# Draft National Statement of Science Investment

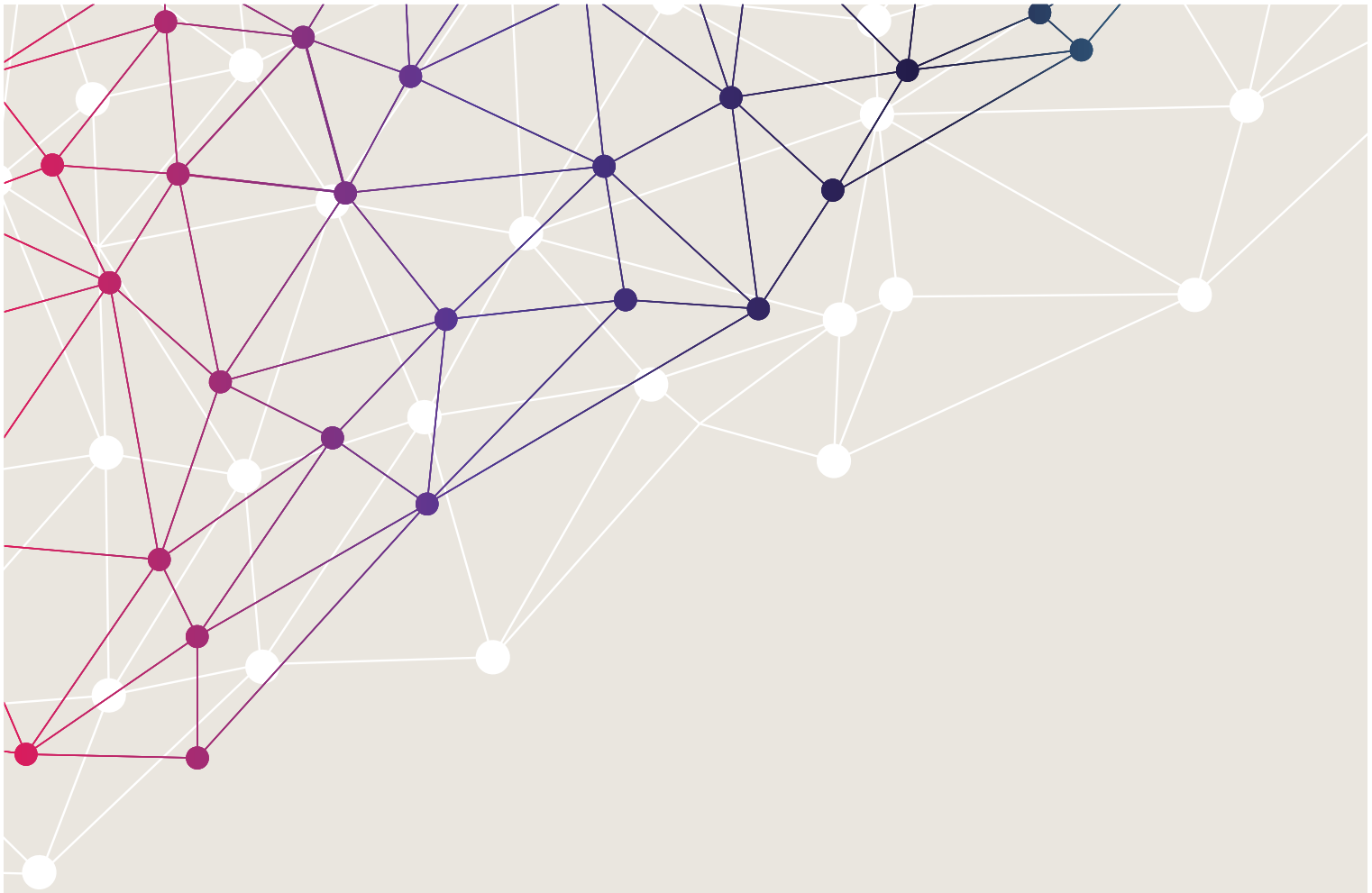
## 2014–2024

[ DRAFT FOR CONSULTATION ]

MAY 2014

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

newzealand.govt.nz



# Contents

# Introduction

## MINISTER'S FOREWORD

**High-quality science and innovation can have a transformational effect on a nation. High-quality research offers the power to increase economic productivity and competitiveness, and can improve health, social and environmental outcomes in unprecedented ways.**

New Zealand's economic and social wellbeing depends on the productivity and competitiveness of our economy and the knowledge we have to make informed decisions as a society. Science provides that knowledge and informs those decisions.

Over the past five years, the New Zealand science system has seen significant change. Seeking to better understand and capitalise on our science and innovation strengths, and to identify priority areas for improvement, one of our first steps has been to map our system against international best practices and areas of high growth or high need in the New Zealand context.

This has resulted in ambitious initiatives. The National Science Challenges are aimed at generating better science faster, and at getting results directly to the areas where the knowledge can benefit New Zealand the most. Callaghan Innovation will help our companies maximise their benefits from New Zealand sciences. We have strengthened the role of science in Government's own decision making through the appointment of the Prime Minister's Chief Science Advisor and now a number of departmental science advisors.

It is now time to take stock. Over the next five- to ten-year horizon, the science system will take on an increased prominence as it both shapes and is shaped by an economy that is increasingly innovation-led, and a population that is more engaged with science in their daily lives than ever before.

This draft National Statement of Science Investment sets out the Government's proposed future direction for, and coordination of, science investment in New Zealand. It is vital that our science system can respond to the unique economic, environmental and cultural challenges that face New Zealand now and in the future.

This consultation considers the structure of our science investment system to ensure it is appropriate and focuses effort in the right areas. It assesses the objectives for, and shape of, the science system, the balance of investment mechanisms, the inter-relationships between funds and institutions, and how we better evaluate effectiveness. I am also proposing improvements to our science contestable funding mechanism to improve its flexibility and responsiveness to business needs, and reduce complexity.

I want your feedback to assist us in focusing our efforts. I encourage you to engage with government to give us your views on our future direction.

Hon Steven Joyce
Minister of Science and Innovation

May 2014

## OVERVIEW OF THE DRAFT NATIONAL STATEMENT

This draft National Statement of Science Investment (the Statement) sets out the Government's current and proposed future priorities for its science investment.

Where possible, it takes a **10-year outlook for the investments noted**, to provide a future-focused picture of science investments. It also considers Government's intended direction for those investments. It is set out in two sections.

**Section 1** is an introduction and overview. It sets out the context for science investment across Government, identifies how much is spent, and explains the rationale for that investment. It also considers significant trends and potential areas for future development.

**Section 2** describes Government's main science investments in more detail, covering expenditure by each different fund and instrument.

As this is a draft Statement for consultation, this version also includes a final section seeking your feedback. This section sets out some questions and proposals to guide your response.

## NOTE ON USE OF FIGURES IN THE DRAFT NATIONAL STATEMENT

Unless otherwise noted, the sums of money used in this Statement refer to money invested for a single year. However, these sums are not necessarily given on a comparable basis. This is due to three factors:

- Planned changes to funding. A number of increases, decreases, and transfers between funds are already planned for the next 10 years. Therefore, the exact amount invested in any given fund will change from year to year.
- Year-to-year one-off changes to funding. Some funds can be underspent in particular years, and that underspend is sometimes transferred to the next year. Where this has happened, neither year is representative of the general intent of the size of Government's investment.
- The use of multi-year appropriations. Multi-year appropriations are fiscal instruments where money is allocated to a purpose over a period of years, rather than a fixed sum for a single year. For example, Government might approve expenditure of $20 million over four years, rather than $5 million per year for four years. This allows flexibility to respond to emerging priorities, and to use money in the most effective way.

The approach generally taken in this draft Statement, unless otherwise specified, is therefore to reflect a notional average year. In the case of funds that are changing, that will be once the planned changes are complete. In the case of funds that have had one-off changes in particular years, a 'normal' year is used. In the case of multi-year appropriations, a single year is represented by the size of the appropriation divided by the number of years.

Many figures are caveated with the word 'about' or 'around', to reflect the potential for year-to-year change in these scenarios. The Statement includes changes made to some funds in Budget 2014.

# Executive summary

High-quality science and innovation can have a transformational effect on a nation. Research and development investment offers the power to increase economic productivity and competitiveness and improve health, social and environmental outcomes in unprecedented ways. Indeed, New Zealand's economic and social wellbeing depends on the productivity and competitiveness of our economy and the knowledge we have to help make informed decisions as a society. Science provides that knowledge and informs those decisions.

This draft National Statement of Science Investment sets out the Government's current and future priorities for its science investment and seeks feedback on these. It is both realistic and aspirational, knowing that supporting high-quality science today will have both planned and unforeseen future benefits, coming in response to the fast-paced and changing contexts of our increasingly technology-driven culture. Certainly, there will also be anticipated and unforeseen challenges at both a global and local level, and New Zealanders will need to carefully weigh and make decisions about where we want our science to take us. A much closer relationship between science and society will ensure that knowledge generated by New Zealand scientists can best serve to benefit all of us.

