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| **From:** | no-reply@mbie.govt.nz |
| **To:** | Research, Science and Innovation Strategy Secretariat |
| **Subject:** | Draft Research, Science and Innovation Strategy submission |
| **Date:** | Friday, 8 November 2019 8:34:17 p.m. |

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**
Gary Bedford and Bill Dyck

**Name of organisation or institutional affiliation**
Regional Council (combined) Science Advisory Group

**Role within organisation**
Science Advisory Group representing 16 Councils

**Email address (in case we would like to follow up with you further about your submission)**
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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)**
Government

**If you selected other, please specify here:**

**How large is your organisation (in number of full-time-equivalent employees)?**
Very large (thousands)

**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.**

**Please upload your submission document here**
Science_Advisory_Group_Regional_Councils_submission_on_MBIE_draft_RSI_to-send.pdf - Download File

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. NZ's strength is in primary production and agriculture, forestry, horticulture and fishing. These not only make major contributions to the country's economy, but the natural physical and biological resources they draw on provide New Zealand a unique advantage from the scientific and research perspective. Our history of study and research in these areas should not be lightly discarded in favour of believing we can be competitive or world-leading in other sectors (eg cloud technology, medical breakthrough). NZ science funding can work with these sectors to help them transition to a clean, green, carbon-neutral country.

There is a need for science and the transfer of scientific knowledge from research providers to assist land managers to transition to profitable but more sustainable land use.

NZ has urgent problems that need to be addressed concerning land use and freshwater and also increasing biosecurity threats that could impact our economy. NZ science funding needs to focus effort in these areas to both protect what we have but also to ensure a sustainable future.

In particular we need to continue to support long-term data collection to understand the complexity of the ecosystems we are dealing with and to develop better knowledge, models and policies to support a transition to a cleaner future.

We need continuous data sets not only to understand land-use impacts on the environment but also to understand the complexities of a changing climate on our productive and natural systems. We wouldn't even know that the climate was changing and that we had a problem if we didn't have long-term datasets.

Science needs to focus on the bigger picture of economic costs and benefits and not just on isolated research on land-use change impacts on emissions and the environment in general.

There needs to be caution about shifting science focus away from traditional areas of environmental research but perhaps encourage a focus on research into "sustainable land use" that looks at the whole system – people, economics, environment.

Additionally there should be greater science effort to help NZ adapt to changing climate. Attempts to reduce the impacts of cattle and GHG emissions appear to be futile relative to what might be achieved from science investment to assist with adaptation.

The recent (November 2019) PCE Report "Focusing Aotearoa New Zealand's environmental reporting system" is critical of how the Government funds science highlighting the preference for "exciting, novel research ahead of the collection of essential underpinning data". Page 37

## The way we fund data

The way we fund the collection of environmental data at a national level suffers from at least three main problems:

- a preference for funding exciting, novel research ahead of the collection of essential underpinning data
- the stagnation of datasets due to a lack of proper maintenance
- a lack of secure, ongoing funding for important new datasets.

### A preference for exciting novel research over essential underpinning data

The collection of much data has its roots in a data collection world that was once dominated by government departments. For example, the Department of Scientific and Industrial Research and the Pollution Advisory Council had a legislated mandate to collect information.[36] The establishment of CRIs and the move to fund research at arm's length (firstly through the Foundation for Research, Science and Technology, and subsequently through a variety of funds administered by the Ministry of Business, Innovation and Employment (MBIE) meant that there was no dedicated 'purchaser' of the data needed for environmental reporting.[37]

Many information sources and information collection initiatives suffer from a lack of a commitment to maintaining them in the long term. The contestable nature of even long-term research funding has made it hard to maintain a commitment to collecting essential underpinning data, particularly when there is pressure to demonstrate novelty and innovation.

