From:	no-reply@mbie.govt.nz
To:	Research, Science and Innovation Strategy Secretariat
Subject:	Draft Research, Science and Innovation Strategy submission
Date:	Friday, 8 November 2019 3:31:09 p.m.
Attachments:	Online-submission-form-uploadsdraft-research-science-and-innovation-strategy-submissionsRSI-Strategy_Submission-from-University-of-Otago.docx

Submission on Draft Research, Science and Innovation Strategy recevied:

Are you making your submission as an individual, or on behalf of an organisation?
Organisation

Name
David Geraghty

Name of organisation or institutional affiliation
University of Otago

Role within organisation
Senior Research and Policy Analyst, Office of the Deputy Vice Chancellor (Research and Enterprise)

Email address (in case we would like to follow up with you further about your submission)
david.geraghty@otago.ac.nz

Which of the below areas do you feel represents your perspective as a submitter? (Please select all that apply)

If you selected other, please specify here:

Gender

Ethnicity

Name of organisation on whose behalf you are submitting, if different to the organisation named above

In which sector does your organisation operate: (Please select all that apply)
Research , Interface of research and industry

If you selected other, please specify here:

How large is your organisation (in number of full-time-equivalent employees)?
4,080 staff FTE (and 18,840 student EFTS)

Please indicate if you would like some or all of the information you provide in your submission kept in confidence, and if so which information.
Our submission isn't confidential.

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MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Research, Science and Innovation Strategy

Submission form

The Government is developing a Research, Science and Innovation (RSI) Strategy to set out our vision for RSI in New Zealand and its role in delivering a productive, sustainable, and inclusive future.

We are keen to hear the views of New Zealanders on the draft Strategy so that we can get a better understanding of what our country needs from RSI. We also are looking for feedback on how we can take action to ensure New Zealand's RSI system is optimised for success. These views will inform the direction of Government investment in RSI and the research and innovation areas for us to focus on as a country, as well as help us understand the challenges we need to overcome.

We encourage anyone with an interest to make a written submission.

How to have a say

We have included a number of questions in the draft RSI Strategy document to highlight issues on which we would like further input. We encourage you to use these questions as a guide when submitting your feedback.

This document provides a template for you to provide your answers. Please upload the completed document using our online submission page.

You do not have to fill out every section – we welcome submissions on some or all of the questions.

The closing date for submissions is 10 November 2019.

After the consultation period finishes, we will analyse the submissions received and incorporate the feedback in the final version of the strategy.

Confidentiality

Please note: All information you provide to MBIE in your submission could be subject to release under the Official Information Act. This includes personal details such as your name or email address, as well as your responses to the questions. MBIE generally releases the information it holds from consultation when requested, and will sometimes publish it by making it available on the MBIE website.

If you do not want some or all the information you provide as part of this consultation to be made public, please let us know when you upload your submission. This does not guarantee that we will not release this information as we may be required to by law. It does mean that we will contact you if we are considering releasing information that you have asked that we keep in confidence, and we will take your reasons for seeking confidentiality into account when making a decision on whether to release it.

If you do not specify that you would prefer that information you provide is kept in confidence, your submission will be made public. While we will do our best to let you know that we plan to publish your submission before we do so, we cannot guarantee that we will be able to do this.

Contribution of Research, Science and Innovation

This strategy is about New Zealand's Research, Science and Innovation (RSI) at a high-level. Its aim is to identify challenges and opportunities that will have the broadest impact on our research and innovation activities. For this reason, it mentions few specific areas or sectors of research and innovation. For this draft version of the Strategy, we are keen to hear from researchers, innovators, businesses, and providers of public services on what the RSI system could be doing to accelerate progress on Government's priorities.

Question 1: Where can the RSI system make the greatest contribution towards the transition to a clean, green, carbon-neutral New Zealand?

Question 2: Where else do you see it making a major contribution?

Question 3: What else could else the RSI system be doing to accelerate the progress towards the Government's priorities*?

* see list of the Government's twelve priorities included in Part 1 of the draft Strategy.

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

We welcome the stated commitment to raising R&D expenditure to 2 per cent of GDP by 2027. We note that this anticipates a 15% compounding annual growth rate for Business R&D funding (Fig. 1, p. 16). We commend to Government that this growth rate be matched or exceeded for the additional spending needed by Government. We recommend that this should include commitments to increases of 10-15% per annum in core contestable funds (Marsden, Endeavour, HRC) and 5-10% per annum in the PBRF. Front loading this investment would help accelerate progress and will likely stimulate business R&D spending further.

The Draft RSI Strategy's emphasis upon shifting from volume to value is also to be applauded. Faced with the uncertainties of climate change, finite resources and fickle markets, innovation is essential if New Zealand is to move beyond continued reliance upon primary production – agriculture, horticulture, forestry, fishing & mining.

In response to the specific questions raised:
Q1. The RSI system make the greatest contribution to these goals by increasing the level of RSI investment in projects (research or practical applications) that seek to understand, prevent, ameliorate and/or reverse the conditions that lead to environmental degradation and climate change, as well as understanding how best to adapt to the consequences of climate change.

