



Science New Zealand Perspectives on

Future Pathways White Paper 2022

A Discussion Paper

27 March 2023

Contents

Foreword	3
Executive Summary	4
Overview	4
Discussion paper structure.....	4
Summary of Science New Zealand position	5
1.1 Establish National Research Priorities.....	5
4.4 Funding mechanisms that support system goals.....	5
4.3 Designing resilient and adaptable public research organisations	5
3.1 Attract, develop and retain talented people	6
Te Tiriti, Mātauranga Māori and Māori Aspirations	7
Te Hanga Anamata Hou	8
Creating New Futures: 1.1 Establish National Research Priorities	8
Te Hanga i te Kakama o te Pūnaha	15
Building System Agility: 4.4 Funding mechanisms that support system goals	15
Te Hanga i te Kakama o te Pūnaha	19
Building System Agility: 4.3 Designing resilient and adaptable public research organisations	19
Te Uara I Ō Mātou Tāngata	22
Valuing our People: 3.1 Attract, develop, and retain talented people.....	22
Appendices	25
Appendix A: New Zealand Agricultural Greenhouse Gas Research Centre Governance	25
Appendix B: The design principles of mission-oriented policies (OECD)	26
Appendix C: The Value of Crown Research Institutes in Aotearoa New Zealand’s Science System Today	27

Foreword

Science New Zealand is an incorporated society comprising the seven Crown Research Institutes (Crown-owned companies) as members, and Callaghan Innovation (a Crown agency) as an associate member. The CRI Chief Executives form the Board. It was formed in 1992 to support CRIs in their mission, set by the CRI Act, to benefit New Zealand.

To ensure New Zealand benefits, the Act requires CRIs to promote and disseminate their research, as well as to pursue excellence in their research and to ensure alignment with ethical and social responsibility. CRIs partner with clients in the public, private and NGO sectors and with other research organisations in New Zealand and globally.

In a word, CRIs are about impact. CRIs are therefore supportive of the proposed reforms which enhance the ability of the Crown's research investment to achieve impact that benefits New Zealand.

It is from this perspective – of identifying, creating, and translating into practice science research that is useful, usable and used – that this discussion paper commences.

The four areas we discuss are vitally important to maximising the impact of science research for New Zealand, as part of a wider system approach. It aligns neatly with the White Paper's aspirations for accelerated impact from the national science investment, to which all parts of the system contribute from their various strengths.

The White Paper signals a greater emphasis on generating impact of tangible benefit, and thus on the whole chain of value-add from the science research investment. While research production is necessary, and must be of the highest quality, it is not sufficient. Outcomes and impact are also necessary – so attention must be paid to implementation pathways, network development, evaluation and inclusion of all major parties in the process from the outset (government, research organisations, Māori and industries or sectors).

This Discussion Paper has been developed collectively by Science New Zealand members as a contribution to the Te Ara Paerangi process being led by the Ministry of Business, Innovation & Employment (MBIE).

Executive Summary

Overview

Science New Zealand strongly identifies with the vision of ‘an RSI system that supports wellbeing for all current and future New Zealanders, a high-wage low-emissions economy, and a thriving, protected environment through excellent and impactful research, science and innovation’.

There are some excellent aspects to the current system of which the CRIs are a major element. New Zealand’s researchers and those who apply the research are of high quality, highly productive and make a demonstrable impact on significant economic, social, cultural, and environmental elements of our society and indeed globally.

There is, however, no room for complacency. Change is needed if New Zealand’s potential in all these areas is to be realised more fully.

The objective is identifying, translating and creating knowledge which is valued and used (by public and private sector end users) for the economic, environmental, social and cultural wellbeing of New Zealand. In other words, research that is useful, usable and used.

We acknowledge that the Te Ara Paerangi process is limited, by design, to Vote RS&I; however, we believe that it is necessary to take a wider view of ‘the system’ if the reforms are to be most effective in delivering maximum value for New Zealand.

This paper contributes thinking towards the implementation of four reform objectives which we believe are critical to the future success of the nation’s RSI system. These are:

1.1 Establish National Research Priorities

3.1 Attract, develop and retain talented people

4.3 Designing resilient and adaptable public research organisations

4.4 Funding mechanisms that support system goals

Matters especially pertinent to Māori engagement, leadership and role and Te Tiriti are fundamental to the reform process and a better RSI system for New Zealand. They must be interwoven throughout all elements of the process, so we address that also.

This paper does not cover all elements of the White Paper and we welcome government’s intent to continue discussions over the period of the reform programme.

Discussion paper structure

All the reform objectives are interconnected and necessarily interlinked. So the paper follows these connections, in this order:

- Addressing the scope, definition and architecture of National Research Priorities (1.1 Establish National Research Priorities).
- Suggesting a funding model for the RSI system (4.4 Funding mechanisms that support system goals).
- Key considerations for the structure and ability of public research organisations to collaborate (4.3 Designing resilient and adaptable public research organisations).
- Offering perspectives on short-term and medium-term actions to alleviate existing workforce challenges (3.1 Attract, develop and retain talented people).

Summary of Science New Zealand position

1.1 Establish National Research Priorities

Te Ara Paerangi White Paper proposes the establishment of National Research Priorities (NRPs) as a critical means by which to resolve the need for strategic direction in the RSI system.

We suggest how these priorities might be developed, organised and governed for effective implementation. We propose a tiered mission architecture and aligned governance model. This model builds on successful precedents, and will ensure NRPs are focused on delivering real-world impact and have effective accountability mechanisms.

4.4 Funding mechanisms that support system goals

Funding structures need to change to allow organisations to focus on beneficial outcomes while ensuring accountability across the RSI system.

Existing reporting and accountability mechanisms can be better leveraged to provide efficient oversight of outcomes.

National Research Priorities represent only one element of the investment in the sector. We propose a funding model comprised of three key components:

1. Base funding for *Public Good Science Services and National Infrastructure*, for example biohazard monitoring, nationally critical data collection and curation, and emergency response capability. This should be indexed appropriately.
2. Contestable funding for *investigator-led research*, particularly in new research areas, with applications reviewed by an external Board (e.g. as with the Endeavour Fund).
3. Time-bound funding for *Mission-led science* as part of National Research Priorities.

4.3 Designing resilient and adaptable public research organisations

The White Paper has, rightly, signalled the need to simplify the RSI system (direction setting, funding, oversight and provision of research and its application). There is opportunity to create a system that is both more effective and efficient. Our suggested reforms to priority setting, funding and governance would enhance the system's adaptability and resilience.

Key enablers include:

1. *Shared long-term priorities to guide joint working.* National Research Priorities will provide direction and opportunity for more effective collaboration at all levels, from scientists to institutions, from researchers to users of science, across private and public sectors.
2. *Base funding for Public Good Science Services and National Infrastructure, distinct from time-bound funding for Missions and contestable funding for new research areas.* If public research organisations are appropriately funded to deliver core capabilities, they will be better placed to deploy resources in collaboration to deliver Mission objectives and sustain critical capabilities to NZ Inc over time.
3. *Forums for sector-wide coordination in setting priorities and delivering Missions.* These are separate tasks. For the first we recommend the creation of a Research Development and Innovation Council (RDI Council) comprising people of mana from government, research organisations, Māori and industry/sectors. For the second, Mission Leadership Groups to guide sector wide and mission-specific activity of participants for real-world impact.
4. *An organisational form that allows public research organisations to manage their own assets, develop and leverage shared resources and assets, and work with private industry and other research entities.* The form should have an appropriate accountability structure for Boards and CEOs, and workable independence for the shareholder and the entity. Our view is that the company model provides these attributes and is effective in delivering public research.
5. As the White Paper indicates, the current funding model drives fragmentation of New Zealand's capability, works against multi-disciplinary teams increasingly more required to address major challenges, and too often leads to transactional or piecemeal approaches. That leads to precarity across parts of the workforce, not least those in early career stages.