And page 38

For example, MBIE administers a variety of research funds, including the $58 million per annum Endeavour Fund.[38] These funds are approved for short funding periods (typically three to five years).[39] All research proposals submitted to be funded under the Endeavour Fund are assessed against an excellence criterion first. This criterion stipulates that research should be well designed, involve risk and/or novelty, and leverage additional value from wider research. In addition, particular regard is paid to whether the proposed research progresses and disseminates new knowledge and is ambitious in terms of scientific risk, technical risk, novelty and/or innovative approaches. Only proposals that have been assessed as "having sufficient quality" against the excellence criterion are then assessed against an impact criterion.[40]

It is hard for organisations to justify gathering essential underpinning data in the face of these relentlessly boundary-pushing criteria. CRIs have been expected to maintain data collection from broad funding platforms like the infrastructure component of the Strategic Science Investment Fund (SSIF), in which it is just one claim on a static pool of resources subject to constantly growing demands.[41] Alternative sources of funding, including the programmes component of the SSIF, are contestable and evaluated against a scientific excellence criterion.

Yet while ambition and novelty may be crowd pleasers, underpinning data is crucial as it forms the foundation for innovation. Neglect through funding pressures over the years has led to the fragmentation of some very important datasets. Some of these datasets and associated monitoring programmes have either been discontinued or are subject to increasingly tenuous funding arrangements.



Q2. RSI should most certainly invest in people and in science that will make a positive impact on NZ's future prosperity.

The NZ science system is small (in terms of funding) and overly complex, perhaps spread too broadly, and constantly changing. This is not good for scientific continuity and nor is it good for maintaining quality scientists.

Simplify the system, stop changing it, reduce the amount of time wasted writing bids, and allow the people with the best knowledge of how to make a positive difference to science and the economy to do their job. In many cases these are the Directors of the CRIs and the top scientists who lead these organisations.

NZ's CRIs are a strength that other countries don't have and we need to encourage them as centres of excellence, as they were designed, and enable them to operate as such. Cawthron included. Universities should also be encouraged to engage more with stakeholders, particularly through longer term studies and data collection. They clearly do this when, but largely only when, there is a Regional Council-funded chair but there seems little incentive to transfer their knowledge to end-users. We find that the PBRF inhibits this from occurring and have raised this issue a number of times with MBIE and with TEC.

Q3. The government priorities include "growing and sharing NZ's prosperity" and "supporting thriving and sustainable regions" yet currently, and for some considerable time, there has been little science to support alternative land uses, and not enough science

into adding value to our primary production. There is a disconnect, both with MBIE but also with the primary sectors. For example, horticultural sectors won't invest levy funds in a sector that doesn't exist as that's not what levy funds are for; therefore there is no strategy for alternative crops that could leverage MBIE funding. In other words, there is no national strategic thinking in this space.

There are, for example, few readily available alternatives to our key primary exports should we be faced with a serious biosecurity incursion that had a major impact on key sectors. This is true for agriculture, horticulture and forestry. There needs to be greater national strategic thinking and more research to support what comes out of this thinking. For example, where are the alternative to kiwifruit should another PSA hit that is more devasting than the last incursion? What are the alternatives to radiata pine should a devastating disease wipe out this species as is happening in Spain? A sector focused on kiwifruit doesn't think about this; nor does a sector focused on radiata pine.

There is also this lack of strategic thinking in biosecurity as the focus is on responding to an incursion, not conducting strategic research to prepare for the incursion (with a couple of exceptions).

## Researching and innovating towards the frontier

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| **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. The draft document appears to be written for another country. Perhaps Singapore. One that doesn't have a large primary production sector that relies heavily on the export of food and fibre for revenue. One that also doesn't face serious environmental and biosecurity issues.

The focus on the global frontier is wrong.

New Zealand has its own frontiers that it needs to work on, and while Rocket Lab is an amazing success story for New Zealand, it is also exceptional. Certainly research needs to go into innovation but it needs to focus on New Zealand's strengths. And there definitely are strengths in advanced engineering, IT, robotics etc, but these should be used in the first instance to focus on where NZ has advantages.

