MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

BRIEFING

Public good activities in Crown Research Institutes

Date:	22 May 2024	**Priority:**	Medium
Security classification:	In Confidence	**Tracking number:**	2324-2733

Action sought		
	Action sought	**Deadline**
Hon Judith Collins, KC **Minister of Science, Innovation and Technology**	Note the range of public good activities in CRIs.	29 May 2024

Contact for telephone discussion (if required)			
Name	**Position**	**Telephone**	**1st contact**
Landon McMillan	Manager, Science Policy	Privacy of natural persons	✓
Linda Moore	Principal Policy Advisory		

The following departments/agencies have been consulted

Minister's office to complete:

- ☐ Approved
- ☐ Noted
- ☐ Seen
- ☐ See Minister's Notes
- ☐ Declined
- ☐ Needs change
- ☐ Overtaken by Events
- ☐ Withdrawn

Comments

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
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BRIEFING

Public good activities in Crown Research Institutes

Date:	15 May 2024	**Priority:**	Medium
Security classification:	In Confidence	**Tracking number:**	2324-2733

Purpose

To provide information about public good activities by Crown Research Institutes (CRIs) to inform your thinking about the role and funding of CRIs.

Executive summary

Public good science is necessary or highly valuable for New Zealand but is unlikely to happen without government intervention due to market failures. Public good science includes research and services that are needed by all well-functioning modern economies, such as measurement standards or public health research and monitoring. It also includes science and research aimed at building competitive advantage, such as supporting new economic sectors or supporting the productivity, sustainability and resilience of existing sectors.

All CRIs perform public good science, with the Strategic Science Investment Fund (SSIF) a key source of funding (approximately $260 million in 2023/24).

Examples include GNS Science's (GNS) monitoring of the geomagnetic field which aided Transpower to manage the effects of the recent solar storms; Plant and Food's holdings of seed and genetic information for key arable and food crops, used by primary sector businesses; and NIWA's operation of the deep-sea Research Vessel Tangaroa, used by the research sector, government and businesses for fisheries, energy, hazards and climate science.

Some CRIs have a higher proportion of research with sector or private benefits, and this is reflected in the extent of government revenue for each CRI. CRIs will commercialise activities where appropriate. However, in some cases, maximising returns for CRIs can reduce uptake of knowledge, and thus broader public benefits.

Recommended action

The Ministry of Business, Innovation and Employment (MBIE) recommends that you:

a **Note** CRIs undertake a range of public good science, which is of high value to New Zealand, but may not offer immediate commercial value.

Noted

b **Indicate** if you wish to discuss this briefing.

Yes / No

Landon McMillan
Manager, Science Policy
Labour, Science and Enterprise, MBIE

24 / 05 / 2024

Hon Judith Collins, KC
Minister of Science, Innovation and Technology

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Background

1. The Science System Advisory Group (SSAG) will consider ways to achieve your objectives to incentivise science and research with a commercial value, and explore a potential refocus for CRIs (CAB-24-MIN-0089).

2. You asked for advice on the extent of 'public good' activities by CRIs during your meeting with officials on 28 February, following a conversation on the work of the SSAG.

3. MBIE has provided you and the SSAG with advice on policy considerations for refocussing of the CRIs. We presented options to separate 'sector-facing' science from science that is essential for New Zealand's social and economic resilience, but is not supported by the private market, often referred to as 'public good' science. (Briefing 2324-2674 refers.)

4. This briefing provides a discussion about public good science in CRIs.

Public good science

Public good activities are necessary or highly valuable for New Zealand but are unlikely to happen without government intervention due to market failures.

5. Science has both public and private or commercial benefit. Public good science covers research and science services with broad benefits, such as increased economic productivity, wealth creation and structural changes to the economy, and greater societal and environmental wellbeing and resilience.

6. As a general principal, science and research are critical to society due to the significant spill-over effects from capability development and their role in generating and applying knowledge. Knowledge itself is often considered to be a public good. While the term 'public goods' has a strict economic definition, we use 'public good' in its less formal sense to refer to things that have high benefits for the economy, society, and the environment.

