



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
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**SCIENCE AND
INNOVATION**



Review of Crown Research Institute Core Funding

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Executive Summary

Government introduced Crown Research Institute (CRI) core funding in July 2011 to give CRIs a much larger portion of stable, long-term funding. Core funding was designed to provide a level of financial stability to:

- help CRIs deliver on their core purpose activities
- plan strategically over the long-term
- pursue long-term research programmes
- develop workforce capability
- increase collaboration between CRIs
- provide flexibility
- reduce costs and investment in complex and numerous contestable funding processes, and
- support ongoing management of relevant Nationally Significant Collections and Databases.

The contracts for core funding were for a five-year period, expiring in June 2016. This review was undertaken to provide advice on the performance, ongoing role and future alignment of core funding in the context of funding of the science and innovation system. This review explores ways to maximise the effectiveness and impact of this investment mechanism.

The review found that CRI core funding has performed well over the last four years against its original policy objectives. It has enabled the CRIs to make improvements in a number of areas, resulting in improved organisational performance, improved strategic planning capability, strengthened skills in strategic workforce planning and better alignment and responsiveness to end-user requirements and priorities. The magnitude of improvements is consistent with the CRIs having had the benefit of core funding for just four years and there is increasing momentum towards ongoing performance improvements as CRIs become more skilled, confident and mature in their use of strategic funding.

The review also identified a number of areas or opportunities where improvements could be made including:

- strengthening progress towards achieving Vision Mātauranga
- enhancing or prioritising pan-CRI programmes
- reviewing the current investment framework for NSC&Ds
- streamlining and enhancing CRI reporting, and
- providing greater guidance to CRIs regarding the Crown's prioritisation and expectations for the use of core funding.

The review concluded it would be appropriate and useful to continue strategic funding for CRIs. However, there is an opportunity to refine core funding to realise greater science system benefits in future years and alignment with the National Statement of Science Investment (NSSI).

The NSSI, released in October 2015, sets the strategic vision for science investment over the next ten years. CRI core funding accounts for around 15 per cent of the Government's total science investment, and as such should be a major lever for achieving the NSSI strategic vision for the science system. In light of the vision of the NSSI and the evolving science system, it is appropriate to

consider sharpening the objectives of the strategic funding mechanism for CRIs to better align with the NSSI and other MBIE Science and Innovation investment mechanisms, and to ensure that CRIs continue to lift their performance and act in a way that promotes science system outcomes. As such, the future funding model should provide for:

- clearly documented investment objectives and outcomes including:
 - line-of-sight to long-term impacts
 - expectations of excellence in science
 - expectations to support increased industry investment in research, and
 - growth of and access to New Zealand’s critical science and research capability within and across the science system
- clarity of accountability and performance expectations between MBIE and the CRI
- stability for CRIs in the face of uncertain funding landscape
- flexibility to respond to changing priorities
- minimisation of transaction costs for both parties, and
- independence of CRIs’ shareholding accountabilities to the Crown.

Introduction

Crown Research Institutes (CRIs), established in 1992, are Crown-owned organisations that carry out research for the benefit of New Zealand. CRIs are a key part of New Zealand's science and innovation system.

In response to the CRI Taskforce Report,¹ Government introduced core funding for CRIs in July 2011. Core funding was designed to provide a level of financial stability to:

- help CRIs deliver on their core purpose activities
- plan strategically over the long-term
- pursue long-term research programmes
- develop workforce capability
- increase collaboration between CRIs
- provide flexibility
- reduce costs and investment in complex and numerous contestable funding processes, and
- support ongoing management of relevant Nationally Significant Collections and Databases.

The contracts for core funding were for a five-year period expiring in June 2016. This review of core funding is to provide advice on the performance, ongoing role and future alignment of core funding in the context of funding of the science and innovation system. This review explores ways to maximise the effectiveness and impact of this investment mechanism.

Background

History of CRI funding

Since the establishment of CRIs in 1992, CRIs have always had some form of non-specific outcome funding. Capability funding was in place prior to 2010 to maintain strategic organisational and scientific capability and capacity (especially enabling and supporting long-term resource planning).

A Strategic Plan (confidential agreement with Treasury) articulated how the funds were to be spent and was summarised in the public facing Statement of Corporate Intent (SCI). The scale of funding was quite small, averaging around 5-10 per cent of CRI income up to 2011.

The activity of the CRI was reported in the Annual Report, which showed specific achievements directly attributable to the capability funding in that year, with reference to long-term development goals. This was a loose accountability framework that channelled information but made no assessments of value generated and no judgements were formed about it. The Annual Reports had no prescribed standard or best practice, and varied in the level of detail about capability funding allocation between strategic themes and the extent to which the funding was attributed to achievements. The funding was largely allocated directly to projects rather than developing longer-term strategic capacity and capability.

¹ CRI Taskforce Report (2010) <http://www.mbie.govt.nz/info-services/science-innovation/research-organisations/pdf-document-library/report-of-the-cri-taskforce.pdf/view?searchterm=CRI%20Taskforce%20Report>

CRI Taskforce

In 2010, the Minister of Science and Innovation established a Taskforce to provide advice on how to increase the benefits CRIs deliver to New Zealand. The Taskforce provided twenty-seven recommendations to Government including recommendations on CRIs' role and purpose, funding of CRIs, technology transfer and partnerships with business, governance arrangements, monitoring and evaluation, and accountability and performance management.

The Taskforce's recommendations were responding to the following key issues and challenges:

- competition had achieved all it could for CRIs, so a different approach was needed (although it was acknowledged that there is a place for contestable funding to drive dynamism and creativity)
- CRIs needed some funding flexibility to operate strategically
- research should focus on enduring challenges to New Zealand, with a stable and long-term platform for addressing these
- collaboration across CRIs (and sector) still needed developing
- business needs should be at the centre of developing research programmes, and involved in monitoring outputs and knowledge/technology transfer
- ownership model seemed appropriate but clarity of expected outcomes was needed, and
- funding, policy and governance functions of government should be aligned to one single government entity.

The Taskforce recommended that a significant portion of CRI funding be allocated directly, on a long-term basis, to support the delivery of CRIs' core purpose activities. The high level of contestable funding was said to render CRIs vulnerable as businesses, creating uncertainty and undermining their ability to act strategically.

The Taskforce's recommendations were based on the needs of CRIs and science in New Zealand as a whole, and core funding was a component of this view. The recommendations created a package to be seen as a whole, and suggested a major behavioural shift for CRIs.

Implementation of core funding

In response to the Taskforce's recommendations, the Government introduced core funding in July 2011 to give CRIs a much larger portion of stable, long-term funding. The amount of core funding granted to each CRI in 2011 was based on historic contractual commitments, largely from MBIE's contestable funds. The amount of core funding granted to each CRI was determined by:

- combining existing capability, scientific infrastructure, and collections funding, and
- consolidating of contestable contracts where:
 - research programmes were aligned with significant areas of national importance,
 - research programmes involved creating and maintaining capability critical to the CRI's core purpose, and/or
 - research programmes were enduring (ie in areas where the CRI had repeatedly won contestable funding).

Approximately 67 per cent of MBIE funding directly received by CRIs in 2010/11 was converted to core funding (Table 1). CRI core funding totalled \$202m across all CRIs, equating to around 33 per cent of CRIs' total revenue in 2011, but with a high degree of variability across CRIs (Table 1).

Table 1: Core funding allocation as a proportion of MBIE funding and total revenue as at June 2011

	Core funding \$000s	MBIE funding 2010/11	Total revenue 2010/11	% of MBIE funding converted to core funding	Core funding as a % of total revenue
AgResearch	38,889	66,547	157,651	58%	25%
ESR	7,723	8,000	51,440	97%	15%
GNS	27,409	40,951	72,119	67%	38%
Landcare	24,204	33,700	63,443	72%	38%
NIWA	42,853	64,624	117,811	66%	36%
PFR	43,103	68,320	113,217	63%	38%
Scion	17,733	20,805	43,054	85%	41%
Total	201,914	302,947	618,735	67%	33%

CRI core funding was introduced alongside wider changes to CRIs' performance expectations. The greater level of autonomy granted to CRI boards through core funding was balanced by greater accountability for delivering outcomes, and improved performance monitoring and evaluation. CRI performance measures were modified in 2011 to have a stronger focus on measuring outcomes and sector impact and to incentivise closer involvement of end-users in setting performance targets and research priorities.

The wider suite of reforms included:

- **Statements of Core Purpose (SCP)** – describe the purpose, national outcomes, operational parameters and operational principles that the Crown is seeking from the CRI
- **Statements of Corporate Intent (SCI)** – updated annually in response to the Minister's Letter of Expectation and the previous year's performance, with a three-to-five year outlook and medium term objectives
- **Non-financial performance measurements** – including end-user engagement survey and sector impact reports, and
- **Four Year Rolling Reviews (4YRR)** – provide a detailed review of each CRI by an independent panel of experts, focusing on their performance, end-user engagement, impact of research and overall strategic direction.

Changes to the science system since the introduction of core funding

National Science Challenges

National Science Challenges (NSCs)² were introduced in May 2013 and were intended to take a more strategic approach to the Government's science investment by targeting a series of goals which, if

² <http://www.mbie.govt.nz/info-services/science-innovation/national-science-challenges>

achieved, would have major and enduring benefits for New Zealand. The NSCs provide an opportunity to align and focus New Zealand's research on large and complex issues by drawing scientists together from different institutions and across disciplines to achieve a common goal through collaboration.

Funding of NSCs has come from three main areas, including new funding from government, maturing MBIE research money, and aligned CRI core funding.

National Statement of Science Investment

The National Statement of Science Investment (NSSI) was published in October 2015, during this review. The NSSI articulates the strategic vision for the science system over the next 10 years and states that this review will ensure the future framework for core funding will align with the objectives set out in the NSSI. CRI core funding accounts for around 15 per cent of the Government's total science investment, and is therefore a major lever for achieving the strategic vision for the science system.

Review of MBIE's Contestable Funding

In 2015, MBIE reviewed Contestable Funding, which resulted in changes being introduced from 2016/17. The changes signal:

- more stable levels of funding year on year
- excellent research, with a clear line of sight to eventual impact
- shifts across the portfolio to invest in higher risk research
- greater leveraging of wider public and private science investment
- increased connectivity across research in New Zealand and overseas
- broadly maintaining proportions of investment to fund objectives, and
- delivering on Vision Mātauranga, across the portfolio.

Contestable funding equates to approximately 16.1 per cent of CRIs' total revenue. These changes will have implications for CRIs in future contestable funding rounds, but the potential impact on core funding is unclear.

International perspective

Institutional funding for research institutions is applied in most countries to ensure long-term stability, develop research capability, create stable and trusting relationships between researchers for sustained research networks, and promote the accumulation of national scientific knowledge. The OECD notes that institutional funding is not generally tied to any programme-like specifications, though performance indicators and target agreements do increasingly play a role in funding distribution.³ The linking of performance to institutional funding varies between countries.

Internationally, institutional funding has been viewed as a creator of stability and a certain degree of autonomy at institutions deemed significant to national science systems. It is allocated to research universities and public research institutes rather than to individual researchers or project teams.