Q5. Our environmental and biosecurity issues are largely unique. If we don't focus on them no one else will. No other country has the combination of geology, soils, climate and land use that NZ has, and even within NZ the combinations differ greatly geographically. And by comparison with other countries and continents, we currently remain remarkably free from serious biosecurity problems, recent outbreaks notwithstanding.

NZ is a world leader in pastoral agriculture, many areas of horticulture (e.g., kiwifruit, apples) and in radiata pine forestry. It is also a world leader in green mussel production. These are areas where we should channel research effort, but in production but also in environmental and biosecurity areas. Our future depends on not only maintaining our position, but also protecting it, for example from biosecurity threats but also from social and cultural threats. We clearly need to improve how we use the land and reduce environmental pollution if we are to maintain a social licence to operate.

We also have to uphold our Treaty obligations and form true partnerships with Māori.

Q6. We do have a very unique opportunity in the world to partner with Māori in the productive sectors but also in understanding and protecting cultural values. This will not only stand us in good stead as an integrated society but will also likely have economic benefits as we have recently witnessed in Asian trade negotiations and a revised free-trade agreement with China.

How can we take even more advantage of this unique situation?

How can we further embrace Mātauranga Māori in our environmental/biosecurity science?

Q7. Over several decades NZ has been able to establish long-term environmental data collection that has resulted in valuable datasets that can be interrogated to better explain the unique environments of NZ. We should not lose sight of this, although we should also look for opportunities for most cost-effective data collection and data management. Data are valuable. We need to extract the most from what we collect, not only in the environmental space, but across all domains. Biosecurity is a good example of a domain where a great deal of data are collected. There is an excellent opportunity to make much better use of all the biosecurity data that are collected in combined datasets that can then be interrogated to identify and then manage key biosecurity risks.

But there are issues with the way data are collected and datasets are managed and these issues need to be fixed (see PCE Report page 40-42)

Some long-standing databases and collections have been lucky enough to be considered 'nationally significant' and receive national funding. A list of 25 nationally significant collections and databases was established in 1992 and has remained unchanged ever since.[45] MBIE is currently reviewing the Government's investment in scientific collections and databases, but no conclusions about a final set of the databases to be funded were available at the time of writing.

It should be noted that existing funding arrangements for these databases and collections do not account for inflation. This can create significant challenges for agencies attempting to maintain the viability of these databases over time.[46]

### Lack of secure, ongoing funding for important new datasets

Any new datasets that have been created since the 1992 list are reliant on interested agencies having to 'put the hat around' to drum up resources to make occasional data harvests, as they do not receive any dedicated national funding.

A country reliant on primary industries and tourism for much of its income needs to know what is happening on the land.[47] This includes understanding how the land cover (the types of vegetation and other features that cover the land) is evolving. It also includes understanding how the land is currently used, how it was used in the past, and what land use changes mean in terms of benefits and pressures. Comprehensive and up-to-date information about land cover and land use would seem to be indispensable to an economy like ours.

## Sorting out who funds what

In summary, while New Zealand's current science system is focused on innovative and leading-edge research, it is difficult (if not impossible) to effectively undertake such research without the solid foundational knowledge needed to ground our understanding. As such, national-level environmental reporting must somehow be linked to New Zealand's science system.

time as well as the setting of research priorities and any management interventions. The absence of a long-term commitment and increasingly tenuous funding arrangements for maintaining important datasets poses significant challenges for their usefulness.

Q8. NZ is the only country, or one of a few, with the sorts of environmental, biosecurity, social and cultural issues around land use. Our land cannot be exported whereas products can – and technology with it. Similarly our Māori and indeed our NZ culture is unique and one that needs to be studied and understood in order to fully realise opportunities. For example, why is gene editing allowed in Australia and not in New Zealand?

