Submission on the Climate Change Commission's 2021 Draft Advice for Consultation – Climate Action for Aotearoa (revised)

Introduction

Thank you for the opportunity to provide a submission on the Climate Change Commission's January 2021 draft advice.

Callaghan Innovation works with and supports innovation by businesses and groups of businesses in areas that will be important contributors to the proposed recommendations and New Zealand's course for reducing emissions. This includes firms, clusters and R&D projects across areas of clean tech, including in agritech, food processing, materials, construction, transport and logistics and advanced manufacturing. More generally, we also support the development of business innovation capability and R&D skills & talent. As such we have a unique and practical perspective on the challenges and opportunities facing New Zealand in adopting new technologies and developing new and enhanced products, practices and business models to reduce emissions while maintaining, indeed improving, commercial potential and adding value to Aotearoa.

Our submission covers:

- Key issues
- Comments on particular recommendations/necessary actions.

Whilst this is Callaghan Innovation's response, we have developed this in discussion with our climate innovation colleagues at New Zealand Trade & Enterprise (NZTE). Our response also reflects the work programme we have on climate innovation with NZTE, Ministry for the Environment, Auckland Unlimited, Edmund Hillary Fellowship, University of Auckland, Victoria University and others.

Summary of our response

The following summarises our recommendations and suggestions for the Commission's final advisory report:

Recommendations:

R1: The final report should properly acknowledge the vital role of system-wide innovation to address climate change, including an overview of what system-wide innovation comprises and how this can be brought about in New Zealand. We recommend that the final report include a system-wide approach to climate innovation as an additional key principle.

R2: We recommend that the final report emphasise the importance of accelerating investment in climate innovation for New Zealand to reinforce long-term behaviour change, to support broader wellbeing benefits and to ensure we can compete with and access offshore markets.

R3: We recommend that the final report include a discussion on how to ensure the widespread real-world application of New Zealand's climate innovation - including R&D - be that through commercialisation or other means.

R4: The final report should include a recommendation that New Zealand corporates and innovators work more closely together to ensure early understanding, validation and adoption of climate innovations.

Suggestions:

S1: We support the recommendation to use the post-Covid-19 recovery to bring forward transformational investment to reach climate and economic goals. We suggest that this occur through the development of a mission-led innovation strategy, which would include a mission/s related to climate change goals.

S2: Although integration and coordination across government will be important, the final report should also emphasise that government needs to be much more innovative itself.

S3: The final report would benefit from referencing the Parliamentary Commissioner for the Environment's work and recommendations to reduce the fragmentation of environmental research funding.

S4: We believe that the final report would benefit from noting some of the real-world innovation opportunities currently being advanced. This would help convey a greater sense of the potential that exists, while also illustrating the importance of commercial potential and capital investment.

S5: We suggest that further investigations into emissions reduction solutions and potential build off the current reviews of sector-based climate innovation systems underway and that this be reflected in the relevant recommendations.

S6: We suggest that the final report discuss the capability challenges and opportunities for small businesses in broader terms. The report would also benefit from referencing the support that is available for businesses to develop their capabilities and to enable business transitions, for example, through NZTE and Callaghan Innovation.

For noting:

N1: We support Enabling recommendation 2 and Necessary action 15, which are mutually reinforcing. Collective and integrated action across government portfolios is consistent with taking a systems approach to climate innovation.

N2: We support the insights and recommendations in the report in relation to Māori and would welcome the opportunity to be involved in actions to ensure genuine and enduring partnerships with iwi/Māori.

Key issues

We congratulate the Climate Change Commission on preparing a thorough and considered set of advice and appreciate the complexity involved in the Commission's task. We agree with many of the findings, recommendations and actions in the draft report. However, based on our experience in supporting R&D, commercialisation and innovation within and across sectors, we have identified three issues that should be considered when developing the Commission's final advice.

