Te Ara Paerangi Future Pathways submission

Summary of submission

I agree with most of the analysis of the issues with NZ's research system within the Future Pathways document, which describe many of the weaknesses of our current system. The amount of competition in the NZ system is much too high and the amount of strategic support for critical priorities is too low, leading to worrying gaps in NZ's research capabilities for facing current and future challenges. There is a lack of the incentives needed for individual actors in the research system to build effective, long-term partnerships, coalesce around national research priorities, create robust career pathways for early-career researchers (ECRs) and to make efficient infrastructure investment decisions. I commend the efforts of MBIE in recent years to put make more strategic investments in research in NZ, and I hope the result of this consultation will lead to a greater and more wide-ranging effort with clear processes and transparency of the decisions made.

The most important and urgent priorities of this submission are:

1. **An institution with the goal of facilitating better national coordination across the research sector in NZ**. This could be the role of Callaghan Innovation if it had more of an "NZ Inc." approach to building connections between research providers and industry, and encouraging better investment decisions by institutions.

2. **To urgently launch a regular (at least annual) ECR/postdoctoral funding scheme** to begin the development of NZ's future research leaders.

3. **A fund/institution** dedicated to establishing long-term partnerships between different stakeholders in the research sector, **to urgently speed up the process of building relationships between university, CRI and IRO researchers, industry, Māori, government and community organisations.** This relationship and network building is a prerequisite for the hard task of developing national research priorities that will have buy-in across NZ.

Answers to the questions

The questions are numbered as in the "Te Ara Paerangi Future Pathways Green Paper 2021 document".

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

There are a few different principles I believe should determine the scope and focus of priorities:

1. There is an ongoing responsibility of government, managed or directly undertaken by government departments, that needs a research platform – e.g. protecting NZ flora and fauna.
2. Where clusters/networks of multiple stakeholders (e.g. researchers, industry, community groups, iwi, government) are grouped around a sector or issue, and they have agreed priorities.

3. Where there are critical gaps known about that are relevant across NZ, e.g. as noted in the Future Pathways document - AI/cybersecurity, infectious disease etc.
4. There must be the potential to define a new priority in relation to strategic opportunities that emerge from relationships NZ has with international partners, as well as particularly successful and strategically important research funded originally from another mechanism such as the Centres of Research Excellence, Catalyst Strategic or Endeavour Funds.

Question 2: Priority-setting process: What principles should guide a national research Priority-setting process, and how can the process best give effect to Te Tiriti?

National priorities should be collective ones, and we cannot hope to agree on priorities and get wide acceptance while the overarching framework is researchers competing between themselves for the resources to work. The main principle I believe must be in place for priority-setting is through **partnerships**. Priorities will only succeed where there are established networks and clusters involving multiple groups across industry, researchers, government, community groups, iwi etc. This ensures the priorities will have buy-in across the board and that priorities don't depend on a few key individuals. Before setting priorities, these networks need to be set up, and encouraging (with some dedicated funding and dedicated facilitators) network establishment is one of the most urgent priorities for changes to the NZ research and science system.

Not all potential priorities will be relevant to or involve Māori interests, but all priorities should have a broad base of support within NZ, across regions, different sectors or institutions. Areas of potential priorities that don't have such networks need them to be set up before attempting to decide on a priority. The underpinning principle of **partnerships first** will help give effect to Te Tiriti when setting national priorities.

Question 3: Operationalising Priorities: How should the strategy for each national research Priority be set and how do we operationalise them?

As mentioned in the previous questions, each priority should have a clear network associated with it. The operation of each priority should be largely left to the networks to manage themselves, as the experts and the main stakeholders, and they are best placed to decide how to best accomplish the priority's goals. However, the priorities and the goals of the priorities themselves should not be set by those who will be doing the work, rather they need to be set by representatives from the wider set of interested stakeholders.

There needs to be governance of each priority that is made up of members of the network who are largely not involved in the day-to-day work of the research, to make sure that the wider group can see how the work is addressing the priority. However, it is important that the governance group includes some research leaders. These people will have a better understanding of the work being done which will mean a closer relationship between the priority workforce and the governance group. It will also have the effect of getting more research leaders to gain governance experience, and to widen the pool of experienced research managers in NZ.