NZ land-use issues, as explained previously, are generally unique and we need our own research and datasets. We can work with other countries on technology to collect data, provide solutions to some issues, and to develop new technologies that can be applied in New Zealand and elsewhere.

Q9. Innovating in the NZ public and private sectors has its unique challenges. In the private sector most enterprises are small and basically need free access to knowledge and technology as they can't compete to purchase IP and/or defend patents. Larger companies are better placed to invest in science and also purchase IP. The public sector tends to lag behind the private sector in innovation because the driver to earn revenue isn't there- and also, the public sector tends to be very risk-adverse by its very nature. Public sectors strive for better efficiency and reduced transactional costs and errors but, with some exceptions, tend not to drive innovation. An exception is biosecurity where MPI has a clear role to protect NZ's unique biodiversity and also its productive ecosystems. It needs to innovate, more than it has, to keep up with increasing biosecurity risks as the world gets smaller and the pests get closer. In fact, the NZ biosecurity system needs an innovation fund much like Australia's $25M fund if we are to be at all successful in protecting our unique ecosystems and our economy.

# 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. Yes, a challenge is to enable stronger connections.

Connections are very important, not only between researchers but especially between end-users, such as Regional Councils and industry, and providers. The connections need to occur early on to help direct research need, and as an end-user we see "impact" as being just as important as science excellence. More on that later.

The draft RSI's vision is very narrowly focused on producing "start ups" and ignores the bigger picture and the importance of Government-funded science to sustainable production and environmental protection. This is evident in the diagram "Our research and innovation System":

There is no placeholder for end users and stakeholders - just a reference "we need engaged users of research and a general public actively interacting with the future possibilities of research and innovation". The reference comes across as being something touched-on-in-passing, and is not developed well in the remainder of the document.

We look forward to seeing how MBIE itself and the research providers it funds give effect to recognition of users of research and to promoting active general public interaction.

Also in this diagram "Government" and the Strategy should recognise regional and local government as likewise a user of research and innovation. Similarly on pg 5- RSU Guiding principles: Under 5 Building firm foundations, the first text block refers to government health, social, environmental and economic objectives. Regional government has objectives in the same area. These should be recognised in the Strategy.

And finally, in this diagram "Institutions": we note the final comment "we need to ensure…that our businesses and public services have access to the research and support they need to build on and use that knowledge". **We strongly support this position, and note that we have previously voiced our disquiet that the MBIE systems seem to be poor at ensuring there is adequate dissemination, awareness, and transfer.**

## Guiding Policy – Excellence

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| **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. The draft document suggests that excellence is all about the number of top researchers producing the most papers cited by the most people; the diversity of the workforce; the numbers of start-ups; and the increase in venture capital. This is only one aspect of "excellence" and it ignores the current government's focus on well-being as an indicator of success. For Regional Councils and many other end-users excellence will relate more to how well scientists engage with us to understand our problems and to try to solve them. Scientists that make the effort to transfer knowledge to us so that it can be used to move NZ forward are more valuable than those that spend time trying to produce the greatest number of publications in prestigious journals. Developing tech companies is important for the NZ economy, but we need to keep sight of the bigger picture and that is the prosperity and wellbeing of the country as a whole.

We support the idea that the balance of investigator led, cf mission-led, cf user-led should remain under live review. We challenge whether the sectors of mission-led and user-led have true and meaningful end-user co-design and co-development, and want to see a stronger recognition of stakeholder and end-user representation in short-term strategic and applied research

Q12. The science system has become much more diverse in the last decade and will continue to diversify. To bring in more Māori researchers we need to continue to recognise Mātauranga Māori and form true partnerships, particularly in environmental and biosecurity science.

Q13. Excellence is generally seen in a global context and for many issues and opportunities we need international connectiveness. There are opportunities for NZ to leverage off the connectiveness that NZ researchers often have with end-users, such as Regional Councils, as international researchers often don't get the same opportunities to connect with end-users in their own countries. To a large extent NZ is somewhat unique.