3.1 Attract, develop and retain talented people

Attracting, developing and retaining talented people requires attention to all elements of education, training, induction into the workforce, and career development. Immigration policy is also critical.

Changes to the current funding model, in particular increasing funding for *Public Good Science Services and National Infrastructure* and flowing funding for *Mission-led science* directly to institutions, will allow public research organisations to invest in long-term capability and reduce institutional and individual precarity.

In recent years, the CRIs have worked alongside universities in creating joint graduate schools and specialist programmes, plus on-site work experience, co-supervision and mentoring for many hundreds of PhD and Masters students annually. This exposes the students to options beyond academia including commercial and client-related work.

We propose that the RDI Council have a role in workforce planning across public research organisations, tertiary education providers, iwi, industry and other relevant entities.

This would entail bringing the tertiary system into the scope of Te Ara Paerangi reforms. Many workforce elements of concern identified in the White Paper, such as the high level of individual precarity amongst PhD and early career staff, relate to university employment practices and culture. Strong base funding can assist with institutional precarity and the related workforce issues.

CRIs are committed to working collaboratively with universities, wānanga, polytechnics and sectors to develop the workforce of the future through extending current initiatives and creating new opportunities. This includes a commitment, with Te Ara Pūtaiao, the Science New Zealand Māori leadership group, to address under-representation of Māori in the RSI system.

Te Tiriti, Mātauranga Māori and Māori Aspirations

“ Te Ara Paerangi Says

- Current RSI policy settings and research institutions fail to adequately uphold the commitments in, and the spirit of, Te Tiriti o Waitangi.
- Mātauranga Māori remains clearly at the RSI margins.
- System responsiveness to Māori is weak and models of engagement are poor.
- There is... a lack of responsiveness and underinvestment in areas of transformational change and research that supports Māori aspirations.
- Phase 1 of the reform will... start embedding Te Tiriti o Waitangi in the RSI system in 2023. The government's obligations, expectations and aspirations for the RSI system will be outlined in an RSI Te Tiriti o Waitangi statement.
- The reforms will ensure Māori and Pacific people are integral to the RSI system, as both participants and users. This will grow the innovative Maori and Pacific economies and support the aspirations and well-being of Māori and Pacific peoples.

“Te Ara Paerangi – Future Pathways acknowledges and responds to a strong call from across the sector to address marginalisation of Māori by the RSI system.” (pg. 32)

Te Tiriti relationship is an essential component of partnership with iwi / Māori. Science New Zealand supports the proposal to embed Te Tiriti into the RSI system and MBIE publishing a statement that outlines how MBIE will honour Te Tiriti obligations and give life to Te Tiriti opportunities.

We encourage the Crown to enact Te Tiriti obligations in current or future research, science and innovation legislation therefore embedding Te Tiriti and promoting closer collaboration between CRIs, with shared Te Tiriti values providing the platform to work across institutes.

Through our work, CRIs are very much aware that Te Tiriti partnership involves working together with iwi, hapū, whānau, and Māori communities to develop strategies for engaging effectively with the research, science, and innovation system.

Several CRIs have already taken the first tentative steps towards explicitly committing to honour Te Tiriti and applying the principles of partnership, participation and active protection in how we do our science and research. Shareholding Ministers have made clear their expectation that CRIs give effect to Te Tiriti obligations and contribute to MBIE's Te Tiriti statement. Te Ara Pūtaiao is contributing to MBIE's work on practical and achievable ways to give effect to Te Tiriti obligations and to the MBIE Te Tiriti Statement on the government's obligations, expectations and aspirations for the RSI system.

Te Hanga Anamata Hou

Creating New Futures: 1.1 Establish National Research Priorities

“ Te Ara Paerangi Says

- The RSI system lacks system-wide direction and is not well configured for assembling multidisciplinary and transdisciplinary research teams integrated expertise across organisations.
- Governance arrangements exist for 7 Crown Research Institutes, 11 National Science Challenges, numerous one-off platform investments, at least 3 Crown entities or companies, 10 Centres of Research Excellence, amongst many others.
- National Research Priorities may include:
 - Missions: significant, time-bound effort to achieve a desired outcome.
 - Public Good priorities: ‘must do’ science activity.
 - New emerging areas of research

“Te Ara Paerangi – Future Pathways acknowledges and responds to a strong call from across the sector to address marginalisation of Māori by the RSI system.” (pg. 32)

Science New Zealand perspective

New Zealand invests in research, science, and innovation to improve outcomes and opportunities for New Zealanders in a dynamic world. This is best achieved when every element of the system has a clear purpose, is supported to deliver those purposes and, where relevant, is working together to deliver a consistent set of priorities. Science New Zealand supports the view in the White Paper that introducing National Research Priorities (NRPs) will bring better focus on tangible impact than is currently evident.

We recommend that NRPs are established by government on the advice of stakeholders across Māori, Industry, Government and Research ie - the quadruple helix. An independent Research, Development and Innovation Council (RDI Council) would be formed from people of mana from these groups. The RDI Council would identify the national priorities for which RD&I can make a difference and advise government of these. Ultimately the NRPs would be set by Cabinet.

It is important that all parties across the quadruple helix are enabled to participate in this process. It has often been particularly difficult for Māori to participate in such processes.

NRPs will be delivered through Missions: substantial, vertically integrated initiatives that are outcome-focused and time-bound¹. Key to the success of NRPs are scope, definition and architecture of the priorities, missions and projects that interact in delivering them. Our perspectives on these factors are outlined below.

¹ Science New Zealand expects that some new and emerging areas of research may be delivered under the banner and funding structure of a National Research Priority but will not follow the Mission structure.

The governance required to support effective design of what NRPs are in general, the governance required around scoping each NRP specifically, and the governance required to ensure performance and delivery, are each different.

This clarity of roles supports the value of the company as a form appropriate to investment and delivery vehicles and avoids proliferation of overlapping governance structures.

Further detail on the proposed role of the RDI Council and other participating groups in establishing and delivering NRPs can be found in Table 1: Overview of stakeholder responsibilities for National Research Priorities.

Scope and definition

Setting NRPs will allow New Zealand to align resources more effectively to declared areas of national importance, including areas of Māori research focus.

As the White Paper makes clear, NRPs are not intended to cover all that New Zealand should expect to have available from the science system. It rightly identifies that ongoing core science capabilities such as biohazard monitoring, long-term data collection and curation, and communicable disease management, in addition to blue sky research and specific sector R&D, are critical components of the RSI system, but will sit outside the remit of NRPs.

The NRPs should reflect a subset of work of national importance that can be clearly defined in terms of time-bound and measurable outcome, with tangible positive national impact, which require collaboration and alignment to be achieved.

The scope of an individual NRP must be sufficiently aspirational, but also specific and realistic so that institutions can be held to account for delivering their outcome/s. NRPs and Missions are by definition time-bound – which leads to consideration of the parameters for science success (e.g. is it when the science is “complete” or when it is adopted?)

Priorities will be delivered through outcome-based, time-bound Missions. Missions themselves will require clear and measurable targets, and definition of ‘completion’ i.e. when participants can state the Mission has been delivered. If the scope of a Mission is right then it should attract non-MBIE Crown investment and be compelling for investment or contribution from private sector interests and NGOs.

In shaping NRPs and Missions, parties will need to consider in which areas of research New Zealand should be a fast follower and in which areas New Zealand is (or should be) world leading. That will include consideration of New Zealand’s unique situation (e.g. in biodiversity) or strategic positioning (e.g. in space research).

Science New Zealand members would welcome a discussion with officials to explore how the above principles apply to defining specific priorities in practice.

Architecture

The organisation of Missions has practical precedents and academic literature, which consider how response to complex challenges can be tackled effectively.

