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To:	Research, Science and Innovation Strategy Secretariat
Subject:	Draft Research, Science and Innovation Strategy submission
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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
Dr Bronwen Kelly

Name of organisation or institutional affiliation
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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

If you selected other, please specify here:

How large is your organisation (in number of full-time-equivalent employees)?
14 FTE, but UNZ represents all 8 universities

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.
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Te Pōkai Tara
Universities
New Zealand

Research, Science and Innovation Strategy

Submission to the Ministry of Business, Innovation and Employment

Introduction

This submission reflects the views of the Vice-Chancellors and the Deputy Vice-Chancellors of Research of all eight universities.

Universities New Zealand (UNZ) thanks MBIE for the opportunity to make a submission on the draft Research. Science, and Innovation (RS&I) strategy ('the draft strategy'). Overall, we are pleased with many aspects of the strategy and offer some suggestions for further improvement. Therefore, this submission is structured accordingly and with the order of content of the draft strategy in mind. While we haven't answered all the questions in the MBIE template, we have indicated where we have done so, for ease of reference.

For further information, please contact Bronwen Kelly, Deputy Chief Executive of Universities New Zealand—Te Pōkai Tara, bronwen.kelly@universitiesnz.ac.nz

Executive summary

UNZ commends MBIE on its ambition for the research sector and its focus on important aspects of the research, science and innovation system—such as connectivity, capability building and diversity. The draft builds well on its foundation document, the National Statement of Science Investment. The importance of this strategy and those of other government agencies aligning with one another will be critical for achieving maximum benefit from this strategy.

We also commend the recognition that to achieve the step changes required to give effect to this strategy and the NSSI, our RS&I system will require a significant increase in funding and recommend front-loading new investments as much as possible to accelerate progress.

The areas within the draft strategy that require the greatest focus for improvement are around impact, the role of NZ universities in the RS&I system, and the emphasis on commercialisation (businesses and 'science technology').

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Affirmations and recommendations

1. **We commend the ambitious 'mission/vision statements'**, in particular, "harnessing research and innovation to advance the wellbeing of all New Zealanders into the future" and that "by 2027, New Zealand will be a global innovation hub, a world-class generator of new ideas for a productive, sustainable and inclusive future". To make these statements even more inclusive and powerful, MBIE could consider revising the ordering to read "By 2027, New Zealand will be a world-class generator of new ideas for a productive, sustainable and inclusive future, and a global innovation hub".
    a. We are pleased to see that the definition of 'innovation' is inclusive of commercial and non-commercial innovations and the use of 'wellbeing' as it applies to RS&I.
    b. The draft strategy aspires to invest in ways to "make the biggest difference to New Zealand and where we are able to maximise the social value of that investment for all New Zealanders". However, some of the biggest challenges we face are global in nature and therefore the revised version of the strategy should include a global outlook in our aspiration.

2. **Universities welcome the additional focus on connectivity.** [MBIE questions 16-18]
    a. We appreciate the acknowledgement that New Zealand is on a par with other small advanced economies in terms of the number of co-authored publications and the ratio of publications to gross domestic expenditure on R&D (GERD). In fact, NZ does extremely well in terms of the number of publications per researcher and the number of publications per million dollars research expenditure (excluding business expenditure).[1]
    b. Universities would like the strategy to acknowledge existing connectivity and recognise that many government research funds already have a strong focus on building capability and connectivity in (eg, National Science Challenges). In particular, the Centres of Research Excellence model has proven to be very successful where collaboration, as one measure of connectivity, has grown significantly over the years.[2] The Commercialisation Partner Network, established almost 10 years ago, is another example of excellent connectivity amongst all the universities.
    c. We note that enduring institutional international connections are not only measured through co-publishing statistics (p 32). Universities, for example, have multiple long-standing research student and staff [3,4,5,6,7] exchange programmes which are also a contributor to connectivity.