7. Governments in advanced economies tend to invest in public good science activities in two 'broad' categories:

    a. **Science-based activities that are simply needed by all well-functioning modern economies**. These provide backbone services or critical information for markets that enable an economy or general society to function, such as measurement standards or volcanic ash monitoring to support airlines to operate. Increasingly and in most advanced economies, research in areas such as natural hazards, environment or population health has come to be considered essential to provide foundational knowledge to guide decisions. These types of activities often support government decision-making and are usually undertaken close to government in public research organisations.

    b. **Science and research to build long term competitive advantage in strategic areas of benefit for the economy**, including both sector-specific research and general-purpose technologies like Artificial Intelligence (AI). Even though there may be private benefits in the long run from this type of research, the private sector won't invest, or will underinvest. This is because the private sector does not capture the full returns, or because of greater risk/uncertainty or the timeframe for return (patient capital). This type of research may be done in universities, public research organisations and/or private businesses.

8. Government provision of capability and infrastructure is intended to 'crowd in' private investment and support economic resilience and the health of the R&D ecosystem. The government's priorities should change as markets change, particularly in relation to science to build competitive advantage. As New Zealand has a smaller economy, with fewer large companies willing to invest, the government may need to play a more active role in supporting R&D to address market failures.

CRIs public good activities

All CRIs perform public good science

9. CRIs' **activities critical to making markets and societies function** include weather and public health monitoring and other collections and databases that require long-term stewardship or support international treaties and trade agreements, plus research in critical areas such as natural hazard research. CRIs with a stronger focus in this area include ESR, GNS, NIWA, and Manaaki Whenua.

10. CRIs' **activities to build competitive advantage** include research to develop economic sectors, such as NIWA's research to develop shore-based aquaculture. It covers programmes to build capabilities needed by New Zealand, such as GNS's geothermal programme, as well as developing expertise in new general-purpose technologies like synthetic biology.

MBIE's Strategic Science Investment Fund (SSIF) provides funding for public good science

11. Since 2016, each CRI has received SSIF funding for research and infrastructure that develops critical capabilities and is the basis for delivering public and commercial value. In 2023/24 approximately $260 million SSIF funding went to CRIs. Other MBIE science funds and other government agencies also support public good science.

12. For example, with SSIF funding, ESR developed genomic testing capability and techniques. During the COVID epidemic, information from ESR's genomic sequencing and contract tracing were critical to avoiding a lockdown in Auckland, with estimated savings of $3.5 billion for the NZ economy.[1]

CRIs also conduct R&D activities for commercial benefit, where the private benefits outweigh the public benefits.

13. In many cases, these activities are paid for by businesses that benefit, for example Zespri invests in the Kiwifruit Breeding Centre at Plant and Food Research (PFR). However, there may be cases where government continues to invest in areas where there are fewer public benefits. This can crowd out private investment.

Some CRIs have a higher proportion of research with sector or private benefits

14. CRIs are not a homogenous group, with different user communities and capabilities, so that some are more focussed on government science needs, and others more engaged with industry.

15. At one end of the spectrum are GNS and ESR, which have high proportions of government investment for public good services – public health and forensic services at ESR and geohazards monitoring at GNS.

16. In the middle are NIWA, Manaaki Whenua and Scion with significant government investment and some private income.

17. AgResearch and PFR, as "sector-facing" CRIs, have relatively high private investment, reflecting a stronger interest from their industry partners in mature and established sectors. They are also funded to do longer-term, basic and over the horizon research (via MBIE) to create new pathways for growth for the primary sector.

18. The extent of government versus other income at each CRI is shown in the chart below. Government revenue is a rough indicator of the public good activities for each CRI. 'Other/private' revenue includes income from businesses, licensing and IP, international research funding, and iwi/Māori investment. (Note that MBIE does not have good data on the extent of partnerships with Māori or the associated income streams.)

[1] NZIER analysis.