Most researchers involved in the priorities will be employed by existing institutions such as the CRIs and universities, rather than being hired by the priorities themselves, and that their institutions are contracted to carry out work for the priorities. Work on the priorities will probably involve different outputs and outcomes compared to those valued by and that are part of career progression at those institutions, for instance PhDs graduated and papers published. Part of setting up the priorities will

have to be finding a way to avoid the active and passive disincentives to researchers getting involved in them because of how their research activities will not always fit the traditional mould assessed in promotions. This means there need to clear career pathways for those involved in the priorities that do not look like second-class options compared to the conventional ones (e.g. at universities that traditional pathway of lecturer to professor through teaching, investigator-led research and service).

Question 4: Engagement: How should we engage with Māori and Treaty Partners?

I am non-Māori and my research area does not have much relevance to current Māori industry or community interests, so my answer needs to be considered in that regard. I agree with the Future Pathways document, and much commentary, that the current situation of partnerships being established with Māori based around getting funding for a certain project or research proposal is a failure. The order of this should be upended – I believe a more successful model will be to **first establish the partnerships**, and that the most effective, long-lasting and impactful research programmes will emerge out of the mutual understanding that will develop. There must be a determined effort to get researchers together with Māori to build these partnerships. They may take a long time to develop, as there will often be different values, priorities, concerns, modes of thinking, incentives and vocabulary, so persistent engagement will be needed to build up mutual understanding and trust. **There must be ongoing funding that is dedicated to the building of such long-term relationships, which cannot live and die by the outcomes of contestable funding results**. Building these relationships between individuals and institutions is also vital to overcome the disregard with which some in the research space consider the principles of Te Tiriti and mātauranga Māori when applied to science, cf some public commentary on the value of mātauranga Māori over the last year.

This relationship building should moreover not be left to either Māori or researchers themselves to always initiate and drive – from the current state, there are too many barriers, and it would be too much work for currently too few incentives. While there are some good current examples of this relationship building to learn from, for instance the SfTI National Science Challenge, and in CoREs such as the MacDiarmid Institute, it would be best if a Māori-led part of a government or public organisation was charged with stimulating this nation-wide. This is potentially a role that Callaghan Innovation could be charged with, as the agency that is supposed to enable connections across NZ's research, science and innovation system.

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

Like in the previous question, I believe this has to start with building the relationships. It is much easier to value things that matter to people you know, rather than to be told what to value because others think it is important.

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

Māori knowledge has no current overlap with my research interests so I have no special thoughts. Placing knowledge hubs close to the relevant people and experts seems like a good idea generally

for providing better access, support and relationship-building opportunities for those knowledge communities.

Question 7: Core Functions: How should we decide what constitutes a core function, and how do we fund them?

I believe there has been a lot of research done on this by various organisations, who have pointed out many functions that are supported contestably or locally by one organisation. This research should be taken advantage of rather than re-investigating it. Some are obvious, as mentioned in the Future Pathways document, such as infectious disease and cybersecurity.

Question 8: Establishing a base grant and base grant design: Do you think a base grant funding model will improve stability and resilience for research organisations?

I agree that some level of a base grant is vital to support the ongoing costs of research organisations that will be there regardless of the actual research being done, and, crucially, to maintain the research workforce. Currently, applying for and getting funding from contestable mechanisms is a matter of survival for researchers and parts of institutions – we **must** apply for funding, so these rounds are not truly a competition of the best ideas. With everyone always applying and low success rates, this leads to a massive waste of valuable researcher time. A base grant which provides some support to smooth over the lean years of no funded programme or research could serve to limit loss of research expertise and should lead to more considered submissions going to contestable funding rounds.

Question 10: Institution design: How do we design collaborative, adaptive and agile research institutions that will serve current and future needs?

This has two parts for me – creating institutions that fill the gaps in what is important to NZ, and changing the incentives for existing institutions so they can reinforce improvements to the research system.

I believe it was a major mistake to have eliminated Industrial Research Limited completely when creating Callaghan Innovation. Since then, there has been no government research organisation in NZ with research capability and understanding in the physical and engineering sciences or the IT space. Future digital, electronic and computing technologies, as well as research issues underpinning the digital economy and online security will all become increasingly important to all NZers, so the lack of such an institution is a critical gap.

