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 prioritiesincluded in Part 1 of the draft Strategy.

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

Q1. The move to focus the RSI system on specific topics, such as the transition to a low emissions economy and other Government goals, is very new for the NZ system. It indicates that there is an intent to have a better balanced portfolio of both bottom up, investigator-driven, and mission-led 'up-stream' and 'mid-stream' projects. That the system wants to take a more mission-oriented approach to a portfolio of investments is appreciated as it is certainly where the NSCs sit, with demonstrated success. We suggest that achieving such a balance will entail taking a broad approach to the topics/missions allowing them to be open to new framings and perspectives on what research might be needed, and to ensure there is a good spread of research across the horizons, in particular in the 5-10 year targets.

Q2. SfTI is pleased to see lots of "technology for" opportunities which could also deliver significant export potential. These can be agnostic to sectors (although would use a sector to generate a proof of concept) so can become platform-type capabilities. This is especially important given the level of disruption globally with many new "sectors" appearing that do not have a NZ industry base for support at this point in time.

Q3. Accelerating progress may also require identifying gaps in the wider eco-system. For example, one of the issues SfTI has noted is that, while we have a sophisticated tech-implementation demand from frontier firms in some sectors, eg Sanford, Wakatu in Aquaculture, the sectors does not have the feeder manufacturing capacity to deliver the technology to be implemented, with the added deficit that this technology, if manufactured, could also be exported. We hope to work with Callaghan Innovation to coordinate some progress here, but it is the sort of gap which is not really the responsibility of any particular player in the RSI system. Risk capital investment, such as experienced angel and intermediate funding before Series A Venture Capital, is also another area that is not yet at a scale to support acceleration.

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. 'Frontier' and 'behind the frontier' language is new to the RSI system. As indicated on p11, adding this focus could be challenging, and perhaps it is unnecessary to distinguish such innovation types. Behind the frontier adaptation in NZ might easily lead to exportable frontier innovation. Any change in emphasis would need to be carefully managed to ensure 'frontier' doesn't just become a proxy for 'excellence' or 'pure', and behind-the frontier for 'applied'. It is more common to talk about firms/companies being at the (productivity) frontier or behind it, but such firms might do a mix of frontier and non-frontier innovation. Is there an inherent assumption that funded research would only support New Zealand's frontier or fast follower firms?

Q5, 6, 7, 8. Within SfTI we interpret such questions as 'what is sticky to NZ'. SfTI considers this to mean; where are the nation's unique advantages/distinctive features, be that a resource, a sector, an environmental, social or cultural characteristic, or even an unusual concentration of capability? We are not sure it is that useful to specify such things in advance in any detail, as they should surface through the RSI system (eg. our new space sector) and be articulated in research proposals and missions. Another question is whether we can identify in advance, and have leverage in the system, to support new areas which could become 'sticky'?

Q9. The public sector (we assume here that you mean central and local government departments rather than publicly owned CRIs and universities) is inherently more risk averse than the private sector. We refer you to the 'Improving State Sector Productivity' Report of the NZ Productivity Commission (August 2018) for more discussion of public sector productivity and innovation. One feature of both private and public sectors is that New Zealand is very good at producing innovation to a prototype level, but scaling up and diffusion are problematic.

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.

Q10. Absolutely – this is a key challenge, and it has been for decades (and not just in the RSI system, but generically across the public and private sectors). We often attempt to 'collaborate' and 'connect' with the best intentions. However, if the incentives in the system aren't tuned to support stronger connections, or there isn't resourcing to cover collaborative risks that can't be mitigated or overcome, it comes to little, or no, effect. SfTI has found that our mission-lab/mission-design process has encouraged the formation of broad multi-disciplinary teams across a variety of domestic institutions. But it takes time to build solid relationships and requires resources not often available through traditional project funding.

There is a presumption in collaboration bibliometrics that we are not newly connected or multi-disciplinary when we develop a team partly comprised of researchers from the same institution. That is true if it is within one discipline/school. However, additional connectivity can be achieved if a team, for example, has an engineer and a linguist from the same institution that haven't worked together before. In fact, this additional connectivity scenario could be more productive than two engineers in the same discipline from different domestic institutions.

Building connectivity with businesses and Māori organisations takes time and resourcing prior to any major attempt to co-design a specific project. SfTI, fortuitously, has been able to resource this relationship-building phase, prior to launching mid-stream Spearhead projects. Our experience with this suggests it is worthy of a separate stream of funding. Within SfTI, we call this our Mission Design Process, which we support with relational capacity development, but it could fit with the observation about leadership capacity development mentioned on p31.