The Government's investment will be $1.5 billion in 2015/16, a figure which has grown by over 70 per cent across Government since 2007/08[1]. The Government's science investment portfolio is split across a range of mechanisms that recognise the different context and needs for different kinds of investment in science and innovation, including:

- collaborative mechanisms, such as the National Science Challenges (around $127 million per year including relevant Crown research institute (CRI) core funding), where collaboration between different researchers and institutions is essential to assembling New Zealand's best teams to address challenges of national significance
- contestable mechanisms, such as Ministry of Business, Innovation and Employment (MBIE)-administered sector-specific research funds ($189 million), where competition and openness drive the emergence of new ideas, knowledge, technologies and applications
- institutional funds, such as the Performance-Based Research Fund ($300 million from 2016/17) and CRI core funding (around $202 million), to provide flexibility and stability to our research institutions
- business-led mechanisms to support research into new products and services, such as various business R&D funds (about $141 million) and the Primary Growth Partnership (about $65 million).

Despite significant growth in Government investment and expenditure, and a comprehensive set of investment mechanisms, there remain opportunities to increase the value and effectiveness of the way this money is used for the benefit of New Zealand. Our expenditure compared with other small advanced economies is still small, and we have committed to raising Government's expenditure on science to 0.8 per cent of GDP (from the current 0.56 per cent) as fiscal conditions allow. Investment and expenditure by industry in research and development (R&D) are also low, and Government is helping to leverage that higher through more focused use of Government investments and focusing on improved knowledge exchange through initiatives such as Callaghan Innovation and new forms of company incubators. It continues to be important to improve the exchange of knowledge between researchers and business.

New Zealand's science investment has traditionally been weighted heavily towards primary industries, with 20 per cent of Government science investment being directed towards agriculture, the largest sector-specific proportion of government investment in science. To support the ongoing development of our economy, new expenditure will also need to be directed towards areas of future growth and identified needs, such as ICT, health, high-value manufacturing and processed primary products, and environmental innovation.

In common with other advanced economies, we recognise the challenges in measuring precisely the impact and value of our investment in science. There are opportunities for us to focus work in this area, both on the performance of the entire system, and on the value and impact of individual research programmes.

1 These figures are GST exclusive.

The innovation potential of our unique Māori knowledge, resources and people continues to be significant, and we will maintain a focus on implementing the Vision Mātauranga policy across our science investments.

To capitalise on these opportunities, the Statement proposes the following key priorities for action over the next five to ten years for Government's science investments.

1. **Producing excellent science of the highest quality**
2. **Ensuring value by focusing on relevant science with highest potential for impact for the benefit of New Zealand**
3. **Committing to continue increasing investment over time**
4. **Increasing focus on sectors of future need or growth**
5. **Increasing the scale of industry-led research**
6. **Continuing to implement Vision Mātauranga**
7. **Strengthening and building international relationships to strengthen the capacity of our science system to benefit New Zealand.**

This version of the Statement is a draft for consultation. We are looking for your feedback on the direction set out above, and for opportunities to implement it. In particular, proposed in this draft Statement are potential reforms to MBIE-managed contestable science funding, to be progressed from 2015. These are the first changes proposed to align our investments with the objectives above.

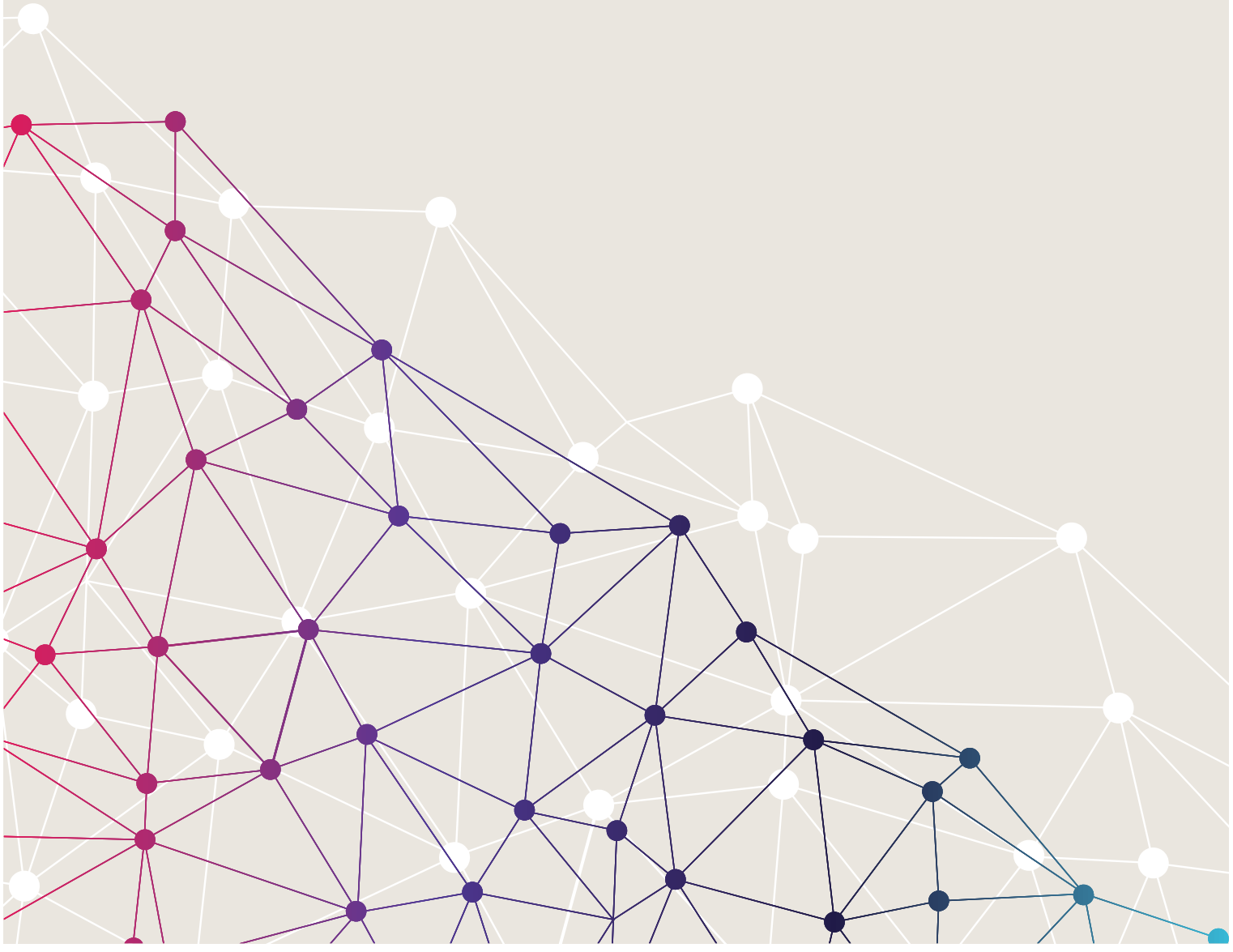
Consultation closes on 22 August 2014. Please email your feedback to NSSI@mbie.govt.nz

Through this Statement, we expect to maximise the critical contribution of science to New Zealand's economic growth, prosperity, and the wellbeing of New Zealanders.

[ DRAFT FOR CONSULTATION ]

# Section 1:

# Introduction and overview



# Why invest in science?

Science and innovation have crucial roles in achieving high-quality economic, social and environmental outcomes for New Zealand. New Zealand's economic and social wellbeing depends on the productivity and competitiveness of our economy and the knowledge we have to help make informed decisions as a society. High-quality and relevant science contributes in three key ways:

## 1. Productivity and sustainable economic growth

Increasing the productivity of an economy is the only path to sustainable long-term economic growth. One way productivity is increased is by discovering and applying new ways to produce more products or services with the same quantity of inputs. Innovation is the introduction of a new or significantly improved product, process or method. It is one of the main ways productivity is increased.

The ability to innovate is based largely on the knowledge that is available to a society, and our ability to use it. The process of scientific discovery is one of the main ways knowledge can be increased. The Organisation for Economic Co-operation and Development's (OECD) recent Science, Technology and Industry Scoreboard (2011) notes that ". . .education and research, together with innovation, are often referred to as the knowledge triangle. They are at the core of today's economies and drive economic growth...".[2]

Government-funded research is seen around the world as an important complement to private sector investment. As the OECD observed in 2000, "The shortening of private-sector product and R&D cycles carries the risk of under-investment in scientific research and long-term technologies with broad applications".[3] Importantly, government investment in science attracts private sector investment – multi-national companies will focus their efforts in countries with the most favourable intellectual, financial and political environments.

## 2. An evidence base for addressing key concerns, developing good public policy and ensuring a better informed public

Science has multiple impacts beyond economic growth. These include playing a crucial role in creating opportunities and finding promising solutions to society's most pressing concerns. For example, the wellbeing of citizens and the environment can be improved and protected by creating and applying new knowledge to policies, processes and products that can enhance the efficiency and efficacy of our current practices, whether in healthcare, land stewardship or in the other domains of high public interest. Indeed, science is central in brokering the balance between the use of our rich natural resources for the benefit of all New Zealanders, and enhancing our unique environmental heritage.