As I mention in other answers, I believe there is a need for an institution with a national remit to incentivise network-forming, relationship-building and sharing of information on research plans and infrastructure investment, and to keep an eye out for opportunities or areas of research need not covered by existing institutions and research programmes – all to help enable a more efficient, proactive and effective NZ research system. This sounds like potentially the role for a national Advanced Technology Institute, however the closest organisation to this, Callaghan Innovation, does not appear to have these as objectives. I think that Callaghan Innovation does not do enough to connect NZ industry with researchers and technical capability at CRIs, universities and independent research organisations, and either a new organisation should be charged with doing this, or

Callaghan needs to have a view of building connections across the entire science system, including the large concentrations of expertise and capability at universities and CRIs. There is a lot to be gained from better links across all parts of the NZ research and science system.

For existing institutions such as universities and CRIs, it is clear that existing incentives are not working, for instance to help build viable careers for early-career researchers, or to encourage better research linkages with industry. Funding from contestable mechanisms is evidently not a sufficient lever for this, and as I mentioned before in my answers to the questions about research priorities, the outputs counted for career progression at these organisations may not be as relevant in work to deliver on national research priorities. There are recent instances where individual institutions' decisions are to the detriment of the overall research system, for instance Massey University's significant downsizing of their College of Sciences. There will need to be other incentives put in place so that the decisions of institutions reinforce progress toward building a stronger research system in NZ.

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

I have answered this in **Question 18: Funding research infrastructure: How do we support sustainable, efficient and enabling investment in research infrastructure?**

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

As noted in the Future Pathways document, our research system is very fragmented, which is an important reason knowledge exchange and impact generation is so difficult. We need better networks that involve researchers, industry, government, Māori etc. so that the connections and relationships underpinning knowledge exchange are in place. The hyper-competitive research environment of NZ means that existing institutions have not been able to build these connections nationwide – though some success has been had with the National Science Challenges and Centres of Research Excellence, which are much less affected by the annual competitions.

An institution that is outside of this competition and that has a nation-wide remit is the right actor to build these networks and support knowledge exchange and impact generation. As I have mentioned in the answers to other questions, Callaghan Innovation could be such an institution, however I am extremely disappointed at the lack of network-building activities facilitated by Callaghan Innovation between research organisations and industry – perhaps they do not have the right KPIs for this work. I feel that Callaghan Innovation is too focussed on industry alone, and could be more useful with a more inclusive 'NZ Inc' approach by connecting researchers to industries where useful partnerships and knowledge exchange could occur. I know of an example where, a few years ago, a Centre of Research Excellence was starting discussions with NZ tech industry companies, and found that the IP agreements for the different universities needed to be harmonised to streamline this process. This seems like something the nation's innovation agency should have been doing to make industry-university partnerships easier – why was it left to a CoRE?

Question 14: Workforce and research Priorities: How should we include workforce considerations in the design of national research Priorities?

Workforce considerations are crucial to building effective research priorities: while the priorities may change significantly and suddenly in relation to new challenges and opportunities, the research workforce, which takes many years to develop, will evolve only slowly with time. **A well-supported and sustainable workforce is the most important aspect of delivering on the priorities.**

My suggestion is for a national postdoctoral/ECR scheme that is closely linked to the priorities or other platforms of research that have long-term funding. These ECRs will be the core workforce for the priorities, which will usually be multi-organisational and multi-disciplinary – the ideal training ground for a future workforce with a deep connection to these priorities, as well as providing a pipeline of the future research leaders for the priorities. These ECR positions would be like an internship in a research area of long-term interest to NZ.

By linking the positions to priorities, this would remove much of the precarity that comes with ECR positions funded by an investigator-led research topic, and provides a better pathway to a relevant career than relying on short-term contestable funds in an area with no guarantee of future support. The priority environment would provide a strong motivation for the direction of their career, and a pathway for them to become the future drivers of these priorities. ECRs leaving the priority for other careers in NZ will still benefit from the national network they have become a part of, and both the ECRs and NZ will continue to reap the benefits of their training in an area of national importance.

There is still a need for ECR funding not tied to national priorities, to allow the workforce to develop in new and emerging research areas, however the priorities should be in areas of long-term importance to NZ, so there is an urgent need to train researchers able to contribute to that strategically important research.

Question 15: Base grant and workforce: What impact would a base grant have on the research workforce?

A base grant would smooth over gaps in contestable funding and potentially allow researchers (especially ECRs) to feel more secure in their careers. This would relieve a massive amount of stress, reduce research workforce turnover and loss of talent, and ultimately will mean better research can be done.

