Review of Centres of Research Excellence:

Discussion Document
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Purpose of this document

The Ministry of Education, with support of the Tertiary Education Commission and the Ministry of Business, Innovation and Employment, is currently leading a review of the Centres of Research Excellence (CoREs).

The original CoRE policy and its intent have not been evaluated since the CoREs were established in 2001. The aim of this review is to identify opportunities to increase the responsiveness of the CoRE policy in meeting government priorities for tertiary education, research, science and innovation.

The discussion document is meant to be read alongside the analytical report, CoREs and Effect (at: http://www.educationcounts.govt.nz/publications/tertiary_education/cores-and-effect), which examines the performance of the current CoREs, within the current CoRE policy, in the areas of strategic impact, research networks and collaboration, research quality and impact, and knowledge transfer (including research commercialisation). These two documents are complementary: the CoREs and Effect report focuses on the impact of the current funded CoREs, while the focus for this discussion document is the policy settings that will inform the selection and oversight of future CoREs, including operational and performance expectations and the monitoring framework.

This discussion document provides an opportunity for stakeholders to present their views on the strengths of the CoRE policy and suggest improvements. The document has three sections:

- **The CoRE policy.** This section provides information on the original policy objectives, the nature of CoREs, selection criteria and funding. It asks stakeholders to consider the effectiveness of the CoRE policy to date and the key policy design features that have contributed to building or limiting the success of the CoREs.

- **The place of the CoREs within the wider skills and innovation systems.** This section provides information on the New Zealand research and development landscape. It asks stakeholders to consider the extent to which the CoRE policy complements, duplicates or conflicts with other government policies and programmes to support research and development.

- **Opportunities to increase the value of public investment in the CoREs.** This section focuses on opportunities to improve the CoRE policy before the next CoREs selection round, including proposed changes to the performance measurement framework for CoREs.

Feedback will inform decisions on the review of CoRE policy, which is due to finish in June 2013.

How to provide feedback

You can provide feedback by emailing tertiary.strategy@minedu.govt.nz. The deadline for providing feedback is Monday 29 April 2013. If you have any questions or queries related to this document, please email these to the above address.
The CoRE policy

CoREs are semi-autonomous, inter-institutional research networks, with researchers from tertiary education institutions and Crown research institutes working together to deliver a commonly agreed research plan.

Original policy objectives

The CoRE fund, introduced in 2001, provides an incentive for researchers in the tertiary education sector to concentrate resources and collaborate to produce world-class research of relevance to New Zealand.

The Government sought to create inter-institutional networks of high-performing researchers who would undertake research that would be:

- strategically focused and linked to New Zealand’s future economic and societal needs
- of excellent quality, supporting high-quality, innovative research and research training environments
- transferable so that new knowledge is incorporated and applied in teaching programmes, and through outreach activities and engagement with end-users.

The CoRE policy was designed to address fragmentation across the tertiary education, research, and science and innovation systems. It drew on international evidence that research is more likely to be successful (in terms of quality, relevance and impact) if there is a critical mass of researchers who work together to share skills, knowledge and resources.

The CoRE policy also recognised that research expertise was widely distributed across New Zealand tertiary education institutions and Crown research institutes, and that New Zealand did not have the resources available to undertake world-class research in all possible research topics. The policy sought to support collaborative research activities that did not lend themselves to alternative funding sources.

The objectives of the CoRE fund were operationalised through the process and criteria used for assessing applications to become CoREs in 2002/03 and 2007.

