# An integrated approach to Research, Science and Innovation system property investment

The opportunity in the Wellington region

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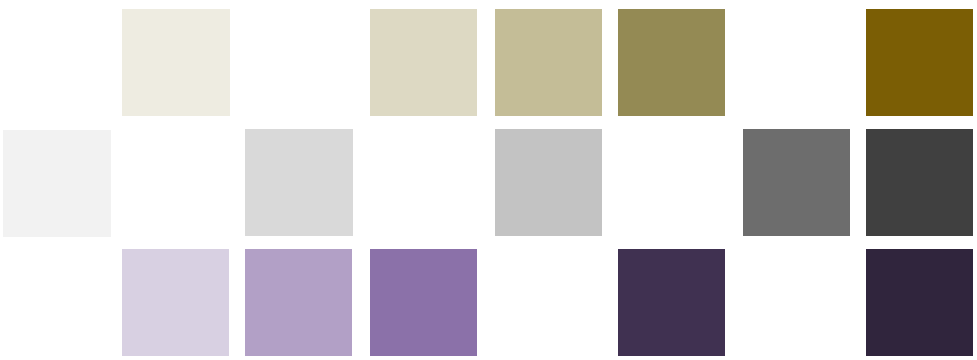


## Contents



## Appendices



## Tables

## Figures

# Executive summary

There is an opportunity for change created by the Research, Science and Innovation system reforms, for the first time in thirty years. This opportunity for change sits firmly within the strategic context set out by Te Pae Kahurangi and Te Ara Paerangi Future Pathways.

On 23 March 2021, shareholding Ministers wrote to the Crown Research Institutes advising them they had asked the Ministry of Business, Innovation, and Employment to engage with Crown Research Institutes about a more integrated approach to capital investment in property. The Ministry of Business, Innovation, and Employment was asked to lead this work and to take a 'Crown perspective' rather than the individual institution's perspective, creating an opportunity to investigate and develop a more integrated approach to Research, Science and Innovation system property investment.

For the Wellington region, which is first-up due to proposed capital investments, this is a once in a generation opportunity to look at the way the region's extensive research and science capability could be strengthened to achieve the goals of the system reforms.

The Research, Science and Innovation systems principles are clear. Identifying for New Zealand's research system to be adaptable for a rapidly changing future, resilient to changes and connected to itself, to industry, to public sector users of research, and internationally. In addition, the system will need to embed Te Tiriti o Waitangi across the design and delivery attributes of the system and enable opportunities for mātauranga Māori. It will also need to recognise that research is a global undertaking and seek to stand alongside the best systems in the world.

The three principles (adaptable, resilient and connected) were used to explore options for a stronger Wellington research community through workshops with nominated research leaders from across the three Crown Research Institutes (GNS Science, ESR and NIWA), Callaghan Innovation, MetService and Victory University of Wellington. Conclusions from the three workshops and subsequent analysis are:

- The current proposals for capital investment provide staff with new facilities, but do not make changes that are expected to deliver material improvements in the Research, Science and Innovation system performance.
- Colocation is important for improving quality of research outputs. Organising on one site would be most advantageous but unlikely due to embedded capital investment in two key locations (Victory University of Wellington in Kelburn and Wellington Regional Hospital in Newtown) and some specific location requirements of some capabilities (e.g., resource consents for emissions).
- The Wellington region needs more than colocation. It also needs institutional mechanisms to ensure increased collaboration between Crown Research Institutes and with universities.
- Crown Research Institutes have been focused on their individual plans rather than on a system view.

Board Chairs and Chief Executives of the Crown Research Institutes need to feel in control of the process going forward. We suggest a process with an independent chair and a joint working group, tasked with development of two to three options for colocation and enhanced collaboration. The process needs to focus on an overall improvement in the excellence and impact of the system while

still meeting the needs of the individual organisations. For example, specific topics such as the need to provide 24/7 services by GNS Science and the MetService need to be addressed, as does the requirements for collections, which occur across most of these organisations and Te Papa.

# 1. A system positioned for future challenges

The Crown wants a Research, Science and Innovation (RSI) system that is positioned to meet future challenges. New Zealand's investment in science and research helps address the most important issues facing the country, and aims for productive, inclusive and sustainable growth. The Government's science investment is built on two key pillars.

- Excellence: Only excellent science will lead to transformative changes to New Zealand's economy, environment, and society.
- Impact: Science research should have a strong link to the eventual 'real world' impact it could have, even if the impact is not clear at the outset and is many years in the future.

The RSI system has a vital role in supporting the delivery of government priorities in all areas to build an inclusive, sustainable and productive future. This includes environmental challenges, transforming the built environment and sectors of our economy, and underpinning our ability to respond to increasing threats to resilience, human health and wellbeing.

Recent reviews have found that the RSI system is not well configured to meet the challenges and opportunities of the future.

## Te Pae Kahurangi recommended better Crown Research Institute coordination and funding model reform

In October 2019, Ministry of Business, Innovation, and Employment (MBIE) commissioned Te Pae Kahurangi, an independent panel, to assess how well Crown Research Institutes are positioned, collectively and respectively, to meet New Zealand's current and future needs.

In summary, the 2020 report (Te Pae Kahurangi, 2020) found that New Zealand's seven CRIs needed better coordination, that the funding model should be reformed, and changes should be extended to the wider science system. The panel made eleven recommendations for where the collective capabilities of CRIs could be better positioned to meet New Zealand's research needs.

## Te Ara Paerangi Future Pathways

Te Ara Paerangi Future Pathways is an MBIE led work programme to establish a connected, adaptable and resilient research system. In 2021, this programme of work began on future pathways for RSI system to consider some aspects of the research system that are not working well (Ministry of Business Innovation & Employment, 2021b). The Cabinet paper highlights issues of fragmentation, role clarity unproductive competition and dislocation from the university system.

> The 'public' research system—those parts funded mainly or owned by Government—is characterised by a significant amount of fragmentation. There is a lack of role clarity for institutions, unproductive competition between institutions, and a lack of integration between our universities, CRIs and other parts of the research system. Individually, our researchers and research organisations continue to produce excellent research. However, the system does not enable a collective contribution to our long-term challenges. We have also seen difficulties in our system adapting to changing national need and building

> capabilities necessary for future transformation and resilience. There is a proliferation of governance, and a large number of competing strategies and priorities which struggle to be given effect…
>
> It is now clear that more fundamental changes are necessary to address connectivity, fragmentation, and responsiveness to priorities…
>
> If we do not address these issues, our current system will not deliver for the future state and meet New Zealand's research needs. The future state for our RSI system needs to be one that is adaptable for the future, resilient to changes and connected; to itself, to industry, to public sector users of research, and internationally.

The Te Ara Paerangi Future Pathways Green Paper 2021 (Ministry of Business Innovation & Employment, 2021a) emphasises the need for compelling change and the need to deliver excellent and impactful research.