[1] Research, Science and Innovation System Performance Report (2018). Ministry of Business, Innovation and Employment, New Zealand.
[2] Smyth, R, Smart, W, Hendy, S and Sisson, C. (2013) Cores and Effect. Ministry of Education, New Zealand.
[3] The University of Waikato's Coastal Marine Group has a flagship international doctoral training exchange programme with Bremen University in Germany, called INTERCOAST.
[4] The University of Canterbury's Erskine Fellowship (https://www.canterbury.ac.nz/engage/erskine/the-bequest/)
[5] The University of Auckland's Bioengineering Institute has a longstanding collaboration with the German Fraunhofer Institutes.
[6] The University of Otago has over 100 formal exchange partners for student exchange and other collaborations (https://www.otago.ac.nz/international/student-exchange/partners/otago001484.html). This includes the Matariki Network (https://www.matarikinetwork.org/) includes seven universities globally and has multiple staff and student exchange programmes, collaborative research themes across the network (https://www.matarikinetwork.org/research/), and a specific Indigenous Student Mobility Programme.
[7] Lincoln University is member of the Global Challenges University Alliance and the Euroleague of Life Sciences (ELLS) established to promote educational collaborations in fields such as animal, agricultural, food and environmental science.

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d. Universities recognise the importance of capability building, attraction and retention to which the draft strategy refers. However, universities also recognise the value of international students who study in NZ but who eventually return to their home countries. These graduates retain their NZ connections—connections that should not be undervalued. The final version of the strategy could acknowledge the importance of these graduates in the context of the focus on 'connectivity'.

e. We encourage MBIE to consider that Crown research impact can extend beyond simply 'innovating towards the frontier'. We note and support the RS&I Strategy focus on creating connections (pp 22-24) but suggest that the actions (p 32) could be broadened out from the examples of Australia and Singapore to include countries that are current and future export education priorities for New Zealand. These include China, the US, Japan, Malaysia, Korea, Thailand, Viet Nam and Taiwan. All are also key trading partners for New Zealand.

f. Investing in research collaborations between these countries and New Zealand offers significant spill-over benefits. For example, cross-border research collaborations lift the reputation of New Zealand universities among overseas academics and are more likely to lead to highly cited articles. Academic reputation and citation rates drive international rankings. These rankings help us recruit and retain world-class researchers and recruit the international students who contribute to our economy and workforce and often end up generating ongoing trade, research and/or soft-power benefits for New Zealand. Academic reputation and rankings mean that overseas Governments invest in doing research with us and allow their citizens to access scholarships to study with us.

g. These interdependencies and impacts are depicted in Attachment 1.

h. The finalised strategy should recognise that—while collaboration is a significant contributor to delivering impactful research—it is not a prerequisite for quality research[8] and/or lifting the impact of research.[9,10] Current research funding settings are very effective in encouraging collaboration when it is likely to produce better outcomes and we support this approach. [MBIE question 14]

i. Universities acknowledge the successes of Singapore and Australia mentioned in the draft strategy. The final version of the strategy could acknowledge that universities already have many productive connections with both countries. [11,12, 13]

j. The final version of the strategy should also acknowledge that other funds, like the Performance Based Research Fund (PBRF), play a significant role in establishing connections. These funds build capability and therefore the reputation of the sector. This in turn drives international rankings, which create opportunities for research collaborations, student and staff attraction, and, ultimately, an increase in external research funding.

3. **Universities commend the addition of "Government Departments - $125m" to the diagram (p 14).** This is an important recognition of government departments' important role as research funders in the wider RS&I context. In addition, on pp 14 and 15:

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[8] As demonstrated, for example, by the majority of Nobel prizes awarded to a single laureate https://www.nobelprize.org/prizes/facts/nobel-prize-facts/

[9] UNZ letter to Minister Salesa, 6 November 2018.

[10] UNZ's 11th Oct 2019 submission to the Ministry of Education in response to the 2019 PBRF Review Terms of Reference

[11] The University of Otago has links with National University of Singapore including joint staff appointments (https://bch.nus.edu.sg/arthu.htm)

[12] Multiple universities are connected to Australia, for instance, through the Synchrotron and research support organisations such as the Australian Institute of Nuclear Sciences and Engineering (https://www.ainse.edu.au/).

[13] Lincoln University has joined forces with the University of Tasmania as part of an Australian programme to cultivate the next generation of horticultural industry leaders

a. We endorse the conceptual framework presented in the draft. We think the framework is effective in depicting the research system and is particularly helpful in making sense of a complex system.

b. We support the separate and distinct recognition of the role of Vote Education though Ministry of Education (MoE) and Tertiary Education Commission (TEC) funding.

c. 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.

d. We note that over time, in the diagram representing MBIE's investments, several of the MBIE funds (eg, Endeavour Fund, HRC and SSIF) have shifted towards the investigator-led end of the spectrum. Universities feel that this shift is not an accurate reflection of these funds.