Existing CoREs

The seven CoREs that currently receive government funding cover research in areas such as public health, Māori development, bio-security, food science, ecology, biomedical science and nanotechnology. Table 1 overleaf details the current government-funded CoREs.
<table>
<thead>
<tr>
<th>CoRE</th>
<th>Area of focus</th>
<th>2011/12 funding ($000)</th>
<th>Host university</th>
<th>Partner organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allan Wilson Centre for Molecular Ecology and Evolution</td>
<td>Use forefront methodologies in genomics and biomathematics to create knowledge and develop new analytic and predictive models for molecular ecology and evolution.</td>
<td>3,049</td>
<td>Massey</td>
<td>Universities: Auckland, Canterbury, Otago, Victoria. CRIs: Plant and Food Ltd.</td>
</tr>
<tr>
<td>Bio-Protection Research Centre</td>
<td>New, non-pesticide and sustainable solutions to protect New Zealand’s plant-based, productive ecosystems from plant pests, pathogens and weeds.</td>
<td>3,723</td>
<td>Lincoln</td>
<td>Massey University. CRIs: AgResearch, Plant and Food Ltd.</td>
</tr>
<tr>
<td>MacDiarmid Institute for Advanced Materials and Nanotechnology</td>
<td>High-quality research in materials science and nanotechnology.</td>
<td>6,561</td>
<td>Victoria</td>
<td>Universities: Canterbury, Massey, Otago. CRIs: Institute of Geological and Nuclear Sciences (GNS). Other: Callaghan Innovation Research Ltd.</td>
</tr>
<tr>
<td>Maurice Wilkins Centre for Molecular Biodiscovery</td>
<td>The Centre targets serious disease. It includes researchers with world-class reputations for inventing new drugs and vaccines targeting cancer, diabetes and infectious disease, as well as new tools to help basic research and clinical medicine.</td>
<td>3,973</td>
<td>Auckland</td>
<td>Universities: Canterbury, Otago, Victoria, Massey, Waikato. CRIs: AgResearch, Plant and Food Ltd. Other: Malaghan Institute, Callaghan Innovation Research Ltd.</td>
</tr>
<tr>
<td>Gravida: National Centre for Growth and Development</td>
<td>Research into the biology of mammalian development, which seeks to reveal how events during pregnancy and childhood influence the health of the individual throughout life.</td>
<td>6,857</td>
<td>Auckland</td>
<td>Universities: Canterbury, Massey, Otago, Liggins Institute (University of Auckland). CRIs: AgResearch Ltd. Other: Landcorp Farming Ltd.</td>
</tr>
<tr>
<td>Ngā Pae o te Māramatanga</td>
<td>Economic development, environmental sustainability, health and social wellbeing, and educational achievement within Māori communities.</td>
<td>5,331</td>
<td>Auckland</td>
<td>All NZ universities and wānanga, Te Tapuae o Rehua, Waikato Tainui College. CRIs: Landcare Research. Other: Auckland Museum, Te Papa Tongarewa.</td>
</tr>
<tr>
<td>The Riddet Institute</td>
<td>Discovery-based scientific research into the structure and behaviour of complex food systems and how these interact with the consumer to influence quality of life.</td>
<td>3,396</td>
<td>Massey</td>
<td>Universities: Auckland, Otago. CRIs: AgResearch Ltd, Plant and Food.</td>
</tr>
</tbody>
</table>

1 and 2 Formerly a CRI, Industrial Research Limited (IRL)
Selection process and funding

The CoREs were selected through a competitive bidding process, with tertiary education institutions invited to submit proposals. A panel of experts assessed the proposals against criteria designed to meet the Government's goals for CoRE funding.

There have been three selection rounds since 2002. Successful CoREs have received operational funding to deliver research in accordance with their research plan, and capital injections to support investment in high-quality, specialist equipment.

Seven CoREs were established through two contestable selection rounds in 2002 and 2003, with total operating funding of $24.6 million/year (ex GST) and capital funding of $30.9 million.

The original CoREs selection criteria focused heavily on the quality and strength of the proposed research plan and the applicants’ reputation for excellence. Additional selection criteria included research relevance (including benefit to New Zealand), and contribution to knowledge transfer (through post-graduate research training, inter-institutional collaboration, international linkages and community links).

Six existing CoREs were successful in a further contestable selection round in 2007. In that round, one CoRE, the New Zealand Institute of Mathematics and its Applications (NZIMA), was not reselected, and one new CoRE, the Riddet Institute, was selected.

The selection criteria for the 2007 selection round maintained a focus on research excellence and relevance, but placed a stronger focus on human capital development and governance and management. The revised selection criteria also emphasised innovation and the expected benefits of research activity on service or policy development, productivity, developing new products, and helping New Zealand firms compete in high-value products and services.