> Research, science and innovation will drive New Zealand's future prosperity and well-being. Combined, the public research organisations, including universities, CRIs, Callaghan Innovation, wānanga, te pūkenga, Ministries and other government organisations, represent nearly half of New Zealand's overall RSI investment. These organisations dominate the public good research areas, including environmental monitoring, climate change, public health in terms of food safety, infectious diseases, productivity, biodiversity and biosecurity, water supply and natural hazards.
>
> It is vital the arrangements supporting public research organisations allow researchers to deliver excellent and impactful research, support critical functions, infrastructure and collections, address significant risks to life and well-being, and embody Te Tiriti in action.
>
> Recent reports make a compelling case for change and present various recommendations for a future state.

## 1.1 System reforms create opportunity

There is an opportunity for change created by the RSI system reforms, for the first time in thirty years. This opportunity for change sits firmly within the strategic context set out by Te Pae Kahurangi and Te Ara Paerangi Future Pathways (Ministry of Business Innovation & Employment, 2021a; Te Pae Kahurangi, 2020).

On 23 March 2021, shareholding Ministers wrote to the CRIs advising them they had asked MBIE to engage with CRIs about a more integrated approach to capital investment in property. MBIE was asked to lead this work and to take a 'Crown perspective' rather than the individual institution's perspective, creating an opportunity to investigate and develop a more integrated approach to RSI system property investment.

MBIE is guided by the principles of creating an adaptable, resilient, and connected RSI system. Ideally, MBIE wants to invest where facilities are fit-for-purpose and where, in the event the current user no longer needs the facility (e.g., as scientific methods evolve), it is in an attractive location for alternative research purposes. This adaptability of facilities strengthens institutional resilience and locating facilities where they are adaptable supports more adaptable and resilient researchers. MBIE's initial

objective is to develop and assess a variety of location options for the planned CRI property investments.

Since then, MBIE has been working with the CRIs and Callaghan Innovation to develop an overarching view of the CRI property investment situation in Wellington, Auckland, Christchurch and Dunedin. These four cities were MBIE's initial focus because each CRIs is planning property investments where colocation could be considered.

In May 2021, MBIE engaged Sapere to prepare independent advice on a more integrated approach to RSI property investment. The preliminary report completed in September 2021 set out:

- a summary of the research evidence on the impact of colocation and performance
- sites identified that could support colocation of CRIs, including university campuses
- proposed next steps.

Given the scale of investment proposed for the Wellington region, it was decided to focus on the Wellington region in the first instance. Key organisations are NIWA, ESR, GNS Science, Callaghan Innovation and Victoria University of Wellington (VUW).

This report outlines the opportunity for the research community in the Wellington region, the engagement process with RSI organisations, key findings and proposed next steps.

## 1.2 An opportunity for a stronger Wellington research community

The Wellington region was identified as the first region to focus on due to the three CRIs currently having investment intentions (with approvals not yet complete), to a value of over $400 million, to build new facilities on their existing sites. In addition, universities have plans invest substantial capital in the short term.

As identified above it is vital that investments deliver as much value as possible for New Zealand, from a Crown perspective, for the wider research, science and innovation system and for the individual involved and the strategic context and ministerial direction suggests these investments will need to demonstrate research impact and excellence by reducing the institutional and co-ordination issues identified in by Te Pae Kahurangi and Te Ara Paerangi Future Pathways (Ministry of Business Innovation & Employment, 2021a; Te Pae Kahurangi, 2020).

The proposed capital investments in Wellington need to show more than improved facilities for individual CRIs; the CRI's need to demonstrate how the science system is strengthened by those investments. In short, this is a once in a generation opportunity to coordinate capital works to achieve the goals of system reforms.

This prompted the Minister to consider if there is an opportunity to invest in capital in a way that strengthens New Zealand research, science and innovation system and lays the foundations for a stronger Wellington system that can become a world centre of excellence in several key areas.

## 1.3 Te Ara Paerangi Future Pathways principles used to assess options

Core principles from Te Ara Paerangi Future Pathways (Ministry of Business Innovation & Employment, 2021a) were used to develop and assess system changes.

For this process of developing and assessing changes to the system we have used the core principles from the Te Ara Paerangi Future Pathways report (Ministry of Business Innovation & Employment, 2021a), which describes creating a modern, future-focused research system for New Zealand.

The principles identified for New Zealand's research system are that it needs to be **adaptable** for a rapidly changing future, **resilient** to changes and **connected** to itself, to industry, to public sector users of research, and internationally. In addition, the system will need to **embed Te Tiriti o Waitangi** across the design and delivery attributes of the system and enable opportunities for **mātauranga Māori**. It will also need to recognise that research is a global undertaking and seek to stand alongside the best systems in the world.

We further explore the three principles.

- **Adaptable** – A modern, future-focused research system needs to be able to adapt to a rapidly changing future by building new capabilities and allocating resources to emerging research priorities and ceasing work on areas that are no longer priorities. Locating facilities where they are attractive to alternative uses, and where the researchers within them can be easily redeployed to other priorities, makes the system more adaptable. The barriers to changing what is being worked on are significantly reduced.
- **Resilient** – We note that the term 'resilient' can be used and interpreted widely from a narrow, process-centric, business continuity perspective (the organisations ability to continue operations during unexpected disruption, e.g., cyber-attack, earthquake) to a broad, more strategic business resilience perspective (the organisations ability to absorb and adapt to the changing environment to enable it to deliver its objectives and to survive and prosper, e.g., priority changes, innovation).

  In the context of the Te Ara Paerangi Future Pathways (Ministry of Business Innovation & Employment, 2021a) resilience is primarily used in the broad, more strategic business resilience sense. A modern, future-focused research system needs to be resilient to changes. A resilient system will be able to easily reconfigure to best meet new opportunities and changing demands without incurring significant costs. A future state CRI operating model will ensure CRIs are organisationally and financially resilient, able to plan with confidence, take considered risks in search of innovation and are accountable for their performance.
- **Connected** – A modern, future-focused research system needs to be connected to itself, to industry, to users of research, and internationally. Better connections can drive science to improve research outcomes (excellence and impact). Evidence from research papers we reviewed confirm there are significant benefits from physical proximity of research facilities with universities and/or business sector. Colocation of research facilities provides a

constructive framework for encouraging both intra- and inter-disciplinary collaboration. This collaboration increases the research outputs and improves commercialisation of ideas.

## Te Tiriti o Waitangi and Māori partnerships

A modern, future-focused research system needs to strengthen the role of Māori in the system and consider how the system achieves outcomes for Māori. Te Tiriti o Waitangi needs to be embedded across the RSI system, better enabling mātauranga Māori and the interface between mātauranga and other forms of research.

## Excellence and Impact

Research should aim to achieve the greatest impact beyond the contribution to knowledge and skills in research organisations. Impact can be changes to the economy, society, or the environment. Methods to achieve the greatest impact include facilitating successful knowledge exchange. This occurs because of connections and relationships with research end users.

