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Dear Policy Team

Re: Submission of the Te Ara Paerangi Future Pathways Green Paper 2021 document

The Institute of Geological and Nuclear Sciences Limited (GNS Science) welcomes the opportunity to submit on the Te Ara Paerangi Future Pathways Green Paper. We agree that there is a sector-wide opportunity to improve the outcomes for the people of Aotearoa New Zealand from the work undertaken in Research, Science and Innovation (RSI).

Our view is that the fundamental questions facing the sector are:

1. How do we build an RSI system that improves the wellbeing of all New Zealanders and contributes to a productive, sustainable and inclusive economy?
2. How do we make better, more system-wide and connected decisions on RSI investment priorities and associated funding?
3. How do we make the RSI system responsive to Māori aspirations?

Together, achieving solutions to these questions, along with appropriate levels of funding will ensure an RSI system that will be the envy of other countries. We are confident that research providers will be able to respond to New Zealand's changing needs. At GNS Science we have successfully navigated the switch from support of the petroleum industry to building zero carbon energy alternatives alongside a greater focus on better understanding the evolution of the wider New Zealand environment as the global climate warms. Below we provide specific direction, from our own experience and our experience working with our research partners from more than 40 nations.

1. How do we build an RSI system that improves the wellbeing of all New Zealanders and contributes to a productive, sustainable and inclusive economy?

The Te Ara Paerangi Future Pathways Green Paper is heavily focussed on mission-led research and the need to bring science to the fore in helping all New Zealanders proactively manage their response to societal challenges. GNS Science agrees, but notes that a responsive RSI system should also include critical (or core) function and research, opportunity for innovation and evolution, R&D to support economic development/growth, the opportunity for mātauranga Māori to drive innovation and the need to support rapid response in dealing with specific unforecast events as well as mission-led research:

- Critical (core) function priorities are to provide long-term capability and resilience, data feeds, maintain capability and grow competency in key disciplinary areas – essentially one of the current functions of the CRIs.

- Rapid event response – particularly important for response to geohazards, biosecurity breaches, disease outbreaks (in animal and people) – currently an expectation of CRIs in legislation but without any funding mechanisms.
- Mission-led priorities are likely to be provider agnostic, agile, cross-sector, responsive, and solution focussed – several previous approaches (e.g. Platforms, National Science Challenges) have been tried but with limited success in providing solutions to pressing societal questions/challenges. A much more question specific, time-limited, approach is required.
- Innovation can be fostered through a contestable process with innovation principles at its core. This is fulfilled by Endeavour, Marsden and Callaghan Innovation processes.
- R&D may also be driven by a contestable process with stakeholders and end-users at the core of the process. This is currently split between Endeavour and Callaghan processes.

While each has different priorities; linkages and coordination are vital to ensure they all perform their respective function in a vibrant and connected RSI sector.

2a. How do we make better more system-wide and connected decisions on RSI investment priorities?

Currently, institutional governance is strong in the CRI model but system-wide accountability is lacking. In order to make a significant impact to achieving the government's aims there needs to be major change in how the science and research system is overseen and stewarded, beyond changes to institutions, funding and infrastructure structures.

Transformative change in system governance is required, with a primary focus on the enablement of the world class researchers and organisations that exist in New Zealand. A new dedicated agency, the 'Research, Science and Innovation Commission', is required to provide oversight and leadership to:

- Develop a nationwide science and research strategy
- Ensure research priorities are connected with Māori by recognising and giving effect to Te Tiriti and mātauranga Māori
- Lead government's relationships with the science and research sector, ensuring improved connectivity and coordination.
- Fund science and research organisations according to strategic priorities
- Grow science and research capability
- Oversee science infrastructure, renewal and growth
- Monitor the performance of the science and research sector
- Strengthen and coordinate connections with education and industry
- Advise the Minister on CRIs and sector performance, and on the operational impact of policy.

This proposed agency referred to here as the 'RSI Commission' (RSIC) is positioned in a similar way to the Tertiary Education Commission (TEC) for the tertiary education sector. Success of the new agency will be reliant on access to a diverse range of well-supported, discipline-based, well-governed research providers that maintain and develop fit-for-purpose capability and capacity.

2b. How do we appropriately fund a responsive RSI system?

OECD nations tend to have a good diversity of providers able to respond to government and private funding instruments. New Zealand is similar, with discipline focussed providers (mostly CRIs) that can align resource. Where we differ from other OECD nations is that,

while we have similar numbers of researchers per capita, we spend close to 50% of the OECD average on R&D.

Lifting our national investment in R&D will be important, but so too will ensuring the appropriate funding instruments are in place to support on-going development of the RSI sector and ensuring the ability to respond to specific societal need. Such a funding model should include:

- Base grants to discipline-based research providers to maintain and develop capability, secure and build specific collections and databases and the competencies required to utilise them
- Innovation funds – competitive funds to drive innovation and development in the RSI system
- Mission-specific funds to drive cross sector collaboration to address specific, time-limited, societal questions or need. The mission-specific funds could also be applied responding to specific iwi and Māori needs
- Response funds – to support immediate response of the RSI system to unforecast events rather than taking funds from other work-streams
- R&D specific funding – investment to help utilise research, science and innovation to build resilience in our economy.

Competitive funding is important as it drives innovation, development of 'best team' approach, and strengthening of RSI capability. The current unproductive competition arises from underfunding of other critical underpinning and mission-led research leading to overbidding of the contestable opportunities in an attempt to bridge the gap so that providers can address key societal challenges (mission-led research) and critical underpinning research and development of national research infrastructure.

3. How do we make the RSI system responsive to Māori aspirations?

Through our observations and engagement activities over the years GNS Science has identified opportunities that can be taken to help rectify impediments such as lack of recognition of Te Tiriti, undervaluation of mātauranga Māori and underinvestment in Māori infrastructure faced by iwi / Māori:

- Inclusion of iwi / Māori research priorities are best addressed by a separate process rather than trying to shoehorn a Māori perspective into a western approach. To this end, a separate national Māori Science forum or governance group may help build these priorities from first principles
- Reset the framework for how Māori research is assessed (and by whom), and how it is funded to better recognise Te Ao Māori priorities and aspirations. This process needs to be co-designed with Māori within a framework of Te Tiriti guiding principles
- Any approach needs to be underpinned by the principles of Te Tiriti alongside meaningful engagement. Now is the time to include this in the design of the RSI sector and ensure iwi aspirations and appropriate ways of engaging are core to any system.
- Increasing numbers of researchers of Māori descent and those with understanding of te ao Māori is critical to the day-to-day function of a Māori inclusive system.