For the current CoRE contracts (covering July 2008 to July 2014), Cabinet increased the operating funding to around $34 million (ex GST) per annum, with a one-off capital allocation of $20 million across all CoREs.

How CoREs operate

Each CoRE is hosted by a university, which provides infrastructural support, including management and coordination of the research plan, fund distribution and asset management. As CoREs are not legal entities, the contract is between the host university and the Tertiary Education Commission. Participating research institutions have partnership agreements with the CoRE covering the sharing of personnel, costs and intellectual property.

Each CoRE has a governance board that sits outside the host university's governance structure and provides autonomy over its own strategic direction. All CoREs also have a research or science advisory board, in most cases with international representation. Individual CoREs also have a director, in most cases half-time, and a full-time administrator. Most CoREs have over 50 investigators, including doctoral students, post-doctoral researchers and interns. A significant number of post-graduate students and post-doctoral researchers have been trained within each CoRE.

Under the operating model adopted by most CoREs, investigators generally spend only part of their time on work done through the CoRE, and their outputs and external research grant applications are generally completed as a member of their host institution rather than channelled through the CoRE.
As well as research, CoREs undertake a range of educational and outreach activities to support the dissemination and uptake of research findings. Activities include post-graduate supervision, public lectures, conferences, media projects, school visits and publications (including teacher resources).

Outreach activities are often developed in partnership with a range of stakeholders including iwi, local government, schools, and local communities. CoREs also engage in the dissemination and application of research findings for use by Government, industry and other end-users.

**Current performance of the CoREs**

The mid-term reviews of CoREs and more recent performance analysis show that CoREs deliver research that is of the highest quality in New Zealand and, in many instances, internationally.\(^3\)

The CoREs also make significant contributions to human capital and skills development. They provide collaborative, multi-disciplinary research environments for training and developing new and emerging researchers and broker collaborations between mid-career researchers, and with end-users. The public outreach activities of the CoREs support the Government’s wider skills agenda, increasing public understanding of research, fostering interest in scientific fields of study, and raising awareness of science-related educational pathways and employment opportunities.

The CoRE policy was not initially designed with a direct focus on the application of research findings to promote innovation. However, the research, training and outreach activities undertaken by the CoREs do support the creation of new knowledge, human capital development, and knowledge transfer – all of which can be underlying determinants of innovation. CoRE managers report that the CoRE fund enables them to undertake significant new investigations that would not otherwise occur. There is significant variation in focus across the CoREs in terms of the emphasis placed on different knowledge transfer objectives.

The way in which the CoREs engage with potential end-users, including the strength of connections to industry, is highly dependent on the area of research focus, and the type of research conducted. This variation reflects the autonomy CoREs have to define and adapt their research agendas, and to determine how their research and activities will contribute to New Zealand’s future development.

There is evidence that the research conducted by the CoREs has provided positive social and economic benefits to New Zealand. The nature of impact varies between the CoREs, and ranges from research commercialisation, public health initiatives, improved biosecurity, better management of New Zealand’s natural environment, and social change.

When CoREs were first introduced, there was an expectation they would be encouraged to become self-funded eventually, where this was realistic. Mid-term reviews of CoREs in 2005 and 2010/11 identified a number of barriers to their sustainability via self-funding. These include New Zealand’s historically low levels of business investment in research and development, and agreements with host universities that do not readily allow CoREs to generate substantial income from intellectual property (IP).\(^4\)

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\(^4\) Although some CoREs have been awarded a number of patents and have created spin-off companies, the institutes cannot own IP, as they are not legal entities. CoREs’ access to profits generated by IP is dependent on the goodwill of the host universities involved.
Questions for stakeholders

The first set of questions asks you to consider key current policy design features and seeks views on whether, and if so how, these should be changed.

1. What are the benefits and costs of conducting research through a formal inter-institutional network of researchers? What are the challenges?

2. In your view, against which of the original objectives has the CoRE policy been most successful? Which have been least successful? Why?