Science New Zealand considers that the architecture set out (below) in *Figure 1: Proposed Mission Architecture (Mazzucato 2021)* provides a useful framework that is applicable for New Zealand RSI context.

In this architecture, addressing our “Grand Challenges” are the NRPs.

More than one Mission may contribute to an NRP, as shown in *Figure 2: Worked Example of a National Research Priority*.

Figure 1: Proposed Mission Architecture. (Source: *Mission Economy: A Moonshot Guide to Changing Capitalism*, Mariana Mazzucato)

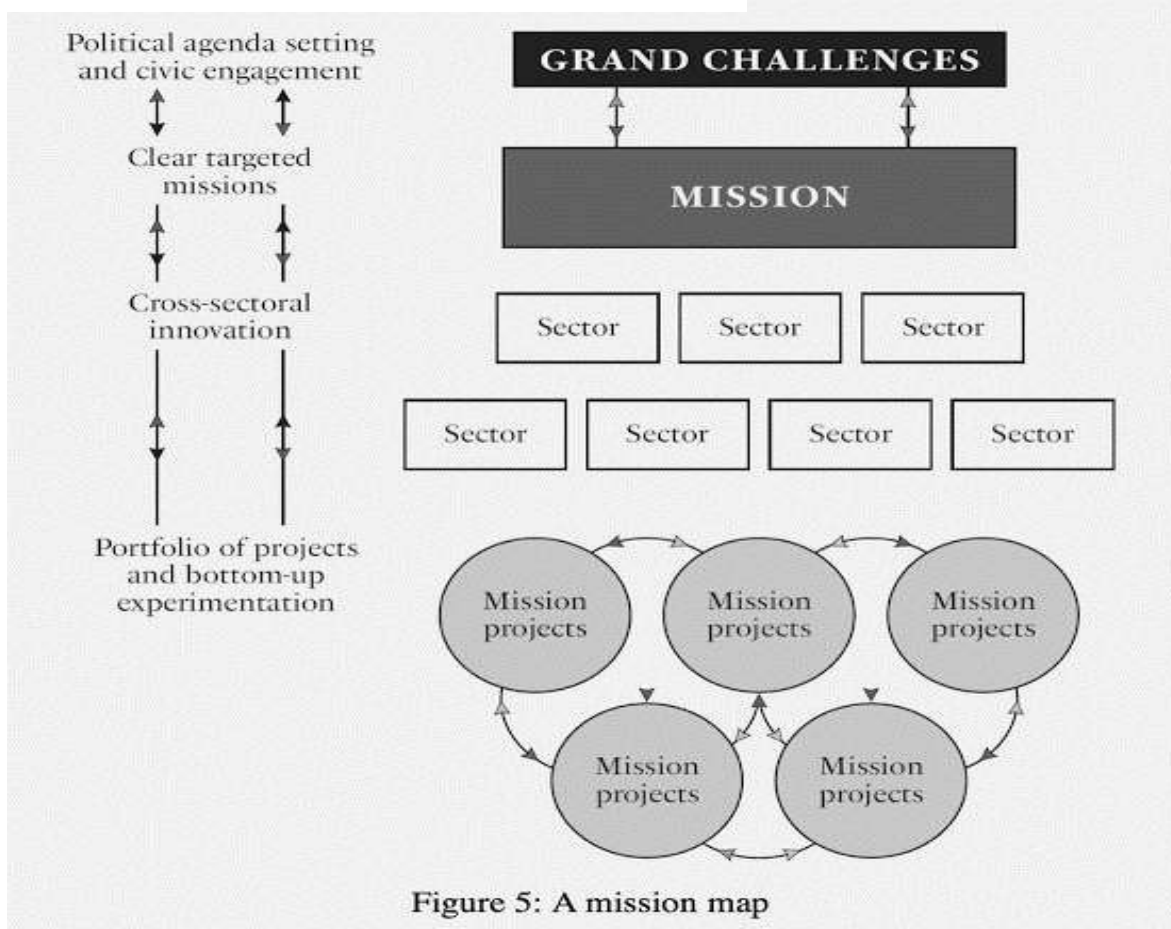


Figure 5: A mission map

The following example shows how the proposed architecture may apply for a potential priority, to give a sense of interconnected activities and participants. The priority is illustrative, taken from Mazzucato's architecture, as referenced above.

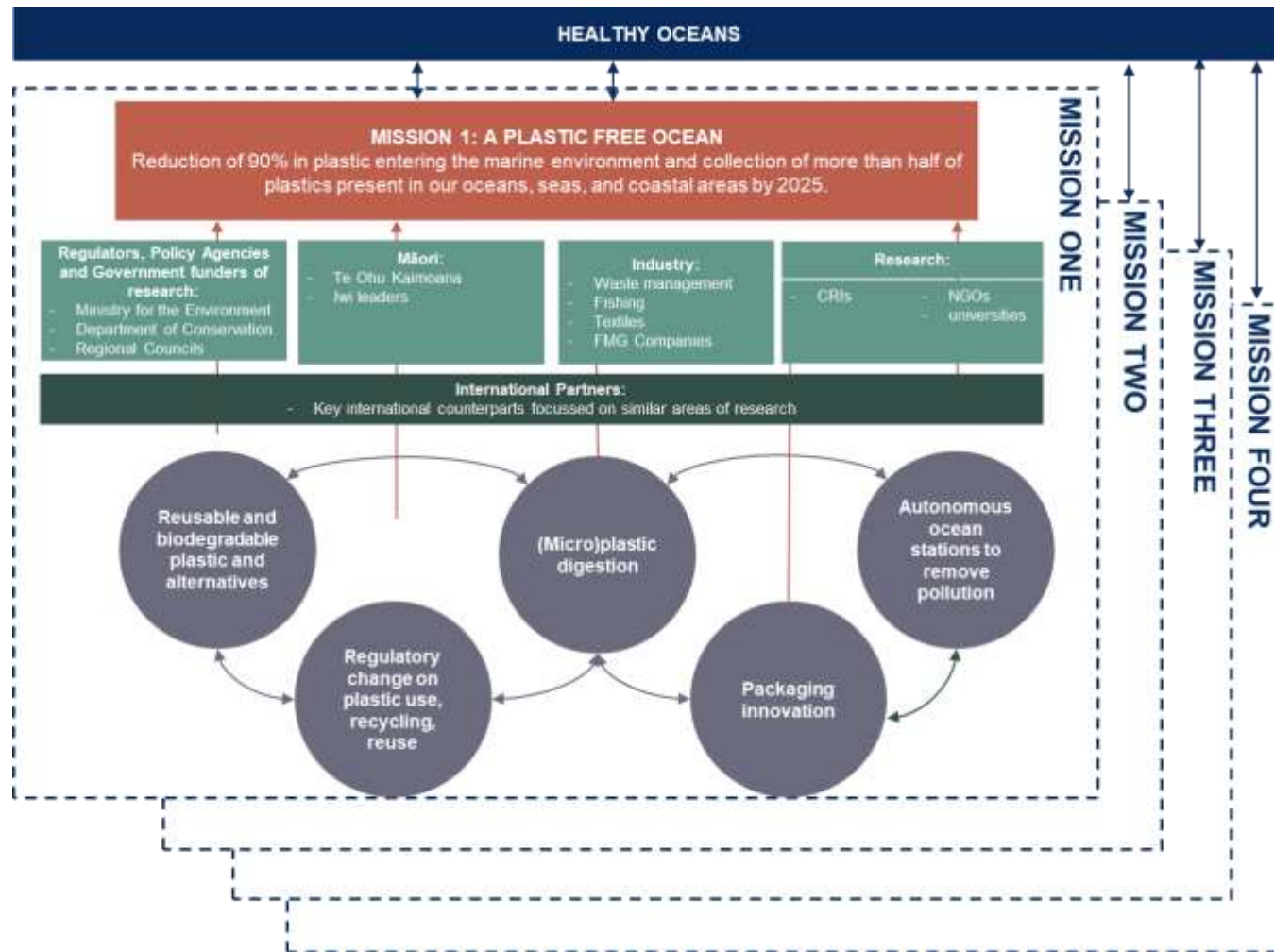


Figure 2: Worked Example of a National Research Priority

Establishing and Governing National Research Priorities

NRPs and Missions will require structures for coordination, oversight and accountability. Several existing mechanisms are well-suited to support this. These, and the roles of additional groups are described in our proposed model below. This draws from practical experience, such as the model for the Horticulture Action Plan and the Agricultural Greenhouse Gas Research Centre².