The gains from new knowledge spread broadly beyond the originators. Others in turn make use of them to create further improvements that are valuable for society as a whole.

## 3. Ensuring we have the skills in our workforce and society to become an innovation-led economy

Science also has a central role in education. Research-led teaching in our tertiary education institutions is crucial to training the highest-skilled part of our future workforce. On top of that, the increasing engagement of all New Zealanders with science and scientific development has the potential to improve our national wellbeing. Being engaged in research at the leading edge of the field is crucial to building and maintaining the capabilities of scientists and engineers throughout their careers. Our Science in Society strategic plan considers this aspect of the science system in more detail than this Statement, but it nonetheless remains a key theme.

2 OECD (2011), OECD Science, Technology and Industry Scoreboard 2011, OECD Publishing, page 67.

3 OECD, Policy Brief September 2000 http://www.oecd.org/science/sci-tech/1918259.pdf

In summary, the Government's scientific investments contribute to:

- economic development – enabling business to improve productivity, increasing the overall wealth of New Zealand
- education and training – key to economic and social development
- the development of evidence to inform better public and private policy and decision making
- better public services, such as improved delivery of health and education services
- solving major national challenges, such as an ageing population, improving resilience to the effects of natural disasters, or balancing our use of natural resources with the environmental impacts of that use.

## WHAT DOES THIS MEAN FOR NEW ZEALAND?

New Zealand is a small, geographically isolated economy. This limits access to physical markets, scale of industry, and the financial and human resources we have available. We are particularly susceptible to environmental shocks (e.g. biosecurity breaches, geological, changes in climate), as well as economic shocks, such as the global financial crisis.

However, we also have unique natural resources, biodiversity, concentrations of expertise and culture, and growing knowledge-intensive sectors such as ICT. Also of importance is Māori traditional knowledge – mātauranga Māori – and the specific values, needs and aspirations of Māori communities are unique and of importance to New Zealand.

Science is able to address these challenges and opportunities. To ensure it does, the New Zealand science system must have certain specific features. It should:

- make the optimal use of funding to produce quality, high-impact science
- clearly prioritise mission-led and business-led investment according to national needs and potential benefit to New Zealand
- be responsive to new ideas and technologies, both from within New Zealand and globally
- support the production of high-quality research
- explicitly support the broadening of our economy, as well as continuing to identify opportunities to increase the value of our primary produce
- focus on science that is critical to the domestic context, or where we will be able to develop and sustain comparative advantage in terms of our economy or expertise
- focus on research that has the potential to benefit New Zealand society and sustain our environment
- be responsive to the needs, aspirations and values of Māori individually and collectively, including Māori economic development
- be strongly connected internationally and look for opportunities to collaborate and participate in major research projects overseas that address global questions that will have an impact on New Zealand's science and innovation priorities
- attract, retain and develop talented researchers to maintain and build capability and capacity to meet our research needs in the future.

All these points mean that we think about Government's involvement in the science system as a broad investment portfolio, made up of activities, with varying risk and return, and of varying time horizons. This mix of activities should, overall, maximise the value of Government's investment to New Zealand.

To manage that portfolio responsibly, Government needs access to a range of instruments and mechanisms best suited to achieving the aims described above. The next part of the Statement sets out those mechanisms and the rationale for them.

## HOW WE THINK ABOUT SCIENCE INVESTMENT

This Statement uses a similar framework to the European Union's (EU) Horizons 2020 Framework Programme[4] to consider types of science investment. This considers whether the science is *investigator-led*, *mission-led* or *industry-led*.

**Investigator-led** science is undertaken to acquire new knowledge but its direction is suggested by the scientists themselves. This type of research generates ideas, expands the knowledge base, and contributes to the development of advanced research skills. Value often accrues over the long term and to a broad range of outcomes. These broad-based benefits are sometimes known as knowledge 'spillovers'.

**Mission-led** science is undertaken towards a particular aim or objective. The intended goal may be broadly or narrowly defined but is often identified by the funder. The science might bring together resources and knowledge across different fields, technologies and disciplines and be directed towards social, environmental or economic outcomes, or a combination of all three.

**Industry-led** science draws on existing knowledge and is focused on the practical development of new materials, products, processes, systems or services. These developments will tend to be 'close to market', with an obvious commercial or practical application that can be realised within a given time frame.

These terms are often seen alongside other, similar, terms. For example, investigator-led science shares many characteristics with 'basic' science, or 'fundamental' science. We have used the terms above as they provide the greatest overall clarity for describing Government's preferred direction for the science system.

## GOVERNMENT'S ROLE IN THE SCIENCE SYSTEM

New Zealand's science system must ensure that the science undertaken is of the highest quality and is applied to the generation of new knowledge with the goal of improving our economic, social and environmental outcomes, and from that can contribute to individual and national wellbeing.

The system is structured around:

- institutions, principally tertiary education organisations, Crown research institutes and independent research organisations
- businesses, which invest in scientific research or use the results of it to generate products and services
- Government investment and associated funding mechanisms
- infrastructure such as research facilities and enabling technologies
- international relationships and interactions – science has always been an international endeavour, and New Zealand, producing only 0.5 per cent of the world's scientific output, absorbs knowledge from abroad as well as developing its own, or co-producing work with international partners.

Different investment mechanisms and interventions are required across these different components of the system and for different purposes. Sometimes mechanisms that encourage competition are appropriate, whereas at other times benefits of scale and cross-disciplinary effort mean that collaboration across parts of the system is desirable to achieve the intended outcomes. Competition is desirable because it ensures innovation and quality, but collaboration is desirable because it facilitates scale and avoids expensive duplication. New Zealand's science system is relatively small, meaning that more collaboration may be needed to achieve the benefits of scale. More or less directive approaches to investment can be better suited to different situations.

4 http://ec.europa.eu/programmes/horizon2020/

In addition, government's role as an investor can be thought of in different ways depending on the types of science invested in and the expected benefits. In general:

- For **investigator-led** science, the value of the research can be significant but may not always be clear at the outset, and can accrue to a large number of people. Businesses are highly unlikely to invest in this type of science, so government has a clear role as a primary investor. Competitive mechanisms that consider the quality of the science as the primary criterion for investment are appropriate.
- For **mission-led** science, the potential value can be clear, but sometimes:
  - challenges are at a scale that requires coordination at a national level
  - commercial values are distributed to the extent that businesses have few incentives to invest
  - benefits are sufficiently far in the future that attracting private investors can be challenging
  - benefits are primarily geared toward the public interest through impact on policy and practice, or on social and environmental health rather than through results capable of being commercialised.

  Government has a role here as a co-investor, or principal investor where the mission is clearly to the public rather than private good (such as research into environmental issues or public health problems). Mechanisms may need to encourage collaboration, or seek to encourage private sector co-funding where appropriate, and will also need to recognise the need for long-term funding stability to pursue long-term missions.
- For **industry-led** science, the principal investor should be individual businesses or a consortium of businesses, as they are likely to gain most from the research, sometimes to the exclusion of other businesses. Government's role here is to encourage more business investment, which is crucial to strengthen the R&D ecosystem across New Zealand (through, for example, policy settings and co-funding). Government can also encourage the development of generic technology where the benefits are private but spread across many firms. It can also provide information and in-kind support, or invest in a way that encourages coordination between similar businesses when they are too small to invest on their own. Industry-led science can also provide research infrastructure and capability.

Investments need to take into account the need for organised infrastructure and human capital to undertake the desired science, and this often resides in institutions. In some cases it is appropriate to invest in institutions directly to enable this organisation, rather than invest on an individual project basis. International partnerships exist across the three science investment types to support the delivery of expected benefits and ensure New Zealand science operates at the forefront of new knowledge and technology.

The multiple objectives in the system and various different roles of Government will necessarily require a range of different mechanisms and funds. We must continually re-consider and review these settings to ensure we are able to invest intelligently in the science system, and maintain appropriate influence over its diverse range of independent actors, while ensuring the system does not become too complex or diverse, such that the aims of the system and our ability to manage it become compromised.

## MAIN SCIENCE INVESTMENT FUNDS

Chart 1, below, provides an overview and comparative sizing of different science investments. These are the main science investment vehicles for government, invested via Vote Science and Innovation (c. $967 million per year), Vote Tertiary Education (c. $335 million per year), and Vote Primary Industries (c. $90 million per year).

