

Te Ara Paerangi Future Pathways

Scion input to the consultation

- 1 Scion agrees with and supports the challenge set out in the Te Ara Paerangi Future Pathways consultation document. Building a prosperous and sustainable future for Aotearoa New Zealand requires us to harness and grow the collective capability of our research, science and innovation (RS&I) system. But delivering impact for Aotearoa New Zealand needs more than that; we need an RS&I system that provides the outcomes needed to address the increasingly complex and systemic challenges facing our country, that works in partnership to protect and promote Māori interests, and one that takes full advantage of the amazing opportunities and bright future for our environment, economy and people as we make a just transition to a prosperous and low-carbon circular bioeconomy.
- 2 Our input to this consultation emphasises four key points:
 - Change to the RS&I system is necessary and overdue. This needed change presents an opportunity to build an RS&I system that works better and helps create a better future for everyone in Aotearoa New Zealand. We must take full advantage of that opportunity.
 - Te Ara Paerangi is an opportunity for the RS&I system to better deliver on the Te Tiriti partnership, protecting and promoting Māori aspirations, and supporting Māori and regional development and resilience.
 - We strongly support the idea of working to co-design clear, high-level national priorities for Aotearoa New Zealand. We have done this in our areas of core purpose in developing Scion's Strategy to 2030.
 - But truly transforming the RS&I system can only be done when the system is supported with a significant increase in investment from government and the private sector, aligned to deliver the outcomes expected of a New Zealand RS&I system.
- 3 That increase in support is not just financial, although that is essential. It is also not only about science: we need to build, grow, and retain the capability in our people and organisations to deliver those priorities, and support their delivery to the benefit of all New Zealanders. And it's not just about more funding although we think that is essential, too: it's about making sure that we use and invest funding more effectively to deliver right through to impact and include mechanisms to ensure impact is delivered and demonstrated. We can see a need for investment in infrastructure to de-risk commercial scale investment in lab-proven innovation needed to support the transition to a low-carbon bioeconomy.

We have worked with our stakeholders and partners to co-design our research priorities...

- 4 Our process to implementing Scion's Strategy to 2030 shows the value of the approach set out in Te Ara Paerangi. Over the last 18 months we have re-built our organisation to drive impact and achieve our strategic vision for Aotearoa New Zealand to 2030 and beyond, based on our government-agreed core purpose. We have a pivotal role in shaping New Zealand's future wellbeing, and New Zealand's forests are a key part of a just, and highly positive, transition to a low-carbon, circular bioeconomy. Forests are a renewable resource with the scale needed to sequester significant amounts of carbon, provide New Zealand with low-emissions materials and fuels to help meet our climate change commitments, grow and transform the economy and improve environmental and social outcomes. They provide a range of ecosystem services, from supporting biodiversity and water quality, to helping support New Zealanders' wellbeing through landscape amenity and recreation, including in our urban treescapes.

...and are building purpose-driven capability to deliver them.

- 5 We are helping bring about the transformation to a low-carbon, circular bioeconomy through our purpose-driven capability, partnerships that support Māori aspiration and economic development, incorporate mātauranga Māori, and build on collaborative connections with industry and the regions. We have completely transformed who we are and how we work, aligning our capability to deliver three major impact areas that focus where we will apply our expertise to deliver maximum impact for New Zealand:
 - *Forests and landscapes.* To grow healthy, resilient forests that are planted primarily for their standing-forest benefits.
 - *High-value timber manufacturing and products.* Development of products, manufacturing, high-value trees and healthy, resilient forests that capture an increasing share of the global high-end market for timber.
 - *Biobased manufacturing and products.* Development of products, processes, manufacturing, trees, other biomaterials and healthy, resilient forests to replace petrochemicals and non-sustainable materials.

Our impact focus is driving our research portfolios...

- 6 Within those three impact areas we have identified 11 research portfolios and have been working with stakeholders to create research roadmaps across 37 research programmes. Those roadmaps have been informed by and co-designed in a series of in-person and online workshops with key stakeholders from across the sector – central and local government, iwi/hapū, industry, researchers and members of the public.

...and transforming how we work with our Māori and regional partners.