We suggest that the company form, governance settings, prescribed focus (ie the statement of core purpose) and specific performance and accountability arrangements to the government as shareholder lends itself to being an appropriate vehicle to deliver on NRPs and Missions. It complements the dynamic of multi-stakeholder representative/governance settings. This enables the Crown to drive accountability, delivery performance and a change in behaviours and culture by working with the strengths of a socially-oriented company form without diluting direction (or losing traction) through multiple layers of governance.

	Participants and Role	Design	Deliver	Monitor
National Research Priority	Cabinet	<ul style="list-style-type: none"> Approves the National Research Priorities 		
	RDI Council Comprise people of mana drawn from the quadruple helix of Government, Māori, Industry and Research	<ul style="list-style-type: none"> Consult with stakeholders on national needs and sector strategies and recommend NRPs Define Missions, participants and beneficiaries Set measurable output and impact targets for Missions 	<ul style="list-style-type: none"> Advise government on RSI sector strategy Guide and coordinate Missions toward the achievement of NRPs Works with Mission leadership to mitigate key risks to achieving NRPs 	
	MBIE / Shareholding Agency Charged with developing and delivering policy, advice and regulation for the RSI sector	<ul style="list-style-type: none"> Propose members of the RDI Council Approve resourcing and funding requests for Missions Approve Mission output and impact targets Support Ministers in preparing the Letter of Expectations and reviewing the SCIs 	<ul style="list-style-type: none"> Distribute funding for Missions directly to participants 	<ul style="list-style-type: none"> Hold institutions accountable for delivery against Mission output and impact targets (in many cases, other organisations such as Climate Change Commission or PCE have a monitoring role on which MBIE can lean)

² See Appendix A: New Zealand Agricultural Greenhouse Gas Research Centre Governance, produced by Westlake Governance Limited, June 2022.

	Participants and Role	Design	Deliver	Monitor
Mission	<p>Mission Leadership Group(s)</p> <p>Representatives of key participants to plan and coordinate delivery of an individual Mission</p> <p><i>See Appendix A: New Zealand Agricultural Greenhouse Gas Research Centre Governance for further detail</i></p>	<ul style="list-style-type: none"> • Confirm delivery structure, projects, and participants • Develop Mission plan, resource and funding requests 	<ul style="list-style-type: none"> • Coordinate institutions involved in delivering the Mission • Programme manage Missions ensuring coordination of activity, and delivery to cost, time, and quality standards 	
	<p>Institutions</p> <p>Public research organisations involved in delivery of Missions, in partnership with Quadruple Helix participants</p>	<ul style="list-style-type: none"> • Plan contribution to Missions through projects, and incorporate the relevant deliverables and KPIs into Statement of Corporate Intent (SCI) 	<ul style="list-style-type: none"> • Deliver projects in accordance with agreed objectives and plans 	<ul style="list-style-type: none"> • Report against deliverables and KPIs through annual reports and other accountability documents
	<p>Independent Monitor</p> <p>External and independent entity monitoring delivery of outputs and impacts against agreed targets</p>			<ul style="list-style-type: none"> • Track progress of Missions against agreed output and impact targets • Highlight risks or concerns regarding progress or non-delivery to MBIE / Shareholding Agency

Table 1: Overview of stakeholder responsibilities for National Research Priorities

Māori National Research Priorities

Science New Zealand anticipates that through Māori representation on the RDI Council, Māori research interests will be integral and interwoven in all elements of the reformed system – including the definition of NRP, Missions, participants, and beneficiaries. Māori must be enabled to participate and partner at all levels pertinent to NRP and the underlying Missions. Science New Zealand supports Te Ara Pūtaiao’s view that serious consideration should be given to a mātauranga Māori-led NRP defined and scoped by Māori. This is in addition to Māori being supported in all NRPs.

Transitioning to National Research Priorities

As the White Paper indicates, there is a multiplicity of governance arrangements across multiple types of entity. Simplifying this landscape will require careful management of transition risk especially when the National Science Challenges are disestablished in 2024. New Zealand cannot afford to lose capability that may be of central importance to a future NRP or to a core purpose.

The complexity of the current system and the requirement to shift focus, funding and resource may mean that interim structures or governance arrangements are required. It is important that the timing and sequencing of this transition is considered to avoid the need to pause existing research or to create confusion for individuals working on the National Science Challenges or other impacted research programmes.

Benefit of Mission-led structures

The OECD defines a Mission Oriented Innovation Programme (MOIP) as a co-ordinated package of policy and regulatory measures tailored specifically to mobilise science, technology and innovation to address well-defined objectives related to a societal challenge, in a defined timeframe³. There are, at any point multiple societal challenges, with many linked to the global context in which New Zealand is a part. The OECD's design principles for a MOIP (see *Appendix B: The design principles of mission-oriented policies (OECD)*) are broadly aligned to Science New Zealand's understanding of a National Research Priority.

OECD research on MOIPs being delivered globally has highlighted the benefit to apply a Mission-led structure to complex science challenges, including:

1. Stronger orientation of innovation systems.
2. Clearer objectives.
3. Better coordination across policy and administration silos.
4. Stronger integration of policy across different stages of the innovation chain.

The research provides helpful descriptions of the different MOIPs for various challenges, and supports Te Ara Paerangi's view that NRP will bring enhanced focus and coordination of the RSI sector to deliver science which improves outcomes for New Zealanders. It reinforces research delivering impact.

Public Good Science Services (PGSS)

While much attention during the reform process has been paid to NRPs, the majority of the national investment will likely be in Public Good Science Services and to an extent, contestable investment mechanisms. PGSS will include development and resourcing of national infrastructure and capabilities. While some areas, such as environmental monitoring and reporting, and disaster preparedness and response may well be considered as core inclusions, other areas may fall into a grey area. Science New Zealand suggests that areas such as education and outreach, knowledge transfer, maintenance of public websites and tools, working with community groups and iwi, and responding to public queries should be considered within the definition of PGSS as activities that New Zealanders would expect a country of our sophistication to have. MBIE will need to ensure, through its stewardship role, that overall government spend on critical Public Good Science Services is not diluted due to internal reprioritisation in other Votes.

³ OECD Green Growth and Sustainable Development Forum, Issue Note, "Do mission-oriented policies for net-zero deliver on their many promises?" 11/2022

Te Hanga i te Kakama o te Pūnaha

Building System Agility: 4.4 Funding mechanisms that support system goals

“ Te Ara Paerangi says

- New Zealand invests a much smaller percentage of GDP in R&D than comparable Small Advanced Economic Initiative countries (1.4% vs. 2.5% OECD average).
- Low levels of government expenditure have focussed efforts into traditional and “must do” areas of research, leading to significant under-spending in health, social research, industrial production and technology, and energy.
- The system is not well placed to absorb the increased funding needed to prepare New Zealand for the future.
- There is poor visibility of the effectiveness of current investments.