Q14. Excellence can be strengthened by stronger connections but it is not guarantee that it will occur. Excellence is strengthened by creating the best team of researchers along with end-users to ensure research is relevant as well as excellent. Excellent research on its own is not very useful.

## Guiding Policy – Impact

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

**Please type your submission below.**

The Indicators of Success for Impact in the draft document reflect a lack of understanding as what is needed by many stakeholders, i.e., not just:

- Increase in use of New Zealand research by industry (eg, New Zealand research publications cited by patents assigned to businesses in New Zealand and elsewhere; number of start-ups/spinouts coming out of New Zealand research institutions; BERD (business expenditure on R&D)/GDP)

- Increase in use of New Zealand research by the public sector (eg, New Zealand research publications cited by public agencies and/or other non-commercial organisations in New Zealand and elsewhere)

But "impact" really needs to consider more realistic measure of the use of the knowledge being generated by NZ science. Reports that transfer knowledge to end users; site visits; workshops; appearances in Environment Court etc.

"Telling stories" can in many ways be more effective for transferring knowledge than writing an esoteric publication in an international journal.

We welcome that alongside science excellence and 'impact', there is now an emphasis upon 'connectivity'. We support this recognition, and look forward to the principle being given effect.

From the PCE November 2019 report pages 77-78:

### The use of environmental data: an application to fiscal policy

In 2018, the Government announced an alternative approach to fiscal policy – one that explicitly places the wellbeing of New Zealanders – current and future – at the core of decisions about how fiscal resources are allocated. More recently, the Government has proposed that the Public Finance Act be amended so that consideration of wellbeing becomes a formal part of the annual budget process.[2]

Four key ideas lie at the heart of this wellbeing approach. The first is that those aspects of our lives where improvements would contribute the most to wellbeing (e.g. education, health, income, environment, housing) should be those where public spending is targeted.[3] The second is that the wellbeing of future generations

However, the proposed approach is also one that requires a great deal more information than the traditional policy process relies on. Fragmented environmental data and a lack of knowledge about the functioning of biophysical systems also have implications for other policy functions. How can we prioritise action on problems we cannot properly describe? How can we assess future risks when we do not have a reliable idea of the way trends have evolved up to now?

## Prioritising what we do

If public money is to be spent according to its potential contribution to wellbeing, then policymakers need to know something about the relative contribution of different aspects of life to wellbeing. For example, how much would New Zealanders value an incremental improvement in education outcomes relative to an equivalent improvement in environmental quality?

Understanding the links between environmental quality, other constituents of wellbeing, and wellbeing itself is a pre-condition for prioritising public policy according to 'what matters most'.

If policymakers do not have access to information highlighting the multiple sources of value that the environment provides, they can hardly be expected to prioritise spending to protect it. Empirical research is required to provide evidence of the links between environmental quality and wellbeing. But this work is itself reliant on the availability of environmental data. Researchers will find it difficult to determine the contribution of environmental quality to wellbeing if the data and knowledge gaps outlined in section three are not addressed.

# Guiding Policy – Connections

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| **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. From a Regional Council perspective there tend to be much weaker connections with university academics than with CRI and Cawthron scientists, except in the case where Regional Councils fund University Chairs. PBRF provides a barrier as it incentivises publications at the expense of practical and useful knowledge transfer.

Q17. Envirolink, created in 2005, stimulated considerable more connectivity between environmental science research providers and councils. Similar schemes in other areas would be useful. HazardLink and IwiLink were in fact proposed by MBIE (MSI) several years ago but never signed off by the then Minister. We note that MBIE has undertaken a review of Envirolink which we understand has found many favourable elements within its structure and delivery; we offer our support for any development of a broader system of like nature.