GNS Science also notes the submissions of Te Putahitanga - Māori collective response and Te Ara Pūtaiao (pan-CRI Senior Māori Managers) and supports, in principle, the broad tenor of the recommendations in those submissions which are reflected throughout this submission.

GNS Science is happy to continue with the Future Pathways Policy team on any of the concepts discussed in the submission.

Ian Simpson
Chief Executive
GNS Science

Specific responses provided by GNS Science are ordered by Section and Question in the Te Ara Paerangi Future Pathways Green Paper document – there is overlap between sections where questions in different parts of the Te Ara Paerangi Future Pathways Green Paper are seeking to address related and/or overlapping questions/issues:

1. NGA WHAKAAROTUA RANGAHAU: NATIONAL RESEARCH PRIORITIES

Key Topics

Ineffective resource allocation

The RSI system currently lacks a mechanism to work cross-sector at scale. Endeavour Programmes are an exception, where Research Providers generally combine effort into a 'best team' approach to deliver excellent research that generates valuable research outcomes for the people of Aotearoa New Zealand. While this work is fine for investigator-led innovation, it is less responsive to specific mission-led research where societally important questions need to be addressed in a time-sensitive manner. Furthermore, the dependency of research providers on contestable funding for core function makes it difficult to be agile and responsive to changing societal needs. A flexible system that recognises the need to provide for, and succeed at, the distinctive elements of a successful RSI sector in different ways requires:

- Discipline-based critical underpinning research,
- Rapid event response
- Mission-led, best teams and question focussed research
- Innovation research – investigator led contestable, developmental, high risk research
- R&D research – research to support the wider science value chain and economic development
- Mātauranga Māori led innovation.

Lack of transparency over core purpose and accountability

GNS Science agrees that the current RSI system can be relatively opaque and difficult to access from outside. However, the experience of researchers within the system is that a strong network of connections and relationships exist and a 'best team' approach is frequently used to respond to calls for proposals, especially around the research innovation space (Endeavour). International research collaborations are very successful and international researchers seem to have a good line of sight to developing best teams through recognition of research excellence.

The landscape is very challenging with responsibilities outlined in different parts of legislation and no single agency responsible for navigating, building and ensuring high performance of the RSI sector and providing clear advice to government on the success of the RSI sector.

Unnecessary complexity

GNS Science agrees that the research system is fragmented and complex. However, one size does not fit all as the RSI sector needs to provide critical underpinning research, develop agility and capability to support changing mission-led and time limited needs, create space for innovation and research development, and support economic development through R&D research.

The opaqueness to users, including government, can be resolved by creating a central agency responsible for all aspects of the RSI sector and to work with RSI providers to build cross-sector

success and generate outcomes for the people of Aotearoa New Zealand, as required by legislation and as sought by government.

Inability to easily shift priorities over time

GNS Science has recently shifted its priorities and developed a science roadmap that aligns its research effort with key challenges for society within the purview of its statement of core purpose and statement of corporate intent. At GNS Science we have successfully navigated the switch from support to the petroleum industry to building zero carbon energy alternatives alongside a greater focus on better understanding the evolution of the wider New Zealand environment as the global climate warms. So, it is already possible for providers to shift priorities over time but those transitions were made 'despite the system' rather than with support of the system. Arguably, the more difficult part of the transition GNS Science undertook was in aligning the funding to enable such a transition. We would argue that it is the funding mechanism rather than research providers that is less flexible.

Understanding the need for changing mission-led research and/or research sprints should be built into any future RSI system.

Persistent uncertainty over the value of investments

While contestability is an important part of the RSI sector to drive innovation, it is difficult to develop the appropriate long-term capabilities and resources and at appropriate capacity and scale without specific funding to support the discipline-based capabilities. Ensuring a good balance between innovation (contestable), R&D, mission-led and critical underpinning research is vital and having a central agency engaged in helping develop that balance so research providers can perform at their best is also vital.

Mātauranga Māori and Te Tiriti o Waitangi

GNS Science recognises the mismatch in the intent of the principles of Te Tiriti and RSI policies and operationalisation of those principles and policies. Improving positioning of mātauranga Māori and Te Tiriti requires acknowledgment of several points:

- A lack of knowledge in the research sector of what mātauranga Māori means and how to incorporate it meaningfully
- A lack of research investment specific to the needs of iwi / Māori
- Double-tasking of Māori researchers being asked to both specialise in a research field and cultural / engagement work
- An educational pipeline that doesn't respond to the needs of Māori.

In seeking research investment or any funding for research initiatives, a major challenge for Māori and iwi is that Māori aspirations and Māori driven research does not yet have the track record of science excellence. As a result, research proposals that would meet the current high expectations of "science relevance" by showing very strong co-innovation and engagement in order to meet Māori aspirations, may not make the science excellence cut.

Te Tiriti relationship is an essential component of partnership with iwi/Māori. Partnership involves working together with iwi, hapū, whānau, and Māori communities to develop strategies for engaging effectively with the research, science, and innovation system.

To assist with the inclusion of iwi/Māori research priorities, research questions that benefit iwi/Māori, dedicated research funding, inclusion of Te Tiriti principles and strategies, GNS Science

supports the recommendations (5-year plan) proposed in Te Putahitanga's submission which calls for:

- Establishing a co-governed national taskforce to direct the RSI reform agenda;
- Implement co-governance of key oversight entities within the RSI sector;
- Dedicated funding for the establishment of an independent Māori RSI entity and appoint a national body to oversee the strategy;
- Develop and implement Te Tiriti criteria for RSI funding and Te Tiriti outcomes for all research; and
- Establish regional RSI hubs.

Unbalanced investment portfolios

GNS Science agrees with the need to balance investment between critical underpinning research, mission-led research, innovation and the support of R&D. Underinvestment in one at the expense of another will limit the performance of the RSI sector. Balancing short term need with long term development of the sector is vital to ensuring that the sector can develop the innovative solutions required while still underpinned by excellence. Providing rapid response funds is one mechanism to ensure that imbalance is not generated by unforecast events. As is ensuring discipline based research providers are adequately funded to maintain and develop core capabilities and competencies.