- 7 That co-design process has strengthened our commitment to work in partnership with Māori. This is not just about the ‘what’ and ‘why’ of our overall mission. It’s also the ‘how’ of our delivery. We are working in partnership with the hapū who are tāngata whenua at our main campus in Rotorua, Ngā Hapū e Toru o Ngāti Whakaue (Ngāti Hurungaterangi, Ngāti Taeotu me Ngāti Te Kahu) to give effect to that.
- 8 Te Ara Paerangi has the potential to be a game changer, not only in delivering on the huge opportunity of the circular bioeconomy but also in delivering on the enormous potential of a Te Tiriti-based approach consistent with Māori worldview/kaupapa Māori-led approach. Scion is already out of the starting gates on this journey, but we know that unless the intent of true partnership is applied, and supported by government, we will fall short. Realising this potential is not just about supporting mātauranga Māori, but also through working with our iwi and hapū partners and other stakeholders to co-design the research programmes needed to achieve our long-term vision to enhance New Zealand’s prosperity, wellbeing, and environment through trees.
- 9 Our regional focus in Rotorua – the heartland of forestry – has enabled us to work closely with iwi/hapū and Māori entities to understand how to build successful relationships, which we hope to prove to be enduring. We have many learnings in this area of what has worked and what has not in delivering both the relationships and the outcomes that Māori are looking for.

Once priorities are agreed, the RS&I system must commit to support them...

- 10 We are now working to sequence and align our capability and resources with our co-designed research priorities, which will determine how we work to deliver our Strategy to 2030. We have some key lessons from that process, including how we have worked alongside our stakeholders and partners to co-design our research priorities, and look forward to sharing such experiences as the Te Ara Paerangi process unfolds.

- 11 Priority setting is just the start. We now have a clear strategic vision, with impact-focussed research programmes that we know our stakeholders support. Once priorities are set, the RS&I system needs to commit to supporting them. The quantum of support needs to increase, and the Te Ara Paerangi consultation document recognises this. But equally, support needs to align with priorities and purpose, and include mechanisms to ensure impact is delivered and demonstrated. The current funding system risks undermining that. It is too short-term in focus and encourages competition among institutions and researchers, rather than the collaboration with stakeholders needed to address complex, systemic challenges.

...including from outside Vote RS&I.

- 12 Scion's own experience in working on sustainable long-term funding has also highlighted the importance of a multi-agency approach. The challenges and opportunities facing Aotearoa New Zealand are complex and need an 'all of system' approach. We know that the opportunity from the transition to a circular bioeconomy could add something like \$30 billion to New Zealand's GDP. Delivering that needs an alignment among aspirations and responses to climate change, waste minimisation and circularity, regional economic development, meeting Māori aspirations and improving wellbeing. There are workstreams across government to meet those challenges which need innovation and evidence supported by more than just core Vote RS&I funding.

Our submission draws on input from Scion staff and supports other submissions from across the science system.

- 13 We enabled all our staff to be involved in developing this submission. We held internal workshops and drop-in discussion sessions, had more focused discussions among groups of people, and gave everyone the opportunity to comment on drafts of this submission as it developed.
- 14 Our institutional submission is necessarily focused in its scope and content. Some of our staff have developed or contributed to other submissions that focus on experience and ideas that are either more systemic than can be covered in Scion's institutional response, or on particular and more focussed issues. Our Te Ao Māori team has provided a complementary submission that elevates and offers recommendations on further areas of specific relevance to Te Ao Māori, based on their experiences as Māori working in the RS&I system. We also draw your attention to the submission of our mana whenua partners, Ngā Hapū e Toru o Ngāti Whakaue (Ngāti Hurungaterangi, Ngāti Taeotu, Ngāti Te Kahu). Some of our early career researchers have also contributed to pan-CRI submissions, as have our collections and databases staff. We have also contributed to and support the submission by Science New Zealand. Our institutional input supports points made in each of these submissions.