Research excellence is an important guiding principle that needs to be considered differently depending on the research context (i.e., research priorities need to value different modes of excellence, depending on the field and type of research being undertaken).

It is important for researchers to have access to the research infrastructure they need to operate at the frontier of research; to support excellent, high impact research, increased connections and increased productivity.

# 2. Identifying the Wellington opportunity

As identified above it is vital that investments deliver as much value as possible for New Zealand, from a Crown perspective, for the wider research, science and innovation system and for the individual involved.

As stated, the Wellington region was identified as the first region to focus on due to the three CRIs currently having investment intentions (with approvals not yet complete), to a value of over $400 million, to build new facilities on their existing sites. In addition, universities have plans invest substantial capital in the short term. This is a once in a generation opportunity to coordinate capital works to support the goals of system reforms.

Sapere and MBIE set about identifying whether the strategic context for the research system could be used to improve the returns from proposed CRI investment plans. The way we approached this, given time constraints, was a series of focused workshops with researchers, looking at capabilities and desired proximity. The answer from the workshop is provisional and there is clearly enough evidence to continue the discussion.

## 2.1 Identifying desirable connections

Sapere and MBIE worked with researchers through workshops to identify how connections could be developed, to what effect. To this end, we engaged with researcher leaders identified by CRIs and VUW to develop and explore options for capital investment. The purpose of this process was to consider, from the Crown's perspective, how to connect public research, science and innovation capabilities, in the Wellington region, to deliver as much value as possible for the wider RSI system and New Zealand for the next 50 plus years. The workshop process was supported by Steve Maharey, as an independent facilitator.

In the following sections we outline the opportunity, engagement process, key findings and proposed next steps.

## 2.2 Setting out a vision for Wellington research and science

Overall, the workshop process identified that there are significant benefits from a strengthened Wellington research and science ecosystem based around identified regional strengths. Stronger connections in these areas of strength will ensure:

- Wellington is recognised internationally as a centre of research excellence that will attract the highest quality international talent and investment in its science.
- We have created a science neighbourhood that will enable and facilitate effective partnerships between institutions and that maximises the value of the science to New Zealand.
- We enhance the value of our science and achieve excellence through fully utilising the density and critical mass of the capability within the Wellington region.

- Investment in the infrastructure and platforms to support these areas of strength are coordinated in a way that benefits all.
- There will be greater depth of partnerships between the science community within Wellington and key stakeholders such as Government, Māori, the business sector and community organisations.

This vision aligns with the direction signalled in the Te Ara Paerangi Future Pathways (Ministry of Business Innovation & Employment, 2021a) and there are opportunities to further embed Te Tiriti o Waitangi and mātauranga Māori into the Wellington research ecosystem.

## 2.3 A positive engagement process

The aim of the engagement process, with relevant RSI organisations, was to inform a perspective for the Minister to consider in MBIE policy advice. Organisations involved in this process were NIWA, ESR, GNS Science, Callaghan Innovation, VUW and MetService. Three workshops were held over a four-week period (14 February to 9 March 2022) with research leaders nominated by each organisation. A parallel a series of three meetings with Board Chairs and Chief Executives were held to keep them informed of the process and findings. More detail on the workshop process and a list of participants is available in 4.4Appendix A.

The timetable was compressed, and the last meeting held online due to COVID-19 concerns. There was no Māori research leader representation.

The workshops attended by research leaders were positive and participants were actively engaged. The discussions highlighted opportunities, costs of dislocation of current plans, as well as several constraints. Meetings with Board Chairs and Chief Executives were less positive, with them seeking more evidence for them to adjust their positions given their current commitments to individual CRI capital plans.

## 2.4 Eight areas of strengths were identified

The first workshop identified capabilities and areas of strength. The second identified optimal connections.

Eight areas of strength were identified by the workshop participants.

- Climate resilience and adaptation
- Natural hazards
- Ecosystem health, conservation and natural resources
- Advance manufacturing
- Materials science
- Energy futures
- Biotechnology
- Public health and wellbeing

Cross-cutting capabilities were also identified including data and modelling, mātauranga Māori and policy and economics.

At the second workshop optimal connections between areas of strength were identified. Table 1 shows that 'same campus' connections between most areas of strength were seen as optimal. In short, tables representing researchers organised by research theme identified they wanted most of the capabilities on offer or would need to locally duplicate many of them.

Table 1 Research leaders' desired connections between area of strength

Key: Same campus / Another campus

| | Natural hazards | Ecosystem health, conservation & natural resources | Advanced manufacturing | Materials science | Energy futures | Biotechnology | Public health & wellbeing | Mātauranga Māori | Data and modelling | Policy and economics |
|---|---|---|---|---|---|---|---|---|---|---|
| **Climate resilience & adaptation** | Same | Another | Same | Same | Same | Same | Another | Same | Same | Another |
| **Natural hazards** | | Same | Another | Another | Same | Same | Same | Same | Same | Same |
| **Ecosystem health, conservation & natural resources** | | | Another | Same | Same | Same | Same | Another | Same | Another |
| **Advanced manufacturing** | | | | Same | Same | Same | Same | Same | Same | Another |
| **Materials science** | | | | | Same | Same | Same | Another | Same | Another |
| **Energy futures** | | | | | | Same | Same | Same | Same | Same |
| **Biotechnology** | | | | | | | Same | Same | Same | Another |
| **Public health & wellbeing** | | | | | | | | Same | Same | Same |
| **Mātauranga Māori** | | | | | | | | | Same | Same |
| **Data and modelling** | | | | | | | | | | Another |

## 2.5 Three 'clusters' emerged

Information gathered in the first two workshops on areas of strength and optimal connections saw three higher-level clusters emerge that could be compelling for the Government to invest in (Table 2). There may be other inter-relationships between clusters, but workshop participants felt that the following three clusters were the strongest, thematically. The first cluster focused climate change and resilience, the second on materials science, energy and biomedical, and the third on public health and wellbeing. The cross-cutting capabilities would need to interact with all three clusters.

Table 2 Areas of strength grouped into three clusters

| Clusters | Areas of strength |
|---|---|
| Cluster 1 | • Climate resilience & adaptation<br>• Natural hazards<br>• Ecosystem health, conservation & natural resources |
| Cluster 2 | • Advanced manufacturing<br>• Materials science<br>• Energy futures<br>• Biomedical (adjusted from biotechnology) |
| Cluster 3 | • Public health & wellbeing |
| Cross-cutting capabilities (above clusters have connections to these) | Including<br>• Data and modelling<br>• Mātauranga Māori<br>• Policy & economics |

## 2.6 Six geographic options

While the first two workshops focused on capabilities and how to group them, the third workshop focused on practical, geographic locations. Six options were developed based on the following considerations:

- clustering and optimal connections identified in the first two workshops
- known location options that have the potential to create a centre of gravity
- evidence from literature on the benefits of colocation for improving collaboration and research outputs
- evidence from international experience that often locates research facilities on university campuses.