Key Question 1: What Principles could be used to determine the scope and focus of research Priorities?

GNS Science recognises the need for an agile National Science Strategy that best supports the RSI sector to respond to changing need. The best impact will be generated by considering all components of research in parallel:

1. Critical underpinning research – providing core data feeds, developing RSI sector capability & capacity and growing long-term competency in the RSI system. These are generally discipline focussed and can also generate long term RSI outcomes. A provider led part of the RSI sector
2. Mission-led research – shorter term (Sprint), provider agnostic, cross-sector, responsive, solution and outcome focussed research designed and built in response to need for specific questions to be resolved or addressed by the RSI sector. A stakeholder / shareholder driven part of the RSI sector.
3. Innovation – this is a fundamental component of the RSI system – this is where cross-sector investigator teams develop new knowledge and scientific understanding. A contestable part of the RSI sector. Contestability drives innovation and responsiveness of the sector.
4. R&D – supporting national economic development through RSI support along the value chain, technological development, IP commercialisation, and industry and commercial sector development.
5. Rapid Response to unforecast events and situations require RSI system support. The potential need could be forecast by critical underpinning work streams, but the timing of need will not.
6. Support for mātauranga Māori – while this will be an important component of all research it will be important to provide an avenue for mātauranga Māori driven research innovation.

Critical underpinning research is best led through discipline based providers with appropriate governance to ensure a responsive RSI sector that has the capabilities and capacity to undertake long term science development and respond to the requirement to innovate and support R&D.

In determining the scope of critical underpinning research – the following principles should be considered:

- Develop core science disciplines required by the long-term National Science Strategy
- Develop capability, capacity and the skillsets required by the National Science Strategy
- Build and maintain national facilities to enable the collection of critical long-term on-going need as well as discipline specific national facilities
- Develop an agile research community able to innovate and respond to mission-led research needs as they evolve
- Build international collaborations to support the wider NZ RSI sector.

Mission-led research is best supported by cross-sector response to the specific societal need. This needs to be directed at the specific question(s) society need solving and draw on sector-wide capability to do so.

In determining the scope of Mission-led research – the following principles should be considered:

- Focussed on resolving specific questions for society, Māori , government
- The work is time-sensitive
- Involve sector-wide collaboration
- Take a 'best teams' approach, including national and international collaboration
- Advance the well-being of wider society.

Innovation (Contestable research) is best supported by a researcher-led contestable process.

In determining the scope of Contestable research – the following principles should be considered:

- Credible and high potential to transform Aotearoa New Zealand's future in areas of value, growth or critical need
- Be focussed on developing excellence in the RSI sector
- Be investigator-led but collaborative across the RSI sector as required by the research need
- Build on and enhance existing capability, including international collaboration
- Include an exploratory or high-risk component (innovation)
- Be responsive to investment signals from Government

R&D research is best supported by a contestable process, but with the stakeholder/end-user driving the proposal process in collaboration with partners from the RSI sector.

In determining the scope of R&D research – the following principles should be considered:

- Credible and high potential to transform Aotearoa New Zealand's future in areas of future value, growth or critical need
- Be focussed on developing the wider science-value-chain
- Be stakeholder-led but involve partners from the RSI sector as required by the research need
- Build on and enhance existing capability
- Include an exploratory or high-risk component (innovation)
- Be responsive to investment signals from Government

Rapid Response research is best supported by a specific fund rather than by expecting individual institutions to redirect funds from other strands of work.

In determining the scope of rapid response research – the following principles should be considered (international exemplars are available such as NSF RAPID and UK urgency funding):

- Response to a transient and unexpected scientific opportunity
- Response to a specific event that requires rapid scientific information to support a societal need
- Addresses community safety – life and economic protection
- Collection of time sensitive data from an event that will be degraded in value if not undertaken promptly
- Response to an international expectation of government.

Mātauranga Māori research funding would provide an opportunity for Māori research aspirations to be directly addressed where they aren't already woven into the above.

Key Question 2: A) What principles should guide a national research Priority-setting process

In order to make a significant impact to achieving the government's aims there needs to be major change in how the RSI sector is overseen and stewarded. Simply changing the current institutional make-up will not have a long term sustainable and agile outcome. It will likely lock in the next set of constraints.

Transformative change in system governance is required, with a primary focus on enabling the world class research, researchers and organisations that exist in Aotearoa New Zealand. A new dedicated agency is required to provide oversight and leadership to:

- Develop a nationwide Research, Science and Innovation (RSI) strategy
- Recognise and give effect to Te Tiriti, ensuring research priorities are connected with Māori
- Lead government's relations with the RSI sector, ensuring improved connectivity and coordination
- Fund RSI organisations according to strategic priorities
- Recognise the need to invest in critical underpinning (discipline based) research, Mission-led Research (sprints), Contestable (innovation development) research, and R&D research.
- Grow national RSI capability and capacity, including early- and mid-career development
- Oversee RSI infrastructure, renewal and growth
- Monitor performance of the science and research sector
- Promote and communicate the importance and contribution of RSI to stakeholders
- Strengthen and coordinate connections between the RSI sector and education and industry sectors
- Advise the Minister on CRIs and sector performance, and on the potential impact of policy.

Such an agency would be similar to the Tertiary Education Commission (TEC) but focussed on the RSI sector – could be referred as the Research, Science and Innovation Commission (RSIC).

Key Question 2: B) How can this process best give effect to Te Tiriti?

Based on our experience over many years of working with iwi/Māori to identify and respond to iwi and Māori aspirations, now is the ideal time to make meaningful change and include Te Tiriti in the RSI sector. GNS Science suggests inclusion of iwi/Māori research priorities in setting National Research priorities, be they critical underpinning, mission led, contestable, or R&D research.