3. How, if at all, should the CoRE policy objectives be revised? What priority should be placed on different objectives and/or activities?

4. Looking at the design features and operation of CoREs, what factors have been the most important in building or limiting success?

5. How could current policy or operational settings be improved to address any aspects of CoRE policy that currently limit the success of the CoREs?
The CoREs within the wider skills and innovation systems

The Government’s Business Growth Agenda sets out a programme of change to the New Zealand research and development landscape. Building innovation is one of six key focus areas.

Successful innovation improves competitiveness, increases our output, drives productivity growth and creates successful exports by introducing new or improved products, processes or methods into the economy. Innovation is also essential to improving environmental, social and health outcomes.

The tertiary education system – including CoREs – contributes to innovation by:

- generating the knowledge needed for innovation by conducting excellent basic and applied research
- delivering high-quality education and training that ensures employers are able to draw on a skilled and flexible workforce
- promoting knowledge transfer and commercialisation of research products through dissemination, collaboration between researchers, industry sectors and end-users, and research partnerships
- engaging in direct commercialisation activities, including contract research, patents, technology licensing and sales, and the formation of spin-out companies.

The Government intends to build on the strengths of existing collaborative research models to generate greater value from public investment in tertiary education research. This will require more interaction between business and researchers, greater exchange of information, more joint research projects, and more ventures to commercialise research.

The New Zealand research and development landscape

New Zealand spent an estimated $2.4 billion on research and development in 2010. Research and development expenditure has increased over recent years, although the total remains low by international standards. In part, this reflects relatively low levels of business expenditure on research and development. In 2010, business expenditure on research and development was 0.54% of GDP, compared to 1.62% across the OECD.

Government research and development expenditure supports a wide range of activities through a number of different mechanisms. Broadly, these can be described as falling into the following categories:

Investigator-led research funds. Government funding for investigator-led research and development is designed to incentivise and support research excellence across a full spectrum of possible research topics or areas of discovery. Such research is driven by the skills, knowledge and interests of individual researchers.

- *Current investigator-led funds include the Marsden Fund and Fellowships for Research Excellence.*
Mission-led research funds. Government funding for mission-led research is designed to concentrate research effort on particular topics or areas of research that align with government’s social, economic, health and environmental priorities. Funds may be allocated on a competitive basis to support specific research proposals, including many investigator-led projects, or through core funding to mission-led public research organisations, such as Crown research institutes.

- *Current mission-led contestable funds include a focus on mātauranga Māori, health research, high value manufacturing and services, biological industries, energy and minerals, and the environment.*

Business-led research and development funds. Government funding to support business-led research and development aims to grow private investment in areas of government priority, improve businesses’ research and development capability, and promote research commercialisation. Current business-led funds are allocated in the form of direct grants to businesses or consortia to support specific research proposals.

- *Current business-led funds include Primary Growth and Development Partnerships, and the Ministry of Science, Business and Innovation’s project grants, capability grants, technology transfer vouchers and technology development grants.*

Performance-led research funds. The Performance-Based Research Fund (PBRF) is the primary way in which the government supports research in tertiary education organisations, supporting institutions to employ, retain and develop talented researchers, deliver research-led degree and post-graduate teaching, and provide high-quality training environments for new and emerging researchers. The PBRF aims to reward and encourage excellent applied research and development as well as basic research. Research outputs assessed through the Performance-Based Research Fund may be investigator-led, mission-led or business-led.

Collaborative research models. Policies to incentivise research partnerships across the tertiary education sector, Crown research institutes, and end-users are designed to build critical mass in a given area of research in order to increase the strategic relevance and impact of government-funded research and development. In addition to the CoREs, the government has established two additional collaborative research models: Research Partnerships and Platforms (Table 2).