1. The draft report does not properly acknowledge the vital role of system-wide innovation to address climate change

Without system-wide climate innovation and the deliberate building of capabilities to bring this about, there is high risk that New Zealand will not achieve its emission targets and miss out of the economic growth opportunities that climate innovation presents.

However, the draft report is currently unclear about what is meant by or required in terms of climate innovation. The draft report makes some recommendations for increased investment in R&D in particular areas (e.g., agriculture, industrial processes, waste reduction) but appears to confuse R&D with innovation.

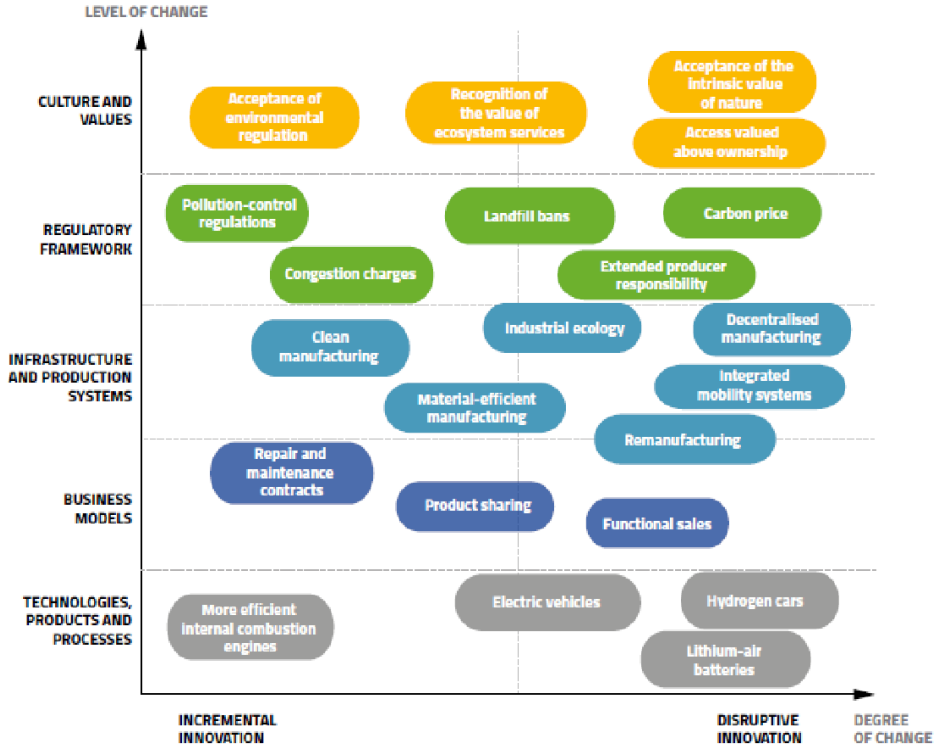
It is well recognised in New Zealand and internationally that a systems approach to climate innovation is required within and across sectors to tackle climate change. This comprises a number of inter-dependent layers including:

- Culture and values

- Policy and regulations
- Infrastructure and production systems
- Business models
- Products and processes
- Technologies.

This is well illustrated in the figure below:

Figure 1. Mapping climate innovation



Source: Miedzinski, M. (2020). *System Climate Innovation for a Transformative Impact. https://www.climate-kic.org/wp-content/uploads/2017/03/Insight03_Proof4.pdf*

Although the Commission's draft advice refers to the need for both a multi-sector strategy and for a combined effort across government, businesses, iwi/Māori, communities and individuals, several of the key recommendations and actions focus on joined up public sector action or product and process innovation in particular industries/fields rather than taking a systems approach.

A systems approach encourages the use of the most diverse perspectives about how to tackle the issues and opportunities and will enable government and the private sector to think about the interactions between different parts of the system and how these should combine to achieve the desired outcomes. A climate innovation systems approach requires coordination and integration across both the public and private sectors, not just across central government agencies or central and local government as is currently emphasised in the draft report.