Te Tiriti of Waitangi principles should guide a national research priority-setting process. Te Putahitanga submission sets out suggested principles, subject to consultation with iwi / Māori, that would meaningfully guide the research priority setting. These principles being:

- **Mana motuhake:** Māori iwi/hāpū/whānau/business/independent researchers driven

- **Ōritenga**: Māori and the Crown share decision making in the setting of national research Priorities
- **Kia tū māia - be bold:** The current environment poses complex challenges for Māori now and into the future. Māori need to be bold and design systems that can evolve with these shifts
- **Tātou, tātou**: By Māori for us all
- **Intergenerational:** Mokopuna decisions (sustainable/durable) are based on tūpuna wisdom, including their adaptability and innovation. The needs of existing institutions should not determine how Māori aspirations are identified, engaged with or addressed
- **He rourou:** Transform from a system that is extractive and deficit-focused to one that is generative and ethical.

Furthermore, over the years GNS Science has taken steps towards committing to applying the principles of partnership, participation and active protection in how we partner with iwi / Māori. In their submission Te Ara Pūtaiao suggests that the Crown could strengthen commitments to apply universally to all CRIs such as mandating the application of Te Tiriti in the current legislation (i.e. CRI Act) or any future legislation defining any new structure. This may in turn help drive closer collaboration between CRIs, with shared Te Tiriti values providing the platform to work across institutes.

GNS Science supports, subject to engagement with iwi / Māori, these principles as being the base in setting research priorities. While GNS Science can propose ideas based on our engagement over the years, we recognise that all new proposals and initiatives must be consulted with iwi/Māori, Te Tiriti partner, in an effective and meaningful engagement process.

Key Question 3: How should the strategy for each priority be set and how do we operate and implement them?

A national strategy should recognise the broader role and need for Research Science and Innovation and the requirements for a responsive, resilient and agile RSI sector. This includes:

- The need for clear expectations and lines of responsibility and appropriate governance.
- The need to balance the development of capability (research and research competence, capability and capacity) versus agility and specific time-sensitive research need.
- The need for appropriate research infrastructure to undertake research
- The need for an RSI sector that underpins societal need both long and short term, such as through responding to the UN Sustainable Development Goals and the Treasury Living Standards Framework.

The RSI sector needs high-functioning research providers with appropriate governance, clear direction and appropriate support to ensure they are responding to expectations.

Individual research providers should be tasked with providing critical underpinning research, capability development, capacity building, and developing national infrastructure.

Cross-sector mission-led (sprints) research should adopt a ‘best team’ approach and be contracted to deliver specific research outcomes. Delivery can be governed through an appropriate negotiated contract to whomever is best placed to lead. Each mission or sprint should have an appropriate advisory board.

Innovation and R&D research can be governed by contracts according to investigator or stakeholder led proposals.

The RSI oversight agency – RSI Commission - can provide oversight and leadership for:

- Development of a nationwide Research, Science and Innovation (RSI) strategy
- Recognition and giving effect to Te Tiriti, ensuring research priorities are connected with Māori
- Leadership of the government's relations with the RSI sector, ensuring improved connectivity and coordination
- Funding of RSI organisation according to strategic priorities
- Recognising the need to invest in critical underpinning (discipline based) research, Mission-led Research (sprints), Contestable (innovation development) research, and R&D research.
- Growth in national RSI capability and capacity
- Oversight of RSI infrastructure, renewal and growth
- Monitoring of performance of the science and research sector
- Strengthening and coordination of connections with education and industry
- Advice to the Minister on individual Research Providers and sector performance, and on the potential impact of policy.

2. TE TIRITI, MĀTAURANGA MĀORI AND MĀORI ASPIRATIONS

Key Topics

Governance

How the RSI system is led and governed, including how Priorities and mission are set, will have a significant impact on the inclusion of Mātauranga Māori and Māori aspirations in the system. As outlined in the Te Putahitanga submission, an effective governance group is key to structured engagement and meaningful collaboration with Te Tiriti partners. Early decisions as well as clarity of the decision making process will influence the overall effectiveness of inclusion efforts.

Workforce Planning

Māori scientists are severely under-represented in the publicly funded science sector. Researchers of Māori origin and those with understanding of te ao Māori and work specifically with iwi/Māori are critical in the day to day function of a Māori inclusive RSI system. There must be appropriate support for Māori researcher capability and development, including in the education pipeline, in the implementation of mātauranga and tikanga Māori in an RSI context, and in career development; there is also a need for support of Māori researcher career development in reducing the 'double-tasking' of Māori researchers. Positive examples, such as the Ahunuku Summer Scholarships, Māori graduate scholarships offered through GNS Science and Victoria University can be drawn on as models of possible avenues for that support. Support systems should account for the needs of both Rangatahi researchers entering the RSI as a career path, and generations with experience of te ao and Mātauranga Māori entering the RSI system for the first time.

Vision Mātauranga Policy

A review of the Vision Mātauranga policy should be considered in a reviewed RSI system to ensure it remains fit for purpose. While it should be acknowledged that the VM policy has seen the RSI system become more inclusive of mātauranga Māori, it is likely in need of an update or replacement to address issues made apparent since its implementation (e.g. 'tick-box inclusion').

Key Question 4: How would you like to be engaged?

Note that this question is primarily directed to Māori, rather than CRIs. We note general principles for success in engagement below:

- **Face to Face Engagement**: The experience of GNS Science in engagement with iwi is that face to face interactions convey the value of the engagement to both sides. It creates a more equal field of engagement, allows for greater recognition of tikanga and hui process, and development of trusted interpersonal relationships. These engagements do need to be carried out deliberately and with consideration. For example; covering the costs of visitation, especially when outside of normal work hours, and ensuring appropriate levels of leadership are present improve quality of engagements and relationship building.
- **Formal, tikanga based initial engagement:** Following tikanga hui for formal initial engagements indicates respect for process, people, and an indication of the significance of the engagement to both parties. Encouraging education of tikanga, and framing engagements with Māori through a formal discussion lens provides a meaningful path to collaboration.
- **Strong Organisational Relationships:** Dedicated Māori advisors acting as key knowledge brokers with strong knowledge of te ao Māori and tikanga, who have developed strong, trusted relationships over time with various hapu, have provided excellent guidance to GNS Science in its engagements with Tiriti partners. They have helped to overcome barriers to engagement caused by lack of competency around tikanga and protocol and facilitate the engagement of researchers with appropriate iwi and hapu. However, it should be emphasised that while relationships are made by people, they should be owned by the organisation and entity; to ensure continuity and trust are maintained through turnover and maintained between the discrete engagements of individual research programmes.
- **Recognising Costs:** Meetings and engagements incur transactional, time, and economic costs to both parties, and failure to recognise these can cause relationships to deteriorate. It is important to drive for compensation of costs incurred as a result of engagements that take place outside of work hours or which displace work, in order to maintain a partnered relationship and respect the limited time resources of both parties.