³ OECD (2011). *Public Research Institutions: Mapping Sector Trends*. OECD Publishing. <http://dx.doi.org/10.1787/9789264119505-en>. (Based on preliminary data from the NESTI project on public R&D funding, September 2010)

The OECD notes that there is, as yet, no ideal balance between contestable funding, performance-based funding and institutional funding. However, all three types are required in a national science system to balance out competing goals and incentives.

The Review Process

The Terms of Reference for the CRI core funding review were signed off by the Minister for Science and Innovation in June 2015 (See Appendix One).

Key information sources used for the review included:

- interviews with key stakeholders
- CRIs' SCPs and SCIs and other key strategy documents
- CRIs' annual and quarterly reports including finance performance data
- core funding agreements
- Four Year Rolling Review reports
- existing CRI stakeholder and other surveys
- data/information from CRIs about how core funding has been spent
- review of international literature about the role and impact of institutional funding, and
- international comparator data.

The review has also drawn on the outcomes of the review of MBIE Contestable Funding for Science and the NSSI.

In-depth interviews with CRIs, other government agencies, research organisations and other stakeholders were undertaken from July to November 2015. Stakeholders interviewed are listed in Appendix Two. Stakeholders were asked a range of questions relevant to the Terms of Reference and the stakeholder's interest in CRIs. Interviews were conducted in a semi-formal manner and the direction of the conversation was led by the stakeholder's responses to key questions.

MBIE wishes to thank all stakeholders for the time and effort into preparing for the interview and in particular all CRIs for providing extensive information throughout the review process.

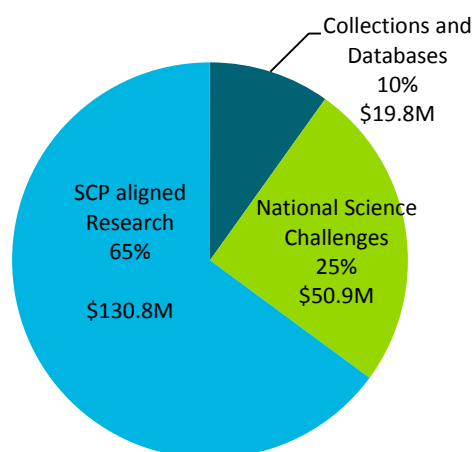
Current Application of core funding

Core funding is currently applied across three key areas:

- research aligned with CRI's SCP directed by the CRI
- other research aligned with the NSCs, and
- Nationally Significant Collections and Databases (NSC&Ds).

Percentage and amount of core funding allocated across these areas is shown in Figure 1.

Figure 1: Total distribution of core funding between collections and databases, National Science Challenges and SCP aligned research planned for 2015/16



Research aligned with CRIs' Statement of Core Purpose

Current allocation of core funding for research aligned with CRIs' SCPs is \$130.8m per annum. Core funding is used to support a range of research types from short-term, blue-sky, quick-fail projects to long-term strategic programmes. Core funding can be applied to research activities supporting the implementation of their strategies, enabling them to deliver their SCP and do one or more of the following:

- basic and applied research
- experimental development
- respond to industry/sector priorities
- technology transfer, dissemination, and commercialisation of intellectual property
- engage with stakeholders eg with sectors, international
- develop strategic capability in the areas of people, equipment and infrastructure, and
- deliver on Vision Mātauranga.

Further discussion on the contribution of core funding to research outcomes and Vision Mātauranga is provided later in this report.

National Science Challenges

Currently, \$50.9m per annum core funding is used for research aligned to an NSC. This allocation describes research that is consistent with the CRI’s SCP and aligned to the NSC Research Strategy. We expect the amount of core funding aligned with NSCs to change over time, depending on the alignment between the Challenge’s research priorities and the CRI’s SCP. The long-term implications of core funding in NSCs remain fluid. Further discussion on NSCs is continued later in this report.

Nationally Significant Collections and Databases

Current allocation of core funding to NSC&Ds is \$19.8m per annum. Twenty-five collections and databases were determined to be nationally significant, and CRIs are responsible for maintaining them and ensuring they remain current and fit-for-purpose for end-users. CRIs are expected to manage databases and collections in a way that enhances their ongoing value to New Zealand and improves stakeholders’ access and use through better interoperability, relevance and affordability. Further discussion on NSC&Ds is continued later in this report.

Distribution of core funding between these three key areas (SCP aligned research, investment in NSCs, and maintaining NSC&Ds) varies between CRIs (Figures 2 and 3) and from year to year. However, these amounts are confirmed via CRIs’ core funding agreements which are negotiated with MBIE annually.

Figure 2: Distribution and allocation of core funding for each CRI as a percentage (2015/16)

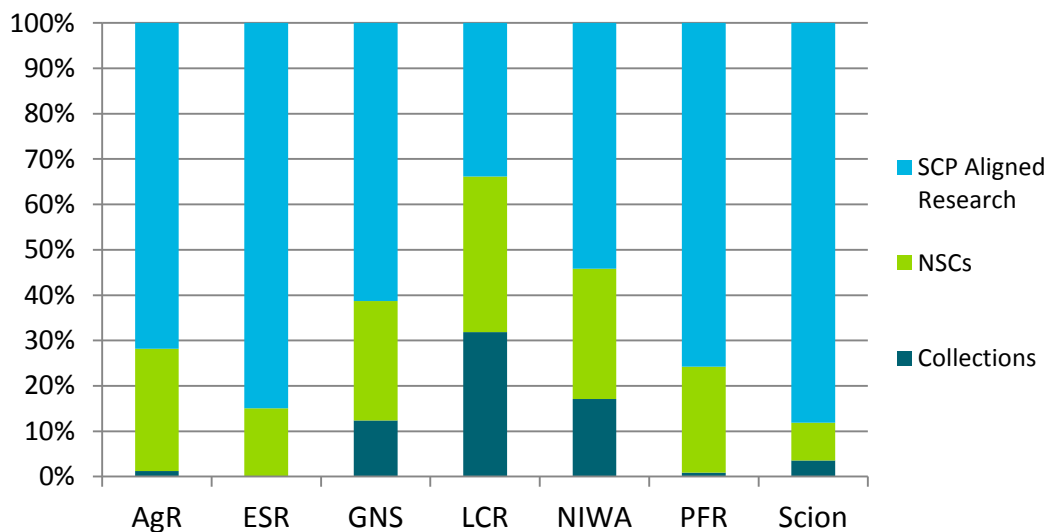
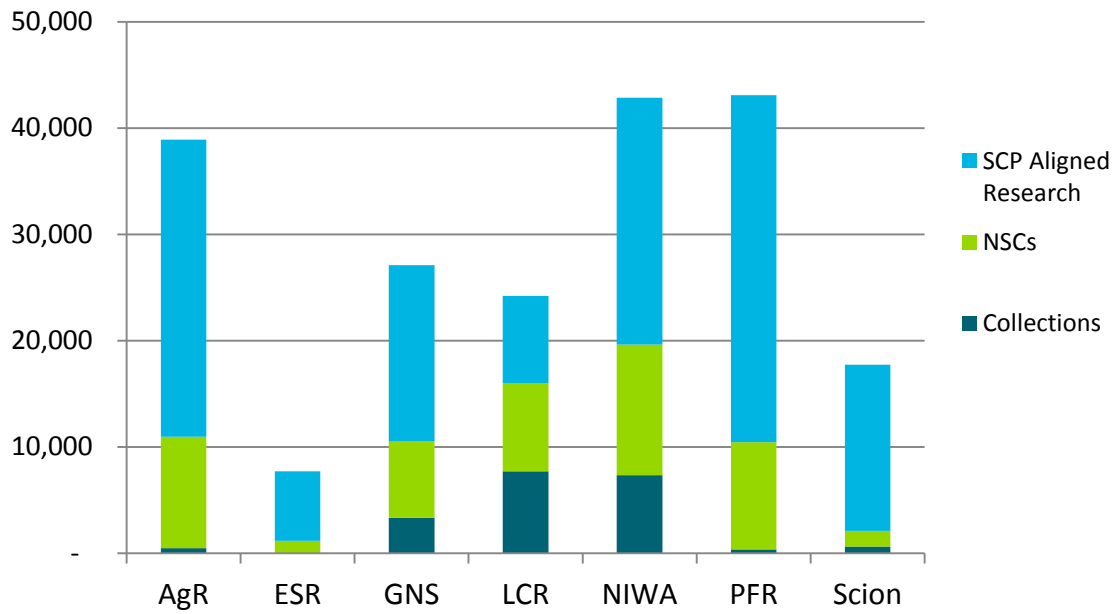


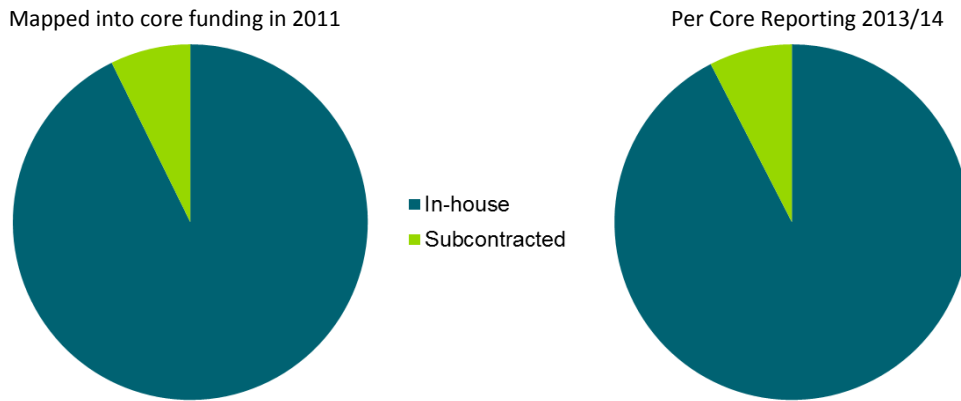
Figure 3: Distribution and allocation of core funding for each CRI as dollars (\$000's) (2015/16)



Sub-contracting

CRI's have continued to sub-contract core funding to other providers in roughly similar proportions as prior to the introduction of core funding (Figure 4). Any changes to sub-contracting arrangements have been aligned with strategic plan changes, or due to quality or other performance concerns.

Figure 4: Core funding – outward subcontracting rates (adjusted)



Performance of core funding

This section covers the observed impact on CRIs and investment performance of four years' core funding.

Rationale for core funding

The CRI Taskforce rationale for introducing core funding was to enable CRIs to improve delivery against core purpose, provide organisational certainty and resilience, develop better strategic capability and planning, provide the ability to grow and manage capability, enable stronger collaborations between CRIs, other research organisations and with end-users, and ultimately deliver greater value to New Zealand.

Core funding and the establishment of SCPs have provided CRIs:

- greater clarity of their individual scope of operation and expected outcomes
- a stable platform to develop and implement strong strategic planning and prioritization practices
- greater capacity to align work with SCP focus with a line of sight to New Zealand impact, and
- improved organisational agility and flexibility in delivering against SCP.