4. **Universities endorse the concept of working at the 'research frontier'**—an activity that is both an art and a science and reflects a breadth of disciplines.

   a. Universities appreciate the draft strategy's acknowledgement that the distinctions between 'behind' and 'at' the frontier are not clear cut (p 11).

   b. The universities view their role in 'pushing the frontier' as being primarily through their staff and graduates. Much university research is aimed at developing scholarship and/or research history. This in turn allows more junior researchers to develop the reputation necessary to successfully pursue research relationships and research funding later in their careers. Research is cumulative and developmental as well as being based on new findings and innovation.

   c. Further to the comment above, in addition to creating knowledge, New Zealand university academics are expected to understand other existing knowledge relevant to their field nationally and internationally. They are expected to add value by sharing their knowledge and insights with students through teaching, as well as with industry, government and other relevant parts of society. In some cases, they make a significant contribution simply by applying and contextualising knowledge generated elsewhere [MBIE question 4].

   d. Working successfully at the frontier therefore requires an environment that is (a) open to failure, (b) suitably flexible to allow for exploration and (c) recognises that this does not always mean creating new knowledge. All suggestions for implementation in this submission will assist in creating such an environment. Universities would be happy to engage further with MBIE in their implementation design phase.

5. **Universities endorse the inclusion and strengthening of Vision Mātauranga and the focus on diversity in the RS&I system.** [MBIE questions 34-37]

   a. We recommend that the section on Vision Mātauranga acknowledges that, while there is still significant room for improvement, NZ is viewed as a world leader for indigenous research,[14] based strongly on research informed by mātauranga Māori.

   b. The final version of the strategy should include a much clearer commitment from MBIE as to how it will genuinely and authentically engage with researchers to co-design the ways in which Vision Mātauranga can be integrated into the policies and the way in which policies are implemented. In fact, the revised version should acknowledge that we should go beyond

[14] https://businessevents.newzealand.com/en/help-and-support/conference-case-studies/new-zealand-ticks-the-bucket-list-for-indigenous-s/

Vision Mātauranga and recognise how Māori ways of knowing and doing can benefit all New Zealand.

6. **The focus on talent development programmes is welcome as this would support the workforce pipeline and therefore create the potential for excellence and impact.** [MBIE questions 19-22].

   We recognise the importance of making NZ attractive to researchers (Action 1 in the draft strategy). We suggest, however, that the title of this action ("Making NZ a Magnet for Talent") doesn't adequately reflect the intent to also retain talent. Therefore, to be more inclusive, we recommend this title be changed to 'Making NZ a Place Where Talent Wants to Live'.[15]

   Capability building is the area in which universities can contribute most to the research system in the longer term.

   The finalised version of the strategy could describe how the Government intends to do more to build research capability. We suggest the following:

   a. **Building the industry research capability pipeline at the level of tertiary education.** This should be done in collaboration with the sector, MoE and the TEC. Many activities could be further explored such as fully funded internships, professional-development courses for graduate research students (including microcredentials, see below) and industry-based PhDs.

   b. **Funding for PhDs with integrated career-development programmes alongside industry across a range of disciplines.** International evidence shows that academic researchers often lack the training and experience necessary to recognise the potential impact of their discoveries for commercial, government and other end-users. This leads to much research either never being adopted or taking as much as 20 years before it is applied to a practical real-world purpose.[16]

      We see significant potential benefits in creating a new type of government-funded 'end-user' PhD[17] where PhD students are required to work with industry, government or other end-users and the full costs of the research are funded. This new type of PhD would therefore go beyond the R&D fellowships currently offered by Callaghan Innovation,[18] which focus only on business needs, primarily support the student and do not cover the full costs involved for universities or the end-user partner.