Key Question 5: What are your thoughts on how to enable and protect mātauranga Māori in the research system?

GNS Science supports Te Putahitanga's position that it is vital that mātauranga Māori be enabled and protected in the RSI system. Support comes in various ways mainly with adequate resourcing that enables greater collaboration with iwi, hapū and Māori communities and targeted RSI investment in mātauranga Māori. Through our experience GNS Science notes the following points:

Mātauranga Māori and western science should be considered as equally valid ways of understanding, and used in concert to build cohesive, resilient understanding. A system that promotes science and mātauranga to be used alongside each other, each giving the other mana and resilience, will create an opportunity for both to flourish. Used together, mātauranga Māori and western science enhance one another to empower partnered Te Tiriti outcomes.

It should be considered unusual for research projects to progress without consultation with Māori or consideration of the inclusion of mātauranga Māori. Projects without a mātauranga Māori component should have consulted with appropriate Te Tiriti partners and reached an informed conclusion that its inclusion is not necessary or appropriate, being the exception to a norm of

inclusion. This does require significant cultural support from research organisations but co-designing the RSI system with Te Tiriti partners to enable adoption will reduce barriers as use of Mātauranga becomes normalised.

Key Question 6: What are your thoughts on regionally based Māori knowledge hubs?

The concept of regional knowledge hubs feels like a compelling response. Regional hubs reflect the nature of Mātauranga as regional and granular, but implementation, particularly in scale, leadership, and mandate, would determine their impact and success. Because of regional differences, the nature of knowledge hubs will need adapting from region to region; REAP (Rural Education Activities Programme) may be a plausible model and working with regional council systems may prove beneficial.

Putting into effect regionally based Māori knowledge hubs requires guidance and direction from a governing body such as the mātauranga Māori Commission/Entity recommended by Te Putahitanga. Te Putahitanga's submission recommends that the Commission would sit outside the public service, with autonomous governance and baseline funding. It would provide leadership over mātauranga Māori including Māori knowledge priorities that extend beyond the RSI sector.

3. TE TUKU PUTEA: FUNDING

Key topics

Linking Funding to Priorities

GNS Science agrees that the same dollar is often used for multiple purposes. For example, there is a need for SSIF funding to develop critical capability but also respond to urgent time limited need as is the case for natural hazard events. It will be important to align increased funding with each investment priority.

- Discipline-based critical underpinning research,
- Mission-led 'best teams' question focussed research,
- Innovation Research – investigator led contestable, developmental, high risk research
- R&D Research – research to support the wider science value chain and economic development
- Rapid response funding when faced with an unforecast event
- Mātauranga Māori driven innovation in RSI.

Underfunding in any one area will limit the performance of the RSI sector and lead to excess competition for funding in contestable opportunities as this will become the default opportunity for research providers to maintain critical underpinning research and capability.

Reducing problems of unproductive competition

Competitive funding is important as it drives innovation, development of 'best team' approach, and strengthening of RSI capability. The current unproductive competition arises from underfunding of other critical underpinning and mission-led research leading to overbidding of the contestable opportunities in an attempt to bridge the gap so that providers can address key societal challenges (mission-led research) and critical underpinning research and development of national research infrastructure.

Ensuring Research organisations can adapt to changing priorities

GNS Science agrees that properly funding the investment priorities for Research – Critical underpinning, mission-led, innovation and R&D will ensure a strong focus on delivering those outcomes for the funder rather than having to compete for funds to develop and maintain core capabilities and infrastructure through contestable rounds. The unintended consequence is that mission-led research and innovation do not receive the level of funding intended and hence outcomes are less collaborative and less impactful.

Properly funding things we think are important

GNS Science agrees that properly recognising critical function, infrastructure, the capability development, and collections, data streams, and databases are vital to the success of the RSI sector and vital to ensuring that research providers can respond to time limited and time sensitive needs of research.

Key Question 7: How should we determine what constitutes a core function and how should core functions be funded?

Core function includes any component of research, research capability and infrastructure that supports the long term aspiration of the people of Aotearoa New Zealand. It should account for long term development of scientific understanding pertinent to keeping Kiwis safe and supporting their long term sustainable economic development. Investment in research infrastructure is often a long-term developmental need that precedes or parallels specific mission-led effort.

Core function should also include:

- Developing fundamental understanding of key scientific processes and functions in areas of significant need for Aotearoa New Zealand
- Maintaining National Research Infrastructure, data feeds, instrumentation and monitoring systems
- Focussing on development of important techniques and approaches that will benefit national need
- Developing an agile capability and workforce that can respond to time-limited and mission specific needs as they arise and evolve.
- Maintaining key international partnerships that can be leveraged for greater benefit for the people of Aotearoa New Zealand through international ability to invest in research infrastructure at a greater scale due to greater (quantum and %) investment in RSI.
- Maintaining key partnerships with NZ industry
- Realising the research potential of research collections and databases of national significance
- Building enduring partnerships with iwi/Māori and key stakeholders
- Providing the government with time sensitive advice to manage national risk in all its forms – through appropriate planning, policy development, event response and advice
- Ensuring national availability and access to infrastructure and data streams.

A provider negotiated block grant is the best way to fund core function, such as that provided to tertiary education providers by the Tertiary Education Commission. Using the University sector as an example, more than 40% of funding is provided through block grants. In the RSI sector, the level of the block grant for individual discipline-based research providers may be higher depending on the specific core services provided / required. The block grant will also need to provide for critical infrastructure required to carry out the critical research function.

Key Question 8: Do you think a base grant funding model will improve stability and resilience for research organisations, and how should we go about designing and implementing such a funding model?

GNS Science agrees that base grant funding will improve stability and resilience for research organisations. However, we do not believe a base grant should be made in isolation. Properly funding each function of the science system – critical function, mission-led, innovation and R&D – is vital to a well-functioning and responsive RSI sector. Competing for funding to maintain critical function is counterproductive and cross-subsidisation results in the reduced effectiveness in other parts of the RSI system.