Impact of core funding on CRIs' organisational performance

The review found that since the introduction of core funding in 2011, CRIs are generally making good progress towards achieving the Taskforce objectives. Evidence of the following can be seen in all CRIs to varying degrees:

- strategic planning capability and processes have improved across the board
- internal monitoring and accountability frameworks have strengthened
- strategic alignment with industry has increased and there is and growing industry investment in science and research with CRIs
- there is greater clarity of their strategic capability requirements and better planning for attraction/retention and divestment
- prioritisation of and planning for science impact within their SCP has improved
- core funding is increasingly being used to accelerate science outcomes and leverage other science investment at a programme and sector basis, rather than through narrow project co-funding, and
- the realisation of the benefits of core funding is apparently increasing as they become more skilled, confident and mature in optimising its use.

Indirect benefits of core funding

The review found evidence of indirect benefits to CRIs of core funding including:

- growing confidence in planning for and anticipating their respective end-users' future science and research needs
- end-user/sector priorities driving CRIs' capability to plan and shape organisational resourcing
- increasing organisational confidence in their ability to attract and secure additional revenue
- increased planning for appropriate capital asset management and upgrades
- stronger ownership of their role in delivering impact through science and research for NZ benefit

- growing agility and responsiveness in the way CRIs structure themselves and operate
- increasing emphasis on disciplines such as project management, business development and workforce planning and development
- active portfolio review and reprioritisation leading to reallocation of resourcing as required on a regular and planned basis
- planning and monitoring framework for performance against SCI output classes, and science deliverables embedded vertically and horizontally throughout the organisation including HR performance management systems
- increased ability to attract and retain strategic resource and capability, and
- scientists understanding and owning science priorities and contributing to decision making at organisational level (including hard decisions).

Core funding is only one contributor to CRI performance. The review team observed that core funding works best where the CRI also has excellent leadership at Board, Senior Management and Science Leadership levels, and a clear and compelling organisational strategy (Figure 5). The combination of adequate institutional funding to allow for planned organisational management and resilience coupled with clarity of direction and the leadership to drive business and operational models is the ‘sweet spot’ all CRIs should be striving to achieve. The review notes that, if CRI contribution to the science system is to be optimised, core funding contracts need to be developed in light of other levers available to consider leadership performance and strategic fit.

Figure 5: Delivering greater value for New Zealand



Over the four years since core funding was introduced, CRIs have increased aspects of productivity. We see evidence of increased publications per FTE (Figure 6) and increased revenue per FTE, despite

no increases in core funding (Table 2). The CRIs also comment that staff utilisation has increased. The attribution of these changes to the introduction of core funding has not been measured.

Table 2: Revenue and staffing levels in 2010/11 and 2014/15

	Revenue 2010/11 (000s)	Revenue 2014/15 (000s)	FTE 2010/11	FTE 2014/15	Revenue per FTE 2011	Revenue per FTE 2015	Increase in productivity
AgResearch	157,651	152,482	780	767	202	199	-2%
ESR	51,440	65,009	325	351	158	185	17%
GNS	72,119	77,878	370	369	195	211	8%
Landcare	63,443	58,213	415	331	153	176	15%
NIWA	117,811	126,190	643	594	183	212	16%
PFR	113,217	128,879	810	805	140	160	15%
Scion	43,054	47,046	313	283	138	166	21%
Total	618,735	655,697	3,656	3,500	169	187	11%

Meeting stakeholders' needs

Core funding has provided the ability for CRIs to better align research to the needs of their stakeholders than they could through previous contestable funding. As decisions on core funding allocations are made by CRI Boards and advised by management, the decision-makers are often closer to sector stakeholders and understand their needs. Decisions about the use of core funding are not constrained by fixed funding cycles, allowing CRI Boards to respond rapidly to emerging sector needs, reallocate funds from unsuccessful projects or reinforce and accelerate successful projects as required.

Core funding has led to:

- improved strategic partnering capability within CRIs and flow-on effect to/from industry
- more dynamic and strategic science through modest investment in early-stage science and input from end-users into CRI planning processes
- increased confidence from end-users to partner and invest in science and research with CRIs, resulting in increased industry investment in certain sectors, and
- faster delivery of science outcomes and end-user uptake as a result of increased ability to respond/partner.

Core funding, to varying degrees, has allowed CRIs to:

- align strategies with industry sectors and establish a true partnership between industry and science
- develop programmes with critical mass, focused on critical industry issues dealing with 'the big levers' and create the scale required to fully answer research questions
- fast-track delivery of solutions to problems
- utilise partner networks for greater R&D outcomes
- establish larger programmes comprised of the right teams and capability, and

- create pipelines from fundamental science knowledge (that industry was not prepared to fund but could be supported by core funding) through to solution-focused research that industry was prepared to fund.

End-users report that since the introduction of core funding, CRIs have been more responsive and work to partner in ways that they previously did not. They also report a greater ability among CRIs to deliver the science that end-users need – rather than the research that is most likely to get funded. This is largely as a result of having a degree of autonomy over the relatively small portion of their funding comprised of core funding (excluding NSD&C). The results of CRI stakeholder surveys show that the high level of satisfaction with CRIs has not changed significantly over time (Table 3).

Table 3: CRI stakeholder survey, average of CRI results

Area	Question	2014	2013	2012
End-user Collaboration	Participants that are satisfied with the way the CRI sets research priorities.	75%	69%	73%
	Participants that are confident the CRI considers their sector's priorities when setting research priorities.	70%	68%	75%
Overall satisfaction	Participants that are satisfied with the overall quality of their experience in the past 3 years.	84%	84%	86%
Knowledge and tech-transfer	Participants that have adopted knowledge or technology from a CRI in the past three years.	92%	95%	93%
	Participants that are satisfied with their experience of accessing knowledge or technology from the CRI.	89%	86%	88%
Research collaboration	Participants that are confident the CRI puts together the most appropriate research teams.	86%	86%	88%

A number of end-users reported that their investment in research had increased in response to the environment created under core funding. The combination of improved strategic partnering, greater flexibility and responsiveness and accelerated timeframes appears to have a positive impact on industry stakeholders' willingness and confidence to co-invest. Commercial revenue across all CRIs has grown from \$166m in 2010/11 to \$190m in 2014/15.

The review found no evidence of core funding being used to crowd out other research organisations or fund research that should be funded commercially. The review also found no evidence of 'gaming' other funding mechanisms through inappropriate use of core funding.

Other observations

The CRIs place more value on core funding than other funding mechanisms, as it allows them a greater degree of autonomy and flexibility to respond, align and manage their research activities. This is consistent with them being autonomous companies subject to the *Companies Act 1993* and other legislation.

Anecdotally, many CRIs report that if they can achieve a minimum 50 per cent of their total revenue through a combination of core funding and contestable funding year-on-year, they are then confident about securing the remaining 50 per cent from other sources. Current percentage of total revenue for all CRIs from core funding and contestable funds is 46.9 per cent but there is great variability of this breakdown between CRIs (Table 4).

On first impressions this appears to be a statement about certainty and effort/success of generation of new business. However, on deeper investigation by the review, it appears to be a statement about the pipeline effect ie needing to have adequate basic or discovery research underway to ensure the development of adequate applied science that is relevant and attractive to industry and other end-users such as local and central government. The review has not been able to establish any other source of evidence to inform these anecdotal observations.

Table 4: Percentage split of total revenue for each CRI in 2015

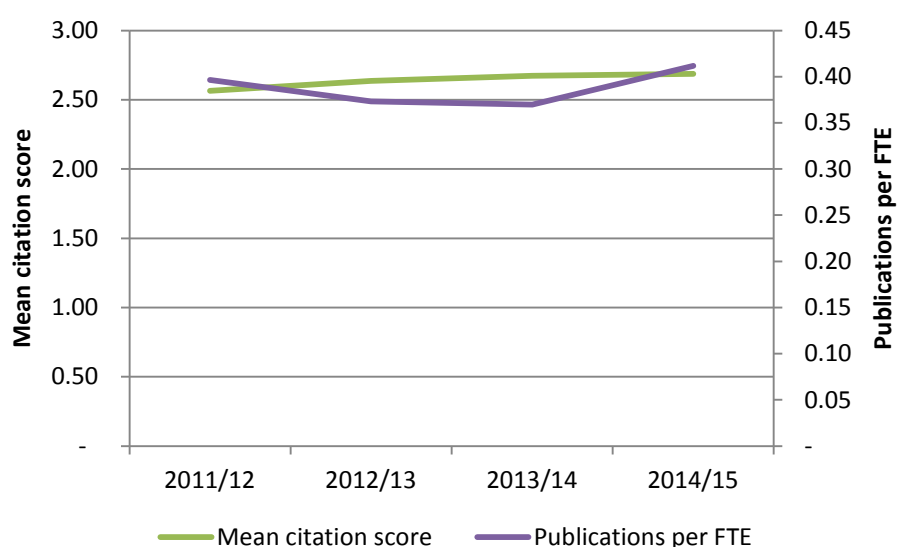
	Core funding	Contestable	Other government	Commercial revenues	Other revenues
AgResearch	25.5%	18.0%	10.1%	32.4%	14.0%
ESR	11.9%	3.0%	66.7%	15.1%	3.9%
GNS	35.2%	21.4%	11.8%	15.4%	16.3%
Landcare	41.6%	16.1%	25.5%	16.9%	0.0%
NIWA	34.0%	16.8%	24.8%	24.4%	0.0%
PFR	33.4%	18.4%	6.0%	25.1%	17.2%
Scion	37.7%	23.5%	15.4%	21.6%	1.9%
Total	30.8%	16.1%	17.3%	27.1%	8.7%

The review notes that there is no evidence of CRIs operating outside of their SCs, complacency or drop in utilisation/performance expectations. The review also notes that the existence of CRI core funding appears to have created an expectation with some other research providers that CRIs should fund other providers to participate in collaboration activities. This is unhelpful and is challenging to the collaboration environment.

The review considers that although there has been significant improvement in CRI performance since the introduction of core funding, the full impact of this investment platform is yet to be realised. Examples of possible further impacts include:

- The CRIs have initiated some cross-CRI programmes such as workforce strategy and the Te Ara Pūtaiao⁴ network as a way of achieving wider system alignment and efficiency, but this is relatively immature and is yet to deliver significant opportunities. CRIs still have some way to go to fully utilise the innovation and investment opportunities presented by the growing Māori economy and maturing post settlement environments. Front-running CRIs that are investing in well-informed strategic scoping of opportunities in this space, and resourcing deep two-way engagement with targeted Māori interests are positioning themselves to be trusted science partners set to deliver new innovation value for the long-term
- CRIs have demonstrated growing experience in re-prioritisation of core funding and resourcing internally. However, we have not seen significant evidence of reprioritisation between or across CRIs (either through collaborations, sub-contracting or other structures), and
- Science quality across the CRI group has not markedly changed over this period (Figure 6). This is mainly due to the ‘lag’ nature of most science quality indicators. The review did not expect to see any measureable effect in the review period.

Figure 6: Aggregated science quality indicators for CRIs⁵



⁴ The aim of Te Ara Pūtaiao is to bring Māori and CRIs together, provide a forum for groups to share knowledge and information and identify opportunities to support Māori growth through science collaborations.

⁵ Mean citation score is defined as the sum of two-year impact factors (derived from SCImago cites / doc) for journals in which the CRI has published divided by the number of papers where the impact factor is available.