International connectivity appears to be strong assuming co-authorship patterns are a good measure of collaboration (figure 3). However, co-authorship can both systematically over- or under-estimate closeness. These data reflect researcher-to-researcher connectivity, rather than institution-to-institution connectivity. SfTI is receiving increasing interest from overseas organisations regarding our approach to mission-led research, and the way we weave Vision Mātauranga (VM) into our mahi, and hope to build more of this type of connectivity. Such connectivity is hard to quantify and resource-intensive to maintain.

With respect to start-up and business activity internationally, there has been considerable New Zealand-based research that has indicated a number of potential issues holding NZ firms back including: a lack of managerial capability (especially with respect to international marketing), and a cultural norm of seeking to maintain control internally (internal locus of control) rather than to collaborate – either locally or internationally. NZ's frontier firms tend to collaborate with lead customers (often acting like an R&D subsidiary) and global science experts, being agnostic to wherever the latter are located.

(More comment in answer to Q16-18).

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. It is a worthy aim to try to think of excellence more broadly and SfTI supports the new definition. Being globally competitive is an important aspect of excellence.

Q12. The traditional process of contestable funding where a Principal Investigator (PI), with a strong 'excellence' CV, bids with a team of less experienced researchers, is not always conducive to achieving diversity, unless that PI purposively seeks to have a diverse team. Given citation counts take time to build up, the citation view of excellence also reinforces the ageist nature of the RSI system. SfTI has observed that we are creating more diversity serendipitously through our Mission Design Process. We send out an EoI on a specific mission (eg. 'intelligent oceans' or 'flexible robots') and ask researchers to bring their capability, not their pet projects, to a facilitated workshop to form one project team and a more detailed project plan. Anyone, from what ever discipline, can make an expression of interest so SfTI has seen more diverse teams form this way – both demographically, as well as in terms of disciplinarity.

SfTI has also encouraged demographic diversity by prioritising funding of Seed projects that propose 'strong' linkages to VM, and with emerging researchers as the lead PI. We also assess our Seed project applications as either fundable or not and, once that hurdle has been reached, the fundable projects go through a ballot process. This is not new to the NZ research scene (eg. in use by HRC) but appears to be very well accepted by researchers who are unsuccessful in the ballot, and possibly works to correct any conservative bias in any more detailed ranking assessments, given SfTI wants to support 'risky' research.

Typically we tend to automatically think of diversity as gender and Māori focused, However, given the diversity that Pacific people bring to Aotearoa-NZ, it's important that the RSI system also accommodates this uniqueness. This paty of the world offers an ancient knowledge and innovation ecosystem with a contemporary pacific world view and a depth of talent that remains untapped within our Pacific communities. This presents an enormous opportunity of potential for our nation.

Q13. Yes, possibly, but there is a need to make sure the typical 'reverse not-invented-here' syndrome doesn't become the proxy for excellence. That is, that anything done in NZ is never as good as anything done overseas. There are also many topics of particular interest to NZ (eg our own native flora and fauna or specific agricultural species) that are not studied

internationally so excellence has to be based in New Zealand.

Q14. Absolutely, especially when working in multi-disciplinary teams because this brings varying perspectives. As award-winning Professor Cather Simpson (a PI on our Mission-led project Precision Farming Technologies for Aquaculture) recently tweeted “Our part of the @sftichallenge project, with Cawthron and others, is one of the science stretchiest projects I’ve ever worked on”.

Guiding Policy – Impact

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

Please type your submission below.

Q15. The notion of projects having a 'line of sight' to impact is useful because it reinforces that exact details of impact are very hard to predict. Taking a well-being approach to impact is also supported. Not all projects will achieve maximum intended impact, so taking a portfolio approach is sensible. It can take a long time to impact if the typical linear way of thinking is followed, so near-term impact is very rarely achieved. Most projects do not have funding to take their research all the way to impact within the time-frame of the research, which is potentially another gap in the system.

SfTI would argue that the 'end-user' language is not helpful in thinking about impact. It implies a technology transfer, 'downstream' notion that impact happens after the research is finished and 'handed over' to the end-user. SfTI's Mission Lab and Mission Design Spearhead project formation process is more of an up-stream and mid-stream approach whereby industry and Māori stakeholders decide the broad mission and stay in the room for the design process and the project operation.