These options were measured against the Te Ara Paerangi Future Pathways (Ministry of Business Innovation & Employment, 2021a) core principles that a modern, future-focused research system for New Zealand needs to be adaptable, resilient and connected.

Table 3 outlines the six options. Options A and B are the proposed, current intentions, or a version of them focused on other forms of collaboration other than colocation. Option F tested having everything on one site, in Kelburn. Other options utilised a mix of Kelburn and Gracefield with consideration of a health 'corridor' from Kelburn through to Newtown.

Table 3 Options, clusters and locations

| | | | | |
|---|---|---|---|---|
| **Option A Six locations – Current intentions** | • ESR at Kenepuru<br>• NIWA at Greta Point<br>• GNS Science and Callaghan Innovation at Gracefield (different sites)<br>• VUW and MetService at Kelburn (different sites) | | | |
| **Option B Six locations – Current intentions with 'open up' facilities** | • ESR at Kenepuru<br>• NIWA at Greta Point<br>• GNS Science and Callaghan Innovation at Gracefield (different sites)<br>• VUW and MetService at Kelburn (different sites)<br>With entities designing new facilities that 'open up' access and connections with other research institutions. | | | |
| **Four further options that consider colocating cluster of capabilities** | | | | |
| | **Cluster 1**<br>• Climate resilience & adaptation<br>• Natural hazard<br>• Ecosystem health, conservation & natural resources | **Cluster 2**<br>• Advanced manufacturing<br>• Materials sciences<br>• Energy futures<br>• Biomedical | **Cluster 3**<br>• Public health & wellbeing | **Cross-cutting capabilities**[1]<br>• Data and modelling<br>• Mātauranga Māori<br>• Policy & economics<br>• Stakeholder engagement |
| **Option C Three locations** | VUW Kelburn | Gracefield | Newtown/ Kelburn/CBD corridor | Cross-cutting capabilities could be distributed or have locations considered later. |
| **Option D Two locations** | VUW Kelburn | Gracefield | VUW Kelburn | |
| **Option E Two locations (only public health and wellbeing separate)** | VUW Kelburn | VUW Kelburn | Newtown/ Kelburn/CBD corridor | |
| **Option F One location** | VUW Kelburn | VUW Kelburn | VUW Kelburn | |

[1] For all options access to some, or all, of the cross-cutting capabilities is required. These capabilities could be distributed with the clusters or have separate locations considered later.

As with any options development there is likely to be other potential options that have not been identified.

A seventh option was provided by VUW after the workshop process had finished. This option is based around Gracefield becoming a Net-Zero Carbon Technology and Innovation Hub, Greta Point becoming a marine precinct with an expanded focus on marine technologies and the blue economy, and Wellington City/Kelburn becoming a more multi-dimensional hub. This option suggests to us that VUW puts a very high value on integrating its research capabilities with those of CRIs.

### 2.6.1 Some additional specialist research locations required

Several constraints were identified in the workshops, but not many. Additional specialist research locations are required if not met by the preferred option.

- Research vessel berthing and localised warehousing and a Marine Science Centre at Greta Point (or provided with seawater on-site or activities shifted out of Wellington to other seawater sites).
- GlycoSyn and support for industrial processes (and any other scale up activity) at Gracefield where the required resource consents are.
- Some capability may be co-located with MPI's PC3+ lab at Wallaceville.
- The location (and role) of 'collections' needs to be considered, including those held by other research organisations such as Te Papa.

Some other constraints were identified that relate to specific issues around facilities design and configuration of specialist facilities.

#### Research leaders' assessment was inconclusive

The overall aim of the third workshop was to consider each option and assess to what extent the option delivers on various components of the vision and lifts the performance (excellence and impact) of the RSI system. The options were discussed and assessed in an online workshop. For each of the three criteria the options were ranked on how well the delivered on the criteria.

- Adaptable – *How easy is it to redeploy the people and facilities to different research purposes?*
- Resilient – *How attractive are the facilities to alternative research or service lab activities?*
- Connected – *How connected are the researchers and organisations that need to be?*

For the adaptability and resilience criteria there was no clear ranking consensus for the options. While, for the connectivity criteria there was consensus that as the number of sites reduced connectivity increased (i.e., Option F one location was ranked the best option for connectivity and Options A and B were ranked as the most unconnected options).

For the purpose running this process in a short format workshop environment the criteria for assessing the option were kept at a high level. We recognise there are advantages and disadvantages of using either higher-level principles or more granular principles. However, the need to look at this from a system perspective strongly suggested system level principles were the right ones, rather than more tactical organisation considerations.

#### Some strong areas of agreement

As stated, no clear consensus was reached among the research leaders participating for one option that performed the best when assessed during this process. However, there was consensus on the following.

- There is need and opportunity to deliver more from the RSI system within the Wellington region.

- The process has given an opportunity to rethink, and more thinking about maximising opportunities needs to be done.
- That alongside capital investment for any option is the need to ensure that the wider system can support the vision and objectives—the link to Te Ara Paerangi Future Pathways (Ministry of Business Innovation & Employment, 2021a) is particularly important.
- Colocation is part of the picture but there also needs to be investment in people and culture to get the full benefits that support aspects of integration.
- While there are several possibilities, what is possible depends on the investment envelope.

### A need for clarity in other areas

Research leaders were less clear about the following.

- The extent that various colocation options deliver on the vision and criteria.
- How many locations and what configuration of locations delivers the optimal outcome.
- The adaptability criteria and resilience criteria were harder to assess than the connectivity criteria.
- There is a tension between connectivity and resilience (if focusing on resilience to natural hazards). However, there was also some divergence of views over other aspects of resilience.
- The extent of impact from breaking existing links versus benefits of creating new links.

## 2.7 The public health and wellbeing cluster

There were positive discussions exploring the opportunities for the public health and wellbeing cluster given the changing environment of the health system reforms. During this process additional meetings were held with the University of Otago, Massey University, VUW and ESR to discuss health capabilities in the Wellington region. These discussions were positive and focused on the idea of institutions collaboratively engaging their capabilities to form a public health and wellbeing corridor from Wellington Regional Hospital (Newtown), through Massey University (Mount Cook campus) to VUW (Te Aro and Kelburn campuses), to government health partners (e.g., Ministry of Health, ACC, Pharmac) in Wellington's CBD.

The Ministry of Health and interim new health organisations (Health New Zealand, Public Health Agency and Māori Health Authority) met to discuss within the new health system how public health and laboratories will be organised. It was signalled that future investment will need to be supported by a thorough analysis of all location options.

