- The future SI&T system should support the pursuit of openly accessible research that is publicly funded.[12]

Innovation

- The future research system should not overemphasize the goal of 'commercialisation'. The majority of research will not be commercialised, yet that research creates societal, environmental and economic benefits. Although research commercialisation is a significant activity and a high-risk part of what universities do, our core DISTINCT mission is research-led teaching to enhance a knowledge-based society across the full range of disciplines and subject areas.[13,14]
- Growing industry engagement and investment in innovation is key to lifting our percentage GDP spend on R&D and will also lead to better translation of research into commercial products in many cases. This can be done through:
    - Increasing applied doctoral and postdoctoral training at universities.
    - Lifting the proportion of New Zealand's workforce with postgraduate (research) qualifications from 7% to at least the OECD average of 15% through reinstating and extending availability of allowances for postgraduate students and providing government-funded doctoral scholarships.
    - Providing guidance/ templates to streamline processes such as the management of intellectual property that stems from publicly funded research.
    - Enabling the inter-sectoral mobility of experienced researchers between academic research, industry, government and the non-profit sector could also infuse research skills into these sectors to achieve desired outcomes and innovation in industry.

---

[9] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[10] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[11] Work to improve knowledge-sharing between university academics and policy makers has been undertaken by UNZ, in collaboration with the Department of the Prime Minister and Cabinet and the Office of the Chief Science Advisor to the Prime Minister. UNZ also supports the Speakers Science Forum bringing Members of Parliament closer to cutting-edge research.
[12] This is publicly supported by all eight universities: Open Access Statement.pdf (universitiesnz.ac.nz)
[13] Emphasising that it is through our research-led taught graduates and our research that we have impact on society, economy, environment etc
[14] UNZ's Science, Innovation and Technology BIM_Nov 2023

- ‘Knowledge/research hubs’ could be based near industry clusters and/or regional hubs could be established in partnership with iwi, for instance.[15]

Public research organisations/ Crown Research Institutes (CRIs)

- Internationally, it is unusual to have public institutions such as CRIs focused on and limited to the dominant sectors in the economy of the recent past. This model means there is a large degree of inertia in the research system and little capacity to support emergent, more knowledge-rich sectors.[16]
- A company structure housing research activity and infrastructure is fundamentally incompatible with driving public research outcomes.[17]
- The current ‘for profit’ model of CRIs has meant research infrastructure isn’t always used and shared effectively [18] across organisations. Similarly, the ‘for profit’ model also drives a higher cost of participation in (and therefore a barrier to) collaborative research programmes with other organisations such as universities.
- Co-locating CRIs (or their future form) with universities may provide many positive benefits such as:
  - Helping to build relationships and enabling collaboration.
  - Supporting the missions and goals of universities and CRIs.
  - Creating efficiencies through shared facilities.
  - Enhancing capability development (e.g., existing joint graduate schools).
- We would therefore support a colocation approach or mergers where key thematic areas such as climate change/resilience or new energy technologies, or where technical expertise such as forensic chemistry/genetic diagnostics are the focus. Although there are significant costs upfront to bringing such resources together, the long-term benefits are far greater than the initial outlay.
- While UNZ supports colocation, the primary barrier to a more collaborative and productive research system in New Zealand is not geographical location but institutional boundaries and the funding system. Colocation of two very different institutions will not necessarily overcome the problems of alignment of vision and purpose, strategy and priorities, measures of success, rewards and drivers, and approaches to intellectual property ownership.

Funding quantum and models

While the topic of the quantum of investment in research is not an initial focus of the review, underinvestment is a major contributor to the problems facing our research system.
We have advised the following [19] to previous governments:

- Research investment should be significantly increased if any future intervention is going to be effective in bringing about positive and lasting change.
- The real cost of research in the university sector is masked by the current funding model that requires approximately 15% of research to be cross-subsidised by teaching and other incomes.[20] And in some jurisdictions (e.g., the Fraunhofer-Gesellschaft model in Germany) pure basic research at universities is almost 100% supported through public funding.
- Successive governments have explicitly supported a target investment in R&D of 2% of GDP, (which is still below the OECD average of 2.5%), and yet, at 1.4%, we are well short of this target. We support a goal of 3% of GDP for overall research investment in Aotearoa, which, in a healthy system, would be approximately 1% investment from government and 2% from the private sector. The current R&D tax incentive has not delivered the intended results, perhaps because the majority of NZ’s private sector is made up of SMEs (less than 10 employees). Therefore, we

[15] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[16] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[17] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[18] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[19] UNZ submission on Te Ara Paerangi - Future Pathways Green Paper.pdf (universitiesnz.ac.nz)
[20] Research cost /research income collated from university 2022 Annual Reports

recommend incentivising SMEs to participate in R&D in addition to creating a more conducive environment for larger enterprises to thrive.