SfTI is finding that viewing such participation – sometimes called co-design and/or co-innovation - is creating future benefits along the way because research assumptions about potential impact are checked for veracity, and spin-off IP generated along the way is picked up quickly. This approach acknowledges the different sources of knowledge that parties bring to projects. Industry and Māori organisations are recognised as research partners, which is especially important when valuable sources of Mātauranga are recognised as genuine co-researchers.

As a result, SfTI has also been open to adjusting typical RSI system approaches to IP to recognise the unique knowledges brought to projects by diverse partners. We worked closely with expert lawyers (including AJ Park's Lynell Tufeery Huria) to adjust our IP policy accordingly. Thus SfTI strongly supports the proposed review of New Zealand's current contractual approaches to IP.

(For an intro to up-stream, mid-stream etc, see Schuurbies & Fisher https://www.embopress.org/doi/full/10.1038/embor.2009.80)

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. The NZ RSI system is very competitive, especially between institutions, as is observable at each PBRF review or Endeavour round. Research funding is relatively scarce, so it's not surprising that researchers are naturally parochial about who they might work with. Teams tend to consist of researchers who have worked together before so they have a strong track record of producing, which is then reinforced by project selection processes. Even though there are no regulatory barriers to cross-institutional teams or collaboration, prior research has found that there are perceptions that permission is needed to visit, and potentially collaborate with, people in other insuitutions (see https://onlinelibrary.wiley.com/doi/full/10.1111/j.1467-8551.2010.00713.x)

Q17, Q18. The CoREs and NSCs are successful approaches to circumventing or breaking down, actual or perceived, barriers to pan-NZ collaboration and build critical mass. In addition, SfTI has found that providing opportunities for researchers to connect with others from diverse backgrounds, through our Mission Design process and our annual researcher workshops, has seeded many new side-projects. As a result of this, SfTI is now facilitating processes for forming new projects and teams from overlaps between our existing teams. Perhaps, as suggested earlier, having a separate funding option to resource such meetings might create many more 'match-making' opportunities.

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. SfTI has encouraged emerging researchers through our rangatahi-led initiatives. This came about after we were challenged by younger tech entrepreneurs at our first Mission Lab about the lack of youth in the room to help decide the new missions. We have responded by developing a Rangatahi (18-35 year old researchers/entrepreneurs) Mission Lab process and have committed to support a Rangatahi Spearhead project to the sum of $3m over 3 years, with advice and support from SfTI Leadership. We are setting up a Rangatahi Advisory Board and have added a Rangatahi tech entrepreneur to our Board. We will share their strategy for/with the RSI system.

Q20. New Zealand is an attractive place to live (lifestyle-wise if not financially) so providing opportunities/mentorship programmes to enable emerging talent (as opposed to well-embedded older researchers) to become involved in research that appeals to them, that is unique to New Zealand, or is hard to get into within their own countries, would be worth exploring. In capital-intensive research, New Zealand will always struggle to attract talent that is better resourced overseas. Recent attempts have seen NZ target ex-pats as a viable refresh option, using existing market research on what attracts them back to NZ.

Q21, 22. There are few opportunities for post-PhD researchers to lead their own projects especially given they are employed at standard overhead rates. SfTI has tried to address this through prioritising emerging researchers to lead Seed projects, which are up to $200,000 and for 1-2 years, so would support a post-doctoral researcher. Through our capacity development initiatives, we have also provided relational research leadership (individual and team) training opportunities to our researchers – both participants, and their managers, have found them to be of great benefit. While it could be argued that this training should come from the institutions, such training tends to be directed toward traditional organisational administration, not about research leadership per se. The latter is assumed to occur through apprenticeship within research teams managed by senior PIs, but that can be variable in quality. SfTI agrees that a more concerted approach to research leadership training for emerging researchers should be funded as part of large grants and, given our experience, if scaled up, would result in considerable benefits to the RSI system.

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.

Q23. In SfTI's experience, making connections early is important, but often not easy because of the level of uncertainty in the science or potential impact.

Q24. Again we note that the use of 'users' implies a down-stream approach, whereas they should be a part of the decision-making process about what should, and could be researched. Our experience is that industry representatives really enjoy engaging in discussion of possibilities for the research and different ways to think about how the results might work for them.