# 3. Analysis shows overlaps and duplication

In our previous review of the CRI business cases, we identified there was close consideration of integration and efficiencies with individual CRIs but not between CRIs, therefore meaning overall research and science benefits might not be achieved. We highlighted the major points in the literature. CRIs noted this literature was, in some instances, relatively old. However, other literature or evidence has not been provided.

Subsequently, we have taken the outputs from the workshop and used network maps to document capabilities and preferred connections. Network maps showing the current investment intentions have duplication and do not provide optimal connections identified.

## 3.1 Recapping the literature

Previously, our review of research papers on the effects of colocation on research and innovation collaboration and quality of research outputs led us to the following conclusions.

- Colocation of researchers improves the quality of research outputs and/or commercialisation of ideas.
- Geographic proximity lowers the costs (both search and execution costs) of collaborating, and thus increase the returns to the collaboration.
- Physical proximity plays a critical role in predicting the impact (both intensity and quality) of scientific research from research laboratories.
    - Intensity of co-publication is significantly higher when researchers are in immediate proximity (40 times higher within laboratories than between laboratories in the same town).
    - Colocated laboratories were around 1.4 times more likely to produce a research paper in the highest quartile of citation distribution.
- After colocation, laboratories are more likely to pursue both lower-quality projects (more marginal ideas being developed) and high-quality projects (research teams apply more effort and improve the quality of their projects).
- The greatest positive effects occur for researchers and firms undertaking similar activities but there is also evidence of positive interdisciplinary spill overs between researchers in different academic fields or commercial sectors.
- University science park colocation impacts positively on research productivity and firm-level patenting research (estimated at around 0.6 compared to around 0.3 for those not colocated on a park).
- Geographic distance significantly decreases the probability of generating and obtaining joint patents.

CRIs have pointed out there are possible disbenefits from colocation at times, such as, the separation of science research from science delivery. There is no easy answer and as the options indicate there are several ways that capabilities can be organised, on one or more sites.

## 3.2 Network maps

We investigated the layers of connections identified in the first and second workshops. Network maps were developed from the outputs of the workshops to visualise how the optimal connections identified by the research leaders are impacted by the way each option co-locates strengths and clusters at various locations.

A network map for each option is presented below. Note that the network maps *are shown in the inverse*, that is, **more lines represent less connections being met and more duplication or separation of functions across multiple sites.** Fewer lines are likely preferable, because this represents more optimal connections (same campus) connections being met and less duplication or separation of functions across multiple sites. In general, as the number of locations decreases so does the number of unmet optimal connections and amount of duplication or separation of functions.

- Gold lines show where optimal connections (same campus) are **not met.**
- Purple lines show where a function is **duplicated or separated across multiple sites**.

One location is clearly the best option

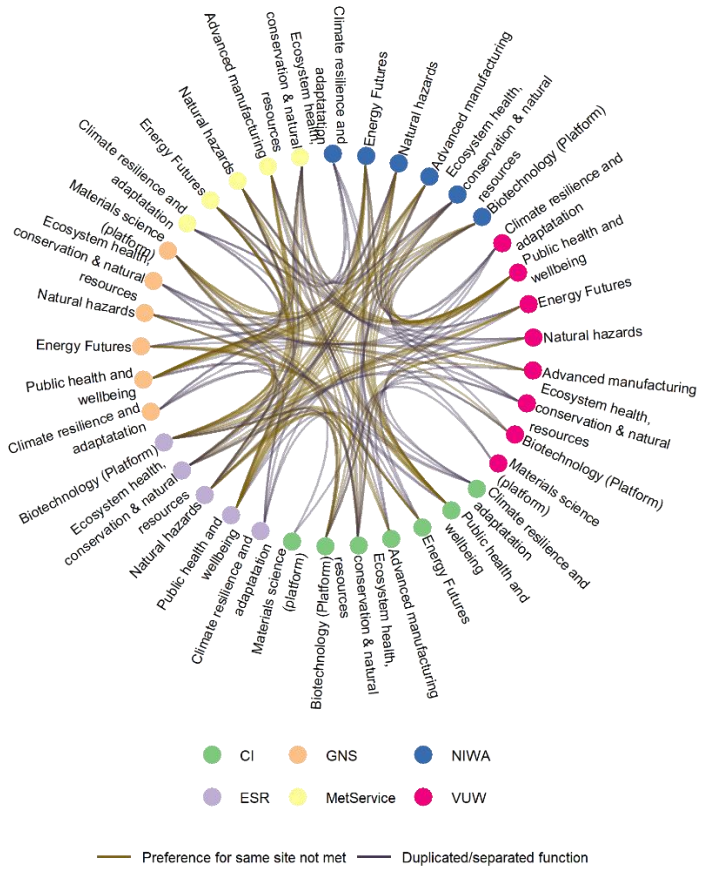
Figure 1 shows Option F One location (VUW Kelburn). This is the only option where all optimal connections are met (no gold lines) and no duplication or separation of functions across sites occurs (no purple lines).

Figure 1 Option F One location

## Many additional connections will be needed if current intentions across six locations are pursued

Figure 2 shows Option A Six locations – current intentions (Option B Six locations – current intentions with 'open up' facilities would produce the same network map as Option A). These options produce numerous gold and purple lines indicating that many optimal connections are not met and that many functions are duplicated or separated across the different locations.

Figure 2 Option A Six locations – current intentions (and Option B Six locations – current intentions with 'open up' facilities)




## Variable performance by other options

In general, as the number of locations is reduced so is the number of unmet optimal connections (gold lines) and amount of duplication or separation of functions (purple lines).

Figure 3 shows Option C Three locations compared to Figure 2 showing Option A and B (Six locations – Current intentions and Current intentions with 'open up' facilities) there are significantly fewer unmet optimal connections and there is no duplication or separate of functions across different locations.