1. Research priorities

- 15 We agree that New Zealand's RS&I investment needs to be focussed on delivering impact for Aotearoa New Zealand. The things that New Zealanders care most deeply about, such as responding to climate change, inequality, and building a sustainable, prosperous, and healthy future, all have a strong intergenerational policy and social impact. As a country we will need focus to respond to these.
- 16 One of the challenges we will face is getting the balance right between adding value to volume in our primary-sector exports and the development of new high-value products and services from the start. It will be too easy to focus the RS&I system on one of these objectives to the detriment of the benefits from the other.

- 17 One of the key principles in priority setting will need to achieve a **balance between novelty and impact**. We need research that pushes the boundaries of our knowledge. We know that building prosperity and supporting wellbeing is closely linked to overall investment in science and research. But achieving those outcomes is strengthened when innovation is focussed on clear outcomes that support innovation, application and impact of existing knowledge.
- 18 That balance can be supported by another key principle, which is to **deliver the potential of a Te Tiriti partnership**. Achieving this will require a priority-setting process that acts in active partnership to protect and develop Māori knowledge and research, allows Māori to set priorities, govern and lead resources, and which looks to build partnerships between science and mātauranga Māori.
- 19 The priority setting process should also acknowledge that setting and delivering national priorities is **not just about the RS&I system**. If the rest of the system/economy/society is not considered, we risk dropping or missing key areas of research and innovation. Priorities should therefore include **strong policy relevance and commitment**, potentially with a clear international consideration, providing the insights from a realisation that our commodity-export focus ties our prosperity to things that are outside New Zealand's direct control (e.g. policies in other countries that change international market conditions for our exports, or a lack of effective global action on climate change).
- 20 At a high level, our priority-setting process needs to **focus on simplicity and clarity of purpose**. Priorities need to be clear enough to direct effort and aspiration, but with flexibility to drive impact. We agree that the current system struggles with too much complexity – and not just for stakeholders. That complexity means the system tends to allocate resources ineffectively and struggles to drive impact. That simplicity should encourage **a focus on purpose and accountability**. In the current system, uncertainties over long-term support tend to drive short-term delivery at the expense of longer-term impact, and a focus on funding applications. This could see a relatively small number of key strategic programmes being supported right through to impact.
- 21 Something similar to the UN Sustainable Development Goals, or the 12 domains of New Zealand's Living Standards Framework, might be an example. There, effort is being focussed to deliver on **a relatively small number of high-level goals, with clear targets and indicators sitting under them**. Indicators in a priority-setting system like that need to be relevant to Aotearoa New Zealand and be expressed in ways that focus on outcomes rather than direct science outputs. To deliver that, our priorities **need a good understanding of our current state**. We need a much better environmental baseline and monitoring data to assign priorities, and a better awareness of the indicators that matter most in delivering impact.
- 22 We'll need to **work across sectors**. The big challenges and opportunities need a systems approach: as the Government's consultation on its first Emissions Reduction Plan shows, we need all sectors of our economy to be transforming together if we're to get on top of the climate change challenge. That's likely to be true for other priorities that a new system develops too.
- 23 As well as having an open and inclusive approach to setting national priorities, we'll need an **open and inclusive approach to delivering them**. Delivering that will be a challenge, but other priority-setting processes have, in our experience, tended to result in a 'closed shop' where potential partners can struggle to be involved in priority delivery beyond the initial establishment phase.
- 24 In designing the system, it will be critical to consider all components of the system and be clear about the core purpose of each component and therefore clarity on everyone's expectations of the system. While National Priorities are important there are many

other aspects of the science system that will need support if the system is to truly deliver improved outcomes for New Zealand (Refer to the layered approach in the Science NZ submission).

2. Te Tiriti, mātauranga Māori and Māori aspirations

Māori and the Māori economy are important partners for Scion as we work together to deliver future benefits for Aotearoa New Zealand. These are aspects that should be embedded within our business, not seen as an add on which is what we believe Vision Mātauranga has become.

We have given life to this commitment through the appointment of a General Manager of Māori Forestry Futures in 2019, the establishment of a dedicated Te Ao Māori research group which is helping to grow cultural capability right across Scion and, most importantly, recognising the importance of a genuine partnership with Māori.