**Table 2: Collaborative research models**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Funding ($000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partnerships</td>
<td><strong>Partnerships</strong> are a funding tool that supports a formal research and development collaboration for user-led research and development (public-private partnership). The partnerships must include research users (businesses or industry bodies) who must match public funding as well as public research organisations. These user-led science partnerships provide market pull and a strong delivery ethic to science programmes.</td>
<td>Approximately 19,000 per annum</td>
</tr>
<tr>
<td>Platforms</td>
<td><strong>Platforms</strong> are a mechanism for large-scale, long-term investment in research with strong input and co-funding from users. Platforms are a multi-organisational model that concentrates world-class research and resources and has a human capital maintenance and development role. Only one Platforms investment has been made so far — the Natural Hazards Research Platform. It is led by GNS Science and includes NIWA, University of Canterbury, Massey University, and University of Auckland as partners.</td>
<td>Currently 12,000 per annum</td>
</tr>
</tbody>
</table>
Callaghan Innovation will play an increasingly important role in promoting networking and collaboration across the innovation system. Callaghan Innovation is a business-facing organisation, designed to support science and technology-based innovation and its commercialisation by businesses, primarily in the manufacturing and services sectors. Its key functions will be to administer business research and development grants, provide innovation services to businesses, foster an environment that encourages business innovation, and facilitate knowledge and technology transfer from research providers to business. See http://callaghaninnovation.govt.nz for more information.

**Comparing CoREs with other research and development policies and programmes**

The Government is developing a set of National Science Challenges to create a more strategic approach to science investment in New Zealand. These Challenges will provide future focus to public investment in mission-led science, helping to provide a unified approach to science and innovation across portfolios and agencies. Business-led research and development policy is also being redesigned, to encourage and incentivise higher levels of business expenditure on research and development.

CoREs can be seen as a hybrid. Much like mission-led research funds, the objectives and selection criteria for CoREs emphasise the importance of conducting research with a strategic focus that contributes to New Zealand’s future development. However, rather than following a ‘top down’ approach that defines specific challenges or problems for the CoREs to address, the CoRE policy uses a ‘bottom up’ approach that allows CoREs to identify for themselves how their research fits into national priorities.

As with investigator-led research funds, CoRE research plans reflect the interests and expertise of individual academics and researchers. However, the relevance criteria in the current CoRE selection framework emphasise collaborative links with others, including the involvement of the relevant sector in determining their research programme. There is also an expectation that CoREs generate additional funding (e.g. through industry-funded research contracts, and through the Government’s contestable research funds).

The CoRE policy has a particular focus on incentivising collaborative research activity across inter-institutional networks of researchers. As such, CoREs share some similarities with the government’s other collaborative research models. However, most of the Partnerships support research in biological industries and have a much more targeted sub-sector or issue focus than the CoREs. The main difference between CoREs and the new Platforms is that Platforms are formed from a top-down, strategic process with negotiation between the parties, rather than a highly contestable, bottom-up process.

Many of the Government’s existing contestable investigator-led, mission-led and business-led research funds may also support collaboration within and across tertiary education organisations, Crown research institutes and the private sector – even where this not is an explicit aim. However, project-specific research and development grants tend to support informal collaborative arrangements that are of a more limited scale and duration than the formal research partnerships established through collaborative research models such as CoREs, Partnerships or Platforms.
Questions for stakeholders

The second set of questions focuses on the relationship between the CoREs and other policies and programmes to support research and development. We are interested in opportunities to build on the strengths of existing collaborative research models – and your views of how similar or different CoREs should be from Platforms and Partnerships in the future.

6. What are the strengths of the CoRE policy relative to other collaborative research models (i.e. Partnerships and Platforms)?

7. In the future, how similar or different should CoREs be from other collaborative models, such as Platforms and Partnerships? Should there be defining features of a CoRE? How should any changes be reflected in policy or operational settings?

8. How should end-users be involved in determining the future research and education direction of the CoREs? What would need to change to achieve this? What benefits or risks would this create?

9. Could the fit be improved between the objectives of CoRE policy and other forms of government support for research and development? How might these be achieved? What would be the benefits and risks of change?
OPPORTUNITIES TO INCREASE THE VALUE OF PUBLIC INVESTMENT IN CoREs

Considerations for a future CoRE selection round

It is useful to consider whether the funding arrangements, organisation or form of CoREs could be improved without jeopardising current strengths. Current CoREs are not legal entities, which enables them to work flexibly within and between host and partner research organisations, and to customise their structures to the needs of the particular CoRE, but which also restricts their ability to own and capture resources.