To make this more effective we believe the draft RSI Strategy needs to more clearly articulate the sequence of stages/goals necessary to engage with environmental degradation and climate change – according to relative urgency – and weight/prioritize its investment accordingly. Given the relatively short time-span of the strategy, agricultural emissions need to be targeted from the outset as a highest priority. [The Ministry for the Environment has identified that nearly half of New Zealand's greenhouse gas emissions come from agriculture, and methane from livestock digestive systems makes up almost

three quarters of these agriculture emissions.[1] Pollution of waterways is a significant associated problem.]

We think the RSI Strategy could encourage rapid uptake of new knowledge/innovation by setting up co-funding opportunities between research organisations and industry.

To expedite innovation via global connectedness the RSI Strategy could establish funds to promote exchanges between countries – enabling NZ-based climate change researchers to learn from other countries which are excelling in adopting "green" practices and technologies, etc.

Q2. By continuing to prioritise and fund innovation in other priority areas significant to improving New Zealanders wellbeing, such as in healthcare research.

Q3. In keeping with the points made under Q1 above, we think the 12 priorities identified in p. 9 of the draft RSI Strategy should be slightly reordered to acknowledge the pressing need for climate change mitigation. The title for the first subset could be changed to "Build a stable, productive, sustainable and inclusive economy", and point 4 ("Transition to a clean, green carbon neutral New Zealand") should become point 1 in this list.

The RSI Strategy could further accelerate progress towards the Government's priorities by increasing investment in early and mid-career researchers, thereby providing greater career certainty and sustainability, which will ensure we retain the best research talent.

[1] https://www.mfe.govt.nz/climate-change/why-climate-change-matters/agriculture-emissions-and-climate-change

Researching and innovating towards the frontier

Question 4:	Do you agree that the RSI Strategy should be focused on innovation at the "frontier" (creating new knowledge) rather than behind the frontier (using existing knowledge to improve the ways we do things)?
Question 5:	In which research and innovation areas does New Zealand have an ability to solve problems that nobody else in the world has solved? Why?
Question 6:	In which areas does New Zealand have a unique opportunity to become a world leader? Why?
Question 7:	What do you consider to be the unique opportunities or advantages available to the RSI system in New Zealand?
Question 8:	What RSI challenges are unique to New Zealand, that New Zealand is the only country likely to address?
Question 9:	What are the challenges of innovating in the public sector? How do they differ from those in the private sector?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Q4. We have found the draft RSI's use of "frontier" slightly confusing, and believe the strategy would benefit from clear statements around the essential, initial role of *discovery* in innovation causal chains – and around basic research as being a primary site in which such discovery occurs.

Innovation, which necessarily involves the translation of research discovery into a new product, process or function (to quote RSI), is already at a remove from the discovery frontier – it is behind the frontier. It thus becomes a question of how far from the frontier innovation occurs. In the case of basic research, it can take some time, but impacts can be profound. With applied research, innovation can happen quite quickly.

We think the strategy should accommodate innovation both at and behind the frontier, and also champion basic research – discovery – which is yet to be translated into "innovation". A balance needs to be struck to ensure that knowledge already being created, but not yet exploited, is translated into practice.

It is also to be noted that "implementation research", which focuses on synthesis and application of established knowledge and/or known techniques to a (New Zealand) context can also be research "at the frontier".

Q5 and Q6. New Zealand is uniquely placed for global leadership in sovereign indigenous knowledge across multiple research areas – economics, agriculture, environment, health, tourism and so on. This may include developing and sharing indigenous knowledge, epistemology and research methodology (i.e. kaupapa Māori research) with indigenous and public sector interests offshore.

Due to our natural resources, we are very well placed with sustainable tourism, sustainable energy and sustainable business. Due to our geographical location we are well placed to contribute to understanding the oceans and marine environments in the Southern Ocean and the role the Antarctic plays in the global climate system.

Due to the pressing challenges we face with agricultural emissions and water pollution, earthquakes, coastal erosion, flooding and drought, we will necessarily be at the front of global efforts in these areas – necessity being the mother of invention.

Due to existing research networks and very strong whakapapa links, New Zealand is well placed to work with Pacific neighbours in addressing common areas of opportunity and risk. We hope the Pacific forms a key part of the new RSI Strategy's roll-out.

Q7. Our small size is both a challenge and an opportunity. On the plus side, New Zealand punches above its weight in terms of research. We are well educated, agile and efficient – and these are clear advantages available to our RSI system. Despite a relatively low proportion of GERD (Government expenditure on R&D) as a proportion of GDP, we perform well on the ratio of publications to GERD relative to both the OECD generally and the set of Small Advanced Economies. This bodes well given the Government's stated intention of increasing R&D expenditure to 2 per cent of GDP by 2027. With improved connections into the global marketplace of ideas, as well as a highly-connected but under-resourced research sector, the Government will continue to see world-leading research productivity as GERD increases.

Q8. Our geographic isolation is unique, and the draft RSI Strategy – through its recommendations around improved connections – addresses this cogently.

New Zealand's distinctive culture, politics, size, income, resource base, etc., also mean that, with regard to many particularly social issues, we won't be able to simply import solutions from overseas.

Q9. We note that changes of Government, changes of Government policy and budgeting priorities, and high staff turnover are barriers to innovation within the public sector. Where possible, adjustments to strategy and funding should be minor to ensure continuity and longevity of endeavour.

We support the recognition and addition of "Government Departments - $125m" to the Investment System diagram on p 14 of the Draft RSI. This clearly identifies Government departments' role as research funders in the wider RS&I context.