Commercial Information

Examples of public good science

CRIs create and share information, technology, and expertise to: (with select examples)	
AgResearch	Improve farming across productivity, biosecurity, sustainability, especially for small farms • Research on reducing methane emissions, including equipment to measure methane emissions on farm, used by breeders, farmers, regulators, and scientists. • Seed collection of grasses and indigenous plants, used by farmers, biodiversity managers, and mana whenua.
Callaghan Innovation	Enable businesses to do R&D • Measurement Standards Laboratory - weights and measures to support trade.
ESR	Support population health and the justice system • Forensic Testing, used by police and the broader justice system. • Food and water safety expertise, used by government and private companies. • Public health monitoring, such as wastewater testing facilities, national disease reference laboratory, used by the public and private health systems.
GNS Science	Grow resilience to natural hazards, enable the energy, and minerals sectors • Geophysical surveys used by energy, mining companies. • Earthquake, tsunami, volcano and landslide monitoring (GeoNet) and research are used by central and local government, infrastructure and building owners, and energy and transport sectors. • Observatories and laboratories measure earth's magnetic fields to monitor space weather to support resilient energy, telecommunications, and transport. Used by Transpower during the recent solar storms.
Manaaki Whenua	Enhance the value and sustainable management of New Zealand's land resources • National soil database used by landowners, agriculture, and horticulture. • New Zealand and Pacific fungi, plant, and insect collections, used for biosecurity and conservation. • Land cover database, which shows changing land use in New Zealand, used for mapping and planning by central and local government. • Plant biosecurity research, used by businesses and government.
NIWA	Enhance the economic value and management of New Zealand's oceans, rivers, and lakes, and increase resilience to weather and climate hazards • Research on weather patterns and climate used by the public, emergency services, transport, energy, and many others. • Hydrology capability and data to understand rivers, floods, used by central and local government, emergency management, and infrastructure operators. • Research Vessel Tangaroa, New Zealand's only deep-water research vessel, for multi- disciplinary research, fisheries monitoring, and energy surveys.

Plant and Food	Enable the horticultural, arable and food and beverage industries • Fruit, arable and vegetable crop seeds and genetic information, used by farmers and businesses. • Biosecurity research for key species, used by industries, and the government. • Plant variety research and expertise, used by industries and government
Scion	Drive innovation and growth in forestry, wood, and other biomaterials • Fire management research, used by landowners, fire, and emergency management. • Research on recovering energy and minerals from municipal waste, used by waste management companies, local and central government.

CRIs commercialise activities where appropriate, but maximising CRI income may result in fewer public good benefits

19. CRIs will commercialise services, via both fee for service work, and longer-term income streams, such as licensing and IP spinouts (both included in 'other revenue'). This can support desired public good outcomes for New Zealand, deliver to private sector science needs, and at the same time provide revenue for individual CRIs.[2] PFR has been the most successful at generating long-term income via plant varieties. Where there are less mature, developing sectors or missing markets, there may be fewer opportunities for CRIs to commercialise.

20. CRIs may set charging rates to maximise return for the organisation. However, high charges may limit uptake, and thus reduce public benefits. CRIs may set lower or nil charges where access and use benefits New Zealand – for example, GeoNet data is provided freely to all users to maximise public benefits from good management of earthquake and volcanic risks. This approach may reduce the returns to CRIs, or require ongoing government funding, as in the case of GeoNet.

21. Riskscape, a multi-hazard modelling tool developed by NIWA and GNS is an example of CRIs seeking to generate income as well as generate public and commercial value. Researchers can access the Riskscape tool for free, but commercial users, such as engineers and insurance companies pay a license fee. The fee covers only partial costs of the platform, since the goal is to have the information widely used.

Government's public good science investment favours historical, rather than future economic needs

22. Compared with other countries, the NZ government is a larger investor in research that supports existing sectors, such as the primary sector, which has mixed public and private/sector benefits. The emphasis on primary sector related research largely reflects our traditional sector profile and industrial policy at the time of the creation of the CRIs in 1992.

23. New Zealand's economic needs have evolved since 1992. To maximise public good benefits, MBIE's view is that we need more investment in general purpose technologies and new sectors. To support the traditional sectors, the government can encourage benefitting industries to fund more research, and focus government's investment on the basic research that supports positive changes in those sectors such as diversification into adjacent areas.

Next steps

24. MBIE will continue to work with the SSAG as they prepare their report on ways to refocus the CRIs, and provide advice on their future functions, scope, and structure.

[2] Examples of CRIs longer term incomes streams include Toitu (MW) STRMIx, Lumi Drug Scan (ESR) kiwi and apple varieties (PfR). Halter, Hyperfarm and ZeaKal (AgR), BSPKL (GNS), EchoGas (Scion).