In this context, Callaghan Innovation is working with NZTE, MfE, Auckland Unlimited, Edmund Hillary Fellowship as well as innovators, investors, corporates, universities and others to assess and improve New Zealand's climate innovation systems across five areas – Agriculture & Food, Energy & Power, Materials & Chemicals, Resources & Environment, and Transport & Logistics. Through this work, we are delivering on a cross-agency transformation plan that is:

- Developing a shared understanding of the ecosystems

- Creating pathways for early-stage businesses to develop scalable global offerings
- Building communities of interest to improve knowledge-sharing, capital raising and collaboration
- Increasing the number and quality of early-stage businesses
- Ensuring key stakeholders are well-informed and proactively engaged.

R1: The final report should properly acknowledge the vital role of system-wide innovation to address climate change, include an overview of system-wide innovation as per the above and recommend how this can be brought about in New Zealand. We recommend that taking a systems approach should be an additional key principle adopted to help guide the Commission's advice and New Zealand's transition.

2. The draft report presents a conservative approach to tackling New Zealand's climate change goals, which may not send the right signals to innovators, investors, corporates, universities or government agencies.

The draft report's executive summary suggests that although transformational change is required to meet New Zealand's emissions targets, the tools to reach the targets and address climate change already exist and Aotearoa does not need to rely on innovation or new technologies.

This provides an unfortunate message which could encourage a Business As Usual mindset and discourage system-wide climate innovation. Instead, we need to encourage and increase investment in climate innovation from the outset.

The draft report neglects the fact that accelerating investment in climate innovation will have a range of other desired benefits for New Zealand, i.e., improvements to productivity, exports and investment, value add and incomes. It also does not consider the trajectories being taken by other Small Advanced Economies to achieve their climate goals - many of these are focusing on significantly increasing investment in climate innovation. New Zealand risks falling behind in its ability to compete with and access offshore markets if it largely focuses on existing technologies and practices.

Although the report reinforces the need to 'hard-wire' carbon reductions into society and long-term behaviour change rather than being overly dependent on politics and policy change, it risks creating a sense of complacency amongst the broader population. The recent Better Futures report 2021 illustrates how New Zealanders' concern for the climate can change depending on the messages they hear and other national and international developments. Stated concern about climate change dropped significantly between 2019 and 2020 (from 52 percent to 38 percent) as Covid-19 became the pre-occupation and almost 50 percent of the people surveyed considered that climate change problems are so far in the future that they do not need to be concerned now.[1]

As noted in the Productivity Commission report on a Low Emissions Economy[2], innovation is strongly path dependent. Delays in making the transition from polluting to clean technologies can make the transition longer and costlier. The Productivity Commission indicated that innovation should have a priority alongside emissions pricing, targets and budgets and the Government should devote significantly more resources to low-emissions innovation than the currently modest allocation.

R2: We recommend that the final report emphasise the importance of accelerating investment in climate innovation for New Zealand to reinforce long-term behaviour change, to support broader wellbeing benefits and to ensure we can compete with and access offshore markets.

[1] Colmar Brunton and Sustainable Business Council (2021). *Better Futures 2021*. https://www.colmarbrunton.co.nz/better-futures-reports-2021/