Government Departments' research funding will hopefully go some way towards addressing resourcing constraints that are currently a barrier to working with the public sector. For example, our experience is that working on research projects with DHBs is complex due to resourcing constraints. DHBs' number one priority is patient care and that is not likely, nor do we want this, to change. DHBs are severely resource constrained and are dealing with the acute needs of patients. Research is thus low on their agenda – despite knowing that research breakthroughs, changes to guidelines for diagnoses and treatment, health system innovations, new tests etc. and evidence informs better patient care. Clinical trials are generally very difficult to get going and the current funding system does not make it easy. Trials are usually held over a large number of sites (many of which are DHBs) and the timeframe for applications do not allow enough time for appropriate consultation. Budget

restrictions also mean trials are underfunded and rely on co-funding – noting that DHBs are not able to contribute funding to projects due to their resource constraints. All costs must be covered from a research project budget.

Our key challenge – Connectivity

Question 10: Do you agree that a key challenge for the RSI system is enabling stronger connections? Why or why not?

Please type your submission below.

We endorse the addition of "connectivity" as an element linking "excellence" to "impact" in the RS&I Strategy as it has evolved out of the *National Statement of Science Investment, 2015-2025* (NSSI). (Please see our responses to Q16-19, below, for more detail.)

While we strongly agree with the value of connections, we note that this should not be measured simply be the number of individuals connected to major projects. The size of research teams varies from discipline to discipline simply because of differing numbers of researchers employed in different areas. We hope that the RSI response to this challenge will focus on the quality of connections over their number.

It would be worthwhile for the RS&I Strategy to 2027 to more clearly recognise that it has arisen as a natural and planned revision of the NSSI (2015-2025). The NSSI implementation period is only halfway through, so making it clear for future audiences that the current RS&I Strategy builds on a strong and meaningful NSSI is important.

Furthermore, enabling stronger connections or collaborations both nationally and internationally is a key challenge for the RSI system. Connections/collaborations are critical to creating and cultivating new knowledge, and ensuring global impact/uptake.

The system as it stands inhibits this to some extent. Restrictions on RSI funding being used on overseas-based researchers should be reconsidered and removed where there is benefit to New Zealand from the activity. For example, full-cost recovery funders (including Marsden) could allow funds to be spent on overseas experts that contribute significantly to a project (i.e. as co-investigators) where global leaders are critical to the growth in knowledge at the local level.

There is also genuine interest for engagement between researchers and those who want/need research, but different institutional drivers, resourcing for research activities (whether conducting research or implementing and evaluating), and appetite for risk are challenges to overcome in order to work productively together. For example, in our experience it is easier to engage and contract research with companies than with CRIs due to drivers for ROI and hard-line views on ownership of IP.

In our experience, engaging and co-developing research proposals with community groups is incredibly valuable, but difficult to achieve in traditional funding cycles especially as pre-proposal activities are not directly funded and we rely on the goodwill and volunteer time of our stakeholders. It can be particularly challenging working with Government departments, who appear by necessity to be severely risk averse – with fear of OIA requests and being called to the Minister's Office – driving decisions and behaviour. There needs to be a culture shift in order to allow the potential partners and parts of the ecosystem to work harmoniously, beyond organisational barriers and for the greater good.

Guiding Policy – Excellence

Question 11:	Do you agree with the definition of excellence presented here as the best thing possible in its context? Why or why not?
Question 12:	How can we achieve diversity within our research workforce? What are the current barriers preventing a diverse range of talent from thriving in the RSI system?
Question 13:	Do you agree that excellence must be seen in a global context, and draw from the best technology, people, and ideas internationally? Why or why not?
Question 14:	Do you agree that excellence is strengthened by stronger connections?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Q11. We support the following key statement within this section: "Excellence is a term that can apply just as easily to applied research as it can to basic or fundamental investigation."

Elsewhere, however, we found the definition of excellence in NSSI 2015-2025 to be clearer than that in the draft RSI. We agree with parts of the new definition, though not others. We also find some of the connections between the parts to be disjoint – non sequiturs.

The sentence "Often, international literature … RSI … solely …" is very suggestive. Scientific excellence is indeed mostly measured by citation-based rankings. But, science is just the "S" in "RSI". Also the sentence "Excellent RSI does not have to result in a publication". Usually, if scientific output is not published, it has not been regarded excellent by peers. Why would MBIE know better than editors and peers in this regard?[2] Probably it is an idea to have different measures for "S" and "I", where "R" is considered an activity rather than an output.

We wonder, also, at the value of the statement "excellent people will do excellent things". This is highly subjective, and being an excellent person is not a precondition for achieving excellence – bad people can do excellent things. The definition's links between excellent people, diversity and innovation are also not clear. Saying that excellence can only be achieved by diversity is inaccurate, as is saying diversity is a necessary precondition for innovating at the frontier. We appreciate the crucial roles of diversity and innovation in an excellent research system, but as currently worded the links are not cogent.

We wonder, also, at a "global outlook" being a precondition for excellence. Would this preclude kaupapa Māori research undertaken in te reo Māori from excellence? Also, the temporal aspect to the sentence ("… when consistently seen in a global context") seemingly contradicts the RSI's earlier appeal to the immediacy of innovation at the frontier. Consistency develops over time, by which the time the frontier has moved. Here, we would reiterate our point that the strategy should accommodate innovation both at and behind the frontier, while also supporting basic research which is yet to be translated from discovery into innovation. We support the necessity for strengthened global connectivity, but the wording here isn't quite right.