The provision of a critical function will most likely come from a single discipline-based research provider even though mission-led and contestable research may require access to several critical functions. A base grant also recognises that science operation is a critical part of the RSI system alongside research.

We propose that funding requirements for all parts of the RSI need – critical function, mission-led, innovation and R&D should be overseen by a single agency (The RSI Commission – a parallel agency to the Tertiary Education Commission) which can have sight of the cross sector need and better enable an efficient and effective sector-wide response. The same agency can also ensure:

- Development of a nationwide Research, Science and Innovation (RSI) strategy
- Recognition and giving effect to Te Tiriti, ensuring research priorities are connected with Māori
- Leadership of the government's relations with the RSI sector, ensuring improved connectivity and coordination
- Funding of RSI organisation according to strategic priorities
- Recognition of the need to invest in critical underpinning (discipline based) research, Mission-led Research (sprints), Contestable (innovation development) research, and R&D research.
- Growth in national RSI capability and capacity, including early- and mid-career development
- Oversight of RSI infrastructure, renewal and growth
- Monitoring of performance of the science and research sector
- Strengthening and coordination of connections with education and industry
- Advice is given to the Minister on individual Research Providers and sector performance, and on the potential impact of policy

4. NGA HINONGA: INSTITUTIONS

Key Topics

Company Model of Operation for CRIs

GNS Science agrees that there is some ambiguity in the current expectation of CRI performance from government and there is some opportunity to clarify that. However, well governed discipline-based research providers that are held to account should be a fundamental tenet of the RSI system. The company model is not necessarily the challenge here, it is more about clarifying the expectations and requirements of the research providers in the RSI sector – the Companies (Directors Duties) Amendment Bill makes it clear that a company director, in acting the mind and will of the company, can take actions that take into account wider matters other than the financial bottom-line (including

matters such as the principles of Te Tiriti, environmental impacts, good company ethics, being a good employer, and the interests of the wider community).

The tertiary education sector provides a model here. The Tertiary Education Commission acts as the overall steward of the tertiary education sector tasked with delivering the benefits required by government. A similar commission could steward the RSI sector – an "RSI Commission". The RSI Commission would be responsible for the success and impact of the RSI sector for public good and could ensure that core functions of the sector receive appropriate investment and return and key providers generate the outcomes required of the sector. How the individual providers are governed and managed would then be a secondary issue, although it is important to have a strong governance model to ensure the RSI sector has successful and responsive providers with strong alignment to national need.

Unproductive competition and barriers to collaboration across all research organisations

GNS Science agrees that the current model introduces barriers to the sharing of critical infrastructure and capability. An RSI Commission could drive better collaborative outcomes and set expectations around research collaboration and infrastructure sharing. It would be relatively easy for the RSI Commission to incentivise infrastructure and capability development in the national interest.

Transactional stakeholder relationships

GNS Science agrees that the current situation is challenging, often with stakeholders expecting that CRIs should provide research support at no cost. Obviously, this is untenable in any system. Including competitive R&D funding that enables the building of partnerships with stakeholders will be important for ensuring better alignment of research effort with end users and better delivery of research outcomes along the value chain.

Inability to respond to system priorities and lack of adaptability

GNS Science has recently shifted its priorities (from supporting petroleum industry exploration to zero carbon energy alternatives and a better understanding of the link between environmental processes and climate change) and developed a science roadmap that aligns its research effort with key challenges for society within the purview of its statement of core purpose and statement of corporate intent. So, it is possible for providers to shift priorities over time. Arguably, the more difficult part of the transition GNS Science undertook was in aligning the funding to enable such a transition. We would argue that it is the funding mechanism rather than research providers that is less flexible.

Understanding the need for changing mission-led research and/or research sprints should be a core part of the future RSI system.

Lack of coordination for large property and capital investments

GNS Science acknowledges that the RSI sector faces a challenge of underinvestment in buildings infrastructure and no national mechanism exists to invest in research equipment infrastructure, with the exception of some ad hoc investments (for example the RV Tangaroa). That said, it is our experience that through collaborative responses to the Endeavour Programme funding, institutions have not only combined access to research infrastructure but also the skills and capabilities to run the infrastructure and the competencies to interpret analytical approaches.

As introduced above, an RSI Commission could drive better collaborative outcomes and set expectations around research collaboration and infrastructure sharing. It would be relatively easy for the RSI Commission to incentivise infrastructure and capability development in the national interest.

Key Question 9: How do we design collaborative, adaptive and agile research institutions that will serve our current and future needs?

It is important to note that CRIs have been responding to the changing needs of society (e.g. transition from oil and gas sector research to zero carbon energy generation) and that one size will not fit all. It is also important to note that a successful RSI sector requires investment in critical underpinning, mission-led, innovation and R&D research. It also requires the consideration of long-term investment in discipline-based critical underpinning capability and infrastructure and shorter-term investment in agile cross-sector interdisciplinary mission-led research.

What is important in the design of the RSI system is that each area is fully funded and no one area of priority (critical underpinning, mission-led, innovation and R&D) is expected to cross-subsidise another (e.g. for rapid response or mātauranga Māori led initiatives) as that will limit success in other parts of the sector.

An oversight agency such as the RSI Commission can ensure the sector-wide success, building and incentivising collaborative approaches, adapting to changing need and developing agility through its various funding mechanisms. It can also support appropriate investment in the critical infrastructure and underpinning capabilities required, alongside the need for mission-led agility to address specific time limited needs of society. Building and supporting critical national research infrastructure (particularly large scale high-tech research tools) and enabling its availability to the wider sector will provide a significant incentive to sector-wide collaboration.

The RSI Commission can also ensure:

- Development of a nationwide Research, Science and Innovation (RSI) strategy
- Recognition and giving effect to Te Tiriti, ensuring research priorities are connected with Māori
- Leadership of the government's relations with the RSI sector, ensuring improved connectivity and coordination
- Funding of RSI organisation according to strategic priorities and
- Recognising the need to invest in critical underpinning (discipline based) research, Mission-led Research (sprints), Contestable (innovation development) research, and R&D research.
- Growth in national RSI capability and capacity, including early- and mid-career development
- Oversight of RSI infrastructure, renewal and growth
- Monitoring of performance of the science and research sector
- Strengthening and coordination of connections and collaborations with education and industry
- Advice to the Minister on individual Research Providers and sector performance, and on the potential impact of policy.