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

One of the most important and urgent things to do is to have a regular – at least annual – funding round for a significant number of postdoctoral researchers. In my answer to question 14 on workforce and research priorities I propose this funding could be usefully linked to the themes of the national research priorities once they have been developed - however **a postdoctoral funding mechanism should be launched immediately**. It will take time for the new research workforce enabled by this mechanism to develop, so this is needed immediately while other changes to the research system that come from this consultation process are being developed.

This mechanism must fully fund these postdoctoral researchers so that they do not need to negotiate with institutions about compromises for employing them, and also allows the postdoc to have the flexibility to go to the institution that is best suited for them and their research. The mechanism must fund postdocs in significant numbers, at least 20 per year, rather than focus on a few potential research stars - the Rutherford Discovery Fellowship mechanism exists for that.

An easy start would be to relaunch the MBIE Science Whitinga Fellowships (with a revised name – they are not just about science) and to make it an annual funding round, then adapting this mechanism later as other research system changes come in.

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

Apart from support for ECRs and developing the future research workforce, research infrastructure is in my view the most obviously under-supported part of NZ's research system. There are several things to do to improve this situation and ensure good quality investment decisions are made.

1. **A database of existing infrastructure.** There is still no national list of capabilities or infrastructure that researchers and institutions can use when building research partnerships, making new investment decisions or attempting to solve research challenges. NRIS, the NZ Research Information System, sounds like a potential hub for this information, however almost 6 years since the RSI Domain Plan, and 18 months since the first phase of public access was planned (September 2019) it is still not available. Good information is at the core of any evidence-supported decisions, and **getting NRIS working and available should be a top, urgent priority.**

2. **An initiative to encourage institutions to make collective decisions on new infrastructure investments.** I have seen situations where similar pieces of research infrastructure have been purchased by several NZ institutions within 12 months of each other, when a collective approach could have encouraged sharing of the costs and decisions, which would have reduced the duplicated expenses for more efficient investment decisions, and resulted in a better range of infrastructure available to the NZ research system. There need to be incentives provided for competing institutions to cooperate on such decisions, and models developed to support access by people from other institutions. Good examples of this can be found overseas, for instance the Australian National Fabrication Facility https://www.anff.org.au/.

3. **A national-level contestable infrastructure fund.** A useful way to encourage joint development of research capability is to invite proposals for new infrastructure of importance to multiple institutions and sectors, especially where no individual institution could justify the investment. This incentivises building the partnerships for supporting the infrastructure, to which other partners are drawn. Major research hubs and programmes often start with investment in high quality research infrastructure, which encourages institutions to co-locate to take advantage of proximity to the new facilities. Australia's LIEF Linkage Infrastructure, Equipment and Facilities scheme https://www.arc.gov.au/grants/linkage-program/linkage-infrastructure-equipment-and-facilities is a well-developed example of this.

4. **A clear process for proposing new government investments in and support of research infrastructure of national importance.** There is some research infrastructure that is valuable across a wide enough range of institutions and stakeholders that a national facility, with ongoing central support for the running, staffing and access costs, is vital. Some infrastructure, such as the Australian Synchrotron, REANNZ, and Genomics Aotearoa, are supported this way in the SSIF mechanism, but there needs to be a way for groups to propose support for new facilities, and transparency in how these decisions are made.

5. **NZ membership of international infrastructure networks.** To carry out the best quality research often needs access to expensive facilities, and NZ will have to choose carefully what it invests in directly. By becoming a node or member of international infrastructure networks, the NZ research system can more cost-effectively gain access to top facilities and will interlink more efficiently with the international research system. The most obvious immediate target for developing this is Australia, a country that is prioritised by MBIE for research cooperation, and with whom an arrangement already exists around the Australian Synchrotron, to which NZ researchers have good access and funding support.

6. **A national institution that coordinates NZ's research infrastructure investments and partnerships, runs and provides access to national facilities.** This organisation needs to have a remit for ensuring government funding and support of infrastructure addresses national needs and priorities, separate to the independent decisions separate institutions will continue to make. Any national facilities will have to be widely accessible, which is most easily done by an institution not in competition with other research providers across NZ. An institution that looks to make connections across the NZ research ecosystem could also be appropriate to run the initiatives mentioned in points 2 and 5, and to facilitate the information sharing between institutions that will lead to better infrastructure investment decisions. Callaghan Innovation could be the national institution for this role, however it would need to have new or additional KPIs to deliver on these goals.