      This new type of PhD also better reflects the nature of New Zealand industry where few large players have the scale and absorptive capacity to embed PhD students and opportunities are more likely to arise in small start-ups. The potential benefits of this type of PhD include:

      i. PhD research that addresses real-world end-user problems and opportunities
      ii. PhD graduates with practical industry knowledge that will make them more employable by that sector, or that provides them with connections they can continue to utilise as they pursue academic careers
      iii. deeper linkages between universities and end-users (industry, government etc.) that are likely to continue after the PhD research has completed

[15] To quote the late Sir Paul Callaghan
[16] https://rosenzweiglab.umbc.edu/files/2016/01/The-Challenges-of-Deep-Innovation-From-American-Academia-to-the-Marketplace.pdf
[17] This would require complementary polices across government including tertiary education and research, science and innovation.
[18] https://www.callaghaninnovation.govt.nz/student-grants/rd-fellowship-grants.

iv. PhD graduates who are likely to continue generating relevant impactful knowledge in areas directly relevant to the New Zealand economy and society.

c. **Support for fully funded research career pathway positions for new and emerging researchers.**

i. New 2- to 4-year post-doctoral positions (within universities and Crown Research Institutes), fully funded by government, would give researchers the opportunity to establish their research expertise in a chosen area before taking on a teaching workload or pursuing an industry research career. Given the primary focus on research, these additional post-doctoral positions would be a productive contribution to the NZ research workforce. Post-doctoral positions will also enable candidates to further enhance their research skills by working with well-established talented academics.

ii. To extend this career pathway, and to recognise emerging talent in the aforementioned post-doctoral group, the government could also provide fully funded 'career fellowships' to support research programmes for 6-8 years, building on schemes such as the Rutherford Discovery Fellowships. This would give research talent stable funding to work effectively at the 'research frontier' and develop leadership in an environment that is suitably flexible to allow for exploration and is open to failure.

d. **We also see a need for more research 'connectors' and 'translators'** within research teams, research offices and tech transfer offices who can ensure research portfolios have the maximum reach and the biggest possible impact on end-users. These specialist 'connectors' and 'translators' could provide training for PhD students and researchers to work more closely with end-users or potential beneficiaries of their research. This includes helping researchers develop the practical skills for framing their knowledge and ideas in ways that are more accessible for business leaders and/or government.

These specialists will need a combination of social science and communication skills with a sound understanding of the research environment. They must be able to balance the need to keep researchers engaged with the translational pathway[19] of their research and freeing up time for researchers to focus on their research. This can be achieved through their focusing on upskilling and supporting research teams and co-designing / co-developing the research with end-users. However, as explained far below, we do not support a stronger and broad focus on impact in all government-funded research. Instead, we acknowledge that more of this 'connector' capability is required even under the current policy settings and for specific types of research (eg, mission-led). [MBIE questions 16-18]

e. **Universities look forward to targeted funding to help the NZ research system address diversity issues.** Targeted supplementary funding will help the substantial efforts universities are already taking to address these issues (eg, the gender imbalance[20]), in addition to growing existing baseline funds (PBRF, Marsden Fund, HRC, Endeavour Fund). [MBIE question 12].

7. Universities welcome the introduction of the success indicator around research uptake by public sector (p 43).

a. This will undoubtedly lead to better, evidence-based decision making in central and local government.

[19] This includes both new and existing translation pathways such as the Commercialisation Partnership Network
[20] UNZ letter to Minister Hipkins, 16 Aug 2018

b. It is also a significant acknowledgement that researchers and their institutions cannot be held entirely responsible for the uptake, application and impact of their research by the public sector. This acknowledgement is much more salient in MBIE's recently released position paper on impact.[21]

   i. The research 'connectors' and 'translators' embedded in research organisations mentioned above could facilitate the uptake, application and impact of research to some degree.

   ii. We see the Chief Science Advisor (CSA) positions in ministries playing a key role in the uptake of research into the public agencies and would support 'connectors' and 'translators' also being embedded in ministries to further support CSAs. This could provide a more seamless three-way connection between the ministries, the universities and CRIs, for instance, which is a desired outcome of the draft strategy (p 37).

   iii. MBIE could consider re-introducing the departmental research fund from which government departments could draw to commission research to inform the development of their policies. This should be 'new' VOTE RS&I funding that could be administered by MBIE in the same way in which they do other funds—through a rigorous assessment process.

Further suggestions for improvement

1. **Emphasising that the National Statement of Science Investment (NSSI) underpins the draft strategy.** We endorse the retention of the pillars of excellence and impact, with the former being fundamental to all research. Excellence and impact are two key features of the NSSI. Therefore, we recommend that the revised version of the strategy formally references the NSSI as an important contextual document that should be read in conjunction with this new strategy. This is particularly important given the NSSI is current—it has an agreed timeframe of 2015-2025. Formal reference to the NSSI will ensure recognition of the long-term nature of strategy development that is therefore a non-partisan process spanning multiple election cycles and subject to rolling review rather than radical change.