CRI Internal Allocation Processes

All CRIs have implemented sound processes to determine the allocation of core funding, but their level of sophistication varies. CRIs report that their processes have been refined over the last four years to ensure transparency and impact. This means that, in contrast to other funding mechanisms, CRI Boards consider core funding allocation annually for its continued relevance, priority (in line with the SCP), and impact potential.

CRIs report that their process for allocation is cyclical in nature and includes time to review their investment/research portfolio, prioritisation of investment/research area, decision-making, programme/project design, implementation, monitoring and evaluation, and reporting.

Most CRIs report that their review and prioritisation process is actively influenced by the following:

- Government strategy and emphasis (eg the Business Growth Agenda)
- benefit to New Zealand
- alignment with sector and end-user needs and priorities (stakeholder pull)
- cutting edge science, exploring innovative ideas, international influence (scientist push)
- alignment with SCP and CRI strategic plan/direction
- internal capability building to deliver impact – supporting critical/unique capability and staff upskilling and development, and
- collaboration with other research providers/projects (eg NSCs and wider collaborations).

Most CRIs have sound decision-making processes to support internal recommendations for allocation of core funding, including:

- engagement with key stakeholders and end-users
- internal dialogue and critique between portfolio and team leaders
- robust discussions at General Manager and Senior Leadership level
- advice and feedback from Science Advisory Panels and/or Investment Committees to ensure science quality, capability and stretch
- sign-off/approval of Investment Plan by the CEO and Board, and
- inclusion in SCI and reporting via regular accountability mechanisms.

Some CRIs consider specific questions when determining allocation of funding for specific research projects or programmes. Questions may include:

- Is this something industry should and can fund?
- What are the expected benefits and costs of this investment?
- What is the potential impact of this work on New Zealand?
- Could it lead to new funding from stakeholders by acting as a seed catalyst?
- What is the estimated sector outcome value?
- Will it grow strategic collaboration with stakeholders to enable a more strategic approach to science?
- What is the opportunity foregone? (ie are there better alternatives?)
- Does the team have the capability and track record to deliver?

- Is there freedom to operate in this area?
- Could valuable intellectual property be generated that will be attractive to external investors?

Benefits of CRIs' allocation processes for core funding

Core funding and allocation processes have delivered the following improvements for CRIs:

- strengthened internal dialogue around prioritisation and investment of resource
- improved prioritisation and alignment of resources
- provided flexibility to move resources between projects, programmes and divisions to align with strategic priorities
- given ownership of decision-making around resourcing including stop/divest decisions
- provided the ability to support early stage scientists to develop their proposal development and competitive bidding skills through internal processes
- provide the ability to support early stage projects before other funding can be attracted, and
- improved responsiveness to end-users which is contributing to improved strategic partnering.

Since the introduction of core funding, CRIs have re-prioritised it for better use, better portfolio balance and to align with their strategic plans. CRIs have reviewed nearly all their projects to assess if the right research is being performed (the exceptions being where there are long standing commitments to collaborators and subcontractors that were honoured post-transition). This review is more frequent than under the legacy contracts and without the perceived barriers to change (eg contract variation discussions with MBIE). CRIs assert that research focus is more dynamic and strategic and supports wider understanding of strategic priorities amongst the CRI science workforce.

The results of reprioritisation are varied – a project may progress or it may refocus on answering new but related problems. Alternatively, funding can be reinvested in entirely different areas of research but this may not be differentiated by the commonly-used profiling categories.

Each CRI uses different internal processes to consider prioritisation, with some making more significant shifts between areas of science than others. However, each CRI reports their process is driven from an assumption that the balance of science activity is aligned with their SCP (as reflected in their SCI).

Many CRIs have also allocated a modest amount of core funding to internal contestable funding to encourage science vitality and encouragement of novel ideas internally. Some have used this to support early-stage scientists to develop their skills in writing science proposals while others have used it to develop early-stage proposals that may result in opportunities to secure contestable funding in the future. CRIs report that this internal contest is resulting in valuable internal challenge and contributing to a focus on science excellence for established and emerging scientists alike.

Types of research and activities to which core funding has been applied

Types of research

CRI's are advised that core funding can be applied to research activities that support the implementation of CRI's strategies and enable them to deliver their SCP and do one or more of the following:

- Provide for Basic and Applied Research
- Provide for Experimental Development
- Respond to industry/sector priorities
- Technology transfer, dissemination, and commercialisation of intellectual property
- Engagement eg with sectors, international
- Development of strategic capability in the areas of people, equipment and infrastructure
- Deliver on Vision Mātauranga.

Core funding is being applied to fund three broad groupings of activity under each CRI's SCP:

- ideas-led research with long-run horizons (often as investment ahead of possible contestable funding applications; as 'proof of concept' ahead of other co-funding for next stage; or as a mechanism for funding public good research which would not otherwise be funded)
- near-to-market developmental, applied and adaptive science directly for industry or government – co-funded (either directly or via industry-good bodies). In some instances this resembles science services rather than research, but is underpinned by earlier research activity, and
- investment in and maintenance of critical national infrastructure.

All CRI's maintain a balance of research across the spectrum that both provides for the needs of its sector, and has vision to future, longer-term benefits and needs. However, the amount (or percentage) of core funding allocated to each type of research differs between CRI's and differs from year to year within CRI's. Figure 7 shows the approximate spread of research (including NSC research) to which core funding has been applied.

Core funding is not the sole revenue source for research undertaken across the spectrum. However, due to differences in the way CRI's report research activity, it is not possible to get a clear aggregated view of total expenditure and source of revenue. Figure 8 provides an example from AgResearch of the spread of core funding and other revenues across the research spectrum.

Figure 7: Approximate spread of research types to which core funding is applied

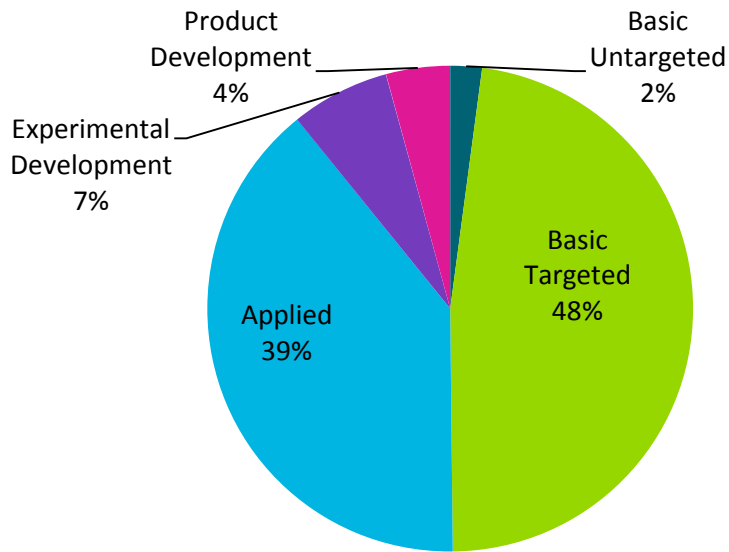
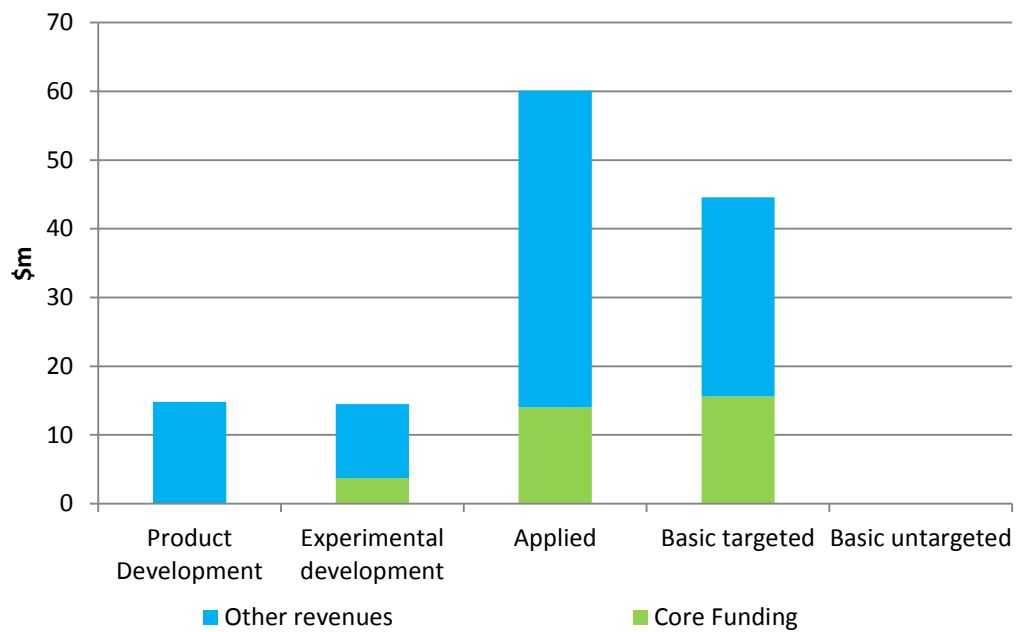


Figure 8: Expenditure of core funding and other revenues in the research spectrum by AgResearch



Technology and knowledge transfer

All CRIs report that core funding has directly contributed to their technology and knowledge transfer activities and the evolution of commercial applications from research. The CRIs' Annual Reports provide impact stories about the uses of core funding. Examples of these impact stories reveal that core funding has:

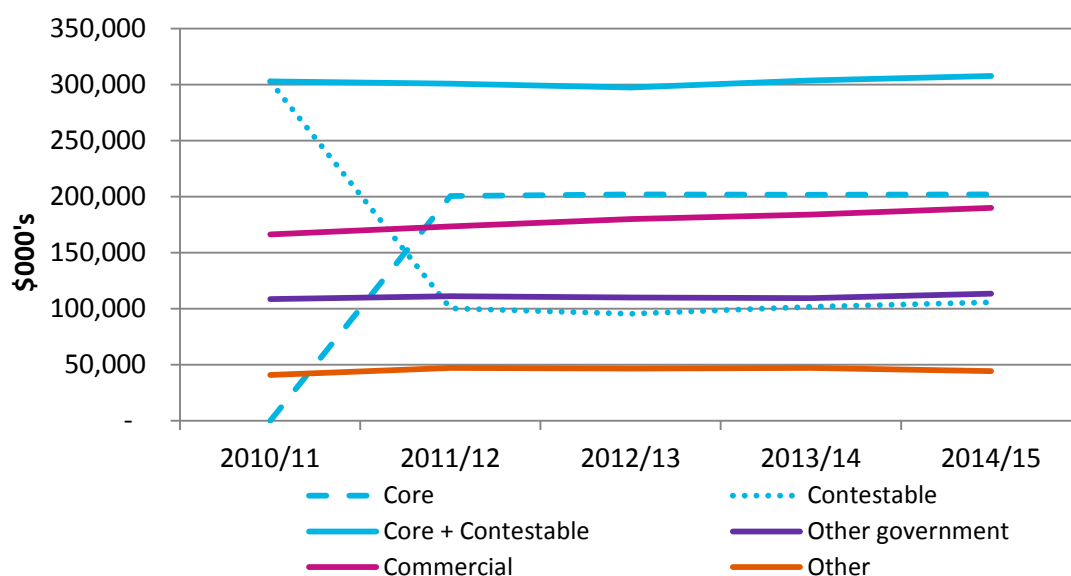
- enabled CRIs to take the time to package up the lessons, findings, data and other information from research projects and work with clients to extend that knowledge and transfer it to others. This is particularly important for clients such as iwi, for whom the transfer of knowledge can take time
- contributed to building capacity in key user groups such as regional councils and central government departments so they can better engage and work with science results
- enabled CRIs to engage with clients in different ways (eg embedding staff in client agencies on secondments, supporting part-time positions, or leading Vision Mātauranga placement programmes) to ensure results are valued, understood and used to support better decisions, better outcomes and ultimately lower environmental and economic costs to NZ, and
- enabled co-development of databases and products with industry partners resulting in better uptake of technology such as:
 - Anti-fouling surfaces for dairy industry
 - Antimicrobial extracts from extremophiles
 - Body Condition Reader
 - Building inter-storey displacement sensor
 - Cloud computing
 - Green packing for fish - ZealaFoam™
 - Groundwater data extraction tool
 - Hoki used for the production of premium wine
 - Hort16A which generated \$7b of income (\$4.1b of exports and \$2.9b through employment effects)
 - LiDAR (Light Detection And Ranging)
 - Microbial culture collection
 - Microbial filter for methane extraction
 - Minerals from geothermal waste
 - Mini ion implanter
 - Novel materials for gas sensors
 - Overseer
 - Pestweb (now AgPest)
 - Precision Seafood Harvesting Modular Harvesting System (expected to reach exports of \$100m by 2020)
 - Remote sensing
 - Secure, sustainable seafood production including: Quality King Salmon - AQUI-S® used by 95% of the NZ industry
 - Seismic analysis software
 - Sensor for battery charge
 - Sensor for fuel identification
 - Software for identifying sources of airborne pollutants

- Software for improving energy efficiency in power plants
- Software for processing large seismic datafiles
- STRmix™ which is now a commercial product
- Wood plastic pellet technology, and
- Wool dyeing technology.

Research investment by other government agencies

Some CRIs report a reduced investment in research by other government agencies; others report an increase or no change. Although there has been some decrease in environmental research, overall the total investment by other government agencies in research with CRIs remains steady (Figure 9).

Figure 9: Total CRI revenue by source from 2010/11 to 2014/15



Collaboration

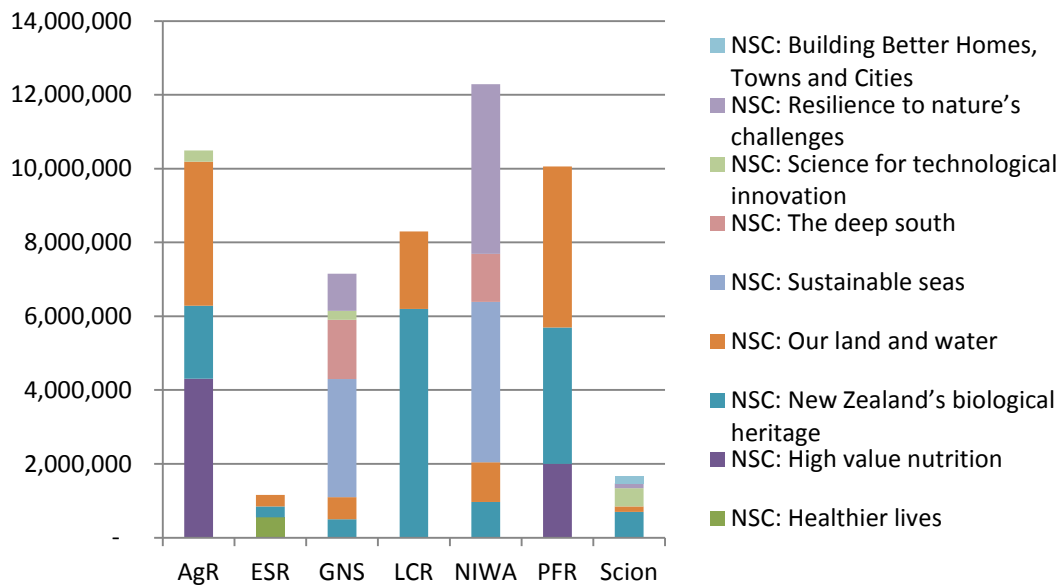
National Science Challenges

CRIs have recognised the importance of close strategic alignment with the NSCs where outcomes are aligned and CRIs have aligned their core funding with NSCs as relevant. CRIs have made significant commitments and investments in establishing and planning for the NSCs and are strongly supportive of the principles that underpin NSCs. At present, the CRIs have some uncertainties about their future alignment and the level of contribution to the NSCs as their objectives are refined. For example, a shift in an NCS's objectives from biophysical research to social science research may no longer align with a CRI's core purpose, resulting in a shift of core funding away from the NSC. Conversely, a shift in an NSC's objectives may result in increased investment of core funding due to better alignment with a CRI's SCP.

This may remain a fluid and evolving picture for some time and CRIs have been encouraged to continue open dialogue and collaboration with NSCs about the level and contribution that aligned core funding will make. It is expected that where NSC priorities remain within the scope of the CRI SCP, the CRI is responsible for assuring itself that alignment of its core funding is appropriate to deliver outcomes for New Zealand in line with its SCP.

Current aligned core funding for each CRI for individual Challenges are shown in Figure 10.

Figure 10: Core funding aligned to National Science Challenges (from 2015/16 SCIs)



Co-authorship of publications

Co-authorship of CRI publications provides insight into collaboration. Figure 11 shows a decrease in CRI-only authored publications since 2012 and a corresponding increase in publications with other New Zealand and international authors. It is clear that CRIs increasingly collaborate with other research agencies, although attribution of core funding to this outcome is challenging.

Further education

CRIs continue to collaborate with universities, particularly in the supervision of postgraduate students. Figure 12 shows the number of Masters and PhD students and post-doctoral researchers associated with CRIs. Many of these students have supervisors within the CRI with formal contractual arrangements with the Universities. CRIs report that core funding is used to some degree to support students' research activities and/or scholarships, and to support internal staff in their supervisory role. Core funding expenditure on this activity cannot be accurately calculated.

Figure 11: Trends in CRI portfolio co-authorship since 2012. Publications by collaboration type, 12 month rolling total (% of total publications)

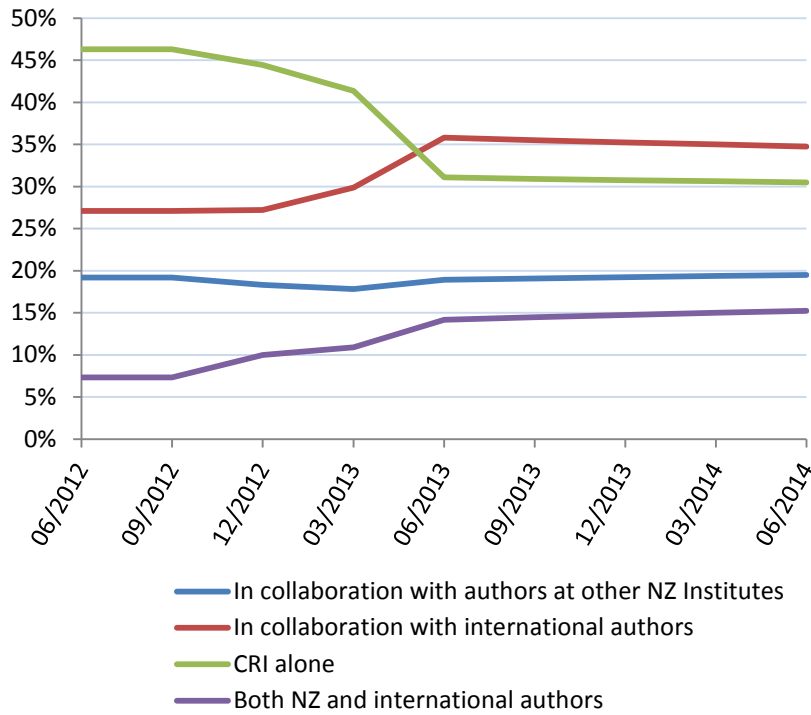
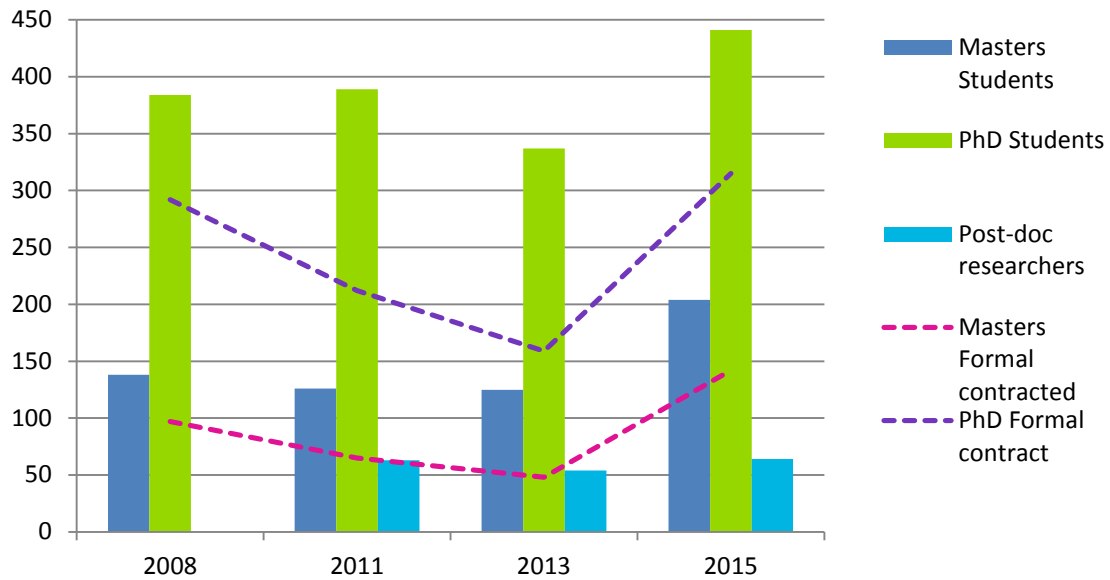


Figure 12: Total numbers of Masters and PhD Students and post-doctoral researchers associated with CRIs since 2008, overlaid with numbers of Masters and PhD student where CRI staff have formal supervision contracts with the University.⁶



⁶ Figures do not include data from IRL, data provided by Science New Zealand

Investment in National Collections and Databases

Management of collections and databases

Core funding is provided to CRIs to maintain the group of collections and databases have been identified as nationally significant (ie the NSC&Ds), and ensure they remain current and fit-for-purpose for end-users.

It is expected that core funding is used for the following activities:

- data collection, maintenance and enhancement of collections, databases and their infrastructure and networks
- provide for basic and applied research that assists in the maintenance and enhancement of collections, databases and their infrastructure and networks
- moving to on-line access, if applicable and not already available, and
- increasing the awareness and use of the collections and databases.