We are seeing great outcomes from this approach, particularly in the building of strong relationships with Māori partners and in supporting mātauranga Māori as part of our research, science and innovation. We are working to strengthen this partnership approach, aligned with Te Tiriti principles. We recognise that this is a journey and it is one where the funding system constrains us and our Māori partners from progressing at a faster rate. It is critical that the RS&I system enables research institutions and Māori to fully participate and to deliver better outcomes for Māori, have Māori lead research initiatives and to enable the knowledge systems of Aotearoa New Zealand to better work together.

- 25 Scion has committed to a journey that is focussed on many of the questions set out in Te Ara Paerangi consultations. This section centres on an area where we can contribute lessons from our own experience to the wider mission, from our staff and from our Māori partners. We know we can still lift our performance, and acknowledge that it is still early days for us in the journey towards excellence in Te Tiriti, mātauranga Māori and Māori aspirations. We are working to meet partnership expectations. We are committed to the opportunities that come through our business to Te Ao Māori nationally, and through our presence in the Rotorua Waiariki community with whom we have special place-based responsibilities. The approach that we are adopting is already showing results, and we will keep refining and evolving our partnership identity.
- 26 We have forged an enduring relationship with the three hapū who are tangata whenua at Scion's Rotorua campus. Nga Hapū e Toru o Ngāti Whakauae (Ngāti Hurunga Te Rangī, Ngāti Taeotu, and Ngāti Te Kahu). In the last 12 months we signed a Kawenata, a Te Tiriti-based relationship agreement that sets out the principles, aspirations, and strategic aims of our partnership, and we have a Hunga Whakahaere Matua/Operations Manager who reports jointly to Scion and the hapū to help navigate this partnership. We are actively supporting discussions for the inclusion of Ngā Hapū e Toru representation on Scion's Board of Directors. This relationship is context- and location-specific, and as Ngā Hapū e Toru and Scion continue our journey together, our relationships are strengthening. We and the hapū would be happy to share our experience of that and would be pleased to welcome the Te Ara Paerangi team to visit us in Rotorua to learn more about our journey.
- 27 Moving beyond the local context, we can see that a **partnership approach should be embedded into our business**, and the RS&I system needs to support us and the RS&I system to do this. We are still working through exactly what that means for us and our work but can see opportunity to actively support innovation in the Māori economy in ways that create opportunity, build wellbeing and support more equitable economic outcomes.

28 We are also working with trusts and incorporations further afield that bring their mātauranga Māori knowledge to lead the technical direction of the kaupapa of our research. The ideal in these situations has been to have western science support and sit alongside and support the kaupapa of research tasks and activities designed by Māori for Māori.

Examples of **kaupapa Māori** underway:

- A tangata whenua group situated in Turanga (Gisborne) is building iwi and hapū science capability beside the guidance, training, mentoring, access and networking of Scion capacity and capability. For two days per month this kaupapa aims to activate a "well land, well whānau" vision for a climate affected catchment, and lands and forests undergoing Treaty transfer. Learning scientific methods to complement hapūtanga reforestation, river restoration and environmental plans and skills is adding to the revitalising activities. This project has a two-way flow of knowledge and transfer and allows the sharing of mātauranga Māori, science, and values to support a strong iwi-led approach to land and forest management.
- A Northland iwi forest incorporation has accessed Scion's support in a One Billion Trees Science Partnership to augment their mātauranga Māori knowledge of seed collection, whenua Māori, and customary kaitiakitanga responsibility for taonga species. Scion's western science seed collection sits alongside a deep-rooted cultural framework. The trial design is mātauranga Māori-led, not a normal establishment trial – kaupapa-led (outcomes-led) which directs us to working with the whenua and the whakapapa connections rather than the commercial returns in a Mauri assessment matrix. A data management plan designed by the hapū protects the old and newly created knowledge and the flow of benefits. So, not a normal establishment trial, but with the same and even more broader outcomes. This way of working and sharing is enriching the lives and experience of Scion's researchers and broadening the possibilities of Scion's approach to applied and participatory research into the future.

29 We do believe that the capability of our scientists and researchers needs to be developed **to better work with Te Tiriti principles and Māori concepts and values**. We are learning more about the benefits of collaborative research as it enables tino rangatiratanga, capability building, knowledge sharing, increased understanding and more.