Key Question 10: How can institutions be designed or incentivised to better support capability, skills and workforce development

Currently, the least well-funded component of CRI agencies is the development of long-term core underpinning capability. An agile, responsive RSI system must be able to draw on a workforce with two qualities; the depth of specialised skill to perform relevant often discipline based inquiry, and the breadth of capability to adjust to new priorities and respond to time limited needs.

Understanding these dual needs should inform frameworks of retraining and the development of flexible skillsets while continuing to provide security in the career-paths of researchers in specific

fields. There would be value in partnering with the education system to develop the skillsets of a flexible workforce in the RSI sector.

GNS Science is also very keen to see a shift from single discipline careers. Incentivising mobility between research providers and cross disciplinary rewarding impact will help. Currently the system incentivises single discipline performance through PBRF style metrics and these incentives are trained into the research workforce through their graduate study and are quite difficult to change when researchers enter the workforce.

Encouraging collaboration through mission-led research funding will help drive cross-sector experience in the workforce and the movement of research staff through access to a critical research infrastructure shared across research providers will also help build a more mobile workforce.

Key Question 11: How should we make decisions on large property and capital investments under a more coordinated approach

Nationally / regionally significant investment decisions could be coordinated by a cross sector agency – the RSI Commission – who are tasked with maximising the national benefit from large scale investment. Ensuring that investments are "national facilities" and built to support the wider sector rather than single institutions will be important – however, discipline based research providers will be required to build, develop and manage critical infrastructure to ensure it delivers the cutting-edge research and sector-wide benefit required. Stand-alone research infrastructure has not delivered the cross-sector benefits expected in other countries but lodging the responsibility with the research provider best placed to develop maximum potential has generated good outcomes, especially where more open access to support mission-led initiatives has been part of the design. Universities are able to use surpluses to fund property and capital investments. The CRI ability to do so is reduced by the requirement to pay tax on surpluses.

The Government may also want to include investment in international collaborative ventures that can benefit Aotearoa New Zealand research goals in this category. Equally, international co-investment in our national facilities may also help with cost effectiveness. Enabling this can be, and in some cases is already being, coordinate by individual CRIs on behalf of the sector – for example GNS Science already hosts GeoDiscovery New Zealand, which is supported by SSIF funding to GNS Science to provide a national membership and engagement in the International Ocean Discovery and International Continental Drilling programmes. A similar approach could also be taken between Industry and the RSI sector.

Key Question 12: How do we design Te Tiriti-enabled institutions?

GNS Science supports recommendations made by both Te Ara Putaiao and Te Putahitanga that the Crown must engage directly with its Te Tiriti partners and support both Māori RSI leadership and Te Tiriti partners to develop a Tiriti-led RSI system. Both submissions recommend that Te Ao Māori leaders engage particularly with Iwi Chairs Forum and other iwi, Māori leaders in the science sector to design a Te Tiriti-led system.

Based on engagement over the years, GNS Science considers ensuring that institutions have a strong understanding of their obligations under Te Tiriti and how they can act to support the Te Tiriti principles (Partnership, Protection, Participation) will provide an informed workforce with greater capability to incorporate Te Tiriti and iwi engagement in its work. This will, at minimum, ensure that the workforce and institutions understand their role in enabling Te Tiriti, and likely provide the foundation for further developing understanding of concepts of tikanga and Mātauranga Māori.

Key Question 13: How do we better support knowledge exchange and impact generation? What should be the role of research organisations in transferring knowledge to operational environments and technologies?

Ensuring that pathways to commercialisation of IP are properly resourced and that projects are supported through post-impact activities are both critical in supporting impact generation.

Impact generation tends to hold a conceptual duality of either enhancing commercial or public good, emphasised in the perceived conflict between the company model of operation and the CRI Act requiring delivery of public good. The recent amendment bill makes it clear that directors can take actions which consider wider matters other than the financial bottom line. Impact should be better understood through a 'weave' model of sectors; research, government, industry, and Māori, and the enhancement of any one of these sectors is likely to lead to the improvement of the others. The current, antagonistic view of commercialisation as a pure monetisation of knowledge does a disservice to the 'weave' by removing the 'industrial' path to impact, and negatively impacts the research sector as a whole in its ability to be commercially self-sustaining.

A common concern raised by industry is difficulty accessing IP from research institutes. The experience at GNS Science is that IP generated from research is often too early in the technology development timeline for businesses to risk investing in. This is likely a case of research projects requiring more time in engagement with end users to ensure the outputs of a research project align with user needs and risk appetites; but this requires more support for post-research impact generating activities.

The role of research institutes in transferring knowledge is in translation of IP into a useable form for anticipated end-users. This denotes a shared responsibility between the research institution that generated the knowledge and the partnered users to meaningfully engage and understand both the form of knowledge, and the needs of the users, to adapt the IP to be useful and deliver impact. Delivering a more effective engagement with the private sector will also incentivise an increase in private sector investment in R&D.

5. TE HUNGA MAHI RANGAHAU: RESEARCH WORKFORCE

Key Topics

Equity, diversity and inclusion

GNS Science agrees that equity, diversity and inclusion are vital to a thriving RSI system and we strive to support that. However, we find that through graduate level training, mentorship can be highly variable and the current level of competitiveness in the RSI system and lack of flexibility in assessing the value of outputs (i.e. a focus on science citation at the exclusion of other values) and outcomes can also be a barrier.

Career precarity for early career researchers

GNS Science researchers have also experienced career uncertainty and precarity. This is often linked to the post-doctoral bottle-neck. Post-doctoral opportunities are severely limited in New Zealand. This means that the opportunities are highly competitive or that early career researchers need to compete for international opportunities – both are barriers to retaining a diverse workforce.

RSI education pipeline

The Te Ara Paerangi Future Pathways Green Paper suggests that significantly more research-related doctoral candidates are coming out of New Zealand Universities than permanent public research

roles available. This is not the experience at GNS Science where we often need to employ internationally trained candidates due to lack of availability or lack of alignment in capability. The current training opportunities in Aotearoa New Zealand are more limited than those available to international graduate students. Aotearoa New Zealand has limited post-doctoral roles which can provide invaluable opportunities for graduate students to develop RSI sector experience which they cannot acquire during their PhD training.