A strong connection to the sector transformation strategies that are currently being developed would help. For example, the sector strategies might identifiy some high-level missions (5-10 years out) that an industry considers important for its future (although this doesn't leave the way open to new industries). A mission-design process, like that proto-typed by SfTI, could then form best NZ teams to address them. However there is gap in our system at this point, in that there is very little funding to adequately resource connection-making prior to project application. SfTI has found that it can take many months, or even a year, to get commitment to develop common understanding and shape well-connected projects.

Q25. To be frank, to increase the number and strength of connections between the RSI system (university) and businesses, the overhead rates applied to research costings need to reviewed to agree a more graduated scale for different types of research. Universities typically charge around 115%, reflecting the most costly of resource/capital intensive research, which makes it unaffordable for most companies to engage meaningfully with parts of the RSI system. Coupled with the uncertainty of research outcomes, long time-frames (engagement is typically forced into multi-year student project formats) and competing objectives (e.g. PBRF/publication requirements), the value proposition to industry is rather low. Callaghan Innovation provides funding to businesses to offset the cost of engaging with research organisations but such funding is not a guarantee for all and involves additional compliance costs.

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.

Q27, 28, 29. SfTI supports the start up intent. SfTI is based at Callaghan Innovation with the logic that we are researcher-focused but industry-facing, and CI is the reverse. However, we have found that we have needed to employ our own commercialisation development facilitator to initiate connections between our researchers and CI's customer base or other commercial players.

SfTI has also had success working closely with Kiwinet, Return-on-Science and the NZ Product Accelerator. It seems accessing relevant parts of the research system remains difficult for companies and Māori organisations. Intermediaries that can boundary-span both CI and their commercial base and the research-intensive parts of the RSI system, may be critical to lowering the (perceived) barriers to access. But TTOs and CRI commercial managers are stretched, meaning there just are not enough of them to successfully amplify the innovation opportunities.

While most universities and CRIs have made progress with start-up progammes, incubators and bootcamps, New Zealand could do with far greater efforts to cultivate an army of entrepreneurs to surround universities and CRIs, that have experience with and knowledge of early stage technologies coming out of universities and CRIs. These entrepreneurs can pick up opportunities and drive them through the commercialisation/startup formation process in the absence of researchers or students willing and capable of doing this themselves. This requires visibility of opportunities, curated networks and flexible processes and policies to help research organisations find and engage such individuals.

Many of these comments for start-ups also apply to SMEs. The RSI system currently works best for larger businesses that have the resources to engage and participate, yet a lot of innovation (and employment) occurs in the multitude of small businesses in NZ. These SMEs are usually characterised by having one or two individuals that drive innovation but they are also owners and day-to-day managers of the business. They struggle to find the time and resources to engage and so often work in relative isolation, and then they struggle to scale and/or globalise their ideas.

A working RSI system would target SMEs and help then grow into significant-sized companies through R&D-driven innovation. SMEs will need funding support as they do not have the resources to undertake significant R&D themselves. When a SME grows, its ability to self-fund research and innovation will increase and less funding support will be necessary but the funding support then needs to move onto the next batch of SMEs. Too many RSI system initiatives targeting support for SMEs, assume that the initiative will become self-

sustaining over time and so the overall funding support for the initiative declines or is time-limited – this may be work for support for an individual business but not for the SME sector as whole.

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. Discussion about the barriers to innovation in the public sector (as defined previously) is canvassed in the Productivity Commission's inquiry into State Sector Productivity. When innovating, the public sector is subject to political and well as technical risk. Innovation does happen but it tends to be in demonstrator/trial projects which are rarely scaled up. We suggest that separating innovation to a safe space distinct from day to day, business as usual, public sector activity would be sensible, such as occurs with the Lightning Lab Govtech programme.

Q31. SfTI assumes this is additional to those missions of some NSCs may of which will produce results relevant to central or local government. It would be sensible to aim public sector innovation at the government's well-being priorities.

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.

Q32. SfTI can see a need for 'graduating' some of our mission-led Spearhead projects to a process that supports scale up. For some of our Spearhead projects, there are already aligned Endeavour and Smart Ideas projects. However, this alignment is somewhat serendipitous and not actively managed, so there are likely to be many projects that could be scaled up to the benefit of NZ, but they have been curtailed because they have not made it through the next hurdle to scale up. Not that such scale-up should be automatic, but at least tracking projects (and people) to identify potential scale up opportunities, eg where they align well with government, industry or Māori organisational goals, could enhance scale up likelihood. We suggest having a clearer pathway to support the progress of important mission-led science would fill a gap in the RSI system. Learning from other nations (the EU in particular) might elucidate approaches to scale up. Such programmes allow industry to experiment with innovation and test markets (without the risk of finding the innovation doesn't offer advantage) in a more concerted fashion, but this would need additional, and probably considerable, funding.