CRIs are expected to manage databases and collections in a way that enhances their ongoing value to New Zealand and improves stakeholders' access to, and reuse of, databases and collections through better interoperability, relevance and affordability.

The CRIs have shown themselves to be effective guardians of New Zealand's research databases and collections despite the funding pressures imposed upon them. Since the introduction of core funding, CRIs have maintained their roles as custodians of the majority of New Zealand's significant collections and databases and have achieved the following:

- no nationally significant databases or collections have been unduly discontinued⁷
- all the CRIs have strong policies for management, maintenance and access to their databases and collections
- the majority of significant databases are subject to regular external review involving users and stakeholders
- the amount of data or number of specimens held within significant databases and collections has continued to grow
- developments in technology have had a significant effect on how databases and collections are maintained and accessed and the costs of these changes have been met by core funding
- data has been made more open and accessible and use of the databases has increased, and
- a number of other databases and collections have been identified by CRIs of equal or greater significance than those designated as "nationally significant" and maintained using core funding.

Funding of collections and databases

Funding for NSC&Ds has been provided in some form since the formation of CRIs and the assignment of NSC&Ds to CRIs as custodians. Funding for NSC&Ds has not changed since 2009 (and in some instances earlier). In 2011, \$17.5m per annum of core funding was mapped to NSC&Ds. Since 2011, CRIs have reprioritised their core funding and increased allocation of core funding to NSC&Ds by

⁷ AgResearch was responsible for a possum genetic database that had no material use or additions for several years. It received broad support before releasing the data to an internationally-recognised open-source platform and transferring funding to its other collections.

\$2.4m to a total of \$19.9m for the 2015/16 financial year. However, in our review CRIs report that the current total spend on databases and collections is now \$23.3m per annum (Table 5). This higher amount includes databases without specific funding that they deemed to have essential public benefit but have not been deemed 'Nationally Significant'.

Table 5: Amount of core funding allocated to NSC&Ds

	Mapped in (2011) \$000's	Committed 2015/16 \$000's	Actual Spend 2013/14* \$000's
AgR	470	470	470
ESR	0	0	
GNS	3,452	3,348	3535
LCR	7,309	7,709	8665
NIWA	5,541	7,340	9840
PFR	378	378	380
Scion	335	635	385
Total	17,485	19,880	23,275

*Actual spend collated by Science NZ. Includes spending on all collections and databases, not just NSC&Ds

The lack of growth in this investment and lack of strategic frameworks could potentially place nationally and internationally relevant infrastructure at risk. The review has received strong messages from all sectors of the science system that these collections and databases underpin critical research for New Zealand (such as Border Security) and the lack of appropriate investment and oversight is putting these collections and infrastructure at risk.

CRIs report that increased funding levels for collections and databases would allow for future developments, including:

- increasing the size and coverage of databases
- improving the housing of collections to increase available storage and allowing for greater interoperability and data layering (allowing faster generation of portals, where a number of databases can be accessed through a single portal)
- new developments in a range of web-based tools to allow better and more meaningful use over the internet
- faster 3D digitisation of collections to allow electronic rather than physical access, and
- developing a pathway for suitable databases to be updated by outside researchers or the public, using smart phone, GPS and camera data.

Vision Mātauranga - How has core funding contributed to CRIs' ability to achieve outcomes?

Background

The purpose of the Vision Mātauranga policy is to:

- use the science and innovation system to help unlock the potential of Māori knowledge, people and resources for the benefit of New Zealand
- recognise Māori as important partners in science and innovation, both as inter-generational guardians of significant natural resources and indigenous knowledge, and owners and managers of commercial assets
- build the capability of Māori individuals, businesses, incorporations, rūnanga, trusts, iwi, hapū, and marae to engage with science and innovation, and
- maximise the quality of the relationship between Māori and the Crown through science and innovation through the Treaty of Waitangi.

This can be achieved by:

- investing in Māori-relevant science and innovation through grants to businesses and research organisations
- developing Māori science and innovation capability through partnerships with individuals, businesses, incorporations, rūnanga, trusts, iwi, hapū and marae
- fostering connections between Māori, government, the science system and industry to grow opportunities for Māori science and innovation
- supporting the development of iwi-led research and development strategies
- collaborating with other agencies to develop whole-of-government approaches to unlock the science and innovation potential of Māori knowledge, people, and resources, and
- partnering with the Regional Business Partners to improve collaboration between Māori, researchers and firms to enhance knowledge transfer and business success.

Expectations of CRIs in enabling Vision Mātauranga

In 2011, Vision Mātauranga policy was incorporated into CRIs' SCPs which set out the following operating principles:

- develop strong, long-term partnerships with key stakeholders, including industry, government and Māori, and work with them to set research priorities that are well-linked to the needs and potential of its end-users
- transfer technology and knowledge from domestic and international sources to key New Zealand stakeholders, including industry, government and Māori, and
- enable the innovation potential of Māori knowledge, resources and people.

Vision Mātauranga is also a component of the SCI. The SCI is expected to show how the CRIs' outputs and activities contribute to the achievement of the Vision Mātauranga themes, including information about:

- investing in research that involves Māori, engages and develops their capability, and develops specialist knowledge transfer techniques
- initiating transfer of knowledge and technology to Māori end-users, where prudent and appropriate
- collaborating and developing effective engagement with the users of Vision Mātauranga research, and
- ensuring the CRI's outputs and activities have a high likelihood of positive impact on Māori economic development and the Māori asset base.

All CRIs articulate their Vision Mātauranga strategy to some degree in their SCIs. Some CRIs have clearly identified goals, activities and performance targets and others highlight Māori engagement as a strategic issue. The review considers that all CRIs could improve how Vision Mātauranga is addressed in their planning and strategies. We have reviewed the CRI Taskforce, CRI Toolkit and generic Expectation Letters. However, we note that there are no specific recommendations on how CRIs should enact Vision Mātauranga.

Vision Mātauranga is also a component of the Four Year Rolling Reviews (4YRR) and we note this paragraph in the March 2015 Expectations Letter to CRIs from the Minister:

“The recent Four Year Rolling Reviews have highlighted the need for CRIs to evolve in their engagement with Māori, to develop partnerships appropriate for the post-Treaty environment and to support a growing Māori economy.”

Māori research and innovation categories

1 Research not involving and not specifically relevant to Māori: research where results have no specific impact on Māori beyond a general benefit to New Zealand and Māori participation has not been sought.

2 Research specifically relevant to Māori: research where the results may contribute to unlocking the potential of Māori resources or people and some Māori participation may contribute to maximising the benefit for New Zealand. This may for example include planned technology transfer targeted to Māori end-users or relevant agencies where that may enhance the growth potential of Māori resources or people.

3 Research involving Māori: research where the results will specifically contribute to unlocking the potential of Māori resources, people or knowledge. There is a substantive level of Māori end-user involvement from idea inception to outcome delivery or a credible pathway planned to specifically unlock the potential of Māori knowledge, resources or people.

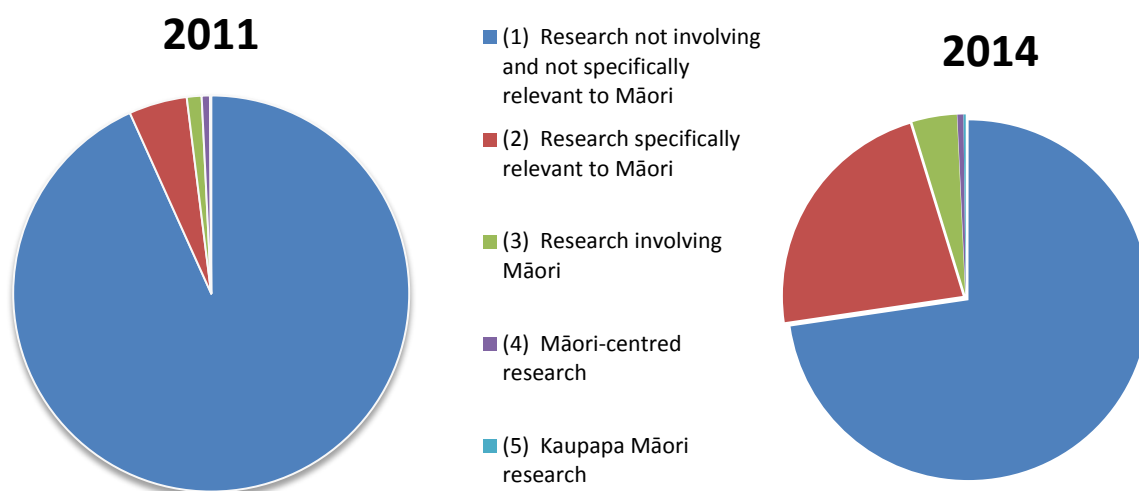
4 Māori-centred research: research where the results will specifically contribute to unlocking the potential of Māori knowledge, people and resources or the research addresses an issue distinct to Māori knowledge, people or resources. There is a substantive level of Māori end-user involvement from idea inception to outcome delivery or a credible pathway planned to specifically unlock the potential of Māori knowledge, people or resources.

5 Kaupapa Māori research: research where the results will specifically contribute to unlocking the potential of Māori knowledge, people and resources. The research addresses a distinct issue to Māori knowledge, people or resources. A Māori world view may help shape the analytical framework or Māori research methodologies are used. There is a substantive level of Māori end-user involvement from idea inception to outcome delivery or a clear pathway planned to specifically unlock the potential of Māori knowledge, people and resources.

Achievements

Although some progress has been made with Māori engagement and Māori-specific projects amongst the CRIs, there is no consistent momentum or collective impact strategy for delivering against Vision Mātauranga. Figure 12 illustrates the percentage of core funding allocated to Māori-related research and shows the change between 2011 and 2014. It should be noted however that the attribution of research to categories 1-5 (see orange box) are self-determined and self-reported by the CRIs. At first glance, it looks like significant improvement has been achieved over the three years, particularly in research specifically relevant to Māori. However, closer inspection of the data reveals that this change represents a change in attribution of research projects by the CRIs, more than a major pan-portfolio change in the relevance, style or impact of the research itself.

Figure 13: Self-reported percentage of core funding allocated to Māori-related research from 2011 and 2014



Overall, traction on achieving Vision Mātauranga has been slow across the entire science system including amongst the CRIs. CRIs have all made some progress in determining their response and role in giving effect to this strategy but capability and resourcing is an issue at most CRIs. While there is increasing momentum, this is an area where there is still considerable opportunity for improvement.

Any future core funding needs be consistent with the expectations set out in the SCP. The review notes that CRIs are committed to continuing to develop capability in this area but that implementation is slow.