Movement in the Research System

There is relatively little overlap in the science aspects undertaken by each CRI meaning that mobility between CRIs is not common. On the other hand, there seems to be a ready flow of researchers between CRIs and Universities.

Key Question 14: How should we include workforce considerations in the design of research Priorities

GNS Science supports a diverse and inclusive system of research and innovation in Aotearoa New Zealand that will inspire a whole new generation of scientists, researchers, technicians, and innovators through:

- Improving research and innovation culture through promoting greater diversity in the RSI workforce and making research Priorities inspirational, relevant, highly visible, and exciting as a career option (Q1).
- Financially incentivising research organisations who invest in supporting researchers focussed on priority science questions.
- Incentivising diverse teams of early career researchers, mid-career researchers, and senior researchers on priority proposals teams and identify professional development support as standard in assessments of research organisations.
- Building alignment between the research priorities and career opportunities for individuals – who aspire to develop specialist skills and progress to higher levels within the organisation without having to migrate between institutions.

Key Question 15: What impact would a base grant have on the research workforce

GNS Science recommends that critical underpinning research supported by an appropriate funding mechanism should include support for capability and workforce development through:

- Developing core science disciplines required by the long-term National RSI Strategy
- Developing capability, capacity and the skillsets required by the National Science Strategy
- Building and maintaining national facilities to enable the collection of critical long-term on-going needs as well as discipline specific national facilities
- Developing an agile research community able to innovate and respond to mission-led research requires needs as they evolve, contestable research opportunities, and R&D need
- Supporting international collaborations and NZ industry collaborations to support the wider Aotearoa New Zealand RSI sector
- A base grant will provide career opportunities for individuals who aspire to develop specialist skills and progress to higher levels within the organisation without having to migrate between institutions.

This would enable research providers to:

- Help attract and retain a diverse pool of talent
- Support early career researchers through their career progression

- Ensure the scale and models of training meet the requirements of our RSI workforce
- Provide an incubator for home-grown talent that is required to support mission-led priority research areas
- Retain and grow talent in-house.

Key Question 16: How do we design new funding mechanisms that strongly focus on workforce outcomes?

GNS Science supports the adoption of programmes to improve workforce outcomes, particularly in the attraction of early and mid-career researchers and the retention of outstanding researchers. The implementation of workforce outcome focussed programmes should be focussed on the values and outcomes it wishes to support, such as wellbeing, resilience, clear career pathways, and workforce satisfaction. International systems implementing a competitive system with a focus on excellent individuals are often draining for staff to participate in and counterproductive by diverting resources from useful work.

Principles for the design of workforce outcome focussed funding mechanisms:

- Clear intent of desired outcomes includes career stability, attraction and retention, workforce agility and wellbeing.
- Raise the recognition and reward of research technical professionals, addressing skills gaps and retention challenges.
- Financially incentivise research organisations to invest in supporting researchers, Māori researchers, and research careers and assess research organisations on their ability to track and develop a range of career paths for researchers.
- Incentivise the movement of people and ideas across and between sectors and assess research organisations on their ability to track and reward interdisciplinary projects.
- Incentivise leadership and management development in research leaders by setting clear expectations of leadership and management qualities.
- Develop assurance mechanisms in conjunction with existing any new funding mechanisms to ensure the workforce outcomes are met and improves the support and development of researchers.
- Building alignment between the funding mechanisms and career opportunities for individuals who aspire to develop specialists' skills and progress to higher levels within the organisation without having to migrate between institutions.

6. TE HANGA RANGAHAU: RESEARCH INFRASTRUCTURE

GNS Science agrees with the Te Ara Paerangi Future Pathways Green Paper regarding limited access and ineffective financing for national research infrastructure and recommends the establishment of a separate well-financed, long-term, sustainable National Research Infrastructure fund as part of the critical underpinning research support including:

- Developing core science disciplines required by the long-term National Science Strategy
- Developing capability, capacity and the skillsets required by the National Science Strategy
- Building and maintaining national facilities to enable the collection of critical long-term on-going need as well as discipline specific national facilities
- Developing an agile research community able to innovate and respond to mission-led research requires needs as they evolve, contestable research opportunities, and R&D need
- Supporting international collaborations to support the wider NZ RSI sector.

Key Question 17: How do we support sustainable, efficient and enabling investment in research infrastructure?

Cross-sector oversight and leadership from a dedicated agency "The RSI Commission" is required for:

- Development of a nationwide Research, Science and Innovation (RSI) strategy
- Recognition and giving effect to Te Tiriti, ensuring research priorities are connected with Māori
- Leadership of the government's relationship with the RSI sector, ensuring improved connectivity and coordination
- Funding of RSI organisation according to strategic priorities
- Recognising the need to invest in critical underpinning (discipline based) research, Mission-led Research (sprints), Contestable (innovation development) research, and R&D research.
- Growth in national RSI capability and capacity
- Oversight of RSCI infrastructure, renewal and growth
- Monitoring of performance of the science and research sector
- Strengthening and coordination of connections with education and industry
- Advice to the Minister on CRIs and sector performance, and on the potential impact of policy

The RSI Commission could make decisions using principles modelled on those of the Research Infrastructure (NRI) in Australia:

1. Maximises the capability of the research and innovation system to contribute to economic outcomes, national security, social wellbeing and environmental sustainability.
2. Research infrastructure is collaborative and planned in a way to provide a network of capabilities that serve the national interest and are aligned to government priorities.
3. Includes the people, skills and knowledge, data, processes and equipment required to realise the value of the NRI.
4. Resources are focussed to achieve maximum impact in national priority areas.
5. Is managed to deliver maximum impact as efficiently as possible. Synergies with complementary and related capabilities drive an ecosystem of support for researchers.
6. Is widely accessible to researchers and industry across Australia. Barriers to access are as low as practicable.
7. Enhances participation of researchers in, and provides access to, the international research system.

In addition, we acknowledge Mātauranga Māori and the need to incorporate Te Tiriti into our own NRI principles and advocate an additional principle:

8. Supports our collaborations with overseas governments and international funders through strategic bilateral co-operation and multilateral research organisations and networks.

We advocate the government should review and build upon existing national assets. Also, we recommend undertaking to complete a decadal national research priority and infrastructure strategy and investment plan in wide consultation with the research sector, business community, and with Māori.