Semantics aside, we see that the overall definition of excellence acknowledges the multi-faceted nature of research, science and innovation in the current New Zealand context, but think it needs more work.

Q12. A major barrier preventing a diverse range of talent contributing to research is the set of historic cultural and social structures that have shaped our current system and environment. Great changes have been made – and the strong, clear intentions signalled in this draft RSI Strategy are encouraging – but we have a long way to go.

Ensuring diversity in the research workforce is a long-term goal that requires careful planning and resourcing. We think change may gather momentum through carefully targeting the top, middle and the bottom levels of the RSI investment system:

- By appointing diverse leaders (particularly Māori and women) to key roles within the RSI system – across the range of activities and functions, including governance. This will ensure connectivity and uptake.

[2] We note that scientific outputs can be kept undisclosed in order to pursue IP protection, and can also be published in an open science/open data context without peer/editorial review.

- By embedding Māori knowledge, culture, and worldviews in all key strategic documents (e.g. Health Research Strategy) and funding rules/guidelines. And, as per our answer for 35, through increased Māori leadership and representation.
- By offering more prestigious Māori and Pacific fellowships equivalent to the Rutherford Discovery Fellowship.
- By offering fellowships to aspiring researchers from 'less developed' and 'developing' economies.
- By establishing a kaupapa Māori research fund, that would allow research expressed and framed from a te ao Māori perspective to thrive, with western and other science or epistemological perspectives brought in when needed.
- Having researchers (especially early-career, female, Māori and Pasifika researchers) go into schools where the employ a 'story-telling' approach may cultivate a natural desire for students to embark on a science or research career.

Humanities and social science research is an essential ingredient to a diverse research workforce. But New Zealand needs a serious capacity build in this area which is hampered by current narratives, funding and processes. (See answers below to questions 19, 32, and 38.)

Q13. We disagree with the absolutism of this statement, and think it might usefully be changed to "excellence is best seen in a global context…" Some areas of research – including certain kaupapa Māori research – may be particular to itself *and* excellent. The system needs to be flexible enough to accommodate and reward this. We need to resist one-size-fits-all thinking.

Q. 14 We agree that excellence is strengthened by stronger connections, very much so. Stronger connectivity in the global research and innovation system will allow improved access to diverse thinking and information, increased dialogue and collaboration among international peers, and ready benchmarking against international standards. Stronger connectivity may also reduce the possibility of duplicating research efforts and allow for the streamlining research support practices – thus achieving cost efficiencies.

Guiding Policy – Impact

Question 15: How can we improve the way we measure the impact of research?

Please type your submission below.

We are supportive of MBIE's work around impact, and are presently engaged with *The Impact of Research* position paper (October 2019).

We do, however, urge flexibility around how impact assessment is embedded within the RSI system so that different types of research can speak to different kinds of impact.

We are particularly concerned at any possible disincentivising of basic research – which is where we believe significant new knowledge is created. On p. 27 impact is defined as "a change to the economy, society or environment, beyond contribution to knowledge and skills in research organisations". This definition specifically excludes what might be called "academic impact" and new ideas that do not entail any obvious economic, societal or environmental changes. On p. 28, the draft RSI Strategy states:

> In the research sector, all of our publicly funded research should have a strong line of sight to impact. This means researchers and institutions receiving public funds should be able to articulate the impact of their research portfolios. Line of sight to these benefits does not mean focussing exclusively on applied, 'close-to-market' research or on individual projects.

This would mean that all university researchers must be able to articulate the impact of their research. In spite of the disclaimer that this does not mean "focussing exclusively on applied, 'close-to-market' research" the proposed policy does count against fundamental research in which the impacts (as defined above) cannot be described.

We note that basic research often occurs at the discovery edge of knowledge without end-user sponsorship (beyond Government and/or university) and without immediate translation to impact. Impact commonly does occur for basic research, but might sometimes only be mapped out as such in the ex-post stage – after the fact. We thus encourage flexibility around time-lines for identifying impact, and flexibility around how the line-of-sight and results chains are articulated for basic research.

To galvanise translation of research to impact, we propose a mechanism where funders allocate a small portion of their funding (5-10% of the value of a grant) to support translation of projects that meet their milestones onto the next users, which could range from another basic researcher all the way to applied industry. Within the final year of a project these funds would go to the institution to develop a post-grant path for the research outputs – in collaboration with the researcher and, where appropriate, Technology Transfer Offices and MBIE's Commercialisation Partner Network (CPN). This might stimulate connectivity, keep the focus of researchers on what they do best, and provide a way to measure and track impact longitudinally.

We urge that research publication and citations are retained as indicators of scholarly impact among various possible types of impact. This would allow researchers to be able to choose and emphasize the type(s) of impact relevant to the type of research being undertaken.

We urge that research publication and citations are retained as indicators of impact for blue sky funds – as is currently the case for the Marsden Fund. In terms of individual applications to the Marsden Fund, impact is assessed solely in terms of scholarly impact – the "demonstrable contribution to shifting understanding and advancing methods, theory and application across and within disciplines."[3]

We support the flexibility of the current PBRF system, where "uptake and impact" is one of the 12 types of activity that can be reported in the Research Contribution component of an Evidence Portfolio (worth 30% of the overall EP assessment).

