

Science System Review

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Introduction

New Zealanders for Health Research (NZHR) was established in 2015 to achieve improved health outcomes through increased investment in health research, and better translation of results into policy and practice.

We welcome the opportunity to contribute to the current Science System Review, noting that our subject matter expertise relates most directly to the health research component of the science system. Where we believe we can do so credibly we've commented on the science system as a whole, and have drawn on our knowledge of the health science and research sector in particular. We have done this for both its own sake and for illustrative purposes with the intention that our insights can be extrapolated to other areas, and to argue that health science and research should be given prominence in any new science system that emerges as a result of this review. This is because health research in particular has been subject to longstanding institutional and financial neglect, with the result that opportunities for improved health and wellbeing have been, and continue to be, foregone and squandered.

Much of the content of this submission is reflected in NZHR's March 2022 response to Te Ara Paerangi Future Pathways Green Paper¹, which should be read as a companion document to this submission.

The remainder of this document addresses a selection of the questions posed in the guideline document, but not necessarily in the order presented, identifiable in **blue**.

- **What are some important factors for the government to consider as criteria when prioritising investment in research appropriate for New Zealand's size and characteristics?**

In numerous submissions NZHR has argued that government investment in health research should as a minimum stand at 2.4% of government's health care costs². The closest that New Zealand has come to this over the last decade however has been 0.8%, and, with the expiry of funding for the

¹ NZHR March 2022. Future Pathways for Health and Medical Research | New Zealanders for Health Research Submission on Te Ara Paerangi Future Pathways Green Paper. <https://nz4healthresearch.org.nz/wp-content/uploads/2022/03/NZHR%20RSI%20Green%20paper%20final%20submission%20160322.pdf>

² NZHR. April 2024. Budget Policy Statement 2024 submission. <https://nz4healthresearch.org.nz/wp-content/uploads/2024/04/NZHR-Budget-Policy-Statement-submission-220424.pdf>

National Science Challenges this is now drifting towards 0.5%. This underinvestment in health research is a symptom of underinvestment in research and development in general. Statistic New Zealand's latest figures report R&D as a percentage of GDP at 1.47%³, which is well short of both the previous government's aspirational 2% target, and NZHR's frequently recommended 3% target which would bring New Zealand into line with levels that are being achieved by comparable small advanced economies. The now disbanded Productivity Commission has made similar observations and developed a comprehensive set of recommendations in response⁴ which unfortunately went largely unheeded.

Underinvestment in R&D is the single most important factor for the government to consider when prioritising investment in research appropriate for New Zealand's size and characteristics. A reviewed science system must be underpinned by an ambitious commitment to significantly increasing investment in R&D, and the resulting rising tide will lift investment for all ships, including health research.

- **Where are the major structural barriers to greater efficiency, effectiveness, and impact?**
- **What principles should underpin the design of a science, innovation, and technology system for New Zealand?**

The current science, innovation and technology system shows little evidence of design nor does its current form indicate the existence of any particular underpinning principles. It has the appearance of a semi-random accumulation of a collection of twenty three time bound CRI, NSC (National Science Challenges) and CoRE priorities, as presented in the following table⁵. (Inferred top priorities are ranked A because they're associated with all three investment sources, inferred medium priorities are ranked B because they have two investment sources, and inferred low priorities are ranked C because they have only one investment source).

Inferred priority ranking	Priority	CRI	NSC	CoRE
A	Weather and climate hazards resilience	✓	✓	✓
A	Freshwater safety	✓	✓	✓
A	Food safety/security and nutrition	✓	✓	✓
A	Geological hazards resilience	✓	✓	✓
A	Biodiversity	✓	✓	✓
B	Land resources	✓	✓	
B	Agriculture	✓	✓	
B	Aquatic resources and environments	✓	✓	

³ <https://www.stats.govt.nz/information-releases/research-and-development-survey-2022/>

⁴ New Zealand Productivity Commission (2021). New Zealand firms: Reaching for the Frontier. <https://www.productivity.govt.nz/assets/Documents/Final-report-Frontier-firms.pdf>

⁵ Detail is provided in the Appendix A, New Zealanders for Health Research Submission on Te Ara Paerangi Future Pathways Green Paper. <https://nz4healthresearch.org.nz/wp-content/uploads/2022/03/NZHR%20RSI%20Green%20paper%20final%20submission%20160322.pdf>