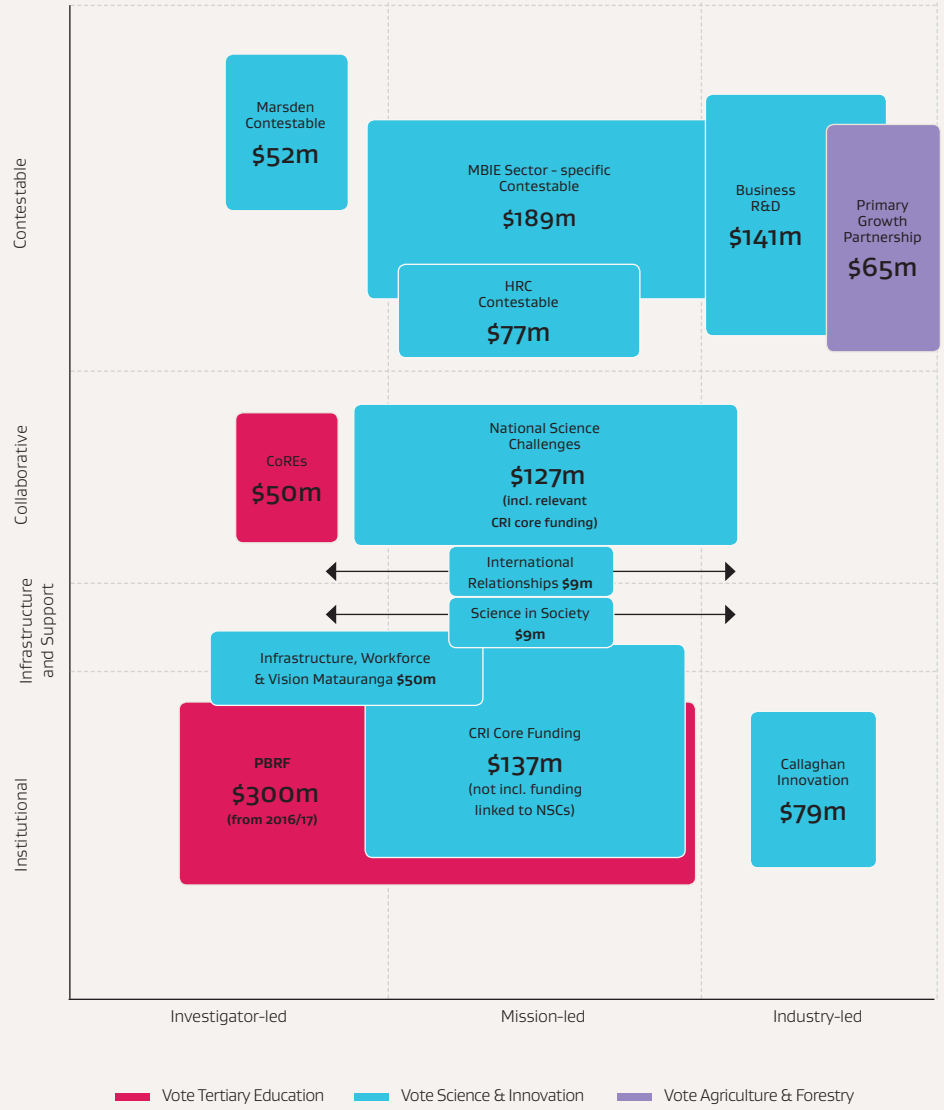
Taking expenditure from other areas of Government into account, Government's total investment in science will be $1.5 billion in 2015/16.

The chart also sets out how the funding is intended to invest in different types of science and through different funds.

The chart sets out an 'ideal' year for science funding (see the section 'Note on use of figures' on page 5 for further explanation).

**PLOT SHOWING GOVERNMENT'S MAIN SCIENCE AND INNOVATION INVESTMENTS BY PROPORTION AND PURPOSE**

[ chart 1 ]



## OVERVIEW OF MAIN SCIENCE & INNOVATION INVESTMENTS

| | FUND | INDICATIVE ANNUAL INVESTMENT | ADMINISTERED BY... | RECIPIENTS |
|---|---|---|---|---|
| Both **investigator-** and **mission-led** | The **Performance-Based Research Fund (PBRF)** funds research and research-based teaching in tertiary education organisations on the basis of measured quality of research. | $300m from 2016/17 | Tertiary Education Commission (TEC) | Tertiary education organisations |
| Primarily **investigator-led** | **Centres of Research Excellence (CoREs)** are for cooperative and collaborative tertiary research in areas of research strength. | About $50m | TEC | CoRE partnerships, which must include a tertiary education organisation |
| | **The Marsden Fund** is for excellent fundamental research. | $52m | Royal Society of New Zealand | Researchers |
| Primarily **mission-led** | **Crown research institute (CRI)** core funding is direct funding to CRIs to enable them to contribute to the outcomes in their Statement of Core Purpose. | $137m (not including funding linked to National Science Challenges) | MBIE | CRIs |
| | **National Science Challenges (NSC)** are research collaborations seeking answers to the most pressing issues of national significance facing New Zealand. | $127m (including relevant CRI core funding) | MBIE | NSC collaborations, which can include public and private research organisations |
| | **MBIE sector-based research** funding is awarded through a contestable process, and goes to a variety of sector-specific research projects. | $189m (not including funding administered by the HRC) | MBIE | Research organisations |
| | Contestable funding for health research is similar in nature to contestable funding (above), but is administered by the **Health Research Council (HRC)** through a separate process. | $77m | HRC | Researchers and research organisations |
| Primarily **industry-led** | The **Primary Growth Partnership** invests in long-term programmes of research and innovation aimed at increasing the value of primary industries. Government funding is matched by industry co-funding. | $65m | MPI | Primary industry business |
| | **Callaghan Innovation** is a Crown entity which works with businesses to help them turn their knowledge into successful commercial products and services, and to improve their growth and competitiveness. Its focus is businesses in the manufacturing and services sectors. It provides services to business and distributes the business R&D funds noted below. | $79m | Callaghan Innovation | Businesses |
| | **Business R&D** funding consists of a variety of funds and projects to assist businesses to engage in research and development. | $141m | MBIE and Callaghan Innovation | Businesses |
| | **International, Infrastructure, Science in Society, and other smaller funds** | International $9.5m, Science in Society $9m, Infrastructure $30.2m | MBIE | Varies |

These funds are described in more detail in section 2.

## OBJECTIVES

The main objective for Government's investment in science is that it supports a transformative system that delivers to New Zealand's economic, social, environmental and cultural needs.

To underpin this objective, the following areas will be priorities for action over the next five to ten years for Government's science investments. The subsequent section of this draft Statement, 'The current state of science investment', sets out the drivers for these objectives.

### 1. Producing excellent science of the highest quality

The quality of the science system and the people who work within it are the key determinants of impact. Investment should be subject to a rigorous test for the quality, value and impact the funded science is expected to create. We will continue to investigate ways of evaluating and quantifying the full range of impacts, and comparative value, of Government's investment in science.

### 2. Ensuring value by focusing on relevant science with the highest potential for impact for the benefit of New Zealand

We want our science to have a strong focus on relevance and pathways to realising value and impact, and to improve our performance on knowledge exchange. Our funding mechanisms should have a greater focus on the utility of research, and ensure that, whether investigator-, mission- or industry-led, funded investments have clear relevance to the most pressing industry, social and environmental needs both domestically and globally.

### 3. Committing to continue increasing investment over time

We will continue to seek further opportunities to increase government investment in science, where funds and opportunities are available. Investment in science, both by government and by industry, leads to improved economic, social and environmental outcomes, and increased investment will help us achieve those goals more quickly, efficiently and sustainably.

### 4. Increasing focus on sectors of future need or growth

We need to deliver an optimal mix of targeted investments that concentrate in priority areas that will maximise benefit to all New Zealand. New investments in science, therefore, should focus on particular emerging important or growth sectors, including extracting greater value from primary production, while existing investments continue to pursue ongoing productivity gains from the primary sector. These high-priority sectors could include:

- high-value manufacturing and information and communications technology
- health care and social services
- high-value processed primary products
- environmental innovation for sustainable production and biodiversity protection.

### 5. Increasing the scale of industry-led research

We want to continue to improve our business investment in R&D. Science funding is one mechanism that can help this, by building on science quality and impact, and placing greater emphasis on investing in projects of high relevance to current and emerging industry sectors. We need to increase the connections between industry and researchers, and to increase the embedded science capacity of industry and wider society.

### 6. Continuing to implement Vision Mātauranga

We want to continue to work to give practical expression to the Vision Mātauranga policy framework. This will be through such actions as requiring applicants for MBIE funding to give effect to the policy, and show how their proposals are relevant to Māori and how Māori will be involved in the research. We will also continue work on how to connect Māori better with the science and innovation system, and to support research organisations to be responsive to Māori values, aspirations and needs.

### 7. Strengthening and building international relationships to strengthen the capacity of our science system to benefit New Zealanders

We need to continue to strengthen and deepen key international relationships and support the development of strategic partnerships between the New Zealand science and innovation sector and foreign counterparts. This will ensure New Zealand is well connected with international science and investment opportunities, remains at the forefront of new knowledge and technology development, and is able to leverage these opportunities for domestic benefit.

## TEN-YEAR FUNDING PROFILE FOR SCIENCE INVESTMENTS

The following table gives an indication of the 10-year funding outlook for the mechanisms covered in this Statement.

The 10-year outlook is extrapolated from agreed funding for each initiative from the 2014/15 budget period – these numbers may be subject to change over time.