We would also encourage MBIE to expand the "society" aspect of impact beyond health innovations and policy refinements to also include science communication and outreach activities – research that helps to educate the public, enhance scientific understanding, and inspire interest/excitement about science. This kind of impact would enhance the researcher-public connectedness of the RSI system and promote diversity – by appealing to diverse younger learners and diverse members of the public.

We are mindful of the extra workload impact requirements will place upon researchers, and urge MBIE to consider monitoring impact at the level of an overall fund, or at the level of a university/CRI. The 2019 Marsden Fund Guidelines later note, for example, that "Impact will be monitored at the level of the whole Fund over a long timeframe."[4]

We understand it is important for research organisations to articulate the value of their research activity, how it makes a difference, and its benefits to New Zealand and the international landscape. However, there are some concerns with the impact agenda: the potential for perverse incentives, disenfranchising researchers and setting up a new industry of activity for measuring impact where resources might be better allocated to impact activities (e.g. building better connections with stakeholders). Certainly research organisations need to make sure that they have or create an environment with enablers to support impact activities of researchers. This includes such things as impact as an integral part of the organisation research strategy, ensuring researchers understand the concept of research impact (i.e. beyond academia) and have support to achieve impact, clear role expectations for researchers and appropriate incentives, awards and promotions for the range of academic activities (and those including impact of research). We think the wellbeing of researchers needs to be considered as increasingly they are expected to do all things (and be measured and compared nationally) in the spectrum of teaching, research and service.

[3] 2019 Marsden Fund Council Award Application Guidelines for Applicants, p. 7.
[4] Ibid., p. 5.

Guiding Policy – Connections

Question 16:	Where do you think weak connections currently exist, and what are the barriers to connections at present?
Question 17:	What actions will stimulate more connectivity between parts of the RSI system?
Question 18:	How could we improve connections between people within the RSI system and people outside it, including users of innovation, and international experts, business communities, and markets?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Q16. We support the statement (p. 29): "We have structures within our research and innovation system that already encourage deliberate, coordinated collaboration, such as the National Science Challenges, and we think they are working well." The Centres of Research Excellence have also proved successful in terms of collaboration.

Beneath the level of large-scale platforms like the National Science Challenges (NSCs) and the CoREs, barriers to connection derive from the highly competitive nature of our funding system – with individual researchers (and their universities) competing for funding, rankings, etc., and from a lack of integrated data systems and infrastructure – though this is being addressed. Connections with international partners/collaborators are also relatively weak, as current funding rules inhibit attracting the best talent to New Zealand.

Q17. We think the data-driven approaches currently under development in New Zealand will go some way towards stimulating new connectivity. These include the New Zealand Research Information System (NZRIS), the ORCID system, the New Zealand Integrated Data Infrastructure (IDI) and the Longitudinal Business Database. But care needs to be taken to ensure that such systems and the data collection processes they impose do not take resources away from research activities disproportionately to the benefits they offer.

We think increased coordination and support of Open Access (or Open Scholarship, as defined by CONZUL) might also stimulate connectivity between parts of the RSI system. The CONZUL Statement on Open Scholarship states:

> Open scholarship, which encompasses open access, open data, open science, open educational resources, and all other forms of openness in the scholarly and research environment, is changing how knowledge is created, preserved and shared. Open scholarship and FAIR (Findable, Accessible, Interoperable, Reusable) scholarly practices underpin the integrity of research, its efficient dissemination to researchers, students, policy makers and to the wider public and facilitates faster scientific discovery and problem solving. [5]

CONZUL notes that only five of the eight New Zealand universities have OA policies or guidelines. Alignment of OA policies and guidelines across New Zealand would support stronger transformative agreements with publishers, and would improve research

[5] https://www.universitiesnz.ac.nz/sites/default/files/uni-nz/CONZUL%20Statement%20on%20Open%20Scholarship%20%20v1.0_0.pdf

connectivity across the sector. We believe there is an opportunity here.

To promote international connectivity, we could offer more scholarships/fellowships to international researchers, and revisit residency requirements for grants – with current settings meaning faculty relocating to New Zealand can't apply to certain funds (HRC projects and programmes, for example) if they are not permanent residents. Allowing pre-PhD graduate researchers (i.e. Research Master's degree students) from overseas to study in New Zealand at domestic tuition rates would also greatly increase the pipeline of talent we could attract from overseas. Previous bilateral agreements with France and Germany that allowed this were key to the attraction of some key researchers who are now contributing at high levels in industry or academia.

Q18. As noted under Q17, improved Open Access could play a key role here. Key points identified by CONZUL include the following:

- Research articles in open repositories which can be accessed by everyone, are cited 66% more than articles behind paywalls, accessible only to researchers whose institutions pay subscriptions to the journals.
- Slightly over half (51%) of university research which is publicly funded by our biggest research funders (HRC, Marsden and others) is behind a paywall – not freely to Government agencies and to the New Zealand public.
- Open articles were referenced in the media 3.5 times more than closed ones and mentioned in policy documents twice as often.[6]

To improve global connectivity, MBIE might also consider holding a global research, science and innovation summit where New Zealand gets to promote our best examples of excellence and innovation. This could act as a springboard to developing a 'virtual hub' for research, science and innovation, led by MBIE.

[6] *Open Access in New Zealand universities: an environmental scan,* Report to CONZUL, 12 August 2019, p. 3.