30 Embedding a partnership approach will need an **RS&I system that is genuinely committed to delivering on that opportunity**. The RS&I system does not currently enable research institutions or Māori to engage in ways needed to deliver much better outcomes. Institutions need support to **build the knowledge, understanding and capability, particularly for non-Māori staff**. We have found that the funding system does not adequately support true partnership and tends to result in relationships that are less about long-term partnerships and more about short-term interactions needed to support a particular project or research proposal.

31 We are building our own capability through the employment of **specialist in-house expertise**, individuals who have provided guidance and coaching to the organisation. We established a Te Ao Māori research group in 2021, which has grown to 13 people. Some of our Te Ao Māori team are leading the research portfolios that we are developing to deliver our Strategy to 2030.

32 This expertise is in **high demand**, and there is often a strain on these individuals to lift the performance of the organisation and negotiate **science system structures and mechanisms (such as funding criteria) that do not adequately support the partnership model**.

33 Our overall experience of the RS&I system is that **systems don't fully capture measures of success that are relevant for Māori or for delivering Māori objectives**. That feeds through to institutions' performance management and objectives for developing staff capability, which do not adequately account for cultural experience and relationships built up over time. The current system also tends to favour activities that deliver narrowly

focussed, short-term outputs, rather than the longer term/intergenerational worldview of Te Ao Māori.

- 34 Please also refer to the submission of Scion's Te Ao Māori Research Group, and to the submission of our mana whenua partners, Ngā Hapū e Toru o Ngāti Whakaue (Ngāti Hurungaterangi, Ngāti Taeotu, Ngāti Te Kahu).

3. Funding

- 35 The current funding system does not support our RS&I system to deliver genuine impact for Aotearoa New Zealand. While an ideal level of support will almost always be 'more than what we have now', there is an urgent need to rebalance the decades-long under-investment in science and research in New Zealand.
- 36 The Te Ara Paerangi document recognises this under-investment too, and the aspirational funding targets it discusses are ambitious. They're also 'moving targets': increasing gross domestic expenditure on R&D to 2% of GDP would require close to a 40% increase in investment, which is nearly eight times greater than the average annual increase in real terms over recent years. Projected increases in GDP in coming years will make the gap between current spending and the amount needed to reach a 2%-of-GDP target even more challenging.
- 37 That under-investment is from both the private and public sector, and we know that on both fronts New Zealand invests less than countries that we regularly compare ourselves against. Working out why is difficult. Partly it is because the economic value of research, science and innovation is greater than its market value, and so companies may be naturally disinclined to invest in innovation with hard-to-capture value. But it could also be because New Zealand's science system has not been able to demonstrate and deliver the impact-focussed approach that would support greater investment. Currently, New Zealand's 'mission-to-impact' story is not strong.
- 38 Questions around provision of base grants for core capability, or on shifting away from full-cost to marginal-cost approach, are important. Giving organisations the security to invest in their long-term capability is an essential part of that. But those questions **don't address the key point that a transformative science system can only be delivered if organisations are properly supported with a significant increase in investment from government and the private sector.**
- 39 We have undertaken our change process over the last three years because the current funding system does not support us to purposefully and deliberately plan and execute against our purpose. Our process involved creating a compelling narrative about New Zealand needs and opportunities, co-design of roadmaps through to actual impact, and structuring our organisation to deliver on those roadmaps and to engage with Māori and other partners. Funding needs to be aligned to purpose and expectations.
- 40 Current funding is too fragmented, lacks continuity (particularly through to end users), does not align with expectations of the system and the entities within the system, and **favours competition at the expense of collaboration.** Funding should support and enable institutional accountability for delivering on those expectations. This is especially important in research that requires ongoing community relationships and engagement.
- 41 Our experience also shows that **genuinely mission-and impact focussed work is broader than just research supported by Vote RS&I.** Future-state discussions around resourcing to deliver on the expectations of the science system needs to reflect this: from Scion's perspective this would include (for instance) outcomes developed and supported by

industry partners, government agencies from outside the core RS&I system, iwi/hapū-led initiatives and local government. It is important that the Te Ara Paerangi process allows for this, and we are concerned that a focus only on parts of the RS&I system supported by Vote RS&I will miss a genuinely transformational opportunity.