Inferred priority ranking	Priority	CRI	NSC	CoRE
B	Energy	✓		✓
B	Health and diseases		✓	✓
B	Biosecurity and resilience		✓	✓
C	Minerals	✓		
C	Nuclear science	✓		
C	Forestry and wood products	✓		
C	A better start for young people		✓	
C	Aging well		✓	
C	Housing and urbanisation		✓	
C	High tech		✓	
C	Quantum technology			✓
C	Materials development			✓
C	Enhancing Māori creativity			✓
C	Poverty reduction			✓
C	Rebuilding civil society			✓

New Zealand’s science, innovation, and technology system should instead be underpinned by the fundamental principle of “form follows function”.

It is a basic duty of the New Zealand government to support its citizens to live well for as long as possible, and at least to the internationally accepted “ripe old age” of seventy five years. This basic duty should be a key driver of the government’s science investments and investment incentives, and science system priorities should be focused on what both promotes and militates against – or puts at risk - realization of this basic duty for the greatest number of people. NZHR **recommends** that the Science System Review report explicitly states that “the government funded components of New Zealand’s RSI system exist to drive significant improvements in New Zealand’s and all New Zealanders’ well-being and future prosperity through the mandated translation and application of results of excellent research into all aspects of government wellbeing and commercial policy and practice”.

A subsidiary four-part principle is that science investment decisions be driven by the need for new knowledge and discovery to:

1. mitigate risks to wellbeing (ie New Zealanders’ and New Zealand’s health, quality of life, productivity, wealth and standard of living)
2. generate new opportunities to improve New Zealand’s and New Zealanders’ wellbeing
3. address New Zealand’s unique circumstances, including mātauranga Māori
4. improve understanding of “how things work”

- **What future should be envisaged for a publicly supported science, innovation and technology systems?**
- **How can opportunities, challenges and barriers that need to be addressed contribute to developing innovative solutions to emerging challenges such as climate change, biodiversity loss, and societal health?**
- **How should the science, innovation, and technology system embrace and reflect the growing diversity of culture and peoples in New Zealand and the contributions of Māori as reflected in the Treaty/te Tiriti?**
- **How should the functions of government research organisations including the current CRIs be organised, governed, and managed into the future?**
- **Are public research organisations too isolated from higher education?**
- **Does New Zealand need to rationalise its research funding mechanisms?**
- **At what levels should prioritisation of research and research investment occur and on what basis?**

Government science system and priorities that could emerge from the above principles are presented in the following table. This is not intended as a complete or best possible list, nor are the assessment descriptors in the cells intended to reflect NZHR’s views one way or the other – they are presented merely to sketch out what a systematic approach to identifying science system priorities could look like. The “size of the prize” rankings are an attempt to illustrate the potential cost-benefit of investing in each area of science and research given the size, imminence and wellbeing impact of the listed focuses for the science system, and point to how science and research investments should be prioritised to avert negative impacts of not investing and promote positive impacts of investing in the science system.

Potential CSIA ⁶	Potential for positive impact on wellbeing through discovery of new opportunities	Sufficiency of knowledge in NZ and globally to implement new opportunities	Adverse impact on wellbeing if risk is unaddressed	Sufficiency of knowledge in New Zealand to minimize the probability of the risk materialising?	Sufficiency of knowledge in NZ and globally to mitigate impact if the risk does materialise?	NZ focused research required?	More understanding required of “how things work”	“size of the prize” ranking
Climate change	High	Low	High	Low	Low	Yes	Yes	1
Health and illness (especially non-	High	Low	High	Low	Low	Yes	Yes	2