Actions – Making New Zealand a Magnet for Talent

Question 19:	How can we better nurture and grow emerging researchers within New Zealand and offer stable career pathways to retain young talent in New Zealand?
Question 20:	How could we attract people with unique skills and experience from overseas to New Zealand?
Question 21:	What changes could be made to support career stability for researchers in New Zealand? What would be the advantages and disadvantages of these approaches?
Question 22:	Do you agree with the initiatives proposed in the Strategy to support and attract talented researchers and innovators? Are any changes needed for these initiatives to be successful? Are there any other initiatives needed to achieve these objectives?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Q19. We can better nurture and grow emerging researchers by providing formal mentoring programmes throughout research and innovation organisations. Consideration should also be given the number and value of researcher-initiated postdoctoral and early-career fellowships that are available. The Rutherford Discovery Fellowship scheme is highly successful, but lacks feed-in from a wider, shorter timeframe, contestable postdoctoral fellowship scheme where the funding goes to the successful recipients to start to develop independence and new project ideas.

Current Government funding processes and priorities have led to low numbers of postdoctoral fellowships in humanities and social science research. The current funding cut-offs in the Marsden Fund, for example, make it difficult to employ postdocs in areas like the social sciences, law, arts, Māori, Pacific and indigenous studies, education, performance, etc. Often, the only career pathway open to graduates who want to start university-based research careers in the humanities is to support themselves by casual teaching. This, in turn, undermines our capacity to address New Zealand's social value and regulatory innovation objectives. Judicious targeting and resourcing of this area will most likely prove valuable in the longer term.

Q20. Overseas researchers could be attracted by providing international fellowships open to applicants outside of New Zealand, ensuring they have funds for an annual trip back to their country of origin – to maintain extended familial connections. This may be very attractive to bring the *best* talent to New Zealand.

Q21. Career stability could be improved by providing more fellowships for early- and mid-career researchers to ensure a smooth career trajectory (see Q19). Advantages would include increased retention. Disadvantages would include high cost, noting that additional investment from both Government and industry is essential if the Government's 2% goal is to be reached.

Q22. These are good suggestions. We commend the planned expansion of the Government's Curious Minds initiatives. Also useful, perhaps, would be increasing the funding for the Rutherford Discovery Fellowships from $800k to $1M – given that the researchers securing these grants tend to be more senior and cost more, which leads to a salary shortfall that has to be met by the host University.

We have some concern about how commercialisation might be configured vis-à-vis the PBRF (as per the statement: "The independent review of the Performance based Research Fund (PBRF) also seeks to expand how the impact of research is assessed, and may lead to increased commercialisation of university research".)

There is certainly a place for commercialisation as part of the ecosystem alongside other forms of knowledge exchange, translation and uptake. We have concerns with the emphasis on it in this context (PBRF) given the aforementioned focus (within the draft RIS) on patents and start-ups. We know that many countries believe they are low performing when it comes to commercialisation of research and certainly when looking at income metrics in isolation to the rest of the research ecosystem.

Actions – Connecting Research and Innovation

Question 23:	What elements will initiatives to strengthen connections between participants in the RSI system need to be successful?
Question 24:	What elements will initiatives to strengthen connections between participants in the RSI system and users of innovation need to be successful?
Question 25:	What elements will initiatives to strengthen connections between participants in the RSI system and international experts, business communities, and markets need to be successful?
Question 26:	Are there any themes, in addition to those proposed in the Strategy (research commercialisation and international connections), that we need to take into consideration?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Please see our responses to Q16-18 above.

Throughout the draft RSI Strategy there is a narrow focus on patent filing and tech start-ups. It is likely possible to increase the numbers of these, if incentivised, but we question whether that will really drive innovation and economic growth. And are these even suitable proxies for how research findings are leveraged, converted, translated? Certainly not in isolation. Current dialogue in the research ecosystem is on knowledge mobilisation – how to enable organisations to rapidly access, understand and apply knowledge into practice with the belief that this will create value and a market advantage and conversely (with the right connections) enable research organisations to appropriately offer up new findings, new knowledge, know-how, etc.

The UK has the KTP (knowledge transfer partnerships) programme,[7] which has been in place for 40 years and is for the benefit of businesses and supports the transfer/translation of IP/knowledge from universities into a company. It funds an associate based at a company under the guidance of an academic for knowledge transfer. There is a bidding process and it is necessary to prove that a project needs academic input as opposed to employing a new graduate.

We understand that universities find these KTPs very suitable and highly desirable for impact studies. In addition, the UK Parliament has a Knowledge Exchange Unit to address the lack of knowledge on engaging with Parliament and to ensure evidence informs Parliament's work. There are various initiatives around this to support the unit's work, e.g. advice on how to write policy briefs, academic fellowship programme.[8]

[7] http://ktp.innovateuk.org/
[8] https://www.parliament.uk/mps-lords-and-offices/offices/bicameral/post/about-post/contacting-post/

Actions – Start-up

Question 27:	How can we better support the growth of start-ups?
Question 28:	Do the initiatives proposed in the draft Strategy to support growth of start-ups need to be changed? Are there any other initiatives needed to support start-ups?
Question 29:	What additional barriers, including regulatory barriers, exist that prevent start-ups and other businesses from conducting research and innovation?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

We applaud the extension of the Technology Incubator system as well as the new investment into New Zealand's early stage capital markets. The key with the latter will be to ensure that the very early stage start-ups, even those who have accessed Technology Incubator funding, can access this new capital to develop and grow in to new high value businesses, and that this new capital is not solely applied to existing firms for expansion capital (which is where much of the current capital is deployed).