The table does not take account of existing commitments. For example, a lot of the sector-specific funding is committed to contracts for some years and is not available for investment until these contracts expire.

The table shows the expected transfers from sector-specific funds to National Science Challenges over the next 10 years.

These numbers are indicative. Due to varying periods and accounting methods these numbers may not reconcile with other accounts for these mechanisms.

## TEN-YEAR FUNDING PROFILE FOR GOVERNMENT RESEARCH INVESTMENT MECHANISMS

| | | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 | 2023/24 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Funding mechanism** | **$M** | | | | | | | | | |
| Both **investigator-** and **mission-led** | Performance-Based Research Fund | 281.3 | 293.8 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Primarily **investigator-led** | Centres of Research Excellence (CoREs) | 40.6 | 50.7 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 |
| | Marsden Fund | 52.4 | 53.6 | 51.8 | 51.8 | 51.8 | 51.8 | 51.8 | 51.8 | 51.8 | 51.8 |
| Primarily **mission-led** | Crown research institute core funding | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 |
| | National Science Challenges (including transferred sector-specific funds)[5] | 46.6 | 46.9 | 46.9 | 46.9 | 79.6 | 79.6 | 79.6 | 79.6 | 79.6 | 47.6 |
| | MBIE sector-specific research funding (excludes 'Commercialisation' funds – below) | 210.1 | 218.1 | 206.2 | 201.4 | 195.6 | 189.9 | 188 | 188.1 | 188.8 | 188.8 |
| | Health Research Fund (HRC) | 77.2 | 77.2 | 77.2 | 77.2 | 77.2 | 77.2 | 77.2 | 77.2 | 77.2 | 77.2 |
| Primarily **industry-led** | Primary Growth Partnership | 77.5 | 84.8 | 71.9 | 66.4 | 66.4 | 66.4 | 66.4 | 66.4 | 66.4 | 66.4 |
| | Callaghan Innovation (including capital funding and repayable grants) | 126.7 | 123.1 | 98.3 | 78.8 | 78.8 | 78.8 | 78.8 | 78.8 | 78.8 | 78.8 |
| | Business R&D funds administered by Callaghan Innovation | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 |
| | Commercialisation (MBIE) | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| | International Relationships | 9.5 | 10.3 | 10.2 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| | Infrastructure | 31.8 | 33.4 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 |
| | Science in Society | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| | Science Workforce | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 |
| | Vision Mātauranga Capability Fund | 6.6 | 6.6 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| | Other (including departmental funding) | 78.2 | 86.7 | 70.4 | 71.0 | 71.0 | 71.0 | 71.0 | 71.0 | 71.0 | 71.0 |
| | **Approximate total:** | **1,410** | **1,456** | **1,405** | **1,354** | **1,381** | **1,376** | **1,374** | **1,374** | **1,374** | **1,342** |

5 These are average numbers for two multi-year appropriations. The actual amount spent in each year may vary according to the Challenges' funding needs. The numbers exclude NSC spending in 2013/14, and contain an out-year in 2023/24 – which is not included within the two multi-year appropriations.

# The current profile of science investment

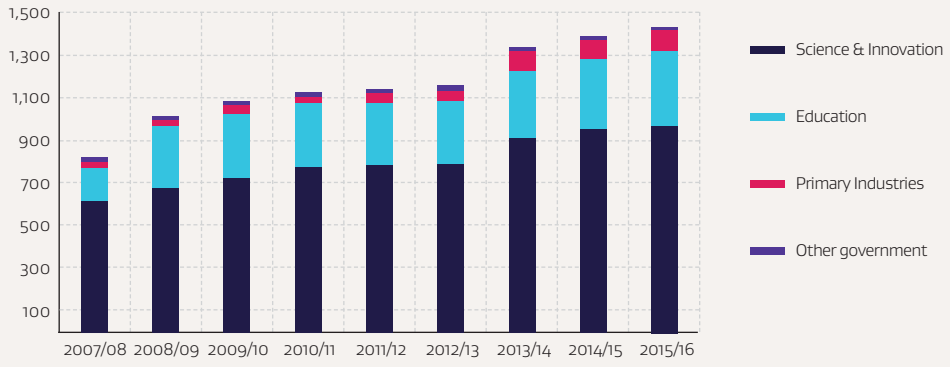
## BY 2015/16 GOVERNMENT FUNDING FOR SCIENCE WILL HAVE GROWN OVER 70 PER CENT SINCE 2007/08

Government's science investment has grown considerably in recent years. Key investments during that time have been:

- $590 million was provided in Budget 2013 over the next four years for Callaghan Innovation's business R&D grants. At around $141 million per year, this funding is about three times what was available in 2009/10. Along with changes to the grant programmes that leverage greater private investment from public funding, this increase in funding will support further growth in business R&D investment.
- Callaghan Innovation was established in February 2013 to work with businesses to help them turn their knowledge into successful commercial products and services, and to improve their growth and competitiveness. Callaghan Innovation receives around $79 million per year to undertake these activities.
- $316.5 million in new funding will be provided to support the National Science Challenges over the next 10 years.
- Primary Growth Partnership investment was $30 million for 2009/10; $40 million for 2010/11; $50 million for 2011/12; and around $65 million per annum from 2012/13. Total committed government investment across 18 programmes announced as at 1 April 2014 is $333 million.
- Budget 2014 increased the PBRF from $267 million in 2013/14 to $281 million in 2014/15. The Government has committed to increase the PBRF to $300 million per year by 2016/17. The increase in funding will provide greater financial incentives for tertiary education organisations to produce high-quality tertiary research and research-led teaching.
- A $20 million funding increase over four years was announced in Budget 2013 for the Marsden Fund to support excellent fundamental research.
- As part of Budget 2014, the Government is increasing the CoREs fund by $53 million over four years. This will increase the number of CoREs supported by the fund from seven to ten.
- As part of Budget 2014, the Government is also increasing its investment in contestable science funds with $56.8 million of operating funding over three years starting from 2015/16.

**TOTAL GOVERNMENT INVESTMENT IN SCIENCE** ($M, GST EXCLUSIVE)

[ chart 2 ]



This increase in investment includes a:

- **54 per cent** increase in Vote Science and Innovation, from $628 million in 2007/08 to $967 million in 2014/15
- **103 per cent** increase in Vote Tertiary Education research funding, from $154 million in 2007/08 to $335 million in 2014/15.

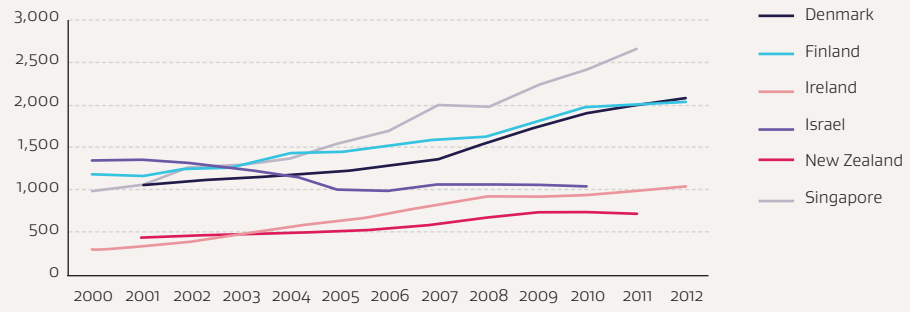
### DESPITE THIS, NEW ZEALAND STILL HAS COMPARATIVELY LOW EXPENDITURE ON SCIENCE OVERALL

When compared with other small advanced economies[6], New Zealand is notable for having a low overall combined public and private investment in science. This is both in absolute terms and as a percentage of GDP. The Business Growth Agenda (BGA) has set a goal of increasing Government's science investment to 0.8 per cent of GDP as fiscal conditions allow. It currently sits at 0.56 per cent.

The BGA also proposes: investments in core science infrastructure; increasing the proportion of total public innovation investment dedicated to firm-led innovation; and further support for business connections with research institutions, especially to encourage commercialisation of research.

The chart below shows total expenditure by Government on R&D in real terms, in comparison with small advanced economies.

**GOVERNMENT-FINANCED EXPENDITURE ON R&D ($M PPP)** [ chart 3 ]



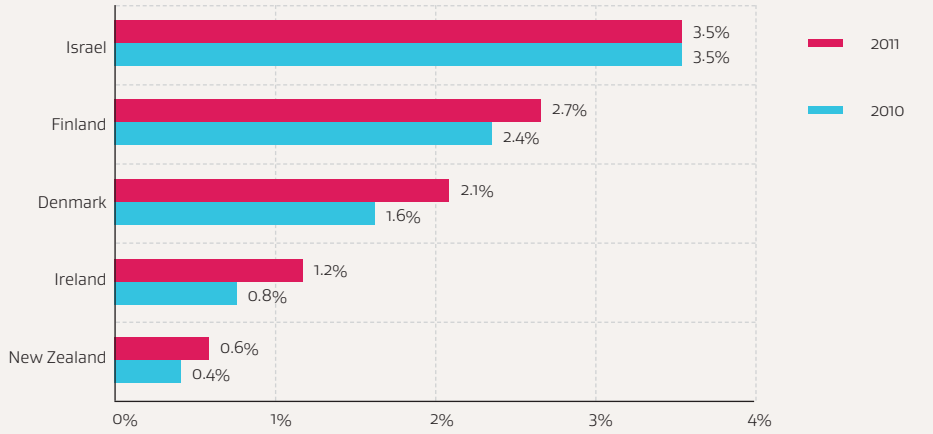

New Zealand's business expenditure on R&D (BERD) is also low, although improving. BERD is the type of research expenditure most closely connected to the creation of new products and production techniques, and is therefore an important driver of economic growth. It is a key indicator of the levels of industry-led science.