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 government'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.

Areas of Focus should fit under three over-arching criteria. They should:

- tick government/Māori priorites and/or
- tick stakeholder longer-term priorities, and/or
- still allow for emergent areas of new strength.

Government priorities, however, vary with the election cycle rather than on a typical research cycle, so there would need to be some assurance of continuity through bi-partisan support. There are so many disruptions happening in science and technology globally that it would not be wise to lock the whole system down to a few priorities, hence the need to safe-guard emergent activity.

The three 'From the KW to the DA' focus areas are perfectly sensible as long as they have a broad scope. For example, SfTI sees our physical sciences and engineering capability as relevant for all. SfTI's three science themes; sensors, robotics and automation; materials, manufacturing technologies and design; and data science and digital technologies, are extremely likely to be research inputs to these, and any other, potential focus areas.

SfTI notes that Renewable Energy is but one aspect of Climate Change/Low Carbon Economy research. There will be other areas of research (agritech applications, building technology, low carbon materials, process technology) that may be equally as important to NZ's transition as renewable energy (and also exportable).

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, 35, 36, 37. SfTI has had a fascinating and enlightening 4-year journey working out how we implement VM in the physical sciences and engineering realm, possibly the last research bastion yet to embrace VM. We have understood the need to form relationships before developing research projects, and the need to upskill our researchers in what VM embodies with respect to scientific research. As indicated earlier, both these activites need resourcing which is rare in the current RSI system unless institutions see merit in doing so.

As Charles Royal outlined in his korero at the recent Raukia Mangai Māori Leadership forum at AUT, the current VM policy is a foundational document of its time (given the 2004 environment of the Brash Orewa Speech etc). It certainly needs bringing into this era, but just 'tweaking' it won't satisfy the needs of the 2020 onwards RSI system and Te Teriti o Waitangi partnership with Māori.

There is an extensive history of Māori involvement in knowledge generation, long before and after European colonisation. At a system goverance level, what is Mātauranga Māori is not up to MBIE, nor the Crown more widely, to decide. There will be some areas of Mātauranga that will always rightly sit with Māori and the RSI system should be enabling to allow this.

Our Māori research and enterprise partners tell us:

- The *Treaty of Waitangi* and *Te Tiriti O Waitangi* should provide the overarching mandate and framework for the relationship between Māori and the RSI system.
- The RSI system needs to support the development of the Māori STEAM capability pipeline to grow more graduates, post graduates and PhDs etc.
- The RSI system needs to be aware the current system is structured in such a way that creates silos which increases the transaction costs for Māori organisations to engage given Māori enterprises operate in multiple sectors simultaneously.
- The RSI systems needs to create the settings for success that support a 'quadruple bottom line approach' to delivering better outcomes for Māori and for all of

Aotearoa-NZ.

- Māori enterprises do not have the resources to engage with the complexity that it is the NZ RSI system, hence many are now partnering with offshore research providers as it's easier (eg: https://gspp.berkeley.edu/global/international-partnerships/taupo-new-zealand)
- When the RSI system wants to engage, consult and meet with Māori enterprises, no compensation nor reimbursement of actual and reasonable costs are offered for this engagement. It is taken for granted travel, meeting fees and time will be offered by Māori free of charge. This is a barrier to quality engagement.
- The RSI systems does not provide policy settings that encourage international *indigenous to indigenous* research collaboration and engagement, again a missed opportunity for Aotearoa-NZ, given we lead the world in this.
- There is a parallel, deep and rich research and innovation conversation that is constantly underway within the Māori world. Māori are sceptical that MBIE and other agencies have the capacity and capability to understand or engage with this parallel conversation. For MBIE to access this conversation, Māori partners tell us that agencies need to resource this conversation in such a way that it will enable MBIE and others to understand and use these internationally unique insights to inform a truly inclusive conversation that will add enormous value to the RSI system.

