

Written Submission on MBIE's October 2021 Green Paper on
Future Pathways for New Zealand's Research, Science and Innovation (RSI) System
Dr Steve Thompson, Auckland
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Broaden the Scope of the Green Paper

The Green Paper focuses on the "RSI Ministerial portfolio". This is a mistake. The whole of the societal challenge should be considered if yet another partial solution is to be avoided. Much is made of the need for 'joined up' government, and steps taken in one Vote should be reciprocated by mutually supportive actions in others. This response tries to look at the whole picture. The paper asks 12 (sometimes distracting) of 17 questions along the lines of "how to." rather than the more important questions about "Why". Rather than respond to all questions, I have given my views in my own words, as below.

RSI Principles and Priorities

Scope and focus of national priorities must stem from:

- Playing our part in the well-being, sustainability and security of global society
- Addressing pluralistic issues of our own national wellbeing and security
- Safeguarding the knowledge, customs and traditions that we value.
- Nurturing and providing conditions for creativity to flourish

A Foresight Approach

Priorities imply scarce capacity to do all we want. Rather than cost-benefit calculations, we should prioritise the greatest contribution to wellbeing, with cost as a lower priority. It is more important to be effective than efficient. National Science Challenges (NSC) started life as a way of interesting the public in science. The NSC *selection* process should now be replaced by a series of pluralistic Foresight processes which include all interested communities. While they may be hosted by government (see the UK for their approach to Foresight), government must position itself as a servant of the process, not its owner. Almost all of the Foresight Challenges will need collaborative science to deal with complex societal issues and challenges – in health, society, and environment.

Delivering Foresight

Foresight Challenges will need more transparent funding mechanisms than the current NSC, though based on similar principles:- Māori involvement and mātauranga; Mission-led; Science quality; Best research collaboration; Stakeholder engagement & public participation. Foresight Challenges should be flexible over time as new issues are developed, and encourage collaboration across the university-CRI-private research-implementation spectrum. They should include pathways to ensure that successful research results progress to commercial or societal implementation. They will need both full-cost and capital investment, and both should be considered together at the time of funding. Large-scale strategic capital investments for societal outcomes should, as now, be decided at national level, and be cross-fertilized by knowledge of Foresight developments.

Answers to questions such as Māori knowledge hubs, and Core functions will fall out of, rather than pre-empt, Foresight Challenges.

What We Have Now

MBIE reckons that New Zealand has around 20,000 FTE researchers (of whom around 40% work in business), 8 Universities and 3 Wānanga, 7 CRIs, Callaghan Innovation and 18

Independent Research Organisations (IROs). Economy-wide expenditure on R&D rose from 1.15% of GDP in 2014 to 1.37% in 2019. (*cf.* OECD average of 2.4%). In 2004, New Zealand set up (now 10) Centres of Research Excellence (CoREs), in indigenous research, complex systems, nanotech, photonics, food, bio-protection, medical research, and earthquakes. New CoREs in 2020 dealt with Coastal Ecosystems and Healthy Hearts. In 2014, National Science Challenges were instituted to research cross-cutting issues in human health and nutrition, our built and natural environments, and innovation. These (now 11) Challenges overtly encourage CRI, university and non-government collaboration.

Why Change It?

1. For 20 years, government saw its role almost entirely as an investor, in *neglect of its ownership responsibility to maintain a viable science infrastructure*, with FRST acting “in loco parentis”. Since 2011, some funding (now 15% of CRI budgets) has been made available to help CRIs maintain their capabilities and infrastructure. The Strategic Science Investment Fund is a move in the right direction.
2. CRIs have responded as best they can. But new client groups are emerging and NZ needs to support them as well. Therein lies a problem – **CRIs have no remit to ‘pivot’ to new areas**. If institutes were allowed to continue forever, we might still have an Institute for Axe-Grinding!

IRO opportunities have been under-played by government for many years. While governments have sought to accelerate research uptake by end-users, their support for the very institutions which embody end-user input has been slow to grow. (with a recent exception being the \$1.5m EDI Fund).

But the overwhelming change in recent decades has been to recognise the **importance of collaboration** – both among those doing the research and with those who frame the question to be researched. Today’s issues are so multi-faceted that their design and execution require broad societal discussion and collaboration. They will frequently benefit from international collaboration.

What Do We Need?

Over time, New Zealand has bolted on programmes and initiatives to fix ad-hoc situations. It’s time now for a complete system re-think. New Zealand undertakes only a tiny percentage of world science but we do need:-

Highly-trained scientists to understand world developments and turn them to use in New Zealand. Excellent Researchers are found throughout the system, but are supported (inadequately) by universities, CoREs, and the Marsden Fund. Government, as owner of CRIs, has a responsibility to develop those staff and their career security. Recurring Post-Docs are simply not enough!

Collaborative science to deal with complex societal issues and challenges– in health, society, and environment. Foresight Challenges, as described, are well suited to this purpose.

Value-creation and value-added in our private and public sectors should allow for contribution from across the applied-discovery spectrum, from end-users, through to CoREs. Funding vehicles should be consolidated and redrawn to encourage such

collaboration and encourage co-investment from the private sector. Callaghan Innovation already bears some similarities to Canada's Industrial Research Assistance Program (IRAP) and more lessons could be learned from their experience over 70 years.

Underpinning infrastructure to enable the above. Capital Infrastructure has been handled in various ways over the years – from special Cabinet submissions to short-listing panels. An enlarged Strategic Science Investment Fund should continue for major public assets/programmes.

How Do We Get There from Here?

We will need to re-write almost all of our funding/investment instruments and increase institutional flexibility. CRI remits should be broadened, rather than being more closely defined, to allow new directions and collaborative work. Government will need to ensure that our science 'capital' is kept up to date by infrastructure investment. A Foresight Challenges process will be the main vehicle for public-good research and be sufficiently funded to further encourage national and international collaborations across societal groups and science disciplines. Value Creation funding will encourage much more industry co-funding. Development of excellent scientists calls for Vote Education and to Vote RS&T to work together, as well as with the private sector. There will, of course, continue to be a need to develop talented students and teachers, as well as EDI and specific tasks.

A 'Virtual' Restructure

Would we need a complete re-structure? No. Changing structure, without focussing first on what New Zealand wants to achieve, always ends in a mess. Much of what we want to achieve can come from our current science capacity, but reconfigured in a 'virtual' rather than physical way, to get the job done.

Priming the Pump

Different countries have built remarkably different science systems over time, and some perform better than others. But perhaps the strongest indicator of system performance is the amount of investment made via the system. New Zealand had a goal for almost 30 years that government investment in R&D should reach 0.8% of GDP – and it failed repeatedly to move that figure much above 0.5%. Do we now have a chance to get serious about knowledge and innovation?