Q18. The RSI system should be simplified. It is very difficult for people to understand, even for those that work in the system.

Reduce the amount of time spent on bidding, perhaps focus competition for funds at the margin rather than at the core of the science needs.

Enable greater integration with sector strategies and long-term programmes, such as conducted by Regional Councils that benefit the environment. This may well involve the re-introduction of requests for proposals related to broad themes, rather than complete 'open slather' in the bidding process.

Focus on outcomes – not the number of top quality papers produced.

# Actions – Making New Zealand a Magnet for Talent

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| **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. Stabilising the science funding system would help provide assurances that science is a good career path in NZ. Ironically a mediocre scientist can earn a lot more money outside a university or CRI than a good scientist in one – and also have less stress from wondering about secure funding.

Q20. Same answer as Q19. Why aren't they attracted now, given NZ is such a great country to live in?

Q21. Same answer as Q19.

Q22.The proposed initiatives in the draft Strategy are vague so it is very difficult to understand what the term "develop initiatives…" actually means. What do you actually intend to do?

## Actions – Connecting Research and Innovation

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| **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.**

Q23-25. Over the years many initiatives have been proposed and not implemented. An example if the establishment of the "Innovation Hub" in biosecurity proposed by an MPI staff person as a joint venture between NZ and Australia last year. Australia loved the idea and implemented the Hub; NZ has yet to do so even though it was a NZ idea. Not too late!

Q26. Research does not have to be commercialised to be useful. In many cases it's more a matter of just using the knowledge, operationalising it, putting it into practice that is important.

## Actions – Start-up

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| **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. Has MBIE analysed the benefits of investing in start-ups given that many, when eventually successful, are simply sold overseas?

Q28. The initiatives proposed are too vague to judge.

Q29. The R&D Tax incentive scheme could be more flexible to acknowledge non-monetary contributions to R&D, such as the use of land, time, and facilities.

# Actions – Innovating for the public good

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| **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.**

Q31. This question is very relevant to regional councils.

*Our public services need to grow their focus on innovating to find new solutions to social and environmental problems, and respond effectively to the government's priorities. Engagement of public services with RSI, including through funding R&D specific to government services and goals, is going to be as important to achieving the objective of this strategy as increased business activity."*

*"Such an approach requires a clear definition of a mission that partners across the government, society and the private sector. Achieving success in this mission will not only bring benefits to New Zealand in terms of better outcomes in areas such as health or the environment but will also ensure our industries are at the forefront of developing those innovative goods and services, both domestically and internationally."*

One opportunity is to encourage and promote greater partnerships across the public sector, between government departments and regional councils, and also with industry.

There are clear opportunities in environmental science and biosecurity science to work more closely together and identify opportunities for new science and new technology to develop to make the public and private sectors more efficient. For example, in environmental monitoring technology and in biosecurity networks.

There are also considerable opportunities in the "environmental health" area where the environment impacts on human health. Traditionally there are artificial barriers to collaboration in this space, but these could be broken down and collaboration strengthened.

## 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 and 33.

A focus in areas of most relevance to NZ would be useful. NZ is unique in many aspects (see previous) and rather than focus in areas where other countries lead, we should focus where NZ should take the lead.

In particular a focused fund for environmental science to provide urgently needed answers to key questions is required to address the governments issues to promote wellbeing.

Refer to the recent (November 2019) PCE Report "Focusing Aotearoa New Zealand's environmental reporting system" e.g., page 6 – and it is clear that New Zealand science needs to fill important knowledge gaps in environmental science:

> The first cycle of reports under the current Act has identified many knowledge gaps. I am not confident that there is a coherent basis for our national investment in environmental science. I am particularly concerned that there is no mechanism that links the ongoing demand environmental reporting makes for an understanding of complex ecological processes that evolve over decades, and a science funding system that is constantly searching for innovation, impact and linkages to the ever-changing demands of business and society.