2. **The development and refinement of appropriate impact measures and responses will need to be carefully considered** [MBIE question 15]. While universities endorse the inclusion of 'impact' in the draft strategy, we would like MBIE to consider several important points:

   a. **Measuring impact is fraught with challenges and expensive.**
   No consistently used, valid and reliable way of measuring impact exists that is not fraught with unintended consequences—such as a highly selective representation of research being considered for assessment, high costs associated with preparing case studies[22] and potential gender-representation distortions.[23] We have recently also raised our concerns about this to the Ministry of Education as part of the PBRF review.[24]

      i. There is extensive literature on the challenges of trying to measure impact—particularly for basic research where any impact may not be seen for decades and where predicting likely or potential impact earlier is effectively impossible.

[21] https://www.mbie.govt.nz/dmsdocument/6983-the-impact-of-research-position-paper-october-2019-pdf
[22] Bornmann, L. (2017), Measuring impact in research evaluations: a thorough discussion of methods for, effects of and problems with impact measurements, High Educ, 73 (5), 775–787, https://doi.org/10.1007/s10734-016-9995-x
[23] https://wonkhe.com/blogs/why-arent-women-leading-research-impact-cases/
[24] UNZ's 11th Oct 2019 submission to the Ministry of Education in response to the 2019 PBRF Review Terms of Reference

ii. Given the criticisms[25,26,27,28,29] of the UK's Research Excellence Framework (REF), which focuses heavily on impact measures, introducing impact measures into the New Zealand funding system should be considered very carefully. If introduced, this should be done in a slow and considered way to avoid unintended consequences and to effectively incorporate the impact framework of the Vision Mātauranga policy.

iii. We are pleased to see that the draft strategy acknowledges the likely resourcing needs if a stronger impact agenda is adopted (p 28). But the extent to which such an agenda will create an industry of its own, as it has in the UK, should be weighed against the benefits. The extensive (and expensive) addition of impact case studies to the UK's REF has had a limited overall impact on funding distribution.

iv. As mentioned above, much university research is aimed at developing scholarship and/or the research history that allows more junior researchers to develop the reputation necessary to successfully pursue research relationships and research funding later in their careers. If most or all government funding is focused on achieving impact, this could lead to unintended adverse consequences in building research capability.

b. **The potential for impact is already a focus of several government research funds.**

i. Excluding the proportion of university research funding that comes from PBRF and SAC, 74% of university research funding is from the Crown through funds awarded based on an assessment of both quality and likely impact. We argue that there is already enough incentive for impact through other Crown funds. The PBRF also supports impact assessment in several ways and we have recommended to the Ministry of Education that no further increase in weighting should be given to impact in the PBRF.[30]

ii. Introducing additional impact metrics risks will therefore further restrict the little freedom researchers have to push knowledge frontiers without fearing they may fail to deliver on impact measures. This could change the NZ research landscape to be overly focused on mission-led and/or 'impact-focused' research at the expense of basic research. As the strategy acknowledges "applied research can extend the global knowledge frontier as much as basic research" (p 18) and therefore we need to design a system that supports all types of research.

c. **If MBIE intends to pursue the focus on impact, it should clarify what is meant by impact and how it will be measured**

i. If MBIE focuses more heavily on research impact, we urge that before this is implemented:

a. careful consideration be given to defining both 'impact' (in a way that is appropriate for all fields of research including kaupapa Māori research) and what may be required to assess quality.
b. MBIE makes a significant initial investment in upskilling research capability to incorporate knowledge translation into practice.

[25] https://www.theguardian.com/education/2009/oct/13/research-funding-economic-impact-humanities
[26] https://www.independent.co.uk/news/education/higher/andrew-oswald-ref-should-stay-out-of-the-game-1827306.html
[27] https://www.theguardian.com/higher-education-network/2014/dec/15/research-excellence-framework-five-reasons-not-fit-for-purpose
[28] https://ianpace.wordpress.com/2018/04/03/the-rae-and-ref-resources-and-critiques/
[29] http://cdbu.org.uk/reflections-on-the-ref-and-the-need-for-change/
[30] UNZ's 11th Oct 2019 submission to the Ministry of Education in response to the 2019 PBRF Review Terms of Reference

ii. We also urge MBIE to consider the way in which the unintended consequences can minimised, for instance, by recommending a low-cost, low-compliance method of assessment.