Q27. The growth of start-ups can be supported better by ensuring there are incentives for researchers to: a) work with their Technology Transfer Office, and b) with and alongside their TTO to engage with MBIE's Commercialisation Partner Network (CPN) to ensure reseach outcomes with commercial potential are best placed to transition to industry via licensing or to engagement in meaningful discussions with Technology Incubators with a view to securing repayable grant funding.

An aggressive R&D tax credit scheme for companies in their first five years of incorporation would also help, supported by a Government loan program guaranteed by said tax credit to avoid cash-flow issues.

Q28. In addition to investment there is a need to develop and grow more entrepreneurial CEO's and other managers to lead and support our start-ups. Presently we are heavily reliant upon New Zealanders returning home after having gained experience in the US or UK – and there are too few of them for current start-up volumes let alone to support the aspirational growth in this strategy. The development of these individuals could occur via the expanded Technology Incubator network as well as through existing CPN providers like KiwiNet.

Q29. It is important to ensure we remain competitive with the Australian start-up ecosystem via R&D Tax Incentives and relocation and rates relief that is offered across the Tasman. The scale in larger Australian cities, and the proximity to many of the support services they require, makes it attractive for New Zealand start-ups to consider crossing the Tasman; we need to retain them.

It should be noted that lack of regulation can also be a barrier to innovation and productivity. Most mature industries sit within stable and well-understood regulatory frameworks. Lack of regulatory frameworks, as we currently see in social media and artificial intelligence, diminish the certainty required for major investment in new technologies. These risks favour large established companies such as Google at the expense of innovative

start-ups.

Actions – Innovating for the public good

Question 30:	How can we better support innovation for the public good?
Question 31:	What public-good opportunities should our initiatives in this area be focused on?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Q30. We support the "new, flexible, and accessible mechanism to ensure public-sector organisations have access to research and the resources to enable them to innovate successfully" – viz. the $125m earmarked for "Government Departments" in the Investment System diagram. This is an important recognition of Government Departments' role(s) as research funders and research end-user in the wider RS&I context.

We would support the alignment of new Government or sector strategies and plans with the RS&I strategy, such as the Tertiary Education Strategy and the National Education Learning Priorities, respectively, in the case of Vote Education, and the New Zealand International Education Strategy.

To best support innovation for the public good, there needs to be consistency of message across key Government or sector strategies and plans, and stability across the lifespan of those strategies and plans (to balance changes in Government, staff turnover, etc.) – including adequate resourcing of staff at the Government end.

There needs to be extensive consultation across key stakeholders to establish meaningful "innovation missions". For example, before addressing the role of "innovation" with regards to "kaitiakitanga of our biological heritage", we would first need to ascertain who is or should be the kaitiaki exercising kaitiakitanga. These things require patience and meaningful consultation.

Actions – Scale up

Question 32:	What is the best way to build scale in focused areas?
Question 33:	Do the initiatives proposed in the Strategy to build scale in focused areas need to be changed? Are there any other initiatives needed to build scale?

Note: see following page to comment on possible areas of focus

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

We support Universities New Zealand's position herein – that science and technology receive too much emphasis throughout the draft RSI Strategy. All 5 actions in the draft strategy – including Action 4 ('Towards and extended Vision Mātauranga') – are very business and science tech-focused.

We believe the strategy would benefit from greater recognition that science research is increasingly transdisciplinary, and utilizes the arts and social sciences among other disciplines.

To make action 3 – "Start-up^Scale-up" – more relevant to wider research sector, it would benefit from the addition of more social or environmental examples.

Scale up – Choosing our areas of focus

For this draft iteration of the strategy, **we seek input on the selection of possible areas of focus**. We will consider establishing around five focus areas, but, depending on the eventual selection, are likely to introduce them over time, rather than immediately. In addition to the criteria set out in the Strategy document, we invite stakeholders to consider the following factors in their suggestions –

- The ambition of this strategy to focus efforts in the RSI portfolio at the global frontier of knowledge and innovation.
- Ways in which the RSI system can accelerate progress on the GovernmentGovernment's goals.
- The focus areas already determined by *From the Knowledge Wave to the Digital Age*.
- Work already underway where we are already seeking to build depth and scale in the RSI system.

The following areas could be a useful start, and are highlighted in *From the Knowledge Wave to the Digital Age:*

- **Aerospace**, including both autonomous vehicles and our growing space industry.
- **Renewable energy**, building on recent investments in the Advanced Energy Technology Platform.
- **Health technologies** to improve delivery of health services and explore opportunities in digital data-driven social and health research.

We invite comment on these suggestions and welcome input on other possible focus areas.

Please type your submission below.

Choosing focus areas is a complex issue and we think it would be best done via a clear, open process separate to this draft RSI Strategy consultation.

We support the UNZ position in this regard – that there needs to be a balance between areas determined/directed by Government and those that are driven by stakeholders and researchers. There need to be flexibility so as to direct efforts towards new opportunities that may arise. Moreover, the examples of innovation provided in the draft strategy should reflect the full range of "commercial, social or environmental innovation" to which the draft strategy refers.