Despite this, in the interim, there can be progress in understanding how the current VM policy has been enacted succesfully in the RSI system since 2004, through understanding where current partnerships are working well, and how they were formed and supported. As indicated previously, the key gap SfTI has observed is in supporting the development of trusted, mutual knowledge-sharing relationships prior to co-design of research projects. These can't just rely on the goodwill of researcher and Māori organisations. It would be beneficial to the science system, to see the need for such processes to be understood and supported with financial and cultural resources.

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. The use of the term 'progressive' is poignant. It is probably meant to mean forward-looking, but it could be argued that it is about managing 'progress' through the RSI system. The coodination/facilitation aspect implied by the latter interpretation would see a more cooperative (less competitive) system, which sees more coordination between rather siloed aspects of MBIE (science policy and economic development, for example) and across public sector departments (MBIE, MPI, CI, NZTE).

Essentially we are repeating our previous point that there seems to be missed opportunity in the system when projects funded at one stage do not progress to the next, even though they have not "failed". This leads to a very disjointed system of project stages and a lack of 'progression' for promising projects. Not that this should be automatic, of course, but there must be some constructive intermediate position whereby promising research supported at the early stage has some hope of 'making it all the way'.

Q39. SfTI has three CRI partners and supports many researchers from CRIs. We have not observed any differences other than the way staff salaries are accommodated in projects. CRIs tend to have closer relationships with the relevant sectors than some (but not all) university researchers, which is useful for collaborative teams. We have supported some very promising cross Uni-CRI projects where the researchers have relatively seamlessly planned and executed very exciting projects. The RSI system does, in general, think of universities first, but a more connected system whereby not only universities and CRIs, but also research associations and research-intensive companies are all seen as contractable lead-providers of capacity, would be ideal.

Q40, 41. Partnerships at the institutional level tend to be more politically charged than at the more pragmatic project level, due to numerous conflicting incentives such as 'counting' research income for PBRF purposes. We have noted, for example, that unless an institution is 'hosting' a large programme, such as an NSC or a CoRE, then they tend not to celebrate funding achievements, even if they may be awarded substantial sub-contracts. Ideally NZ institutions should take a more NZ Inc approach to the RSI system, especially if the intent to collaborate more in the international innovation system is to be achieved.

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.

SfTI suggests priorities should be governed by a researcher/stakeholder/Māori consensus. If it was achieved then any priorities should have some longevity (hopefully with bi-partisan political support). Not surprisingly, SfTI would recommend a more diverse version of our Mission Lab and Mission Design processes, with the former potentially being run by CI ,and the latter run in conjunction with the research organisations.
https://www.sftichallenge.govt.nz/research/spearhead-project-development-process

General

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

Please type your submission below.

Q43. While SfTI applauds the 'stretch' goal of being a global innovation hub by 2027', we think this probably needs to be tempered somewhat, given as noted earlier in the strategy – we are a small system with scarce resources, even if we do produce outputs at a high rate per researcher. We certainly can be a hub where we have that 'stretchy, sticky' capability that makes us stand apart on the world stage. Similarly, aiming for 2% of GDP is laudable as we are seeing GERD and BERD increase, but they must increase at a greater rate than GDP to achieve this.

The notion of developing a dashboard of indicators is also supported as long as metrics are not the basis for all decisions, because not everything positive can be measured. The NSCs have recently gone through a reassessment of our KPIs upon which we report to MBIE, and were encouraged to make them SMART (Specific, Measureable, Achievable, Relevant, Time-based) which might be a useful guide for the strategy Indicators of Success. The caveat in any RSI system, especially the components at the 'stretch' end of the system, is that attribution/causality will always be difficult, hence the coupling of metrics with structured case studies is sensible in order to try to capture impact and causality broadly.

We suggest that MBIE (and all govt agencies) see themselves in a 'shaping', as well as 'steering' role in our system. SfTI looks to the work of Marriana Mazzucato in developing our strategy, as we seek to innovate our NZ innovation processes, the success of which (or otherwise) is a learning opportunity for the system. https://www.ucl.ac.uk/bartlett/public-purpose/research/shaping-innovation

A recent paper that our Spearhead project 'Building NZ Innovation Capacity' (BNZIC) has published in the TIMReview might be informative. It has been downloaded globally, and received coverage on social media within innovation communities. Based on behavioural science observations of the experiments in SfTI, it is titled 'Giving Innovation Systems a 'Nudge'. https://timreview.ca/article/1275. Some of the 'nudging' roles could easily be played by public sector organisations.