Figure 3 Option C Three locations

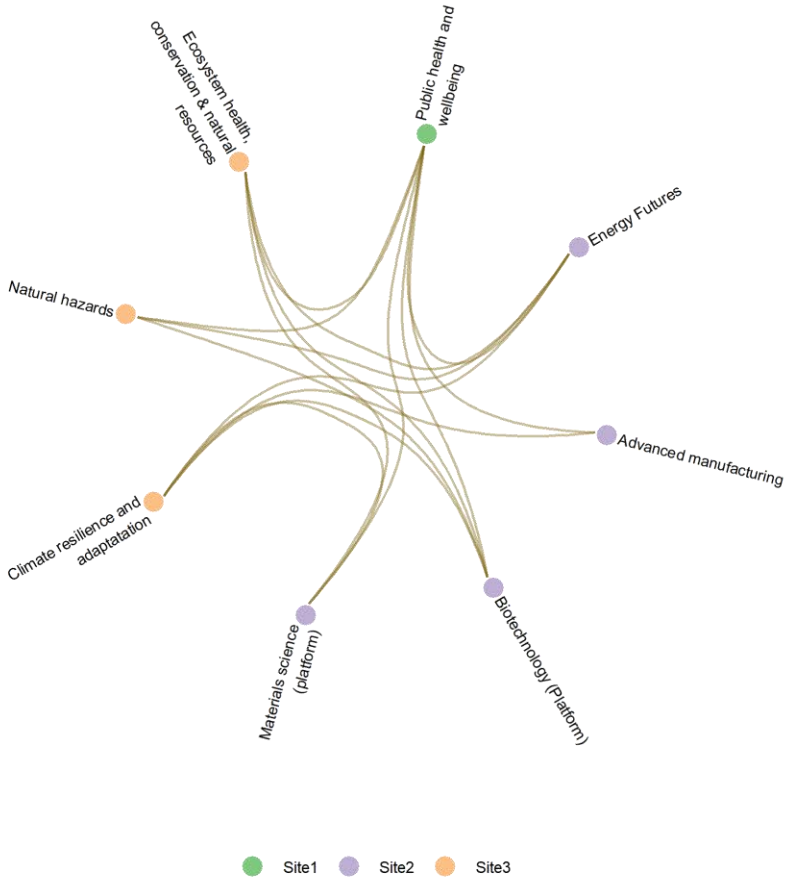



Figure 4 shows Option D Two locations where functions are split evenly between the two locations while Figure 5 shows Option E Two locations where one function (public health and wellbeing) is separated (at a second location) from the other functions. These figures illustrate how the number and combination of functions co-located can significantly change the number of additional connections that will need to be made. That is, Option E (Figure 5) results in fewer additional connections needing to be made than Option D (Figure 4).

Figure 4 Option D Two locations

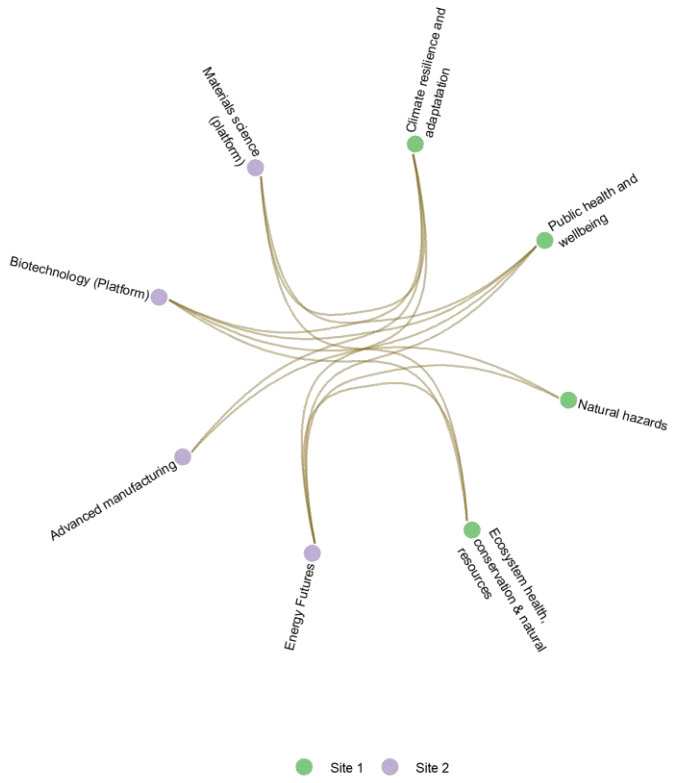
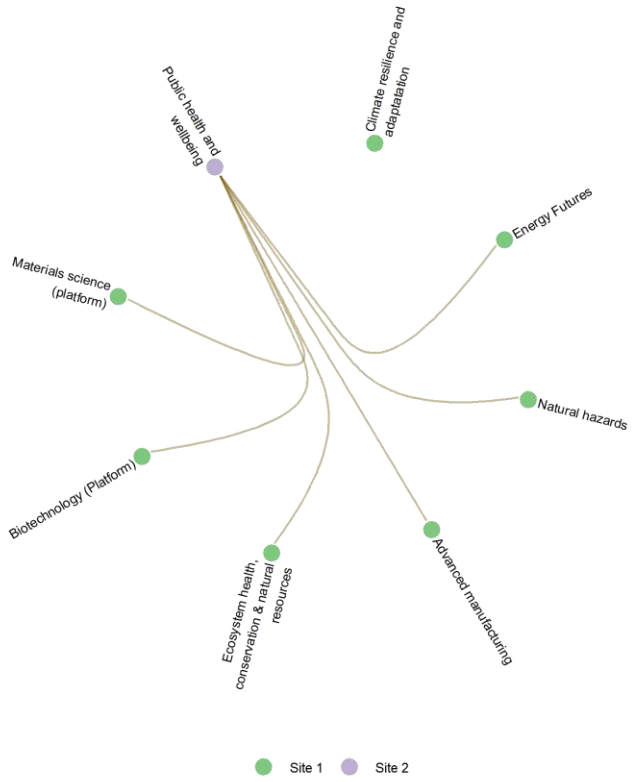



Figure 5 Option E Two locations (only public health and wellbeing separated)



# 4. Key findings and a way forward

This section summarises the key findings from this process, suggest a way forward, and pitfalls to avoid.

The workshop process has highlighted the current intentions for property investment are not likely to deliver more in the future than they currently do now. There is an opportunity now to adopt Te Ara Paerangi Future Pathways focused approach that is more likely to offer a better whole of science system result. Given the CRIs' commitment to their current intentions, this will need strong leadership and a robust process.

## 4.1 Key findings

### The timing is right to consider the opportunity for change

With a process for reforming the current RSI system underway and the Crown's desire for a more integrated approach to RSI property investment the time is right to consider the opportunity for change. This is particularly so in the Wellington region where the three CRIs currently have investment intentions (approvals not yet complete), to the value of over $400 million, to build new facilities on their existing sites.

### This process shows there is a case for change and provides a direction of travel

This process has initiated engagement, confirmed there is a case for change and an opportunity to strengthen the RSI system in the Wellington region and established a direction of travel. Research leaders were positive about having the chance to consider the opportunity and they provided useful insights during the process. A vision of a strengthened Wellington research and science ecosystem based around identified regional strengths was identified. Stronger connections in these areas of strength will ensure international recognition attracts investment and talent, effective partnerships are facilitated, the value of science achieved is enhanced, investment in infrastructure benefits all and greater partnership with end-users. This vision aligns with the direction signalled in Te Ara Paerangi Future Pathways.

### Evidence on colocation suggest quality improves

Evidence from the literature reviewed confirms that colocation of researchers improves research quality and reduces costs. Our network analysis of the workshop outputs shows that, in general, as the number colocated strengths is increased the number of unmet optimal connections and duplication or separation of functions across multiple sites is decreased.

## 4.2 Further work is needed to fully realise what can be achieved

With this process being completed in a relatively short time frame there has not been enough time to fully consider divergent views. Therefore, further work is still needed to develop the optimal configuration for the Wellington region.