iii. MBIE should also ensure the revised strategy aligns with MBIE's recently released position paper on impact[31] such as in the way in which it acknowledges the results-chain framework across the sector. In both the position paper and the draft RS&I strategy, the assignment of responsibility to pursue and demonstrate impact should be at the portfolio level of institutions and not at the level of all individual researchers.

d. **Considering the points above, we encourage MBIE to consider that responsibilities concerning impact should be at the level of programmes and institutions and not at the level of the individual researcher** for several reasons:

i. Research impact takes time and therefore the measure of success of individual researchers' careers should not rely heavily on their research having impact.

ii. True impact is most appropriately articulated through an extensive portfolio of research/programme run by an institution or a research fund rather than an individual.

iii. Impact is more appropriately applied to mission-led research rather than investigator-led fundamental research. So, if measurements of impact are to be applied, they should be applied to organisations charged with making an impact on society, the economy and/or the environment.

3. **Producing patents, as opposed to how intellectual property is used, should not be the ultimate measure of research commercialisation success (p 20)**.

a. Most research conducted by universities is, in some way, funded by the Crown. As publicly funded institutions, universities recognise that their research outputs are for public good. They therefore encourage free publication and dissemination of new ideas, which—if embedded in a patent—should be made available through licensing or sale, for instance. Universities actively support a range of commercial activities including the licensing and sale of intellectual property. This is typically done through commercial research and knowledge transfer entities. [32]

b. Patents are an important precursor to commercialising IP but are not a measure of end-user value. Patents have value only if they are licensed, sold or utilised (as indications of the value to end-users). It should also be noted that the role of universities in the research landscape is to develop capability and to share knowledge—not to produce patents.

4. **If we want to make NZ an attractive place for researchers, more funding needs to be injected into the RS&I system.** [MBIE questions 19-22]

a. However, the ways in which this is done is of equal importance. We note from the diagram on p 14 that to reach the Government's target of 2% of GDP for overall research investment, business R&D expenditure is expected to grow at 15% per annum (compounding) out to 2027. A strong signal should be made that Government investment growth, including growth in core baseline funds, should grow at a similar rate. Some thought should be put into frontloading such Government investment increases to accelerate progress.

b. We agree with MBIE that a relatively low success rate in prestigious competitive funding rounds (eg, the Marsden with a 12.4%[33] success rate) is not an issue in its own right.[34]

[31] https://www.mbie.govt.nz/dmsdocument/6983-the-impact-of-research-position-paper-pdf
[32] Such as the University of Auckland's UniServices, and the University of Otago's Otago Innovation Limited
[33] Marden Fund result for 2019 https://royalsociety.org.nz/news/new-marsden-fund-grants-2018/

However, further thought needs to be given to the efficiency and productivity of the workforce investing substantial time and effort in applying for MBIE contestable funding with low rates of success.[35] In the wider context of rapidly rising costs for universities[36] and a significant reduction of discretionary funding per FTE available to universities through the PBRF,[37] a substantial injection of funding would go a long way to making New Zealand an attractive place to conduct research. The wellbeing of the relevant workforce should be at the heart of any strategy that intends to drive a productive, sustainable and inclusive future for NZ.

c. Universities strongly support a healthy degree of competition to drive excellence in research. However, an overly competitive system has a negative impact on the workforce. An overly competitive granting system is often reported as a significant frustration by academics.[38] It also generates a significant flight risk. Having higher success rates for funding will be attractive to domestic researchers as well as attracting international researchers.

d. The market for academics is truly global and New Zealand struggles to compete with international academic salaries. Academic salaries here have historically been much lower than Australia,[39] Canada and the UK.[40,41] The solution to this is also simply one of funding.

e. MBIE should consider establishing a mechanism to provide support and growth funding for existing successful programmes. This should be 'new' (additional) Vote RS&I funding that could be administered by MBIE in the same way in which they do other funds—through a rigorous assessment process. Many examples exist of highly successful research programmes facing real or potential risk of a cessation in government funding, including the Centres of Research Excellence (through the pending competitive process) and the Entrepreneurial Fund programmes (with a finite funding term of four years). MBIE could consider providing discretionary funds to support these programmes to derive the maximum benefit from the investment that government has already made in their establishment. Further funding would ensure the growth and sustainability of programmes that have already proved themselves to be excellent. This is particularly important when it is well recognised that the full impact of research could take ten or more years. If this suggestion is pursued, MBIE must ensure that:

   i. it is funded with 'new' government investment so that supporting these established highly successful programmes does not come at the expense of new programmes being funded

   ii. the successful programmes must be subject to rolling performance reviews to ensure these programmes continue to deliver to a high standard.