⁶ Crown Science Investment Agency

Potential CSIA ⁶	Potential for positive impact on wellbeing through discovery of new opportunities	Sufficiency of knowledge in NZ and globally to implement new opportunities	Adverse impact on wellbeing if risk is unaddressed	Sufficiency of knowledge in New Zealand to minimize the probability of the risk materialising?	Sufficiency of knowledge in NZ and globally to mitigate impact if the risk does materialise?	NZ focused research required?	More understanding required of “how things work”	“size of the prize” ranking
amenable morbidity and non-amenable premature mortality) ⁷								
Water (oceans, lakes, rivers, drinking water)	High	Low	High	Moderate	Moderate	Yes	Yes	3
Geology (earthquake, volcano, tsunami)	High	Low	High	Low	Low	Yes	Yes	4
Biosecurity	High	High	High	Moderate	Low	Yes	Yes	5
Biodiversity	High	Low	High	Moderate	Low	Yes	Yes	6
Education	High	Moderate	High	Moderate	Low	Yes	Moderate	7
Farming (agri/aqua/horticulture)	High	High	High	High	High	Yes	Moderate	8
Wealth distribution	High	Moderate	High	Low	Low	Yes	High	9
Buildings	High	Moderate	High	Adequate	Moderate	Yes	Moderate	10
Justice	High	Moderate	High	Low	Low	Yes	High	11
Transport	High	Moderate	Moderate	Adequate	Moderate	Yes	Moderate	12
Tourism	High	Moderate	Low	High	High	Yes	Moderate	13

⁷ NZIER. October 2022. Valuing Health Research in New Zealand Feasibility Study. NZIER report to New Zealanders for Health Research. This report states that “considering the body of evidence from countries with similar health issues, health systems and economies, reflecting a wide range of health research similar to New Zealand’s research portfolio, an expected value can be estimated. Our ballpark estimate is that based on approximately \$493.444 million of investment in health research [from all sources] annually, the total benefits to New Zealand are likely to be between \$1.1 billion and \$1.9 billion, or annual flows of between \$64 million and \$148 million. These estimates require further research to be confirmed...one simple way of illustrating the potential value of future health research is to estimate the value of lost production due to premature deaths from what are currently considered to be non-amenable causes of mortality. Based on deaths in 2017 (the most recent complete year for which complete mortality data is available), our estimate of this potential is \$3 billion to \$4 billion.”

Whatever the final list and rankings look like NZHR's suggested approach is to reform the current ad hoc science priority arrangements and replace them with a set of professionally governed, mātauranga Māori informed, Tiriti embedded, permanently and equitably funded Crown Science Investment Agencies (CSIAs) for each of the agreed science priority areas. All CSIAs would be resourced with a PMCSA advised, Treasury recommended, government financial allocation determined by a combination of its ranking on the final iteration of the above table and government expenditure as a percentage of GDP, and be required to:

- develop RSI Minister approved annually refreshed five year priority and investment plans
- allocate an RSI Minister determined proportion of their total allocations to the CSIA's own permanent science and research programme.
- invest an RSI Minister determined proportion of their allocations to external science entities via competitive RFP processes. Successful projects will not:
 - duplicate international research which is directly translatable to the New Zealand context
 - unnecessarily duplicate research which has already been undertaken in New Zealand
 - duplicate research where low impact is attributable to failure to translate the results of previous research into legislation, policy and practice
 - be prioritised for investment in the absence of a line of sight to impact⁸

These arrangements would replace all existing government science and research funding and investment channels, including CRIs, CoREs, Health Research Council, all MBIE science investment pools including the Marsden Fund and Callaghan Innovation, etc.

They would also allow the science system to dispense with current requirements for different research disciplines to compete with each other for scarce generic resources (eg health and medical research vs climate change research vs plant and food research etc) in favour of larger allocations associated with each research priority, with the actual amount and growth trajectory determined by the sector's share of GDP, and potential for environmental, health and wellbeing, and economic impact.

The current science system arrangements are subject to varying degrees of precarity, as illustrated for example by the ending of the NSCs with no plans for what will happen next, and the still recent discontinuation of the Centre for Brain Research and MedTech CoREs. Permanent CSIA's could help to address this issue.

⁸ NZHR believes that health research and innovation is the single most important way in which we improve our health and healthcare – by identifying and implementing the best means to prevent, diagnose and treat conditions. We therefore want the science system to achieve greater impact as expressed by way of better health outcomes) rather than academic citations. Citations are important as a measure of how knowledge and discoveries are shared, but shouldn't be conflated with impact per se.

Investment in health research has suffered historically because it hasn't been sufficiently prioritised within the science system itself (eg health research doesn't have its own discrete CRI, and is fragmented across CRIs, NSCs and CoREs. This would be addressed through a purposeful approach to identifying science system priorities. A health CSIA would undertake and fund health and medical research, provide for health research workforce development and retention, remove the current high level of precarity associated with the current arrangements, and facilitate processes for translating research results into policy and practice. It would also be a natural single place to locate, further develop, and ensure continuing implementation of New Zealand's pre-existing Health Research Strategy⁹ (the parties to which are currently MBIE, HRC and Manatū Hauora | Ministry of Health).