42 We do know that our stakeholders are expecting us to deliver things that we are not funded to support. At Scion 100% of our revenue comes by contract and therefore our effort must go to delivering against those contracts. So, where our stakeholders have expectations about our capacity to work with them in ways that aren't aligned with this contracted revenue, we have limited capacity to deliver. That can include supporting government to develop evidence-based policy to support the transition to a low-carbon circular bioeconomy. If it were designed well, **a base grant model could support us to better deliver on those currently unfunded stakeholder expectations** and allow Scion to act more directly in the interests of all New Zealanders, rather than indirectly through the interests of our shareholders.

43 We also see that:

- Mechanisms need to be established to provide capital for critical Infrastructure, particularly scale up infrastructure to get research through to impact – the National Biopilot Network is a good example where our stakeholders are telling us they can see a transformational opportunity to demonstrate that what works at lab-scale can also work at pre-commercial scale. This is currently an enormous gap in our innovation infrastructure.
- The system needs a more systemic approach to support. The RS&I system shouldn't only depend on investment from Vote RS&I – this increase needs to come from other Government portfolios (e.g. health, tertiary education, primary sector, environment) as well as from efforts to encourage and enable greater private-sector investment. The more impact-focussed approach set out in Te Ara Paerangi is an important way to go about this: it's possible that some of the reason for historically low private-sector investment in RS&I has been because the sector has not been able to demonstrate/achieve impact.
- A more programmatic approach is needed to deliver outcomes. Currently, what the RS&I system thinks of as 'programmes' are really just complex 'projects'. Clear and consistent direction would assist all CRIs to establish a platform across which multiple project, programme and portfolio structures, tools and templates could be most effectively shared and applied.

4. Institutions

44 In Scion's view, questions around institutional form are less critical than the overarching opportunities around outcomes and impact and the support to deliver on those. As a result, we do not have strong views on the 'institutional form' questions. But at a high level, we would make the following key points:

- We support the focus on a future-state that encourages and supports more collaborative and connected people and institutions. That aligns with Scion's natural collaborative and agile approach, reinforced by our own reorganisation to deliver our Strategy to 2030.
- The government's investment in research, science and innovation needs to have a strong focus on impact. Scion's experience as a regionally based institution, with strong links to tangata whenua, to our regional community and to industry, demonstrates the value in that. We have built a community of key stakeholders keen to work with us.
- Our stakeholders have a growing expectation on knowledge transfer to help them deliver impact, with less interest about 'academic' knowledge creation. But we find the current funding model is not well aligned to this cooperative and collaborative approach.

- We can see value in a regionally clustered approach to institutional organisation. Our role as part of innovation ecosystems centred on Rotorua's Te Papa Tipu Innovation Park and in Christchurch, demonstrates that value.

- 45 Although we have not questioned this directly with our stakeholders, our impression is that they are less concerned about institutional form, and more about supporting science and innovation that drives impact. The current system emphasises the creation of ideas rather than the flow of knowledge through to end-users. For instance, we see a critical organisational gap in the RS&I system for open-access innovation facilities that could help in the pre-commercial testing and scale up of new ideas. These facilities are a common part of institutional investments in other countries (e.g. the Fraunhofer Centre for Chemical-Biotechnological Processes) but, apart from the Food Innovation Network, are lacking in New Zealand.
- 46 We can see opportunity through the Te Ara Paerangi process to support a national Biopilot Network to fill this gap, and create a network of open-access test bed and pre-commercial scale-up infrastructure with the ideas, technology and equipment needed to transform bio-feedstocks into the new compounds and materials needed to pivot to a fossil carbon-free bioeconomy. This cooperative facility could be built with a kaupapa Māori approach 'designed in', supporting for Māori economic development and bringing indigenous value-streams into the low-carbon bioeconomy.
- 47 This kind of innovation-focused and cooperative capital investment is not a good match for core RS&I funds, and commercial partners don't have scale/resource to invest themselves – if they did, they'd be doing it already.
- 48 We can see a future state where elements of the system have clear set purpose and expectations, with support to deliver on those: Universities with a focus on research-informed education; CRIs (or their equivalent) with a focus on research-enabled innovation and growth for economic, social and environmental outcomes for Aotearoa New Zealand, and research-enabled services to stakeholders; a system to support uptake, implementation, and commercialisation of impact-focussed innovation; and support for short timeframe research to build private-sector capability.