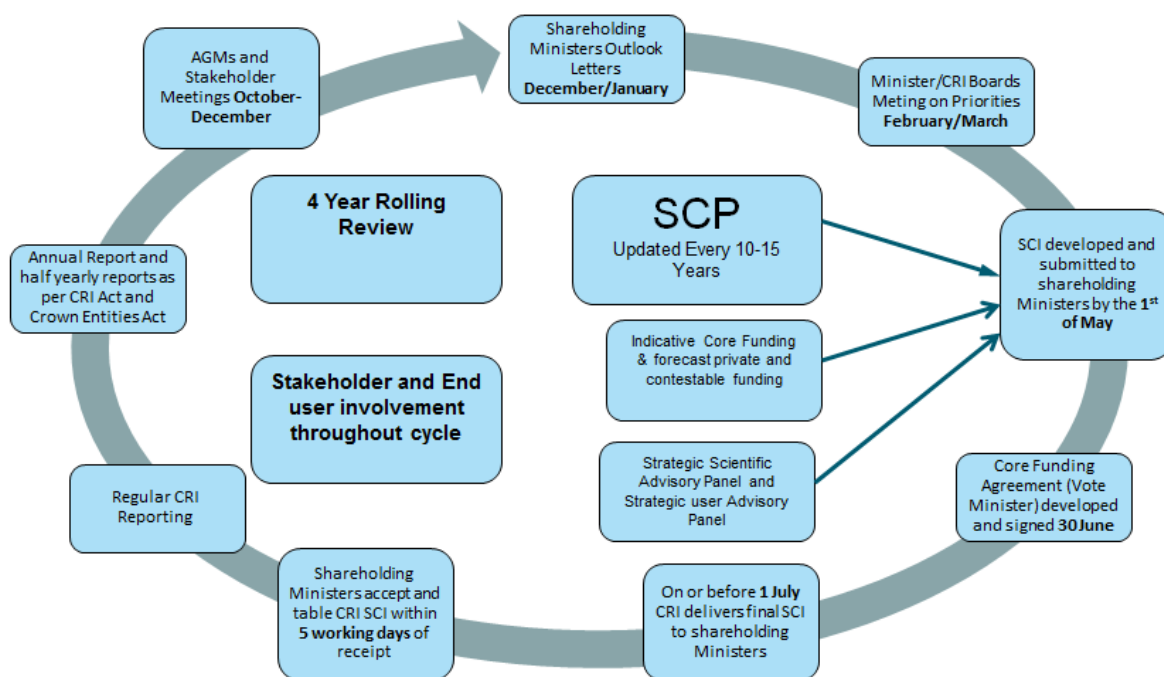
How effective are the performance arrangements for core funding?

CRI core funding was introduced alongside wider changes in CRIs’ performance. The greater autonomy granted to CRI boards through core funding was balanced by greater accountability for delivering outcomes and improved performance monitoring and evaluation. CRI performance measures were modified in 2011 (and further refined in 2014) to have a stronger focus on measuring outcomes and sector impact and to incentivise closer involvement of end-users in setting performance targets and research priorities.

Performance management framework

The current planning, reporting and accountability cycle is illustrated in Figure 14. The performance management framework is very comprehensive, although few elements of the framework focus directly on core funding. Core funding is understood as a constituent component of the overall framework.

Figure 14: Planning, reporting and accountability cycle for CRIs



Monitoring: financial performance

CRIs are expected to remain financially viable and enhance shareholder value in their operation over the longer term. This expectation is set out in the *Crown Research Institutes Act 1992*, with viability defined as generating an adequate rate of return on shareholder funds and continuing to operate as a going concern.

Each year in the SCI, the Board is required to set out how these requirements will be delivered, using narrative and indicators. Appropriate financial targets ensure that CRIs:

- are focussed on achieving appropriate risk-adjusted rates of return over the financial year
- replicate the disciplines exerted over private sector companies, and
- operate in an environment that is competitively neutral with the private sector.

This does not mean that a Return on Equity target in excess of the cost of capital needs to be achieved consistently every year, as long as an appropriate average return is achieved over time. A lower Return on Equity requires Ministerial approval.

There are no specific financial performance indicators directly related to core funding.

Monitoring: non-financial performance indicators

CRIs are expected to show changes over time in the following areas:

- **End-user collaboration:** CRIs are expected to develop strong, long-term partnerships with industry, government and Māori, and to work with them to set research priorities that are well-linked to the needs and potential of their end-users.
- **Research collaboration:** CRIs are expected to develop collaborative relationships with other CRIs, universities and other research institutions within New Zealand and internationally to form the best teams to deliver the CRI's core purpose.
- **Technology and knowledge transfer (science relevance):** CRIs are expected to transfer technology and knowledge from domestic and international sources to New Zealand industry, government and Māori.
- **Science quality:** CRIs are expected to pursue excellence in all their activities.

CRIs report on a set of generic key performance indicators that were defined in 2014. These indicators measure entity-level performance and are not split by funding source.

CRIs are also expected to develop their own non-financial performance indicators to show performance against their SCP and SCI. Additionally, CRIs are required to include at least nine impact stories in their Annual Report to articulate examples of science impact for New Zealand. There are no specific non-financial performance indicators directly related to core funding.

Levers for non-performance

If a CRI anticipates that it will not achieve its performance targets, the shareholding Ministers expect early advice from the Board, including details of the reason for the expected shortfall and the remedial actions put in place to remedy the situation. In general, this can be achieved through the quarterly reporting process. Where performance shortfalls are significant, the shareholding Ministers expect more direct notification and to be kept informed of progress.

In cases of serious underperformance or financial distress by a CRI, the shareholding Ministers may:

- increase reporting requirements
- seek more detailed information from the CRI, including monthly accounts and cash flow forecasts
- work with the Board with a view to improving its performance
- review the membership of the Board
- appoint a special advisor to the Board, or
- in extreme circumstance, liquidate or re-capitalise the CRI.

Design and adequacy of current accountability arrangements

CRI currently undertake a large amount of organisational-level reporting to shareholding Ministers to satisfy the Government's requirements as owner of the CRIs. There is an underlying expectation that these arrangements also provide transparency about the use of core funding and meets MBIE's requirements as an investor in science and research.

The review found that the information provided through the current accountability arrangements is sometimes not as visible or well-used as it could be, and some of it is redundant or not fit-for-purpose. The review also found that CRIs report slightly differently on some core performance metrics, which made it difficult to construct a comparative performance story, or one that could reflect accurately the performance of core funding as an investment mechanism.

To inform MBIE as a purchaser and policy maker, CRIs provide core funding information as a confidential annex to their quarterly and annual reports. MBIE requests information on project activity, collaborators, co-funding, subcontracting, profiling by sector, priority, NSCs and Vision Mātauranga. No profiling by research horizon is requested. Requests for profiling information for this review resulted in inconsistent information, making portfolio analysis problematic.

Whilst this information provides some clarity on core funding investment by individual CRIs, the way in which this is reported varies between CRIs, making it difficult to undertake comparisons of performance. It also does not provide consistent detail on other uses of core funding such as:

- nationally significant collections and databases
- investment in and maintenance of critical national infrastructure and physical assets
- capability building, and
- education (such as funding of PhD and Masters students).

The current performance and accountability arrangements for CRIs, including levers available to manage non-performance, are aimed at meeting the Minister's requirements as a shareholder of CRIs.

The review considers that it may be appropriate to develop separate, effective and efficient performance and accountability arrangements for core funding that provide for increased transparency and comprehensive evaluation and monitoring, but are aligned with the current accountability and reporting framework for CRIs. There is also opportunity to review and refine current ownership accountability instruments to remove redundant requirements and ensure all reporting is streamlined and fit-for-purpose.

How core funding fits within the evolving science system

CRI core funding is the largest ‘mission-led’ science investment fund, along with the MBIE Contestable Fund, NSCs, and Health Research Council funds. Mission-led science is undertaken towards a particular policy aim or goal, typically geared towards broad public benefit. The value of this type of research may be clear but may only be realised far in the future.

The difference between CRI core funding and other mission-led science funding is primarily the purpose of the funding and the duration of the research undertaken. Other mission-led funding is aimed at specific projects or programmes of research with defined end dates for research funding, whereas CRI core funding is primarily organisational funding to enable CRIs to fulfil the objectives set out in their SCP.

National Statement of Science Investment (2015 – 2025)

The recent publication of the NSSI articulates the strategic vision for the science system over the next 10 years. The future framework for core funding will ensure alignment with the objectives set out in the NSSI.

The NSSI vision is for “a highly dynamic science system that enriches New Zealand, making a more visible, measurable contribution to our productivity and wellbeing through excellent science.” In 2025 we want to see:

- a better performing science system that is larger, more agile and more responsive, investing effectively for long-term impact on our health, economy, environment and society
- growth of Business Expenditure on Research and Development to well above one per cent of GDP, driving a thriving independent research sector that is a major pillar of the New Zealand science system
- reduced complexity and increased transparency in the public science system
- continuous improvement in New Zealand’s international standing as a high-quality R&D destination, development and retention of talented scientists, and direct investment by multinational organisations, and
- comprehensive evaluation and monitoring of performance, underpinned by easily available, reliable data on the science system, to measure progress towards these goals.

The design principles underpinning the NSSI are:

- ensuring an appropriate role for government
- ensuring the science system is transparent and high performing
- creating as simple a system as possible, and
- creating a system that is stable over time.

The NSSI also signals:

- a shift towards more ideas-led discovery research over time
- balancing the investment in applied science with more future-focussed research that will challenge existing approaches and grow new knowledge-intensive enterprises, and

- a science system underpinned by expectations of excellence and impact for New Zealand in its science and research.

This strategic vision for the science system should be the overarching consideration for a future framework for core funding. CRI core funding accounts for around 15 per cent of the Government's total science investment, and as such should be a major lever for achieving this vision. Additionally, CRIs are a key part of New Zealand's science and innovation system and, as Crown-owned research organisations, should be expected to lead the way to achieving the NSSI Vision.

MBIE Contestable Funding

The Contestable Research Fund Investment Plan (published November 2015) contains details about where and how government will invest. The Plan signalled that the future direction of investment across the Fund (2016 - 2018) is for:

- more stable levels of funding year on year
- excellent research, with clear line of sight to eventual impact
- shift across the portfolio to invest in higher risk research
- greater leveraging of wider public and private science investment
- increased connectivity with research in New Zealand and overseas
- broadly maintaining proportions of investment to fund objectives, and
- give greater effect to Vision Mātauranga across the portfolio.

Government priorities for the use of core funding

At present, there is little direct guidance to CRIs regarding the Government's priorities and expectations for the use of core funding. This has resulted in variability of the use of core funding, depending on the particular strategy and circumstances of the individual CRI.

The review did not find any evidence of inappropriate use of core funding. CRIs have all complied with both the contractual terms and wider expectations of use of core funding. Different organisational leadership, strategies (including science and sector strategies) and cultures (as well as external factors affecting the CRI's priorities) have led to different approaches.

Additionally, the current core funding mechanism limits the ability of the Government to re-prioritise and reshape its investment across the CRI portfolio and wider science system with its strategic goals. There are no strong arguments or evidence to support reallocation of core funding between CRIs at present. The benefits of reallocation cannot be assessed without a clear understanding of the Government's investment priorities and expectations, and clear information on the outcomes and impact of core funding.

There is an opportunity for the Government to become a more active and strategic investor in research and provide stronger signals to CRIs about the priorities for the use of core funding, and accountability for performance and delivery on those priorities in alignment with the NSSI. High level guidance on research priorities and expectations could be given to CRIs without diminishing the role and responsibilities of the CRI Boards.