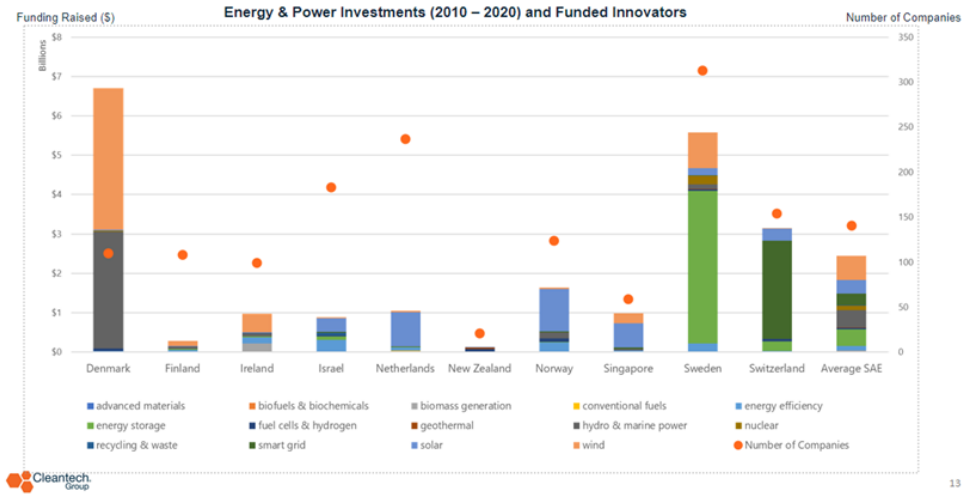
[2] New Zealand Productivity Commission. (2018). *Low-emissions economy: Final report.* https://www.productivity.govt.nz/inquiries/lowemissions/

3. The draft report positively discusses the importance of New Zealand investing in climate-related R&D but New Zealand does not yet have a good track record of commercialising such R&D

R3: We recommend that the final report include a discussion on how to ensure the widespread real-world application of New Zealand's R&D (be that through commercialisation or other means) and overseas technologies.

An independent assessment commissioned by Callaghan Innovation and its partners on climate innovation has found that New Zealand consistently lags other Small Advanced Economies in terms of the pipeline strength of R&D-to-commercialisation. The same independent assessment has found that investment in New Zealand's carbon reduction innovations across five sectors is currently well behind the scale and level of sophistication that exists overseas. Estimates indicate that this investment is around 1000 times less than that in other Small Advanced Economies. An example of this for Energy & Power is provided in the figure below.

Figure 2. Low Carbon Innovation in Small Advanced Economies (SAEs)



Source: Callaghan Innovation

Further investment will be required to support the commercialisation and deployment of clean tech in New Zealand, beyond R&D. Some of the levers will be found in the private sector. For example, Callaghan's assessment of climate innovation ecosystems indicate that New Zealand corporates are only working with innovators to a limited extent and in doing so, hindering their own efforts to find innovative approaches to carbon reductions and climate adaptation.

R4: The final report should include a recommendation that New Zealand corporates and innovators work more closely together to ensure early understanding, validation and adoption of and investment in climate innovations.

The government also has a range of levers it can pull to support commercialisation, including procurement, investment attraction & facilitation and capability support. For example, making major procurement projects more clean-tech oriented could be achieved through the use of appropriate criteria in purchasing decisions. The significant pipeline of infrastructure and housing projects in New Zealand presents one opportunity for trialling such an approach. We note that 'Necessary action 15' in the Commission's report includes a recommendation to require government procurement policies to include climate change considerations, in order to leverage purchasing power to support low emissions products and practices. This would require a significant change in current practice – as the Productivity Commission recently noted in its Low Emissions Economy report, no serious attempt has been made in New Zealand to use government procurement as such a lever.[3]

Focusing investment attraction efforts on FDI for clean tech would be another approach, including joint ventures, intellectual property positions and even acquisitions, as long as New Zealand benefits from knowledge/tech transfer, capability development, paths to market etc. This would require targeting of specific potential FDI partners based on a thorough understanding of the clean tech capabilities that exist that could be of value to those investors; comprehensive, cross-government, national and regional assistance tailored to the investor/s being targeted (spanning R&D, education & training, infrastructure, consenting support etc); and well-resourced aftercare and post-investment services to support additional investment.

Beyond the commercialisation of domestic R&D, in many areas Aotearoa will be a technology adopter from overseas. As noted by the Productivity Commission in their Low Emissions Economy report, this will also require capabilities and resourcing to identify, absorb, adapt and deploy technologies from offshore.[4]

Comments on specific action areas and recommendations in the report

4. Necessary action 6 and associated recommendation – align investment for climate outcomes

S1: We support the recommendation to use the post-Covid-19 recovery to bring forward transformational investment to reach climate and economic goals. We suggest that this occur through the development of a mission-led innovation strategy, which would include a mission/s related to climate change goals.