- As discussed in the above section on the future SI&T system, New Zealand needs dedicated government investment to support a national research infrastructure strategy (as in the UK and Canada). Good examples of where research infrastructure is shared among multiple institutions but accessed by all relevant researchers include the Australian National Nanofabrication Facility and the Microscopy Australia consortium. Currently the full-cost funding model does not support infrastructure being used fully, nor does it support purchasing large capital items.
- There is a degree of unproductive competition in the funding system, but some competitive processes and benchmarks of international standing are required to improve system performance and to reward excellence.
- Currently, the pursuit of international research funding comes at a cost to NZ research institutes as these international funds are not typically fully costed. Solutions to this can include increasing universities bulk funding or changing the research costing model.
- The future SI&T funding system should also reduce the current administrative burden for universities and research organisations by:
    - Ensuring that budgeting, submission, and assessment processes associated with contestable or directly commissioned research align across all major NZ research funding mechanisms/funders, and
    - providing a single comprehensive coordinated information site that captures all the major research funding opportunities in New Zealand (like the UKRI website) and which ensures the timing of funding rounds are spread more evenly throughout the calendar year.
- The future shape and size of the research workforce is inextricably linked to other aspects of the national system such as (but not limited to) strategic research priorities, infrastructure, and total national investment. The current funding system is not designed to fund capability but rather to fund individual projects or programmes for a finite period, resulting in workforce precarity, particularly for early career research workforce who are employed on short- medium-term contracts that end if government funding is not renewed or extended – a point we wish to emphasise. Balance can be achieved through a base fund for capability and discretionary funding for projects or programmes overseen and evaluated by an independent research council.
- Finally, we have also publicly supported the recommendation that all future contestable research funding should be inflation adjusted. [21]

[21] UNZ's Science, Innovation and Technology BIM_Nov 2023

Appendix 1. Science System Review phase one questions

from ssaq.org.nz/submit

Phase 1 consists of broad high-level questions regarding the shape of the science, innovation and technology system that will inform subsequent phases. It is not intended that we consider operational or fiscal detail at this stage and there are many other issues not considered at this stage. Where possible it may be useful to distinguish short-term issues from longer-term desired outcomes.

Question set 1 – The Science, Innovation and Technology System.

1. What future should be envisaged for a publicly supported science, innovation and technology systems?

2. What are the opportunities, challenges and barriers that need to be addressed to build a more thriving research, science, innovation, and technology system that delivers positive sustainable growth and prosperity for New Zealand?
   This might include specific comment on the following topics:
   a. How can they drive innovation and accelerate the shift towards a knowledge-based, diversified economy?
   b. How can they contribute to developing innovative solutions to emerging challenges such as climate change, biodiversity loss, and societal health?
   c. How should they adapt to, and make good of opportunities provided by, a rapidly evolving global research landscape?
   d. How can the Government's effectiveness be enhanced using scientific data, knowledge, and new technologies?

3. What principles should underpin the design of a science, innovation, and technology system for New Zealand, given its demographic composition and distinctive cultural makeup, its geographical position, and its social, environmental and economic futures?

   This might include specific comment on the following:
   a. Where are the major structural barriers to greater efficiency, effectiveness, and impact?
   b. What are the barriers between publicly funded research entities (especially universities and Crown Research Institutes (CRI)), and in turn how can we facilitate closer partnerships between them, the private sector, government agencies and communities including hāpori Māori?
   c. How should the science, innovation, and technology system embrace and reflect the growing diversity of culture and peoples in New Zealand and the contributions of Māori as reflected in the Treaty/te Tiriti?
   d. What are some important factors for the government to consider as criteria when prioritising investment in research appropriate for New Zealand's size and characteristics?
   e. How can New Zealand better leverage its small domestic, science, innovation, and technology system to be more effective?
   f. What future are we envisaging for the science, innovation, and technology system in New Zealand?

Question set 2 – Public Research Organisations.

4. What is the role of public research organisations such as Crown Research Institutes (CRIs) in the New Zealand context?
   In answering this question, you might consider:

a. How should the functions of government research organisations including the current CRIs be organised, governed, and managed into the future?
b. Are public research organisations too isolated from higher education?
c. To what extent should public research organisations be public good facing versus private good facing? Should these roles be separate?
d. How should public research organisations manage intellectual property?

5. Does New Zealand need an advanced technology organisation doing applied and developmental research? If so, how would it be structured, governed, and organised? How would the private sector be engaged?

Question set 3 – The Innovation System

6. Does New Zealand have appropriate mechanisms to develop the innovation pipeline, attract global partners and funding?
    a. Does New Zealand need a revised approach to promote innovation?
    b. How can we use innovation and technology to make New Zealand's economy more competitive?
    c. If an innovation-focused policy and promotional organisation is needed, what would its core functions be?
    d. How should Callaghan Innovation and other publicly funded industrial and commercial innovation support mechanisms evolve? For example, New Zealand Growth Capital Partners (NZGCP), incubators, accelerators and similar (excluding tax incentives).

Question set 4 – Contestable Research

7. What is an optimal structure for managing mission-led and contestable research?
   In answering this question consider:
    a. Should the Ministry of Business, Innovation and Employment and its policy functions be more clearly separated from contestable funding decisions?
    b. Does New Zealand need to rationalise its research funding mechanisms?
    c. At what levels should prioritisation of research and research investment occur and on what basis?
    d. How should investment into Māori research priorities be determined?
    e. How should research involving the study of or the application of mātauranga Māori be managed and funded?
    f. What should a Pacific research strategy consist of?
    g. In what areas should New Zealand develop in depth research expertise over the next two decades?
    h. How could the system better coordinate research across priority areas?
    i. How should high intellectual risk, high innovation research applications be identified and supported?
    j. How should the balance of research investment extend across from the humanities, social sciences, health sciences life sciences, physical sciences and earth sciences?
    k. What checks and balances should be in place to ensure effective and efficient science?

Question set 5 – Governments Research Needs.

8. How should the government's own research needs be identified and addressed? How should such research be quality assured?