Conclusions

This review concludes that, over the last four years, CRI core funding has performed well against the original policy objectives. It has enabled the CRIs to make improvements resulting in improved organisational performance; improved strategic planning capability; strengthened skills in strategic workforce planning; better alignment and responsiveness to end-user requirements and priorities; and greater impact for NZ. The magnitude of improvements is consistent with the CRIs having the use of core funding for four years and there appears to be increasing momentum in achieving the performance improvements as CRIs become more skilled, confident and mature in their use of core funding.

This review has also uncovered a number of opportunities to make improvements. These include:

1. Overall, traction on achieving Vision Mātauranga has been slow. Although CRIs have all made some progress in determining their response and role in giving effect to this strategy, capability and resourcing is an issue at most CRIs.
2. Pan-CRI programmes such as a workforce strategy and the Te Ara Pūtaiao network are relatively immature and yet to deliver significant opportunities for the system. There is opportunity to achieve wider system alignment and efficiencies if these are enhanced or prioritised.
3. The lack of growth in investment in NSC&Ds and lack of strategic frameworks means that nationally and internationally relevant infrastructure is potentially at risk. There is opportunity to review and refine the current investment framework for NSC&Ds to ensure these assets continue to underpin critical research for New Zealand.
4. CRIs currently undertake a large amount of organisational-level reporting to shareholding Ministers to satisfy the Government's requirements as owners of CRIs. There is an underlying expectation that these arrangements also provide transparency for the allocation and expenditure of core funding and meet MBIE's requirements as an investor in science and research. However, the current performance and reporting arrangements, being organisation-based, make it difficult to have a clear line of sight to the impact of core-funded research as distinct from the impact of research supported by other revenue streams.
5. The information provided through the current accountability arrangements is sometimes not as visible or well-used as it could be, and some of it is redundant or not fit-for-purpose. Additionally, CRIs report slightly differently on some core performance metrics, making it difficult to construct a comparative performance story, or one that could reflect accurately the performance of core funding as an investment mechanism. There is an opportunity to streamline and enhance CRI reporting.
6. At present there is little direct guidance to CRIs about the Crown's priorities and expectations for the use of core funding. The absence of strategic guidance has resulted in variable use of core funding, depending on the particular strategy and circumstances of the individual CRI. CRI Chairs indicated they would welcome greater strategic direction from the Government, with clearer government expectations and high-level priorities for core funding.

This review concludes it would be both appropriate and useful to continue strategic funding for the CRIs over the period of the NSSI. However, there are opportunities to refine core funding to realise greater science system benefit in future years.

The NSSI sets the strategic vision for science investment over the next ten years. CRI core funding accounts for around 15 per cent of the Government's total science investment and as such should be a major lever for achieving the strategic vision for the science system.

It is appropriate to consider sharpening the objectives of core funding to reflect the NSSI and provide better alignment with other MBIE Science and Innovation investment mechanisms. This should ensure that the CRIs continue to lift performance and act in a way that promotes science system outcomes. As such, the future funding model should provide for:

- an appropriate role for government by developing clearly documented investment objectives and outcomes including:
 - the Government's investment objectives and priorities for the investment period
 - the value of the fund over the investment period, including any additional investments to be made during the period
 - expectations of science excellence delivering impact for New Zealand as articulated in the NSSI
 - expected level of financial contribution to research programmes by partners, co-funders and end-users within particular research horizons
 - expectations and goals for collaborative research activities (including NSCs)
 - expectations on delivering the Vision Mātauranga policy, and
 - expectations on access to research outputs arising from this investment.
- continued stability for CRIs
- flexibility to respond to changing priorities
- minimised transactions costs for both parties, and
- differentiation between CRIs' funding mechanisms and their shareholding accountability to the Crown.

Appendix One: Terms of Reference - Review of Crown Research Institute Core Funding

Background information

Crown Research Institutes (CRIs), established in 1992, are Crown-owned companies that carry out research which “should be undertaken for the benefit of New Zealand” (Section 5 of the *Crown Research Institute Act 1992*).

CRIs are a key part of New Zealand’s science and innovation system. Approximately 32 per cent of total Vote Science and Innovation funding goes to CRIs through the Ministry of Business, Innovation and Employment’s contestable funds and CRI core funding (core funding).

CRIs have two shareholding Ministers, the Minister of Science and Innovation and the Minister of Finance, who act to protect the Crown’s investment in CRIs. The shareholding Ministers exercise influence through the development and agreement of CRIs’ Statements of Core Purpose and Statements of Corporate Intent, the controls set in the Core Funding Agreement, and through appointing Boards.

Government introduced core funding in July 2011 based on five-year contracts. Core funding is \$202m per year across all CRIs (which represents 31 per cent of the total funding to CRIs), but with a high degree of variability between CRIs. Core funding was designed to help CRIs deliver on their core purpose activities, plan strategically over the long-term, and develop workforce capability, among other things.

The contracts for core funding expire in June 2016. To determine whether changes should be made to core funding in order to maximise its effectiveness, MBIE will undertake a review of core funding (the Review).

Purpose

The Review will provide the Minister of Science and Innovation with advice on the ongoing role, performance and future alignment of core funding in the context of funding of the science and innovation system. The Review will explore ways to maximise the effectiveness and impact of this investment mechanism.

Scope

The Review will provide the Minister of Science and Innovation with advice on the following key questions:

Performance of core funding

1. Has core funding enabled CRIs to better deliver against their Statement of Core Purpose?
2. What principles has each CRI adopted to determine the allocation of core funding, and how have these evolved over time?
3. What types of research (discovery, applied, technology transfer) have core funding been applied to and how aligned is it to the needs of the CRIs’ stakeholders?
4. Has core funding been successfully used to extend further other funding? Has it been used to substitute for other funding?
5. How else has core funding been applied and how successful have those investments been?
6. How effective are the performance arrangements for core funding?

Core funding - Vision Mātauranga outcomes

7. How has core funding contributed to the CRI's ability to achieve Vision Mātauranga outcomes?

Core funding fit within the evolving science system

8. How does core funding need to change to respond to changes in the wider science system?

9. What mechanism(s) will best determine the level and allocation of core funding?

10. What funding mechanisms will support optimisation of core funding investment in CRIs?

Detailed Scope

Performance of core funding

The Review will include analysis of:

- experience and impact of core funding to date on CRIs and the wider science system
- ways CRIs have used core funding and the outcomes achieved
- contribution of core funding to the operational efficiency and effectiveness of CRIs
- impacts on operational decision-making, allocation processes and research practices by CRIs
- nature and impact of research and other outcomes achieved through the application of core funding
- extent and circumstances in which core funding has been used to extend revenue attracted and/or replace lost revenue by the CRI
- profile of CRIs' revenue and research contract durations
- design and adequacy of current accountability arrangements
- extent to which core funding has enabled CRIs to grow research revenues
- extent to which core funding is synergistic with other funding mechanisms
- application of core funding to maintenance and investment in nationally significant collections and databases
- extent to which core funding has contributed to science excellence
- extent to which core funding has contributed to technology and/or knowledge transfer and/or commercialisation realisation
- nature of and extent to which core funding has resulted in increased collaboration
- efficiency and effectiveness of existing performance and monitoring frameworks
- allocation and contracting processes for core funding
- proportion of core funding in context of wider funding context, and
- responsiveness of current funding to support intended outcomes.

Core funding - Vision Mātauranga outcomes

The Review will include analysis of:

- extent to which Vision Mātauranga is reflected in CRI activities
- visibility and consideration of Vision Mātauranga in CRI planning and strategies, and
- core funding support for Vision Mātauranga activities.

Core funding fit within the evolving science system

The Review will consider the following in the wider funding context:

- purpose of core funding and how is this best structured to deliver against that purpose
- alignment of core funding with current and future funding mechanisms
- the appropriate balance of the various funding mechanisms available to optimise performance outcomes
- allocation and contracting mechanisms for core funding, and
- performance and monitoring frameworks for core funding.

Interdependencies

The Review will draw on and input into the outcomes of:

- the National Statement of Science Investment
- the review of MBIE Contestable Funding for Science
- any future work on extension and commercialisation mechanisms, and
- any future work on levy funding for research organisations.

Deliverables

The key deliverables from the Review will be:

- advice to the Minister of Science and Innovation on the role, performance arrangements and funding mechanisms and future level of core funding
- a Report documenting the Review processes and findings including summary of engagement with stakeholders, and
- input into other policy documents and processes relating to funding of science and innovation.

Methods

The key methods used to undertake this Review are:

- reviewing international literature about the role and impact of institutional funding
- developing an intervention logic model for core funding to inform detailed questions and performance indicators
- conducting in-depth evaluative interviews with CRIs, businesses and other stakeholders, and
- analysing and evaluating a range of qualitative and quantitative data in relation to the intervention logic and the above questions.

Key information sources include:

- CRI annual and quarterly reports
- core funding agreements
- Four Year Rolling Review reports
- existing CRI stakeholder and other surveys
- finance performance data
- data collected from CRIs about how core funding has been spent
- international comparator data
- CRIs' Statements of Core Purposes and Corporate Intent, and other key strategy documents
- in-depth interviews with CRIs, collaborators, and end-users, and
- analysis and evaluation based on the above information sources

Engagement with CRIs

MBIE will engage with CRIs through the following mechanisms:

- Direct correspondence with Chairs and CEs at commencement of review
- Collectively through the Science NZ Strategy Managers Group at key times through the life of the review, and
- Individually through surveys and in-depth interviews during the evaluative stage of the review.

Planning and implementation arrangements

MBIE will lead the development of the Review. The Governance Group will comprise senior officials from MBIE, who will oversee the project and meet on a monthly basis to ensure effective oversight of the project.

Timeline

Date	Communications to the Minister
Late March	Advice on broad scope for the Review
Early June	Terms of reference for the Review
July	Initial advice to Minister on progress of the Review
August	Briefing to Minister on provisional findings and draft report structure
September	Draft report
October	Final Report

Appendix Two: List of Stakeholders Interviewed

Crown Research Institutes

Scion
AgResearch
Landcare Research
NIWA
Plant & Food Research
ESR
GNS
CRI Māori Board members

Government

Ministry of Primary Industries
Ministry for the Environment
Department of Conservation
Ministry of Education
Tertiary Education Commission
Ministry of Health
Earthquake Commission
Environment Canterbury
Environment Southland
Office of the Chief Science Advisor

Research Institutes

Callaghan Innovation
Cawthron Institute
Lincoln Hub
Royal Society of New Zealand
Bioprotection Research Centre (Lincoln)
National Science Challenges

- Our Land and Water
- Resilience to Nature's Challenges
- Biological Heritage

Universities NZ – Research Committee

Advisory Panels

MBIE Expert advisory panel
Four year rolling review panels
CRI Taskforce Members

Industry Organisations

Science NZ
DairyNZ
Beef & Lamb NZ
Horticulture NZ
Federated Farmers
Foundation for Arable Research
Pipfruit NZ
Forest Owners Association
Wood Processors' & Manufacturers'
Association
Irrigation NZ
Aquaculture NZ
Fertiliser Association of NZ
Antarctica NZ