A recent Callaghan Innovation commissioned review of international agencies found that other countries are now investing in mission-oriented or mission led approaches and looking to optimise their innovation systems rather than 'fix' them.[5] These approaches are focused on incentivising innovation and investment across the public and private sectors in areas that address major societal and economic challenges or opportunities, often associated with significant R&D investment (e.g., energy, environment or health). For example, the OECD has identified that at least 30 countries have established major initiatives to advance their economies in the areas of green transport, circular economy and clean energy innovation.[6]

Enduring missions are co-created between businesses, research organisations and government. They encourage resources across sectors to be aligned around the major shared challenges. Central to this approach is a focus on strategic innovation, rather than relying on a range of firm or sector-based interventions to direct resources into the right areas. Addressing societal and technological challenges associated with climate change could be one such mission for New Zealand.

[3] New Zealand Productivity Commission. (2018). *Low-emissions economy: Final report.* https://www.productivity.govt.nz/inquiries/lowemissions/

[4] Ibid

[5] Stakeholder Strategies. *Leading Innovation Agencies: International Insights Report*. November 2020 (available on request).

[6] OECD (2020). *Making the Green Recovery work for jobs, income and growth.* Policy Brief. https://www.oecd.org/coronavirus/policy-responses/making-the-green-recovery-work-for-jobs-income-and-growth-a505f3e7/

Such a process would need to be accompanied by clear governance, targeting of capabilities (rather than sectors or projects), allow for experimentation and flexibility, ensure long-term certainty in investment rather than constant change, and involve genuine co-design across the public and private sectors.

A mission-led strategy for climate change innovation would also need to be accompanied by a significant increase in investment. As the Productivity Commission identified in its Low Emissions Economy report, public and private sources devoted to research and innovation in New Zealand are very modest by OECD standards. Furthermore, current funding either does not give priority to low-emissions innovation or it is relatively minor.[7]

5. Enabling recommendation 2 – Coordinate efforts to address climate change across Government and Necessary action 15 – Integrate Government policy making across climate change and other domains

N1: We support Enabling recommendation 2 and Necessary action 15, which are mutually reinforcing. Collective and integrated action across government portfolios is consistent with taking a systems approach to climate innovation.

Callaghan Innovation is currently not listed as one of the government agencies identified for coordination. We should be included in the final report as we will play an important role in supporting the achievement of the climate change goals through:

- The administration of over $250m of business R&D funding
- Support for incubator and accelerator programmes
- Showcasing of Industry 4.0 technologies
- Hosting the Science for Technological Innovation National Science Challenge
- The Bioresource Processing Alliance
- International missions and follow-up initiatives to promote the diffusion of technology from the international frontier to local businesses
- Capability and other support for businesses and groups of businesses in the areas of clean technology, advanced manufacturing, construction, transport and logistics, and food and beverage sectors, to name a few.

S2: Although integration and coordination across government will be important, the final report should also emphasise that government needs to be much more innovative itself.

Our recent review of leading international innovation agencies and economies found that cross-sector and cross-organisational working were critical for mission driven innovation, for example, through the use of innovation environments/labs.[8]

It may be worth noting in the final report that the required collective action and joint responsibility in government has been encouraged through the Public Service Act 2020. The development and implementation of an integrated approach to climate change across government agencies and portfolios would be a good way of demonstrating this – indeed, the Act was designed in part to make it easier for the public sector to tackle major challenges facing New Zealand.