5. Research workforce

- 49 At this early stage in the Te Ara Paerangi process, our thinking on workforce issues remains high-level. However, we make the following key points:
- Our current system tends to undermine workforce security. Our people are uncertain about their futures, and whether the research they do will continue from one funding round to the next. Clear national priorities, and the funding to deliver on those to impact, will help – without this, it is difficult to plan for and develop capability.
 - The Te Ara Paerangi process needs to include more than 'just' our research workforce. 'Workforce' means more than just 'research workforce' – delivering impact for New Zealand needs more than researchers; it needs the capability to support that, and to make sure that science and innovation outcomes are taken up and used.
 - Workforce considerations also need to consider the pipeline of talent coming into our RS&I system, and how we can attract and retain the full range of expertise needed to create impact for Aotearoa New Zealand. How do we attract, develop, and retain Māori scientists in our RS&I system? How can our system acknowledge and value impact- and innovation-focussed talent and practice from outside the academic science system? Does only focussing on the school-university-PhD-researcher pipeline constrict our worldview?

6. Research infrastructure

- 50 Our thinking on the research infrastructure questions is still developing. But we can see a need for greater coordination among institutions on large-scale infrastructure investments. From our own experience, relying on ad-hoc interventions or institutions' retained earnings has resulted in a 'try and make do' approach rather than one that encourages proposals to really deliver impact for Aotearoa New Zealand.
- 51 New Zealand's current approach to research infrastructure investments does not encourage efficient allocation of resources, and instead encourages a more competitive approach to infrastructure acquisition. That can result in less-than ideal outcomes, where capital-intensive research infrastructure is duplicated among organisations, or where access to infrastructure is managed in ways that inhibit open-access collaboration. We have opportunities to be smarter and more connected among our research institutes – not just our CRIs, but universities and independent research organisations as well. A more collaborative approach should also apply to our digital and collections infrastructure, and for a more joined-up approach to ecosystem and environmental monitoring.

Investment in a biopilot network is needed to de-risk investment in lab-proven innovation.

- 52 Our system also makes it difficult to invest in infrastructure to help bridge the gap between technology we know works and the pre-commercial demonstration scale needed to de-risk investment needed to transform bio-feedstocks into the new compounds and materials needed to pivot to a fossil carbon-free bioeconomy at scale.
- 53 This is an enormous opportunity for New Zealand. The transition to a low-carbon future is a NZ\$30 billion opportunity for New Zealand, boosting our economy by developing innovative new low-carbon products, re-purposing waste, revitalising regions and lifting productivity and innovation. Realising those opportunities needs a collaborative mission – a bio-innovation network to empower and enable a step-change shift to a circular bioeconomy, transforming volume to value.
- 54 A biopilot network and could supercharge four innovation streams in bioenergy, bioplastics and biopolymers, niche high-value compounds/extracts, and waste/co-product re-purposing. This would support Aotearoa New Zealand's distinct value-add. As well as our deep experience in primary production, a Treaty-based kaupapa and support for Māori economic development will bring indigenous value-streams into the low-carbon bioeconomy.
- 55 There are parallels with the Food Innovation Network, and a new biopilot network can take lessons-learned from that, as well as from international examples, to create something truly transformative for New Zealand. Those experiences tell us that innovation infrastructure like this works best when it has a clear focus on partnerships to tackle 'anchor challenges', making sure we get the right infrastructure, ideas and people in the right place at the right time. It is also clear that partnerships are key, bringing together innovation and funding streams from a range of sources.
- 56 A national opportunity needs a national response. New Zealand's experience with the Food Innovation Network tells us bio-pilots work best when they are built on a foundation of committed and mission-focussed government support. It will need partnerships de-risked by a significant government investment in the future of our low-carbon bioeconomy.

16 March 2022