There were some significant increases in New Zealand's BERD between 2010 and 2012, from 0.51 per cent of GDP to 0.58 per cent. However, New Zealand still lies behind comparable small economies (see Chart 4 below). New Zealand's BERD is at 0.58 per cent of GDP, compared with the OECD average of 1.59 per cent. In 2012, only eight percent of New Zealand firms undertook R&D. The BGA set out a goal of encouraging the business sector to double its expenditure on R&D to more than one per cent of GDP.

New Zealand faces unique challenges in increasing its levels of BERD. New Zealand's economy is characterised by having a comparatively small number of large firms. Both domestically and internationally, larger firms have access to the scale, capital, and ability to manage risk that enables them to invest proportionally greater amounts in R&D. New Zealand is also the location for relatively few multi-national companies, which tend to be the largest investors in R&D. Finally, New Zealand also lacks at significant scale the sectors that tend to invest most in R&D, such as defence and pharmaceuticals.

6 Denmark, Finland, Israel, Ireland, Singapore and New Zealand.

**BERD AS A PERCENTAGE OF GDP** [ chart 4 ]




In addition to these factors, compared with other small advanced economies, the New Zealand Government spends less on supporting BERD through, for example, grants to businesses.

Government has recently made significant increases to its business R&D support, increasing it to over $141 million per year, over three times what was available in 2009/10. Nonetheless, further activity on the part of both Government and industry may be necessary to raise business R&D expenditure to levels commensurate with other small advanced economies.

Using Government's science investment more explicitly to support improved levels of industry-led R&D is a key focus for our future direction.

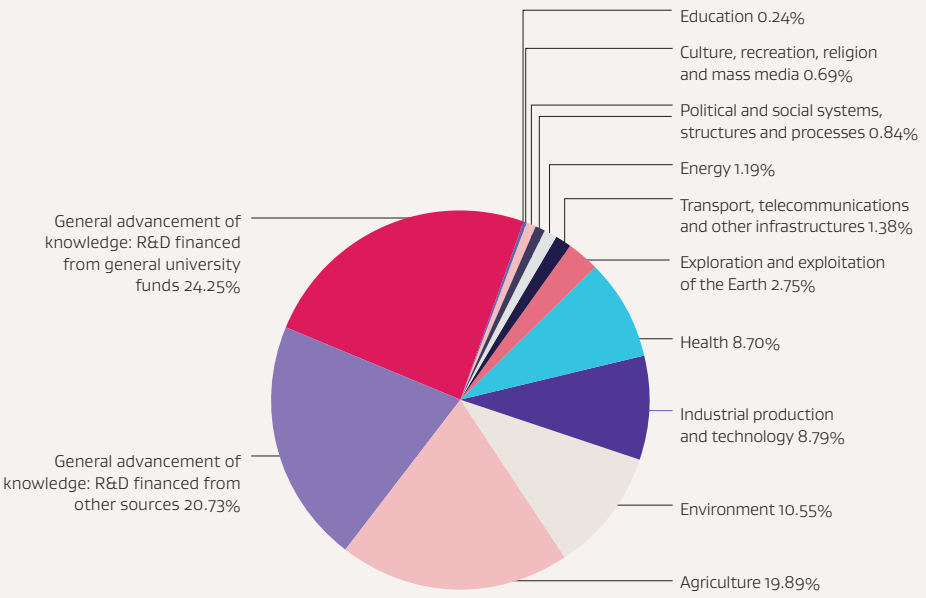
### WE NEED TO ENCOURAGE THE DEVELOPMENT OF SECTORS OF FUTURE NEED OR GROWTH

New Zealand's economy is continuing to broaden, on top of its traditional base in primary industries. This growth has included growth in ICT and other services. Services now make up nearly three-quarters of New Zealand's GDP, including over 70 per cent of New Zealand's registered businesses and employment, and have significant export potential. They are critical to New Zealand's international competitiveness, and in 2009 services represented 22 per cent of all New Zealand's exports. ICT is particularly important both as a growth industry in its own right and as a supporting technology to enable growth in other sectors. Research has established strong links between ICT and productivity in the services sector, both overseas and in New Zealand.

Historically, Government's science investment has been heavily focused on the primary sector of the economy. In 2013, research into agriculture was the largest sector-specific component of Government budget appropriations and outlays on R&D (GBAORD), at just under 20 per cent. Over 10 per cent of Government's investment was also directed towards environmental research, some of which supports primary sectors by exploring matters such as sustainable land use. At least two per cent of the 24 per cent of GBAORD attributed to university funds is also attributable to research related to primary industries. It is likely that well over 25 per cent of GBAORD supports agriculture or primary industries in some form.

**GBAORD BY SECTOR OF RESEARCH 2013 (%)**

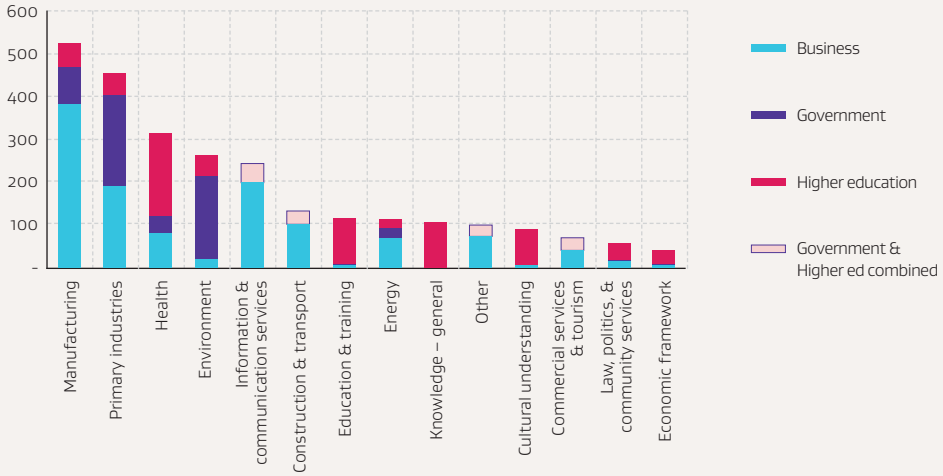
[ chart 5 ]




In 2012, Government expenditure on R&D, not including grants to business, made up 57 per cent of New Zealand's total expenditure on research in the primary sector.

**EXPENDITURE ON RESEARCH BY PURPOSE OF RESEARCH AND SECTOR 2012 ($M)**

[ chart 6 ]



Economies diversify and grow on the basis of extending in areas where they already have concentrations of expertise, and research and development is a key input to innovation.

New Zealand's science investments should continue to support this approach by targeting high-growth, high-productivity sectors, while also supporting greater diversification of the economy. This will include Government's continued support of research and development efforts for our primary industries and our high-value manufacturing sector, particularly because these are relatively high-productivity sectors, are export-oriented, and are areas of comparative advantage for New Zealand.

We must also invest in research that protects our unique environmental heritage, and research that responds to both global and local environmental, social, health and economic challenges.

### CONTINUED FOCUS ON VISION MĀTAURANGA

Vision Mātauranga is a policy framework intended "to unlock the innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future". Although it concerns distinctive issues, challenges and opportunities arising within Māori communities, Vision Mātauranga encourages research that will contribute to New Zealand as a whole.

The policy:

- is concerned with discovering the distinctive contribution that Māori knowledge, resources and people can make to science and innovation
- provides strategic direction for research of relevance to Māori, funded through Vote Science and Innovation
- is about creating an environment in which distinctive activities and products are fashioned from Māori knowledge, resources and people.

Vision Mātauranga comprises four themes:

- **Indigenous innovation: Contributing to economic growth through distinctive R&D**

  This theme concerns the development of distinctive products, processes, systems and services from Māori knowledge, resources and people. Of particular interest are products that may be distinctive in the international marketplace.
- **Taiao: Achieving environmental sustainability through iwi and hapū relationships with land and sea**

  This theme addresses distinctive environmental issues arising in Māori communities and relates to the expression of iwi and hapū knowledge, culture and experience – including kaitiakitanga.
- **Hauora/Oranga: Improving health and social wellbeing**

  This theme addresses distinctive challenges to Māori health and social wellbeing that continue to arise within Māori communities. Research is needed to meet these ongoing needs.
- **Mātauranga: Exploring indigenous knowledge and R&D**

  This theme aims to develop a body of knowledge at the interface between mātauranga Māori and research, science and technology.