> When I set out on this investigation, the Government was in the process of announcing its commitment to prioritise public spending by accounting for its contribution to wellbeing. By including natural capital as a key pillar, the Government has recognised the importance of maintaining the natural environment for both current wellbeing and that of future generations.
>
> Explicitly recognising that wellbeing depends on a range of factors and directing public spending to the factors that 'matter most' is a welcome development. But implementing this approach in practice places considerable demands on the underlying evidence base.

If the purpose of public spending is to support wellbeing, then policymakers need an improved understanding of the linkages between wellbeing and those aspects of life (such as environmental quality) that contribute to it. Establishing these linkages requires research, but as this report makes clear for the environmental domain, the data required to undertake this research is not always available.

Similarly, if the Government is to assess risks to the wellbeing of future generations, it will require an understanding of how the natural environment is changing, as well as knowledge about how it may change in future. The extent to which natural resources can be safely depleted in pursuit of building up other desirable assets is at the heart of a longstanding debate about what 'sustainable development' entails. But again, the existing evidence base is insufficient to allow us to gauge the risks we may be running.

# 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.**

Continuing on the theme of environmental science needs from the PCE Report:

Previous Investment Statements have focused almost exclusively on the Crown's portfolio of built and financial assets with relatively little attention devoted to the natural environment. Similarly, Statements on the Long-Term Fiscal Position shed little light on the potential risks that environmental degradation poses to the Government's finances.

The Treasury is well aware of these issues and has identified data gaps as a barrier to further progress. The shortcomings of the environmental indicators of future wellbeing were apparent in the Living Standards Framework Dashboard published late last year. The absence of comprehensive and authoritative environmental data stands in the way of making good links between the state of the environment and wellbeing. Without a serious investment in data – and work on how it can then be incorporated into the wellbeing framework – references to the environmental pillar of wellbeing risk remaining as placeholders. I have decided to offer some thoughts on how to make progress in a separate report next year.

Sometimes our **knowledge** of complex biophysical processes is limited. The poorer our understanding of fundamental processes, the harder it is to know what data to gather and whether the data we are gathering is indicating anything significant. As a result, it is difficult to improve our understanding.

As recently as June this year the Government's Freshwater Science and Technical Advisory Group called for urgent work to fill the identified knowledge gaps that currently constrain our ability to effectively manage freshwater and the health of freshwater ecosystems.[8] Unfortunately, the need for urgent work goes far beyond freshwater.

Fundamental knowledge gaps around soil health, including the factors that affect soil structure and functioning under different land uses, are particularly worrisome – soil is one of our greatest natural assets, and it is also a non-renewable resource.[9] Without the necessary information to assess the effectiveness of management practices and determine whether or not we are sustainably managing this precious resource, we risk losing it altogether.[10]

New Zealand's diverse and distinctive land invertebrate fauna is another example.

Invertebrate communities are just one example of serious gaps in both data and knowledge relating to New Zealand's biodiversity. Yet our very identity as 'Kiwis' is intrinsically linked with our natural biodiversity, and most if not all of us view the ability to access and immerse ourselves in nature as our birthright.

A similar situation exists in the marine environment. Marine biodiversity is poorly understood, and we have only a limited understanding of the impact our various activities are having on our marine ecosystems. Current fisheries management systems have a single-species focus and rarely take into account the effects of fishing on the wider ecosystem. For example, ecosystem changes due to fishing and climate change are rarely explicitly included in the single-species fisheries management carried out in New Zealand.

Other key knowledge gaps relate to the cumulative and cascading impacts of climate change, including uncertainty around the role of climate change in terms of exacerbating existing pressures and subsequent secondary impacts.

A lack of knowledge regarding the impact of changes in the environment on mātauranga Māori and cultural values is another significant gap. For a discussion of these issues, see 'Giving voice to te ao Māori' in section four.