There are questions about whether changes to funding, organisational form or hosting arrangements could incentivise CoREs to generate greater value from their activities, increase income for CoREs, or improve outcomes from collaboration. For example, some in the sector have suggested there would be value in allowing a more flexible model of collaboration that could allow hosting, for example, by a Crown research institute.

The difficulties the CoREs face in becoming self-funding create some challenges, including how best to maintain existing collaborative research activities, while also supporting new collaborations in emerging areas. There may also be opportunities through changes to create stronger incentives for CoREs to engage in research funded by business.

It has been suggested by some that the CoRE policy has had the effect of creating a valuable ‘brand’, both nationally and internationally. In considering a future selection of CoREs, it may be valuable to explore how we could extend the brand or apply it differently, for example by having a wider range of CoRE models.

Now that the CoREs are well-established, there are choices to be made about:

- the number of CoREs that receive government funding
- the amount of funding received by individual CoREs
- areas of research focus and alignment with broader Government priorities, including tertiary education and science priorities
- the optimal duration of CoREs contracts
- the appropriate mix of ongoing operational and one-off capital funding.

Improving performance measurement of the CoREs

CoREs currently submit annual plans and annual reports to the Tertiary Education Commission. All CoREs report to the TEC on the same areas of activity. However, there is a high level of variation across the CoREs in terms of how they define and measure their performance. This reflects differences in the nature of activity undertaken in the CoREs, and in the reporting systems developed by host universities. It also reflects the freedom that individual CoREs have been given to determine the performance measures applied to their reports.

There are few entirely consistent approaches to reporting between the CoREs – even on the matter of how to categorise and report publications. For example, there is no agreed approach to the treatment of income and expenditure across the CoREs. Some CoREs maintain clear records of the income they attract from mission-led contestable funds or contract research, while others do not separate CoRE earnings from the host institution’s finances.

Because nearly all CoRE investigators spread time between a department/faculty in the host university or another research institution, and the CoRE, there are also different approaches
among the CoREs as to how to count staff – some report headcounts and FTEs, while others report only headcounts, while some do not report staffing numbers at all. In the same way, it is not straightforward for the CoREs to report on their contribution to postgraduate supervision, as the student may be co-supervised by academics in other departments or universities.

Developing a more consistent approach to performance measurement is important to assist the CoREs to demonstrate, and government to assess, the contribution that CoREs are making. This means gaining a measure of the value of public investment in the CoREs as a group and as individual CoREs. This will require greater standardisation in the way that performance measures are defined and reported. It will also require developing common definitions and measures to enable consistent measurement.

We propose to develop common definitions to guide future performance monitoring of all CoREs in each of the following areas:

- the number and quality of research outputs, including publications and reports by CoRE researchers
- results for graduates who train in CoREs, such as completion of qualifications and/or the longer term outcomes for graduates (such as measures of their earnings and employment)
- demand for CoREs research, including external research income attracted to the CoREs and income generated by CoREs research, development and innovation
- the extent of collaboration by CoRE researchers in investigations, contracts and projects.

It is also important that any future selection and performance measurement framework continues to capture the unique strategic contribution of each individual CoRE.

**Questions for stakeholders**

The final set of questions focuses on future opportunities to increase the public value of investment in the CoREs. We are seeking your feedback on considerations for the next selection round, and proposals to improve performance measurement of the CoREs.

10. Should the CoRE policy place stronger incentives on the application, utilisation and commercialisation of research? How? What benefits or risks would this create?

11. How might the obligations on host organisations, or the relationship between CoREs, host organisations and other organisational partners be changed to support CoREs to generate greater value from their activities, increase income for CoREs, or improve outcomes from collaboration?

12. There are a number of choices presented on page 11. Assuming the size of the CoRE fund remains constant, how would you respond to the choices identified?

13. How could performance monitoring for CoREs be improved?

14. Which performance measures should all CoREs report against in a consistent manner?

15. What more could CoREs contribute in the future?

16. Any other comments?