In terms of the Government's investment through MBIE contestable funds, a general policy objective (as specified in Gazette notices) is to fund research, science or technology that has the potential to give effect to the Vision Mātauranga policy.

Giving effect to the Vision Mātauranga policy is not only about how the research responds to distinctive issues and needs of Māori and Māori communities, but also about how Māori can participate in, and contribute to, research initiatives that benefit New Zealand. It will remain a key element of our approach to investing in science.

## THE SCIENCE WORKFORCE AND INSTITUTIONS

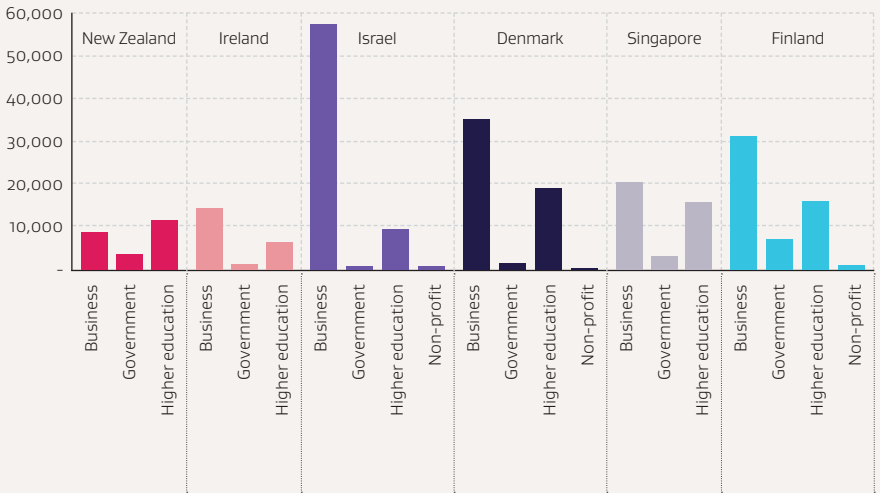
In 2012, there were 16,300 full-time equivalent (FTE) researchers in New Zealand – a three per cent increase from 2010. In addition, there were 4,500 FTE technicians and 3,100 FTE R&D support staff. From 2010 to 2012, total R&D personnel increased by seven per cent.

In most small advanced economies, R&D personnel in the business sector outnumber those working in higher education. New Zealand, however, displays the opposite relationship. Approximately one third of New Zealand's researcher FTEs are in the business sector. In the OECD, only Poland, Portugal and Slovakia have a smaller proportion of their researcher population working in business.

New Zealand's institutional makeup is also unusual. A much greater proportion of our scientific activity takes place in our Crown research institutes than in comparable institutions in other small advanced economies. A subsequent effect of this is that proportionally fewer researchers are employed in tertiary education institutes.

Chart 7 shows the size of different sectors of employment for R&D personnel in small advanced economies. It is broken up into business, government, higher education and non-profit.

**NUMBERS OF R&D PERSONNEL BY SECTOR** [ chart 7 ]




As shown in Chart 7, relative to all other small advanced economies New Zealand has a proportionally large number of R&D personnel employed by the government. This in part reflects the significant size of the Crown research institutes relative to other parts of the science sector in New Zealand. In 2012, of the total 21,200 FTE researchers:

- 11,440 (48.3 per cent) were employed in higher education
- 8,400 (37.6 per cent) were employed in the private sector
- 3,340 (14.1 per cent) were employed in government, of which the majority were employed by CRIs.

### EXCHANGE OF KNOWLEDGE BETWEEN RESEARCHERS AND END USERS NEEDS TO BE IMPROVED

Across a range of measures, New Zealand has in the past seen poor connections between researchers and business, principally in the high-value manufacturing sector. Of countries compared by the OECD, New Zealand ranks 29th of 33 for both large and small firm collaboration with public research institutions.

Evidence also suggests that the new knowledge being generated from New Zealand universities is being under-exploited by firms and researchers, thereby missing opportunities to generate economic and social value and limiting the performance of the science system. For example, in 2011 only four per cent of university R&D was funded by business, compared with an OECD average of six per cent. In addition, the Global Innovation Index survey (2011) found that business and universities appear to collaborate on research and development less in New Zealand than in other small advanced economies and in the majority of OECD countries.

This is a concern because ensuring innovation results in new firms, products or services and ensuring firms have the capacity to conduct or access the research they need to grow their businesses are key contributors to economic growth.

Callaghan Innovation was established in 2013 to work across the whole innovation system to accelerate the commercialisation of innovation by firms in New Zealand. Government has committed $166.6 million to it over the next four years, and is also providing $141.5 million co-funding for Callaghan Innovation's business R&D grants per annum. Newly developing national technology networks will catalyse greater connectivity and collaboration across industry, research institutions and government to advance commercialisation of information and communications technology, food technology, robotics, automation and sensing technologies, and advanced materials technologies.

Establishing new technology incubators will deliver a more targeted and sophisticated approach to commercialising complex technology, primarily sourced from publicly funded research organisations such as universities and Crown research institutes, while increasing the rate of formation and success of early-stage, technology-based start-up firms.

### AN INCREASED FOCUS ON THE PERFORMANCE OF SCIENCE INVESTMENTS

The performance of the science system is measured by its contribution to our wellbeing, the health of the economy, social gain and its contribution to the world's knowledge base. We want to understand the relative scale of this contribution from different parts of the system, to enable government to manage its portfolio of investments to maximise their value.

There are three broad approaches currently used to assess the performance of science investments:

- Regular monitoring at the project, programme or institution level – to track progress against stated objectives.
- Regular monitoring of the system as a whole – to track high-level impacts and the mechanisms which generate those impacts.
- Periodic evaluations – to provide an in-depth assessment of the performance of specific investments.

Within these categories, we employ a range of approaches to ensure that policies are performing. Ongoing, detailed monitoring at the contract and programme level is central to the funding system. This provides ongoing feedback on the health of investments and the extent to which they are on track to deliver on expected outputs and outcomes.

For example, current significant initiatives include the development of a comprehensive performance framework for the National Science Challenges, and development of a performance-based framework for reviewing Crown research institute core funding. A systematic framework for evaluating the social and economic impacts of MBIE-funded research has also been commissioned by MBIE, and is being developed by an international expert in science impact assessment. This framework will draw on recently developed sets of performance metrics to isolate the difference in outcomes generated by research investments (the 'treatment effect'). It is expected to deliver insights that will inform future funding allocations. Initiatives to monitor the performance of individual investments are covered in more detail in section 2 of this report, alongside the summary of each investment.

# Evaluating the quality, value and impact of our science investment

The New Zealand Government wants to achieve the maximum possible impact from public science investments. This means being a smart, informed investor.

We want the science system to make a more significant contribution to supporting the prosperity and wellbeing of all New Zealanders through business growth, through protecting our people and environment, and assisting well-informed public policy and decision making. To deliver on this, Government needs to design science investment programmes to maximise high-quality knowledge that is mobilised for delivery of best possible economic, social, environmental and health outcomes. We also need to evaluate the success of programmes on those dimensions.

It is in the nature of science that the outcomes of programmes are not certain, and value can accrue at different scales over different periods of time. There is also an added accounting complexity: it is not straightforward to determine the value to New Zealand of, for example, a new piece of software, in comparison with a new technology or practice that improves the preservation of native species.

These difficulties are not insurmountable, however. In addition to using a robust set of indicators to monitor the performance of the system and individual programmes and projects in producing science of the highest quality, we are progressing work with the Small Advanced Economies group to consider consistent ways to estimate the current and potential impact of science investments across a broad range of possible economic and non-economic impacts[7] Developing a framework to estimate the impact of science investments is a challenge faced by all national science systems.

We are also making progress on assessing the impact of individual projects. Although individual investments are monitored and evaluated, there is scope to increase the explicit consideration of impact. For example, once criteria for scientific quality in the application process have been met, Ireland's science funding criteria also explicitly seek impact (and consider scientists' track records of impact) as a central component for determining funding and evaluating performance. Agencies actively engage with researchers to determine what impacts are relevant to the research and what metrics may be appropriate to measure this. The processes are under continual improvement and impact is considered across the economic, social and environmental space. We are currently incorporating this approach across our investments, for example within the criteria used to assess proposals for the National Science Challenges and in a new performance-based funding framework for CRIs.

Competition between ideas can raise the quality of science and innovation activity and ensure value for money: competition will occur within National Science Challenge collaborations, and is central to HRC- and MBIE-managed contestable funding. Ongoing work to improve our understanding of the expected impact and value for money of investments, along with science quality, historical performance and strategic fit, will raise the profile of impact and value as criteria for making research investments.

Given New Zealand's population size and our location, some of the best opportunities for innovation will also lie in both public and private sector internationally linked collaborations. The impact of science and innovation is known to be greater when undertaken with international partners.

7 The Small Advanced Economics Initiative has established an informal dialogue with a select number of small advanced economies. The dialogue is focused on how small countries position themselves for economic growth.