“Government investment needs to increase and diversify.” (pg. 19)

Science New Zealand perspective

Many of the issues set out in Te Ara Paerangi White Paper relate to the reduction in the real value of strategic investment in research programmes and infrastructure, and inefficient funding mechanisms based on competition for fragmented, short-term funding. Funding mechanisms affect all other parts of the system. While some competition is valuable and productive, it can also be corrosive if its excessive and be counter to collaboration. Underinvestment can limit flexibility and lessen the ability to attract or retain necessary talent, deliver required services or the ability to respond to substantially increased demand from potential investors and users.

For the Crown’s research institutes, this environment has made it difficult to maintain ongoing core capability, offer career certainty for staff and deliver mission-led research.

The Te Ara Paerangi process provides an opportunity to review funding arrangements and look at the mix of project-based and institutional funding, and the balance between competitive short-term funding and investment in longer-term missions and capability platforms. This is important for all public research organisations.

Proposed Funding Model Overview

Science New Zealand proposes a layered funding approach, which will enable directing investment to priority areas and inviting competition for new ideas and applications. Funding NRPs will only be one part of the national investment. All purposes across the RSI system will have a clear line of sight to how it is expected institutions are funded to deliver on those purposes.

Our vision is a future in which capability and outcomes are funded, rather than activity. This is in line with the view that New Zealand invests in RSI to achieve impact. This will need to be supported by mechanisms to ensure transparent allocation of funding, and accountability for delivering outcomes.

Key principles of the proposed model include:

1. All funding layers are fully costed, including people and overhead costs.
2. A greater proportion of funding is allocated to provide longer-term stability, allowing public research organisations to invest in capability development and building stronger relationships with users and contributors, including Māori and industry.
3. Capability and outcomes are funded, not activity.
4. Te Tiriti obligations are funded
5. Funding for National Research Priorities flows directly to institutions delivering Missions, enabling them to invest in the commitments expected of them (which includes multi-organisational collaboration).
6. Key research providers are resourced commensurate with the expectations of government over the duration of a Mission.
7. Competitive funding is retained through a contest of ideas where new entrants can thrive and provide a testing ground for new research.
8. The cost of bidding for contestable funding is significantly lowered.

We envisage three layers of funding as shown in the diagram below. The relative size of the layers is not to scale on this diagram.

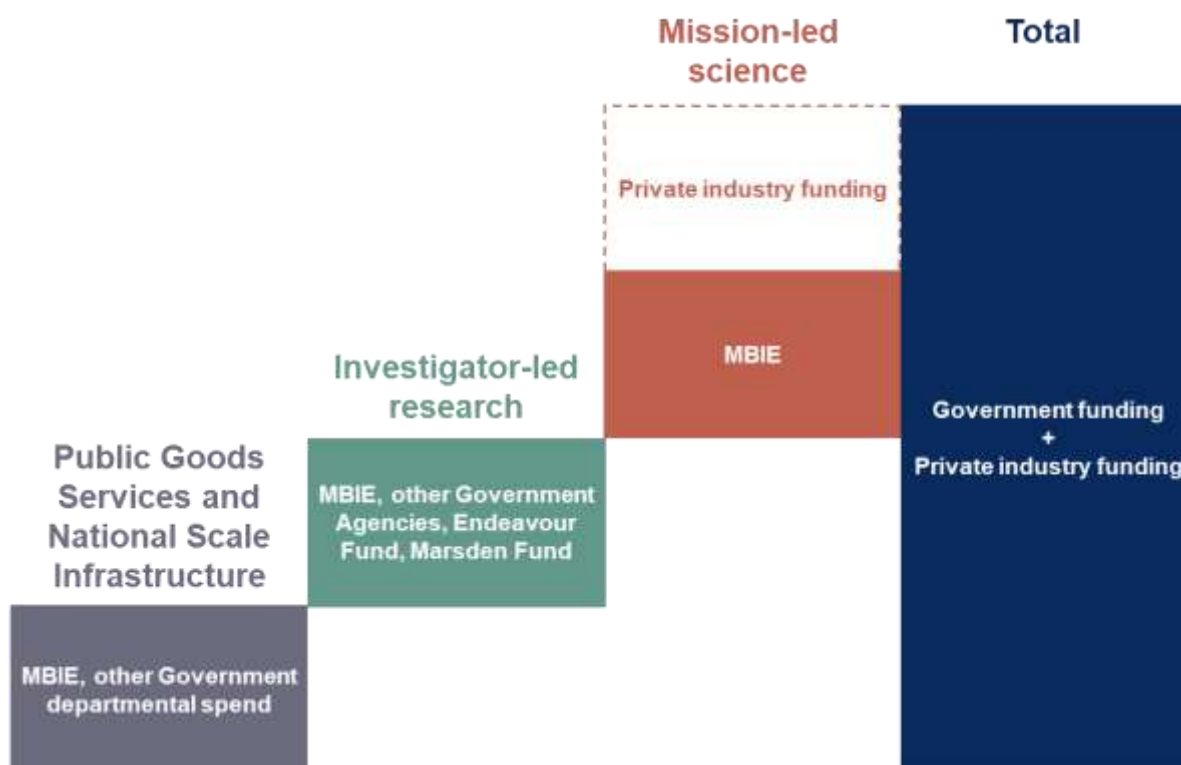


Figure 3: Proposed Funding Model

The proposed funding model is consistent with the vertical integration proposal outlined in our *Pathways to the Future* discussion paper (September 2021), which enables the integration of the development, exchange, and application of scientific knowledge⁴. It also allows for capability funding and enabling Te Tiriti obligations.

⁴ See *Pathways to the Future: A strategy to lift the positive impact of science on Aotearoa New Zealand's economy, environment, society and culture*: <https://sciencenewzealand.org/publications/pathways-to-the-future/>

The purpose of each layer of funding is outlined in the table below.

Funding Layer	Overview	Source(s)	Form	Notes
Public Good Science Services and National Infrastructure	Base funding to cover core national science capability and infrastructure e.g. biosecurity, long-term data collection, communicable diseases management, disaster preparedness and response.	MBIE, Other government departmental spend	Indexed funding	<ul style="list-style-type: none"> A greater proportion of funds directed to Public Good Science Services to provide stability and enable capability development. Funding provided directly to institutions, indexed to inflation.
Investigator-led Research	Competitive funding to support a contest of ideas for blue sky ideas, aligned to the current model for the Endeavour and Marsden funds. Major contestable fund(s) to be aligned with the strategic priorities of the whole of government.	MBIE, Endeavour, Marsden Funds	Grant	<ul style="list-style-type: none"> The current sequential bidding process for Marsden and Endeavour Funds focused on science excellence and impact should be retained with a broadened application of excellence beyond academic definitions. The direct and indirect costs of bidding, currently estimated at \$0.5m⁵ per bid, must be lowered.
Mission-led Science	National Research Priorities: strategic investment in areas of long-term research focus for New Zealand, delivered through collaboration and use of collective vehicles for action.	MBIE, Mission funding, Private funding	Outcome-based	<ul style="list-style-type: none"> Priorities to follow a Mission-based architecture. Funding model and governance to encourage private sector co-investment. Funding provided directly to institutions participating in Missions and are held accountable for their outcomes.