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[34] https://www.mbie.govt.nz/assets/9c551e0eb9/marsden-fund-assessment.pdf
[35] The 2019 success rate for MBIE's Endeavor Fund was approximately 17%.
[36] UNZ's submission to the Ministry of Education on the proposed Annual Maximum Fee Movement for 2020
[37] Smart, W. (2019) Government funding for research-led teaching and research performance- an analysis of PBRF and research top-up funding allocations, Ministry of Education, New Zealand.
[38] Career support for researchers: Understanding needs and developing best practice approach (2012) A Toss Gascoigne and Associates, commissioned by the Department of Industry, Innovation, Science, Research and Tertiary Education, Australian Government.
[39] In 2015, Australian academics were paid, on average, the NZD equivalent of $199,764 compared to NZ academics being paid $118,831 (sources: www.education.govt.au and Tribal NZBT)
[40] Universities Staff Academic Salaries and Remuneration. A comparison of New Zealand and Select International (Australia, Canada, UK and USA) Data (2012) A report prepared by Deloitte and commissioned by Universities New Zealand.
[41] Awaiting data from NZBT to allow for a more recent academic salary comparison.

f. Similarly, investments in new programmes or through new funding mechanisms should be for longer than four years. Establishing large new research programmes involves substantial effort, which means the full potential of a programme is achieved only in the medium to long term. This is especially so if impact measurements are to be included in new funding mechanisms, which we do not support.

5. **A distinctive role of universities in the research, science and innovation context is to build capability**. The draft strategy should emphasise the different roles each type of organisation (eg, tertiary education organisations, like universities, versus crown research institutions) plays in the New Zealand research landscape. A well differentiated system will enable specialist organisations to contribute maximally to their areas of expertise. Therefore, while we acknowledge that universities must connect with industries, for instance, the area in which universities can contribute the most is to develop research capability. As recognised by the draft strategy "people are the critical determining factor" in an excellent research system (p 25).

6. **'Science and technology' receive too much emphasis.** All 5 actions in the draft strategy, except for Action 4 ('Towards and extended VM'), are very business focused. The revised version of the RS&I strategy needs to give greater recognition that science research increasingly relies on transdisciplinary platforms, themselves based on other diverse disciplines (including the arts and social sciences). This strategy is very 'science tech' focused and real-world problems demand multi-disciplinary and inter-disciplinary solutions. 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. Similarly, Action 3 'Start-up^Scale-up' would benefit from adding more social or environmental examples—this would make this action more relevant to wider research sector.

7. **Further to Action 3, the subsection 'choosing areas of focus' raises an important dilemma which should be carefully considered**. Striking a balance in focus areas between those that are top-down (directed by Government) and those driven by stakeholders and researchers is challenging. We recognise the need for Government to support its chosen areas of foci but also the need for the freedom and flexibility to direct efforts where new opportunities arise in unforeseen areas. Three other things need to be carefully considered in the revised version of the draft:

    a. the amount of ring-fenced funding for these areas of foci

    b. the timescale over which focus areas will be defined (eg, the National Science Challenges, which were given five years to prove their worth and another five years to get traction)

    c. the mechanisms for selecting focus areas on a rolling basis (for instance, the areas of focus could cycle annually through the MBIE's five main MBIE research domains of health, environment, society, economy, Kaupapa Māori and Pacific Peoples research).

8. **The voice of businesses.** The draft strategy focuses a lot on increasing connections between industry and researchers, but little reference is made to the known barriers or disincentives reported by New Zealand businesses (eg, business capability and capacity). MBIE could consider ways of optimising the uptake of the R&D tax incentive. We think greater support and guidance is needed to improve the understanding of this incentive to enable universities to leverage this with their industry partners.

Attachment 1: The New Zealand Internationalisation Virtuous Cycle

Economic benefits figures come from ENZ and NZIER and have been generated using different methodologies and assumptions, so do not necessarily fully align.