Actions – Towards an Extended Vision Mātauranga

This section of the draft Strategy signals our intention to consult and collaborate further with Māori stakeholders to co-design our responses and initiatives. From that perspective, we consider the signals in the draft Strategy to be a start, rather than a set of final decisions. Nonetheless, we are keen on initial feedback in the following areas.

Question 34: Does our suggested approach to extending Vision Mātauranga focus in the right five areas? If not, where should it focus?

Question 35: How can we ensure the RSI system is open to the best Māori thinkers and researchers?

Question 36: How can we ensure that Māori knowledge, culture, and worldviews are integrated throughout our RSI system?

Question 37: How can we strengthen connections between the RSI system and Māori businesses and enterprises?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Q34. Yes, the focus areas are appropriate, though the language in this section is too passive – it needs to be more direct and more ambitious. It also needs to expand beyond "business" to encompass broader hauora. We suggest the following adjustments (p. 36 under "Towards an Extended 'Vision Mātauranga'").

A starting place for these conversations will be considering initiatives which –
- ensure the RSI system attracts the best Māori thinkers and researchers, and supports them to thrive in the broadest range of endeavours
- create pathways for Māori engagement with RSI, and support RSI projects of local and national significance to Māori
- ensure RSI supports captures and advances the energy and ideas of ~~our~~ Māori entrepreneurs towards innovation ~~businesses~~
- create an environment where Māori entities ~~and businesses~~ choose to invest with confidence in research and innovation ~~businesses~~
- resource, protect and promote Mātauranga Māori as appropriate within the framework of the Treaty of Waitangi.

Q35. This can be achieved by appointing more Māori leaders (from across iwi) to key roles within the RSI system – across the range of activities and functions, including governance. This will ensure connectivity and uptake.

It is also important tooffer more prestigious Māori fellowships equivalent to the Rutherford Discovery Fellowship, for example.

Q36. Embedding Māori knowledge, culture, and worldviews in all key strategic documents (e.g. Health Research Strategy) and funding rules/guidelines will help meet this goal. And, as per our answer for Q35, increased Māori leadership and representation is essential.

Q37. This can be achieved by engaging key figures in the Māori economy (including Māori

entrepreneurs) to help lead RSI system design. Partnership and substantial, meaningful engagement is also critical.

Actions – Building Firm Foundations

Question 38:	Do the current structures, funding, and policies encourage public research organisations to form a coordinated, dynamic network of research across the horizons of research and innovation? What changes might be made?
Question 39:	Is the CRI operating model appropriately designed to support dynamic, connected institutions and leading edge research? What changes might be made?
Question 40:	What additional research and innovation infrastructure is necessary to achieve the goals of this Strategy? What opportunities are there to share infrastructure across institutions or with international partners?
Question 41:	What elements will initiatives in this area need to be successful?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Q38. We applaud the stability and increased funding signalled in this section of the draft RSI Strategy (p. 37):

> In addition, we will create a progressive investment programme to enhance the contribution of main RSI funds to the government health, social, environmental and economic objectives. We will focus on enduring, sustainable increases to existing funds including the R&D Tax Incentive (driven by increased R&D spending from firms), the Endeavour Fund, The Marsden Fund, the Health Research Council, and the Strategic Science Investment Fund.

From our perspective, the current system is functioning very well, albeit significantly under resourced. Our opening remarks to this response signal our endorsement and preferred approach to increasing investment, repeated here for clarity:

> We welcome the stated commitment to raising R&D expenditure to 2 per cent of GDP by 2027. We note that this anticipates a 15% compounding annual growth rate for Business R&D funding (Fig. 1, p. 16). We commend to Government that this growth rate be matched or exceeded for the additional spending needed by Government. We recommend that this should include commitments to increases of 10-15% per annum in core contestable funds (Marsden, Endeavour, HRC) and 5-10% per annum in the PBRF.

We note, furthermore, that New Zealand has very different levels of capacity regarding the stated "government health, social, environmental and economic objectives"; with health being the strongest and social being the weakest. It is important that New Zealand redress this imbalance as many of our most important issues (climate change, technological unemployment, etc.) have significant social dimensions. Paradpoxically our present research system, with the amounts and type of funding available, often leaves our social scientists underutilised and potentially leads to social problems being being addressed by other disciplinary experts, which limits the types of solutions and innovations that are likely to be evaluated.

Actions – General

Question 42: How should the Government prioritise the areas of action, and the initiatives proposed under each area?

Please type your submission below.

As above, we believe choosing focus areas is a complex issue that would be best done via a clear, open process separate to this draft RSI Strategy consultation.

Such a process could be refreshed periodically by soliciting the views of the major stakeholders in the RSI system (e.g. online survey).

General

Question 43: Do you have any other comments on the Strategy which have not yet been addressed?

Please type your submission below.

We are greatly heartened by the positivity we see within the draft RSI Strategy.

We note, however, that numerous researchers within our university have noted concern that basic research is absent or de-emphasized within this draft strategy. We (the Office of the DVC R&E) assume your intention is not to de-emphasize the ongoing significance of basic research but, rather, to articulate and champion the clear potential for applied research —via innovation — to achieve particular pressing economic and environmental goals.

Clear statements at the outset of the strategy around the ongoing importance of basic research within the New Zealand university system might allay these concerns.

We also note that the role of entrepreneurship is not sufficiently addressed. While the word itself pops-up several times, it is always used as a noun and not as a verb. We think the role of entrepreneurship as an activity needs to be more stressed in Section 3.