Table 2: Description of funding layers

⁵ MBIE Departmental Science Advisors have estimated each bid costs about \$500,000. See page 34. <https://www.mbie.govt.nz/dmsdocument/20832-science-new-zealand-te-ara-paerangi-future-pathways-green-paper-submission-pdf>

National Research Priority Funding

We propose that funding for NRPs is based on the Strategic Science Investment Fund (SSIF) model⁶, as follows:

- 1 Mission led.** Supports a clearly defined goal, agreed between government and research providers. Priorities should be structured to include Missions and Projects to deliver excellent, relevant science for New Zealand. Contracting, funding and accountability is targeted at the Mission or Project level, under the umbrella of a Priority.
- 2 Transparent and high performing.** All Missions and Projects delivered as part of a Priority should be monitored, with performance expectations set out in the funding agreement between MBIE and individual providers. Company structure and CRI performance, accountability and monitoring structures support this. Like SSIF contracts, KPIs should be included for measurable output and impact targets within each Project.
- 3 Focused on long-term capability building.** As in SSIF, funding for Priorities must be long-term but provide a mechanism to adapt the investment portfolio to changing capability and outcome needs. A focus on broader, aspirational Priorities must be accompanied by broader and longer-term funding mechanisms, with provider-neutral and non-contestable purchasing. There is space for competitive funding within the RSI sector, but this is not best suited to funding for Priorities, which benefit from partnership between government and provider(s).
- 4 Enable industry co-funding.** The SSIF facilitates contributions from research users. This ensures that government investment is focused on public benefit, to increase business investment in R&D. Priority funding would benefit from similar arrangements, where government funding is complemented by private investment / co-funding. If compelling Missions are selected then industry, Māori and other parts of government may well want to increase their level of support and hence expand the funding and resources being applied to the Mission.

Benefits of the Proposed Funding Model

The benefits of this model include:

- **Lower transaction costs.** Funding institutions directly reduces administrative costs by leveraging existing accountability mechanisms, cutting out an administrative layer to sub-contract to individual research institutions. An example is the difference between SSIF and National Science Challenge (NSC) mechanisms when NSCs became mini-funding entities.
- **Additional surety of roles.** The longer-term nature of this funding enables public research organisations to invest in enduring capability and infrastructure.
- **Greater integration of Māori-led activity in the national research effort,** in capability building for the RSI system, and application into economic, environmental, social and cultural fields.
- **Robust accountability mechanisms to ensure delivery against targets.** The proposal to include output and impact measures in an entity's Letter of Expectations, Statement of Corporate Intent, and Annual Report, and to involve an independent external monitor, will underpin transparency and oversight and focus on research impact.
- **Ability for the private sector to invest.** The proposed model allows industry investment, strengthening the connection with end user applications.

⁶ See: <https://www.mbie.govt.nz/assets/436ecb3be9/strategic-science-investment-fund-investment-plan.pdf>

Te Hanga i te Kakama o te Pūnaha

Building System Agility: 4.3 Designing resilient and adaptable public research organisations

“ Te Ara Paerangi Says

- Poor integration and unproductive competition reduce system effectiveness and impact.
- Institutions need to operate in a way that is more collaborative, adaptive and agile.
- The RSI system is disincentivised from working together due to competitive funding models, overlapping research priorities and clunky layers of management and overheads.
- The current settings result in an RSI system that can be slow to adapt to evolving national needs and challenges.

“A fundamental reconsideration of the basis on which the system was designed is necessary.” (pg. 20)

Science New Zealand perspective

The RSI system spans universities, public research organisations and private sector R&D, each with their own purpose and strengths.

Public research organisations, undertaking research on the government’s behalf, need to be responsive to evolving priorities across their areas of research. This means that they “...require the scale and scope to redirect their resources, adapt and invest in new areas of scientific endeavour and pursue new opportunities while maintaining core capabilities and public good service functions”.⁷

Science New Zealand members have proven adaptable and delivered against government priorities despite frequent system changes. Since their establishment in 1992, CRIs have been subject to reviews and responded with institutional changes several times⁸. They have also initiated institutional reform (such as termination of a CRI and merging CRIs), placing priority on better creation and delivery of quality research to and with clients across the public and private sectors, above institutional longevity.

As the White Paper indicates, the RSI landscape is cluttered. It includes 7 CRIs, 11 National Science Challenges, numerous one-off investment platform, at least 3 Crown Entities or Companies, 10 Centres of Research Excellence, and 8 universities among many others. We support the objective to rationalise the complexity of existing governance groups, whilst leveraging the strength of research delivery and its application through the public research organisations.

There is strong evidence for the positive impact of CRIs in the RSI sector, as shown in Appendix C: *The Value of Crown Research Institutes in Aotearoa New Zealand’s Science System Today* It is our view that building on existing collaboration will be best achieved if the following critical elements of the system are in place:

⁷ <https://www.mbie.govt.nz/assets/te-ara-paerangi-future-pathways-white-paper-2022.pdf>, pg.56.

⁸ This includes the disestablishment of one of the original 10 CRIs, the merger of two others to form Plant & Food Research, integration of a CRI with a university which, when further assessed by officials was found to not be viable due to purpose, cultural and financial reasons), and restructure of IRL (which became part of Callaghan Innovation).

1. *Shared long-term priorities to guide joint working.* National Research Priorities will provide direction and opportunity for collaboration at all levels, from scientists to institutions, from researchers to users of science, across private and public sectors.
2. *Base funding for Public Good Science Services and National Infrastructure, distinct from time-bound funding for Missions and contestable funding for new research areas.* If public research organisations are appropriately funded to deliver core capabilities, they will be better placed to deploy resources in collaboration to deliver Mission objectives.
3. *Forums for sector-wide coordination in setting priorities and delivering Missions.* We recommend the creation of groups, such as a Research Development and Innovation Council (RDI Council) and Mission Leadership Groups to guide sector wide and mission-specific activity of participants for real-world impact.
4. *An organisational structure which allows public research organisations to manage their own assets, leverage shared assets and resources, and work with private industry.* Our view is that the company model provides these attributes and is effective in delivering public research and delivering impact.

Shared long-term priorities to guide joint working

Government policy has strongly encouraged collaboration between research organisations. The objective is to increase sharing between knowledge creators, in the expectation that this horizontal integration will transform New Zealand's economic, environmental, social and cultural wealth and wellbeing. Our submission to the Te Ara Paerangi Green Paper provided several examples of collaboration across CRIs in various research domains.

In addition to horizontal integration, there is significant opportunity in increasing the vertical collaboration between knowledge creators and those who apply and scale the outputs of knowledge development as part of a two-way exchange. This route is focussed on impact.

The success of joint working and collaboration will depend on changing behaviours. A pragmatic approach to fostering collaboration would be to develop consistent principles and forums for the long-term co-ordination of infrastructure and other services, as appropriate across the RSI system.

The focus should be on high-value and strategic collaboration (such as major capital expenditure including co-location and research collaboration) rather than lower value collaboration (such as stationery procurement). Business-like practices, encouraged by the company form, are already ensuring significant resource and procurement sharing (including backroom services and business support services such as insurances). Collaboration across this spectrum imposes different costs and offers different benefits for types of organisation and at particular times. These need to be balanced.

The principle-based approach will ensure governance and management consideration of the benefits of shared approaches versus the freedom to act in a particular situation. This is a similar balance struck in all-of-government procurement processes. The overall objective however is to enhance the effectiveness, as well as efficiency, of public research organisations working collectively on a NRP, Mission or piece of research.

Science New Zealand would welcome the opportunity to engage with officials to develop collaboration principles and mechanisms for the long-term co-ordination of infrastructure and shared services. Having a shared view of priorities (as NRPs) would direct where this investment is needed most.

Collaboration should extend across public research organisations and other government agencies, and we must consider how to collaborate effectively with the private sector.

Appendix C: The Value of Crown Research Institutes in Aotearoa New Zealand's Science System Today highlights examples of the partnership between public research organisations and the private sector which have resulted in new products and services and have in turn delivered significant value in export earnings, underpinned new industries, and incubated globally leading companies.

The ability of public research organisations to partner effectively with the private sector is partly dependent on the company model.

Base funding for Public Good Science Services and National Infrastructure, distinct from time-bound funding for Missions and contestable funding for new research areas

Our recommendations on funding are outlined in section 4.4 of this paper.

Allocating sufficient funding to cover all direct and overhead costs will enable public research organisations to build, grow and develop base capabilities and infrastructure with a view of long-term needs. This capability can then be directed to areas of research that are a priority for the government, even if they change over time.