We note that the CoREs were out of scope for MBIE's Green Paper, which NZHR believes was a weakness. We hope that the current review will consider them to be in scope.

- **What are the barriers between publicly funded research entities?**

A structural barrier which is a problem for health research at least is the requirement for HRC funding to contribute to institutional overheads. NZHR leans in favour of uncoupling funding for health research infrastructure from health research investment, particularly where both the source of the investment and the host research institution are government agencies. We think that the current system which requires, for example, the HRC to contribute up to, say 40%, of the total value of a grant as a contribution to the host's general overheads and infrastructure costs lacks transparency and distorts any assessment of what the cost benefit of any research might be. We therefore recommend that government host institutions be fully funded directly by their primary funders for all of their generic overhead and infrastructure requirements, and that health research funders would only cover new infrastructure costs directly associated with and required for the research to be undertaken.

- **What are some important factors for the government to consider as criteria when prioritising investment in research appropriate for New Zealand's size and characteristics?**
- **In what areas should New Zealand develop in depth research expertise over the next two decades?**

There needs to be a serious approach to talent development and retention. For example, Reid et al (2014)¹⁰ “look back on a decade of diminishing investment in health research in New Zealand. During this time, investment in our hospitals has substantially increased, as have the number of academic staff working in medicine and public health. As a result, an increasing number of would-be researchers have been pursuing a progressively

⁹ New Zealand Health Research Strategy 2017 – 2027. Ministry of Health and Ministry of Business Innovation and Employment. 2017
<https://www.health.govt.nz/system/files/documents/publications/nz-health-research-strategy-jun17.pdf>

¹⁰ Reid I et al. Government funding of health research in New Zealand. NZMJ. Vol 127 No 1389: 14 Feb 2014. <https://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2014/vol-127-no.-1389/5992>

diminishing pool of resource to support research, resulting in funding rates in HRC grant rounds which are among the lowest in the world, and one-third of those in Australia.”

“Such low rates of grant success discourage individuals from submitting grants, but also discourage academics from working in New Zealand. The medical faculties in both Otago and Auckland suffer a steady loss of academics disgruntled by the research funding environment, who move overseas, most commonly to Australia”.

“We also face a continual battle to recruit academics, including expatriate New Zealanders, because there is the perception that moving to New Zealand necessitates abandonment of serious medical research activity”.

“The current crisis has arisen because there has been no indexing of research funding to the cost of research, nor to the size of the workforce that should be research-active. Structural changes need to be put in place to ensure that these parameters guide future levels of funding”.

Otago University’s Division of Health Sciences has noted that “we have great difficulty getting clinicians in some of the DHBs we work with to engage at all as they are 100% focussed on meeting the KPIs of the DHB in terms of patients seen, etc. Research has very low status in these DHBS”.¹¹

The University of Auckland Faculty of Medical and Health Sciences Postdoctoral Society¹² has highlighted the many barriers to recruiting and retaining early stage health and medical researchers, and submit that there would be much benefit in career pathways which are unshackled from short term contracts based on short term research project funding.

The Maurice Wilkins Centre says that health research workforce development should include commitments to both diversity and adequate remuneration¹³.

The Healthier Lives National Science Challenge adds that there appears to be a steady drain of Māori PhDs from the science system, especially in the field of health, and as a result there is considerable strain placed on Māori researchers who remain in the system from the many demands on them¹⁴.

¹¹ November 2019. <https://www.mbie.govt.nz/dmsdocument/10548-university-of-otago-division-of-health-sciences-draft-research-science-and-innovation-strategy-submission-pdf>

¹² November 2019. <https://www.mbie.govt.nz/dmsdocument/10544-university-of-auckland-faculty-of-medical-and-health-sciences-postdoctoral-society-draft-research-science-and-innovation-strategy-submission-pdf>

¹³ November 2019. <https://www.mbie.govt.nz/dmsdocument/10496-maurice-wilkins-centre-draft-research-science-and-innovation-strategy-submission-pdf>

¹⁴ November 2019. <https://www.mbie.govt.nz/dmsdocument/10481-healthier-lives-national-science-challenge-draft-research-science-and-innovation-strategy-submission-pdf>