We also note that the Parliamentary Commissioner for the Environment (PCE) has recently recommended that the government fundamentally reconsider the way if funds environmental research in New Zealand. The PCE's review in 2020 found that the way public funds are invested in environmental research is fragmented, making it difficult to respond to long-term environmental problems such as climate change. Integrated policy advice should be accompanied by integrated investment. The PCE recommended that the environmental

[7] New Zealand Productivity Commission. (2018). *Low-emissions economy: Final report.* https://www.productivity.govt.nz/inquiries/lowemissions/

[8] Stakeholder Strategies. *Leading Innovation Agencies: International Insights Report*. November 2020 (available on request).

research funding system be guided by a national-level environmental research strategy and ring-fenced, long-term funding for that research.[9]

S3: The Climate Change Commission's final report would benefit from referencing the PCE's work and recommendations.

6. Reducing emissions – opportunities and challenges across sectors

The Commission's draft report and accompanying evidence base positively discusses the potential associated with a range of new technologies and innovation being developed, for example, in relation to agriculture (e.g., methane inhibitors, low nitrogen feed), industrial processing (e.g., use of supplementary materials, hydrogen as a feedstock), waste (e.g., improved production processes, waste recovery), construction and buildings (e.g., prefabrication, low emissions materials), and transport (e.g., biofuels, hydrogen power), amongst others.

The report suggests that due to scale, current costs and risks, the ability of the majority of these innovations to contribute to emissions reduction is too uncertain to be currently factored into transition pathways. Depending on the sector, the draft report either recommends the development of long-term R&D plans (i.e., for reducing biogenic emissions from agriculture, for waste reduction) or suggests investigating emissions reduction solutions and potential further (e.g., for industrial processes, food production, construction, amongst others).

As per our introductory comments, we consider the approach to climate innovation being suggested across these sectors:

- risks being too conservative and conveying binary options for some sectors (i.e., greater adoption of existing practices and technologies versus transformative R&D)
- over-emphasises R&D planning and solutions (in addition to the range of regulatory mechanisms covered), rather than taking a broader innovation systems perspective, and
- in some cases, understates the opportunities that exist and the added value that can be captured through climate change innovation.

For example, in relation to waste, the draft report emphasises the need to prevent waste at the source but only briefly refers to the considerable value that can be obtained by transforming waste streams:

- Callaghan Innovation's C-Prize 2019/2020 challenged eight finalist teams with finding tech-based solutions to climate change, improving our water quality, and preserving our planet's finite resources. Supreme winner Zincovery developed a novel approach to repurposing waste acids produced during the steel-galvanising process.
- Callaghan Innovation is also part of the Bioresource Processing Alliance, which combines the capabilities of AgResearch, Callaghan Innovation, Plant & Food Research and Scion. The BPA provides industry partners access to leading New Zealand scientists, engineers and economic specialists, who create ways to add value to low-value biological by-products of primary industry processing.

We support many waste-to-value businesses that convert industrial, biological, wood or plastic waste streams, as well as businesses whose technologies sort waste by type and increase waste's value for recyclers and re-processors. We also work with several clean water tech innovators in New Zealand, which are reducing pollutants before discharge, treating water downstream and reducing water consumption.

From a systems perspective, there are challenges in generating value from waste including securing large volumes of feedstock at the right price over the long-term and supply issues are likely to grow as waste is designed out of manufacturing and product stewardship grows. These trade-offs need to be considered when coming up with the waste reduction and recovery targets recommended in the Commission's draft report.

As another example, in relation to construction, the sector is already in the process of re-defining itself to focus on environmental sustainability with a range of disruptive technologies emerging within the sector and from other

[9] Parliamentary Commissioner for the Environment (2020). *A review of the funding and prioritisation of environmental research in New Zealand*. https://www.pce.parliament.nz/publications/environmental-research-funding-review

sectors that are contributing to this, including pre-fabrication and modular construction, advanced building materials, augmented reality, data analytics, robotics, to name a few. There are many projects in New Zealand beyond proof-of-concept stage and that offer real opportunities for wider deployment and commercialisation across the building and construction sector.