Reducing the cost to secure funding and increase certainty of funding will also enable public research organisations to collaborate more.

Forums for sector-wide coordination in setting priorities and delivering Missions.

A central recommendation from Science New Zealand is the creation of an RDI Council. This would consist of a 'quadruple helix' of Government, Māori, industry, and research organisations, with people of mana drawn from those areas. Key responsibilities would include:

- Collectively identifying National Research Priorities.
- Setting targets and identifying participants in Missions.
- Overseeing the allocation of funds to institutions for delivery of Mission outcomes.
- Providing visibility of the beneficiaries of Missions and who is willing to pay.
- Regularly reviewing the Priorities.

The recommended governance model for overseeing National Research Priorities introduced in 4.4 would provide direction and support public research organisations to adapt to changing research priorities.

The model is well suited to a Mission-based structure. For example, the New Zealand Agricultural Greenhouse Gas Research Centre shares a number of similarities with National Research Priorities. Both have:

- An enduring and aspirational goal.
- Interest and / or investment from government and industry.
- A multi-year delivery timeframe, with early years focused on proof-of-concept, and later years on application and commercialisation.
- Programmes of work conducting different types of research, all contributing to the same broad goal but involving different stakeholders.

This framework has precedent in New Zealand. The PGP / SFF Programme⁹, a partnership between MPI and industry, has leveraged this model to great success¹⁰. It has the advantage of focus while ensuring research is resilient to changing priorities. It provides a structure which facilitates future increases in funding from either the government or private industry and delivering increasingly valuable applied science for the benefit of New Zealand.

Science New Zealand would welcome further discussion with officials on how to apply this framework to National Research Priorities.

⁹ *Primary Growth Partnership and Sustainable Farming Fund is now the Sustainable Food and Fibre Futures programme.*

¹⁰ *Information on completed SFF Futures projects can be found [here](#).*

An organisational structure that allows public research organisations to manage their own assets and work with private industry

The CRIs have operated as companies since 1992, in a deliberate decision by Parliament to make them responsive to end users. This model has on occasion been misunderstood, both inside and outside the CRIs, as 'profit maximising' whereas it was intended, and has generally been implemented, as working for financial sustainability (the CRI Act requires 'financial viability').

The company model has given CRIs access to good governance and the insight of directors, imposed financial diligence, allowed independence (which is an attribute highly valued by multiple sectors), ensured a focus on customers, and the ability to use their balance sheets to acquire and maintain an asset base to support their tasks. It has also enabled CRIs to work with the private sector and raise capital for re-investment in science research and its translation into use. Science New Zealand recommends that CRIs continue to operate as companies.

Te Uara I Ō Mātou Tāngata

Valuing our People: 3.1 Attract, develop, and retain talented people

“ Te Ara Paerangi Says

- The OECD has noted a growing global mismatch between the things researchers will be required to deliver, and the career structures which support those researchers.
- Māori and Pacific peoples are under-represented in our workforce.
- Poor diversity, equity and inclusion outcomes are strongly linked to the instability of RSI careers.
- We need to develop new workforce career trajectories that enable more diverse and multidisciplinary pathways within academia.

“We need to rethink what careers in research, science and innovation look like.” (pg. 27)

Science New Zealand perspective

Science New Zealand recognises the workforce challenges set out in Te Ara Paerangi White Paper and the need to rethink what the workforce and workplaces of the future will look like. The CRI workforce is much wider than research scientists alone. The talented people CRIs need to fulfil their purpose also include technicians, data scientists, commercialisation and knowledge transfer people, business development, iwi interface and engagement leaders, policy engagement leaders, amongst others. We believe that to attract, develop and retain talented people the system must address the funding and structural challenges leading to institutional and individual job precarity.

Precarity

The precarity felt by many individuals in the RSI workforce stems partly from short-term project-based funding. Grant funding for research roles provides job certainty only for the duration of a research project, and teams and individuals must frequently apply for new funding. We have already commented on the cost of applying for contestable funding (see 5) which only worsens the issue. Fellowships and similar mechanisms are a short-term fix which move the precarity down the road but do not address the underlying issues.

CRIs provide a more stable employment environment for employees at all career stages than workplaces which require each employee or team to gain their own funding. CRIs are a model for operating as a joint enterprise, with programmes aimed at attracting, retaining and developing staff and thus allocating the company's resources accordingly.

CRIs are nonetheless ultimately reliant upon gaining revenue from contestable government and commercial sources to offset declining real value of SSIF contracts. This creates a level of institutional uncertainty which requires hard choices on capability retention and prioritising.

Stable, long-term funding which covers all personnel costs is needed to enable public research organisations to employ the necessary range of staff on a long-term basis, invest in their skill development and re-training (where needed), and provide stability for the RSI workforce.

Setting National Research Priorities will help provide opportunities to shape career pathways in priority areas that will bring new researchers through their early- and mid-career stages into established research careers.

It will also help the other necessary members of an effective RSI community – such as technicians and knowledge transfer people – to be confident of their own career opportunities to help deliver for New Zealand.

Workforce planning

The tertiary education sector has a critical role in nurturing talent entering the RSI system, including Māori. Public research organisations connect with the tertiary sector through various programmes to advance efforts towards recruitment, including recruitment of Māori students. For CRIs this includes:¹¹

- CRIs co-located or close to every university.
- 30+ joint appointments.
- 13 joint graduate schools or specialised programmes.
- CRI participation in 8 of the 10 Centres of Research Excellence.
- Numerous jointly authored papers, collaborative funding bids, co-supervision, and mentoring arrangements.
- Several hundred PhD and Masters students mentored and co-supervised annually.

These initiatives have largely come from the individual organisations and are dependent upon their resources. A driver has been a perceived mismatch between the needs of the RSI sector (demand) and the skills and training provided by the tertiary education sector (supply). This has arisen because there is no system wide workforce planning at present.

Current recruitment efforts and initiatives to attract talented people have primarily focused on PhD candidates and omitted other roles and skills within the RSI workforce (e.g. technicians, data scientists, kaupapa Māori researchers, technicians, and knowledge translation staff).

The concept of a training and career 'pipeline' is linear and does not reflect the reality and opportunity for diverse pathways in and through the RSI system (including the wider private sector) e.g. re-training, upskilling, lateral transitions, and pathways for Māori and Pacific students.

Science New Zealand members are committed to working collaboratively with the RSI sector, the wider tertiary education sector, officials, and other relevant organisations to formalise and accelerate our progress in this area. We recommend that the RDI Council plays a role in workforce planning, leveraging input from government, Māori, industry and research organisations to better understand the workforce needs of the future, and the multiple pathways of entry and progress over a career.

¹¹ <https://sciencenewzealand.org/publications/the-value-of-crown-research-institutes-in-aotearoa-new-zealands-science-system-today/page-6>

Diversity, Equity and Inclusion (DEI)

Public research organisations play a key role in supporting DEI, including providing clear pathways to leadership roles for Māori and Pacific researchers, supporting mobility across the RSI system, and attracting individuals from the global science community.

A key barrier to retaining and developing individuals with diverse backgrounds is the definition of research excellence. The current definition used in New Zealand, based on the National Statement of Science Investment: 2015-2025¹², is insufficiently broad to recognise the value of all forms of research.

The merits of fundamental research, applied research, and research involving and embedded in Te Ao Māori are not appropriately reflected in the current definition. This disadvantages and, at times, discriminates against Māori, Pasifika, individuals belonging to particular ethnic groups or who have pursued non-traditional areas of study, individuals looking to change careers or re-train, and those who have taken time out of the workforce (e.g. for a career break or to have a family) as these individuals are less likely to meet current requirements of research excellence.