Skilled Migrants
- 30% of international students are still working in NZ 5 years after graduating. j

Soft Power
- Net promoters of NZ for tourism and education.
- PhD level graduates continue research collaborations with NZ Qj$
- Ongoing soft-power links – trade, diplomacy, etc.
- Ongoing academic collaborations

Employable, work-ready graduates
- Cross-cultural competencies and skills for supporting employers working across borders. j

Additional direct and indirect economic activity
- Universities represent around 1.2% of GDP and directly and indirectly account for around 1.02% of the total NZ workforce.
- University direct & indirect expenditure is an average of 2.4% of the GDP of the regions that house them. This rises to 10.6% when further induced activity is included. $

Knowledge & ideas
- University research returns around $5.10 for every dollar invested.
- The stock of knowledge generated by universities and adopted over time accounts for around 8.2%-9.7% of GDP – or $25.9 billion in 2017.
- Research investment by NZ universities between 1984 and 2015 is estimated to have increased real GDP by $129 billion in 2017 dollars over the period.
- Expenditure on university research 2010-2015 estimated to have lifted GDP 0.3%-0.4%.
- NZ workforce productivity 3-6% higher due to university graduates across the economy.
- Research also contributes across public policy, wellbeing, social and cultural areas. Qj$

1. Ability to recruit and retain world-class teachers & researchers

2. Infrastructure & Offerings
- Comprehensive range of qualifications & courses.
- Objective indicators of good student experience & good grad outcomes.
- Attractive welcoming campuses
- Equipment & facilities to support quality teaching and research.
- Good student amenities (cafes, accommodation, social spaces, study spaces, etc).
- Recreation and entertainment on and around the campus.

3. Carry out research & transfer and apply knowledge
Crown funds 83% of university research

Reputation driving returns
- NZ has 0.06% of the world's researchers, but 1.4% of the world's most highly cited articles.
- Cross-border research collaborations 15-year NPV of $2.46 for every $1.00 invested.

j $

4. Institution & Subject Rankings
Disproportionately large benefits from:
- Cross-border research collaborations.
- Internationally cited research.

5. International students' awareness of NZ and seeing it as a good study option
- Promotions, marketing, fairs, & agents
- Visa requirements & time to process.
- Work rights during & after study.
- Recommendations from, family & friends, teachers, (often alumni) etc.
- Background awareness (Lord of the Rings effect) or meeting NZders.
- Perceptions around student experience from websites & social media.
- Subject & institution rankings
- Perceptions around relevance & usefulness of qualifications.

6. Recruit, teach, & progress (retain) students in NZ
Support, house, feed, entertain over 3+ years.

Domestic Students
85% of EFTS & 48% of university sector income (SAC funding & fees)

International Students
15% of EFTS & 12.3% of university sector income.

7. Improve employability & work-readiness

Domestic Students - Study & live with people from other cultures
- On & near campus
- Study abroad

International Students – study, live & work in an English language setting
- Work-integrated learning

8. Produce successful, capable, employable graduates.

Study abroad
- Graduates with a study abroad experience enjoy slightly better employment rates and 3% higher earnings on average.
- Provides employers with graduates with skills in working across borders & with different cultures. j$

Work-integrated learning
- Generates 15-year NPV of $5.87 for every $1.00 invested.
- Much better employment outcomes for graduates. j$
- Employers see graduates with WIL as more employable & work ready.

Direct and indirect economic benefits from international education $
- NZ university earnings from international students = 1.68% of all NZ exports.
- Every $1 earned by a university flows through to $1.6 for the wider economy.
- Additional direct, indirect & induced economic benefits (community & country) from international students studying in NZ = currently 2.77 times the direct revenue [calculated from ENZ's published 2017-18 analysis]. So if each student is $25,300 per year and $88,000 over 3.48 years, the additional economic benefits are $70,000 per year per student, or $243,000 per student over 3.48 years.
- Visits by friends and family of students = ~$30m annually.

Direct (university) Revenue from international education studying in NZ on campus $
- $25,300 per student per year [based on the average actual earnings from all eight universities annual reports] for an average $88,000 per student over the 3.48 years international students enrol on average.
  - Student fees
  - Text books & other on-campus consumables.
  - Accommodation and other services
- Cost of domestic student tuition subsidised – meaning lower cost for the Crown and/or higher quality for all students

Symbol Key

Text in red shows Crown investment in the virtuous cycle.

Text in green shows benefits – to universities, the communities they are located within, employers, industry, New Zealand generally, and/or the Crown.

Three types of benefits are indicated

Q = knowledge & intellectual property.

j = more capable & employable graduates

$ = economic benefits