In summary, pervasive data and knowledge gaps bedevil our understanding of key environmental issues. The first cycle of reporting has documented many such gaps. What is now needed is a major push to progressively fill those data gaps that stand between us and a better understanding of New Zealand's key environmental issues.

## The limited availability of time-series data

The limited availability of time-series data that enables us to track the trajectory of issues over time is another shortcoming of the broader system of environmental information.

Given that many of the environmental problems we face have been decades in the making and that for nearly 30 years we have had the RMA, which makes specific reference to cumulative effects that arise over time,[15] it is astonishing that we have so little data on trends over time.

# 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.**

Q34-37. This section doesn't seem to have had much thought. However, MBIE can learn much from the recent (November 2019) PCE Report "Focusing Aotearoa New Zealand's environmental reporting system" e.g., page 6

> The other source of knowledge is that embedded in mātauranga Māori – the traditional knowledge of this land's original settlers. For the 600-odd years before the arrival of Europeans, mātauranga Māori represents the only human record we have of the environment of these islands and their surrounding waters. For that reason alone, it is of immense importance. Given how much we do not know, we can ill afford to disregard this traditionally curated knowledge. The importance of making this a complementary part of future state of the environment reporting has already been acknowledged. It now needs to be deepened.
>
> It is also important that in collecting data of any kind to inform reporting, due emphasis is given to information that is useful to Māori. As I note in section four, it is not hard to make the case that if the Treaty of Waitangi commits the Crown to protecting certain taonga (which include many environmental resources), then gathering information about their state is an important responsibility.

# 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. NZ science is a very dynamic area and new funding mechanisms are created on a frequent basis. OBI's were a disaster, that most of MBIE have probably never heard of, but "Research Partnerships" seemed to be a success. Why were these dropped?

More than anything the NZ science system needs to be stabilised; less funding for administration and bid writing, and more funding for science. Long-term research needs to be encouraged, not discouraged, and the value of long-term databases needs to be recognised.

The CRI model certainly works better than the university model- we see CRIs having some serious regard for public good and for maintenance science investment, which never comes thru from the universities. The PCE's view is that the CRI model is inadequately funded for the public good/ environmental monitoring/database maintenance etc, which is a point we'd concur with.

# 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.**

The Government should prioritise areas of action where there is the greatest need as well as the greatest opportunity. E.g., science for the natural environment.

The November 2019 PCE Report describes the situation: page 78

> Previous Investment Statements have focused almost exclusively on the Crown's portfolio of built and financial assets. Despite their importance for future wellbeing – and the fact that a significant proportion remains in Crown ownership – relatively little attention has been directed towards the natural environment.[6] Similar issues are relevant for the Statements on the Long-Term Fiscal Position, despite the risk that environment degradation poses to the Government's finances.[7]
>
> The Treasury is well aware of these issues, but highlights data gaps as a key barrier to further progress. The shortcomings of the environmental indicators of future wellbeing that have been included in the Living Standards Framework Dashboard are one illustration of this issue (see box 5.1). Further, in the 2016 Statement on the Long-Term Fiscal Position, the Treasury stated: "In particular, resource management could be improved by building a better evidence base to assess the state of our natural resources, the value derived from them, rate of change, and return on investments."[8]

And page 87

> **6. Bridge knowledge gaps:**
>
> The Minister for the Environment and the Minister of Research, Science and Innovation should jointly task their officials to report within 12 months on the best way to link New Zealand's environmental reporting system with the science system to ensure that key knowledge gaps are incrementally closed.

# General

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

**Please type your submission below.**

Success indicators: we welcome that MBIE are reviewing how success can be measured and reported, based on the application of research in private and public sectors. It is very disappointing that the suggested indicators of success (Annex 2) are very researcher-based, not end-user based. Likewise, we suggest that the number of citations of research reports by the public service is a very superficial measure of impact. Indeed, it presupposes that transfer and dissemination are routinely taking place and need not be addressed further- hardly a justified assumption.