Science New Zealand supports MBIE's shift to offer researchers the option to use a Narrative CV¹³ as part of grant applications. A Narrative CV provides a more rounded picture of an individual's career, their achievements, and overall contribution to research. It will however need to be buttressed against unconscious bias by providing ongoing support to reviewers to ensure broad life experience is valued.

As an illustration of developments in the CRI sector, AgResearch has become the first New Zealand research organisation to sign up to the San Francisco Declaration on Research Assessment (DORA), committing to valuing the scientific content of publications over and above traditional metrics.

Supporting and recognising the contribution of Māori to the RSI workforce

Science New Zealand supports the recommendations made by Te Ara Pūtaiao to address the underrepresentation of Maori in the RSI system. This includes:

- Connecting with and supporting the tertiary education sector to grow the talent pool and entry routes of Māori students into the RSI sector.
- Recognising and acknowledging the unique positions Māori hold within institutions, as representatives of their whānau, hapū, and iwi, and the obligations that come with this.
- Developing and embedding programmes to support Māori into authentic leadership positions, with commitment to Te Tiriti inbuilt at all levels across the RSI system.
- Establishing new Māori units and research teams, specifically focussed on Māori-led initiatives, including developing new remuneration frameworks and processes, embedding Māori-led operational and strategic science or research groups enabling Mātauranga Māori-led research to grow and flourish, and providing mentoring and professional development to support career growth for Māori.
- Partnering with organisations outside the RSI sector to attract Māori students, for example the Pūhoro STEM Academy, secondary education providers and Kura kaupapa organisations, and developing alternative pathways into the RSI system.
- Investing in shared investment models across public research organisations.
- Building the cultural awareness and capability of public research organisations and developing Te Tiriti based relationships with iwi and Māori.

¹² [NSSI 2015-2025 \(mbie.govt.nz\)](https://www.mbie.govt.nz/nssi-2015-2025)

¹³ [Investment Management System \(IMS\) Portal | Ministry of Business, Innovation & Employment \(mbie.govt.nz\)](https://www.mbie.govt.nz/investment-management-system-ims-portal)

Appendices

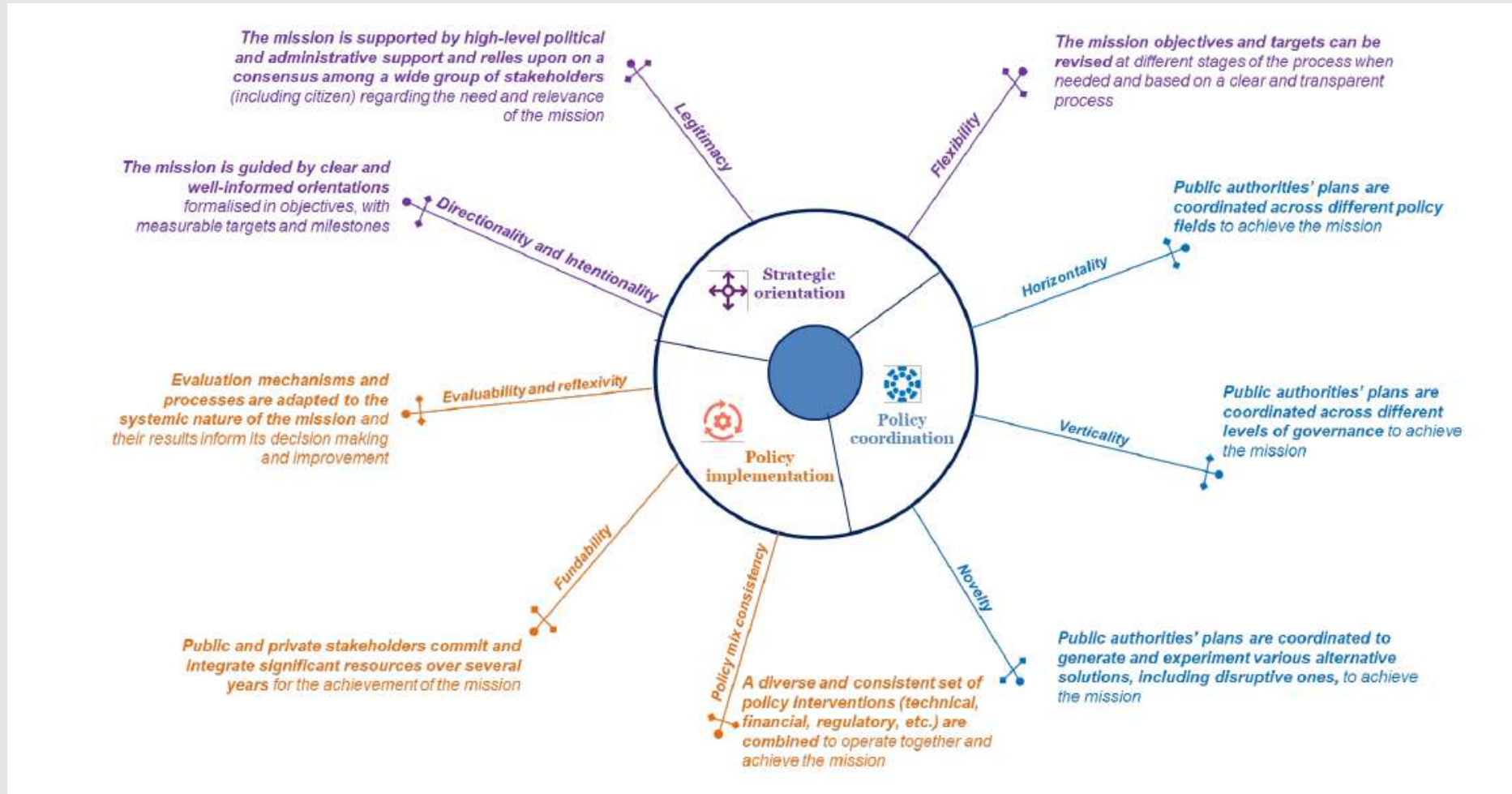
Appendix A: New Zealand Agricultural Greenhouse Gas Research Centre Governance

This is an example of how the leadership of a mission-driven initiative has been structured in New Zealand.

Component	Description
Funders Council	<ul style="list-style-type: none"> • Collective body responsible for appointing Board members and holding them to account, without becoming a 'board above a board'. • Regularly negotiates with the Board to agree strategic objectives and deliverable goals. • Holds the Board accountable for prudent management of funds and delivery against funding agreements. • Funders Council issues the Letter of Expectation setting out targets and expected return for agreed level of investment.
Governance Board	<ul style="list-style-type: none"> • Negotiates the strategy and direction of travel with the Funders Council. • Holds the Director accountable for providing scientific and operational leadership and achieving the agreed goals and research milestones. • Determines risk tolerances, helps to identify key risks and ensure these are being effectively managed.
Advisory Groups	<ul style="list-style-type: none"> • Two distinct Advisory Groups: one to represent the interests of research and ensure excellence in science, and one to represent the interests of industry and ensure science can be rapidly applied for the benefit of end users. • Potential third Maori Advisory Group to recognise obligations under Te Tiriti and ensure a Maori worldview is incorporated in decision-making. • Membership of Advisory groups would comprise 'core' membership which does not change, and flexible additional membership which changes based on the specific science of programmes.

Appendix B: The design principles of mission-oriented policies (OECD)

The following summarises the key characteristics and design principles of mission-oriented policies presented in a recent OECD issues paper¹⁴



¹⁴ <https://www.oecd.org/greengrowth/2022GGSD-IssueNote1-mission-oriented-policies.pdf>

Appendix C: The Value of Crown Research Institutes in Aotearoa New Zealand's Science System Today

From Science New Zealand, published 1 September 2021:

The Value of Crown Research Institutes in Aotearoa New Zealand's Science System Today

<https://sciencenewzealand.org/publications/the-value-of-crown-research-institutes-in-aotearoa-new-zealands-science-system-today/>