A specific, significant systems opportunity for the sector is in relation to the provision of quality, affordable housing for Māori, with an estimated pipeline of 150,000 homes required. In addition to meeting urgent housing needs and creating business and employment opportunities for Māori, the pipeline could drive the development and deployment of low-emissions innovation in the construction sector, including the use of wood products, waste to value streams and pre-fabrication, at scale.

A third example, in relation to agriculture, is the Farm2050 Nutrient Initiative being developed as a priority project under the Agri-tech Industry Transformation Plan. Agritech New Zealand is working with a range of partners to undertake trials of nutrient technologies to improve plant yield and mitigate against environmental impacts, such as increasing carbon sequestration. The initiative is also exploring pathways to global capital to support commercialisation.

S4: We believe that the final report would benefit from noting some of the real-world innovation opportunities currently being advanced to help convey a greater sense of the potential that exists, while also illustrating the importance of commercial potential and capital investment.

As mentioned earlier, Callaghan Innovation is already working with partners to map and assess the innovation system landscape and potential associated with some sectors where the Commission's draft report is recommending further investigations (e.g., Necessary Action 15, recommendation b).

S5: We suggest that further investigations build off the current reviews underway and that this be reflected in the relevant recommendations.

7. Necessary action 1 recommendation – An equitable, inclusive and well-planned climate transition

We support the intention of Necessary action 1, with a focus on creating a workforce with the skills needed for accelerating the low emissions transition and developing a plan for how to support small businesses through the transition. However, the report focuses on the capability of businesses to response to changes in energy electricity prices, natural gas and transport prices. This ignores the significant demands and opportunities for small businesses to develop 'circular economy' business models. This will not only have emissions benefits but will support productivity growth and higher incomes.

S6: We suggest that the final report discuss the capability challenges and opportunities for small businesses in broader terms. The report would also benefit from referencing the support that is available for businesses to develop their capabilities and support business transitions, for example, through NZTE and Callaghan Innovation.

Callaghan Innovation provides innovation skills initiatives (e.g., Lean, Capital Education), promotes Industry 4.0 capabilities, supports the Regional Business Partner Network and voucher scheme, has a range of technical experts in the fields of advanced materials, biotechnology, advanced manufacturing and data solutions, and provides support for businesses to access innovation expertise through Student and Project Grants. We are also currently developing a programme that aims to rapidly build and embed dynamic capabilities in suitable companies through a mix of knowledge transfer, coach supported experimentation and use of high intensity training across all levels of an organisation.

8. Enabling Recommendation 3 – a genuine, active and enduring partnership with Iwi/Māori

N2: We support the insights and recommendations in the report in relation to Māori and would welcome the opportunity to be involved in actions to ensure genuine and enduring partnerships with iwi/Māori.

As the Climate Change Commission may be aware, Callaghan Innovation has a specialist team that works with iwi organisations, land trusts, incorporations and businesses that self-identify as Māori. We work with these organisations to connect them to the right services and networks they need to innovate and grow faster. We have engaged with 118 Maori customers in the last 12 months.

We are focused on supporting a Māori-led approach to improving the Māori innovation ecosystem. For example, we partnered with Te Wānanga o Aotearoa and Māori leaders to develop and implement Kōkiri, which is a business accelerator focused on speeding up the development of early-stage Māori-led businesses. It is built upon a foundation of Kia angitū te tāuira (founder success), designed to strengthen founders and in turn strengthen their business. Another example is Te Whare a Māori – The Māori Innovation Hub at Gracefield, which offers Māori innovators a shared working space and support to assist with collaboration and innovation.

We have identified that Māori have a much higher propensity for innovation, but under access government services which are rarely Māori centred or considered. Outsourcing to bridge the capability gap is a missed opportunity to build internal capability and increase productivity. Flexible, responsive interagency approaches building long term relationships and co-designing initiatives and solutions with Māori at the centre is a proven method of which Callaghan Innovation has several examples.