During this process the following areas were identified as needing further consideration.

- Embedding Te Tiriti o Waitangi and mātauranga Māori into the Wellington research ecosystem.
- Assessment of the extent that various colocation options deliver on the vision and criteria.
- How many locations and what configuration of locations delivers the optimal outcome.
- The extent of impact from breaking existing links and benefits of creating new links.
- Inter-relationships between clusters in different locations (e.g., public health and wellbeing and biomedical).
- Requirements and possible locations for research collections as well as collections for other organisations (e.g., Te Papa).
- Requirements for 24/7 emergency centres (e.g., MetService and GNS Science).

## 4.3 Collaboration and colocation

CRIs need to come together to find their own way through issues relating to collaboration and colocation. There are clear examples where colocation has not yielded expected benefits and where an MBIE directive is unlikely to be successful. There is little point in, for instance, NIWA building in Kelburn the same building that it would build at Greta Point. Any process needs to bring forward benefits of institutional collaboration as well as providing colocation.

A study by (Irving et al., 2020) on collaboration, physical proximity and serendipity suggests that although physical proximity between employees can facilitate collaboration in some circumstances, employees may also try to avoid collaborating in collaborative buildings. Four strategies that employees adopted to avoid developing new collaborations were identified.

1. Focusing on existing collaborations.
2. Reinforcing boundaries between groups.
3. Enacting legacy policies.
4. Minimising social interactions.

The study also points to the differences between professional groups, namely scientists and managers, in terms of the reasons inhibiting new collaboration. Time constraints are the main reason why managers focus on existing collaborations, while scientists raised the need to build long-term trust with disciplinary experts.

This study suggests that a combination of organisational efforts and individual openness is required to promote serendipitous encounters and collaboration between organisations.

In addition to colocated facilities, there needs to be some institutional mechanisms to ensure increased collaboration and that the benefits and disbenefits of colocation are appropriately and consistently measured. For example:

- What is the trade-off between breaking existing links between capabilities/functions and continuing to duplicate capabilities/functions across organisations?
- What opportunity is there with colocation to decrease footprints and costs through shared common facilities?

## 4.4 A way forward

The work to date is proof of concept. The next stage of work needs to be organised differently to closely integrate MBIE, as sector steward, with CRIs and universities and to bring a strong RSI system perspective.

MBIE would provide a secretariat role defining what needs to be done and ensuring that an RSI system view of joining areas of strengths without being constrained by organisational boundaries. At this point, two or three options need to be identified and taken forward into an indicative business case and site concept plans, with a strong expression of how a Wellington region research and science vision will be achieved.

To this end, our recommendations are to:

- appoint a Chair to run the process, with a small board (with a strong RSI system perspective) including the Prime Minister's Chief Science Advisor
- ensure there is a treaty partnership operating, at governance level
- appoint a working group from CRIs, universities and other research organisations that will work to the Chair
- fund the project team, from MBIE.

# References

Irving, G. L., Ayoko, O. B., & Ashkanasy, N. M. (2020). Collaboration, Physical Proximity and Serendipitous Encounters: Avoiding collaboration in a collaborative building. *Organization Studies*, *41*(8), 1123–1146. https://doi.org/10.1177/0170840619856913

Ministry of Business Innovation & Employment. (2021a). *Te ara paerangi future pathways green paper 2021*.

Ministry of Business Innovation & Employment. (2021b). *Cabinet paper: Future Pathways for the Research, Science and Innovation System; and Future Pathways for the Research, Science and Innovation System: Release of discussion document*.

Te Pae Kahurangi. (2020). *Positioning Crown Research Institutes to collectively and respectively meet New Zealand's current and future needs*.

# Appendix A The process

MBIE engaged Sapere to prepare independent advice on a more integrated approach to RSI System Property investment. The Sapere Preliminary Report set out:

- a summary of the research evidence on the impact of colocation on lab performance
- the sites identified that could support co-location of CRIs, including sites on university campuses
- proposed next steps.

Given the scale of investment proposed for the Wellington region, it was decided that this work will focus on Wellington in the first instance. Key organisations are NIWA, ESR, GNS Science, Callaghan Innovation and VUW.

This report outlines the opportunity for the research community in the Wellington region, the engagement process with RSI organisations, key findings and proposed next steps.

MBIE engaged Steve Maharey to facilitate the engagement process with relevant RSI organisations and to provide a perspective for Ministers to consider alongside Sapere's final report and MBIE advice.

A series of meetings with Board Chairs and Chief Executives and workshops with research leaders were held. The three workshops were held over a four-week period (14 February to 9 March 2022).

Table 4 Timeline of meetings and workshops

| Date | Event |
|---|---|
| 20 December 2021 | Chairs, CEs, Chancellor's meeting 1 |
| 14 February 2022 | Research Leaders Workshop 1 |
| 16 February 2022 | Chairs, CEs, Chancellor's meeting 2 |
| 21 February 2022 | Research Leaders Workshop 2 |
| 9 March 2022 | Research Leaders Workshop 3 |
| 18 March 2022 | Chairs, CEs, Chancellor's meeting 3 |
| 31 March 2022 | Sapere report and Steve Maharey's letter due |
| Late April 2022 | MBIE advice to Ministers |

The three workshops with research leaders were held over a four-week period (14 February to 9 March 2022).

Workshop 1 focused on grouping the regions capabilities into key themes and platforms.

Workshop 2 focused on identifying the connections between the themes, platforms and capabilities identified in Workshop 1 and identifying location related requirements and constraints for specific capabilities.

Workshop 3 focused on presenting back the process and ranking potential options against the vision components and high-level criteria (connectivity, adaptability, resilience).

## Workshop participants

Thirty-one research leaders from seven organisations participated in the process. The last workshop was held online with reduced numbers due to COVID-19 concerns.

Table 5 Participants at research leaders' workshops

| Name | Organisation | Workshop 1 | Workshop 2 | Workshop 3 (virtual) |
|---|---|---|---|---|
| Juliet Gerrard | Prime Minister's Chief Science Advisor | Y | | Y |
| Rob Murdoch | NIWA | Y | Y | Y |
| Helen Neil | NIWA | Y | Y | Y |
| Geoff Baird | NIWA | | Y | |
| Alex Thompson | NIWA | Y | Y | |
| Jill Vintiner | ESR | Y | Y | |
| Sue Huang | ESR | Y | | |
| Joanne Hewitt | ESR | Y | | Y |
| Sarah Jefferies | ESR | | Y | Y |
| Mehnaz Adnan | ESR | Y | | |
| Andrea Bubendorfer | Callaghan Innovation | Y | Y | Y |
| Cliff Hastings | Callaghan Innovation | Y | Y | Y |
| Paul Rose | Callaghan Innovation | Y | Y | |
| Gary Wilson | GNS Science | Y | Y | Y |
| Peter Benfell | GNS Science | | Y | Y |
| Gill Jolly | GNS Science | Y | Y | |
| John Burnell | GNS Science | | Y | |
| Richard Skyes | GNS Science | Y | Y | |
| Chris Kroger | MetService | Y | Y | Y |
| Chris Noble | MetService | Y | Y | Y |
| Margaret Hyland | VUW | Y | Y | Y |
| Ehsan Mesbahi | VUW | Y | Y | Y |
| Dave Harper | VUW | Y | Y | |
| Nick Long | VUW | Y | Y | |
| Richard Arnold | VUW | Y | Y | |
| Rob McKay | VUW | Y | | |
| John Townend | VUW | Y | Y | |
| Emily Parker | VUW | Y | | |
| Simon Davy | VUW | Y | | |
| Nokuthaba Sibanda | VUW | Y | | |
| Elysia Ellis | VUW | | Y | |
| Graham Le Gros | Malaghan Institute of Medical Research | Y | Y | |

# Appendix B ESR/GNS Science principles

**Improved science and research outcomes** – Decisions about the location of science activities should be focused on the delivery of enhanced research outcomes and responding to government and public science priorities.

**Wider science collaboration** – An overarching objective for any decision is that greater scientific and operational collaboration needs to be developed between CRIs, universities and other science organisations.

**Maximum return on invested taxpayer funds** – All decisions need to achieve maximum return for the taxpayer funds that will be invested.

**Maximise resilience; not all eggs in one basket** – Decisions for the Wellington region's science sector must mitigate the risks of a major event to ensure the continued operations of vital science services.

**Embed Māori partnership** – Interaction and partnership between CRIs and local whānau, hāpu and iwi is important. Developing local relationships takes considerable time and commitment, which needs to be continually nurtured and grown.

**Engage with local communities** – Being seen as out in the communities they serve and not just an 'ivory tower' or 'another government department' is also a consideration for any decision-making around locations.

**Staff retention and recruitment** – Decision on CRI facility locations need to consider not only the likely impact and cost of staff relocation and redundancies, but also the very tangible risk that CRI staff may be unwilling to be substantially relocated

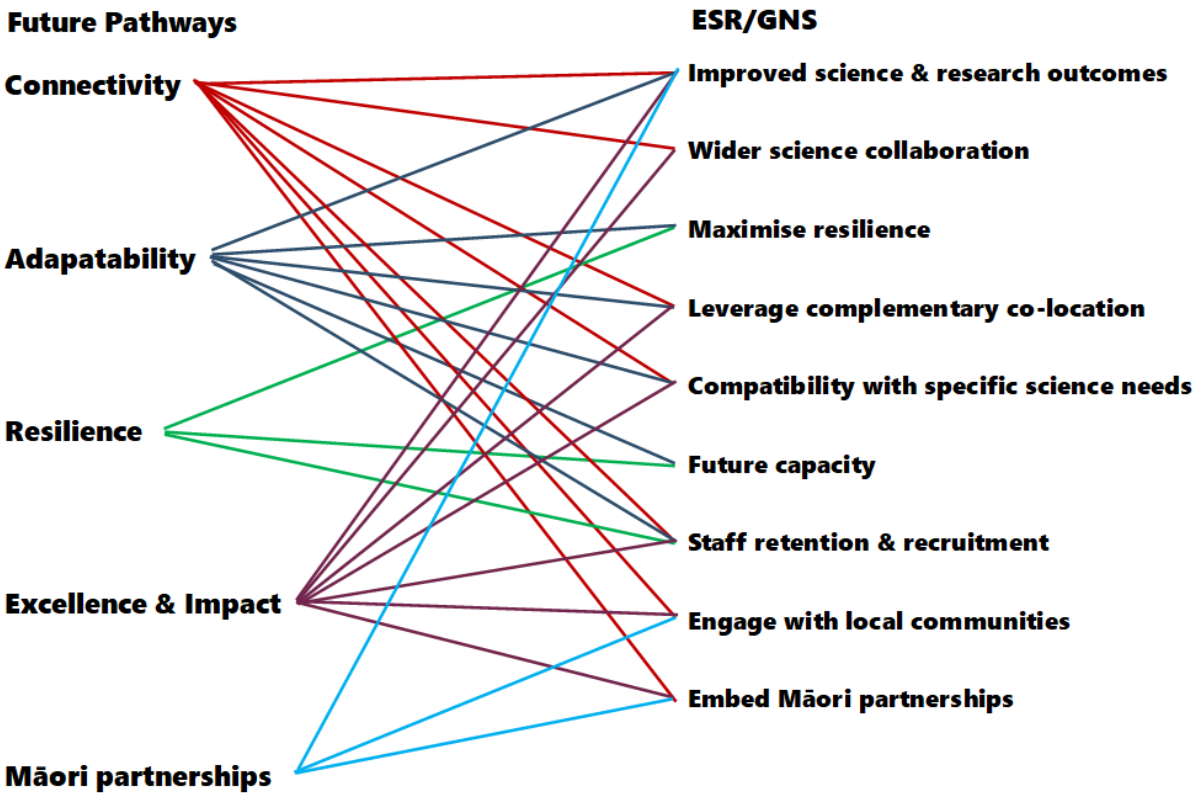
**Leverage complementary co-location** – It is important that future decisions continue to support and encourage compatible partnerships, though need to ensure other counter-productive doors are not closed as an unintentional side effect.

**Future capacity** – Facility location decisions need to allow for an unknown future and provide sufficient flexibility for adjustment and growth over time.

**Compatibility with specific science needs** – High risk requirements must be considered when considering co-location options. For different science organisations to successfully share the same physical space, they must have the similar requirements and expectations as to what is needed from the environment in which they work.

Figure 6 show how the Future Pathways principles and ESR/GNS Science principles map to each other. There is clear mapping of connections between the higher-level Future Pathways principles and the more granular principles provided by ESR/GNS Science.

Figure 6 Connections between Future Pathways and ESR/GNS Science principles



# About Sapere

Sapere is one of the largest expert consulting firms in Australasia, and a leader in the provision of independent economic, forensic accounting and public policy services. We provide independent expert testimony, strategic advisory services, data analytics and other advice to Australasia's private sector corporate clients, major law firms, government agencies, and regulatory bodies.

'Sapere' comes from Latin (to be wise) and the phrase 'sapere aude' (dare to be wise). The phrase is associated with German philosopher Immanuel Kant, who promoted the use of reason as a tool of thought; an approach that underpins all Sapere's practice groups.

We build and maintain effective relationships as demonstrated by the volume of repeat work. Many of our experts have held leadership and senior management positions and are experienced in navigating complex relationships in government, industry, and academic settings.

We adopt a collaborative approach to our work and routinely partner with specialist firms in other fields, such as social research, IT design and architecture, and survey design. This enables us to deliver a comprehensive product and to ensure value for money.

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