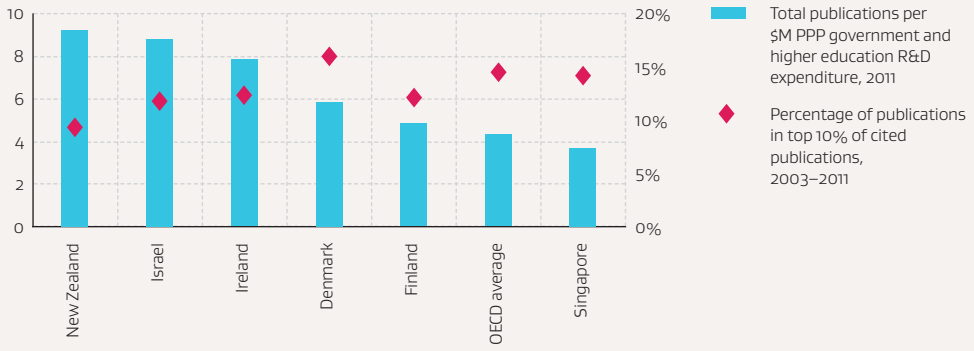
## MEASURING THE PERFORMANCE OF THE SCIENCE SYSTEM

New Zealand's science system has some unique features in terms of its performance. Output per dollar is high, meaning that in some ways the system performs efficiently at generating science outputs. On the quality of these outputs, New Zealand's measure of top-cited publications (the percentage of domestic publications that feature in the top decile of citations) is lower than other small advanced economies, and also lower than the OECD average.

This means that New Zealand's system produces a high level of outputs relative to investment, but those outputs are possibly of a lower academic impact relative to global counterparts.

**PUBLICATIONS PER $M PPP FOR 2011, AND PERCENTAGE OF PUBLICATIONS IN THE TOP 10 PER CENT OF CITATIONS WORLDWIDE 2003-2011**[8]

[ chart 8 ]



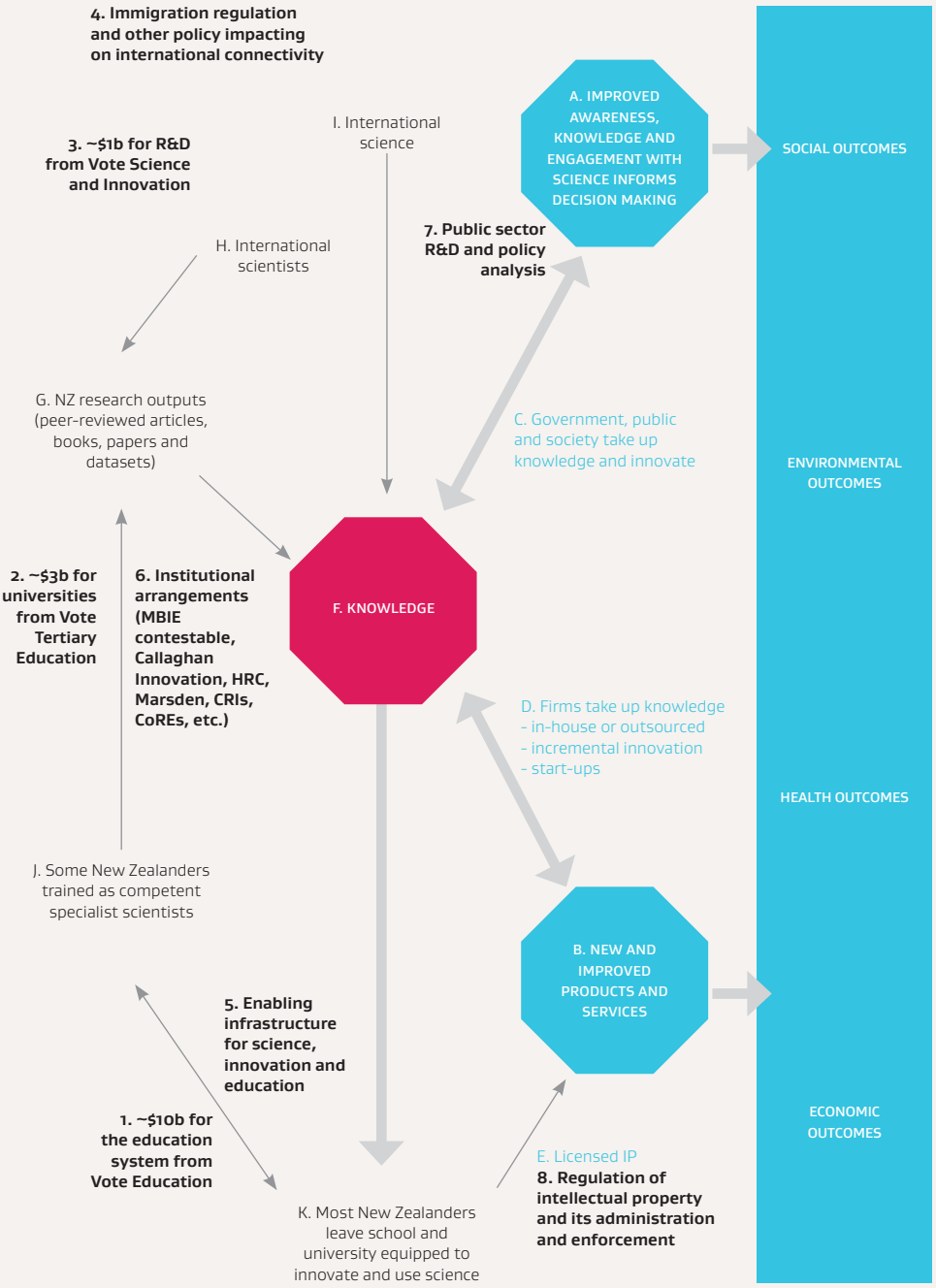

New Zealand also ranks sixth globally for the number of scientific and technical articles relative to GDP, but 26th for the rate at which this academic output is being cited (a measure of research quality). New Zealand's performance in terms of 'important' trademarks per capita and international patents per capita presents a further mixed picture on the commercialisation of research and knowledge exchange as discussed above.

However, viewed independently, on their own these indicators do not sufficiently inform overall system performance. To measure the overall success of the Government's investment in the system, we need a model of how science and innovation contribute to economic and social returns, including social, environmental and health outcomes. A possible model is provided in Chart 9 below, which aims to show how the multiple points of engagement by the government contribute to the overall process.

8 Purchasing Power Parity (PPP)

**GOVERNMENT ENGAGEMENT TO HELP THE SCIENCE AND INNOVATION SYSTEM DELIVER OUTCOMES**

[ chart 9 ]



This model can be supported by indicators of key inputs, outputs and outcomes. A proposed list of indicators is shown below.

| TARGET CONCEPT TO MEASURE | RECOMMENDED INDICATOR |
|---|---|
| Around $10b for the school system | Percentage of teachers that have science, technology, engineering and mathematics (STEM) qualifications |
| New Zealanders leave school equipped to innovate and use science | PISA science and math scores |
| New Zealanders trained as competent scientists | Bachelor and postgraduate degree completions in STEM subjects |
| Immigration regulation and other policy impacting on international connectivity | Inwards permanent and long-term migration of science and engineering professionals |
| International science links | Publications from NZ researchers with internationally based co-authors |
| International scientists | Publications from NZ researchers with overseas originated co-authors |
| Institutional arrangements | Rating for quality of institutions supporting innovation |
| Enabling infrastructure for innovation and science | Fixed and mobile broadband subscribers per 100 people |
| $3b for universities from Vote Tertiary Education | Average quality rating of New Zealand universities |
| $1b per year for research from Vote Science and Innovation | Consistency of focus of government investment with the strategic settings of government |
| NZ research outputs | Share of world's top 10 per cent most cited science and innovation publications attributed to NZ research |
| Regulation of intellectual property | Rating for intellectual property protection, including anti-counterfeit measures |
| Licensed intellectual property | Exports of royalties and licence fees |
| Firms take up knowledge – through R&D and incremental innovation | Percentage of firms that report they have made innovations |
| | Business expenditure on research and development as percentage of GDP |
| Public sector R&D and policy analysis | Government expenditure on research and development as percentage of GDP |
| Take-up of science by government, public and society | Rating or index of evidence-based policy in the state sector |
| New and improved products/services from firms | Exports of high-tech (and possibly medium-tech) manufactured products (noting more investigation is needed, as the currently proposed indicator does not cover innovations in processed primary goods or in services) |
| Improved policy and improved acceptance of scientific evidence in the public domain | Adult scientific literacy |

As part of the consultation on this draft Statement, we will further consider through 2014 how data-driven indicators could be applied to this draft performance framework to present a full picture of the performance of the science system. The formal NSSI consultation process will be supported by focused discussions with key stakeholders about the draft framework and proposed indicators.

## SCIENCE IN SOCIETY

The science system also has a broader role in informing sound public policy, contributing to education, engagement and communication. This is important because:

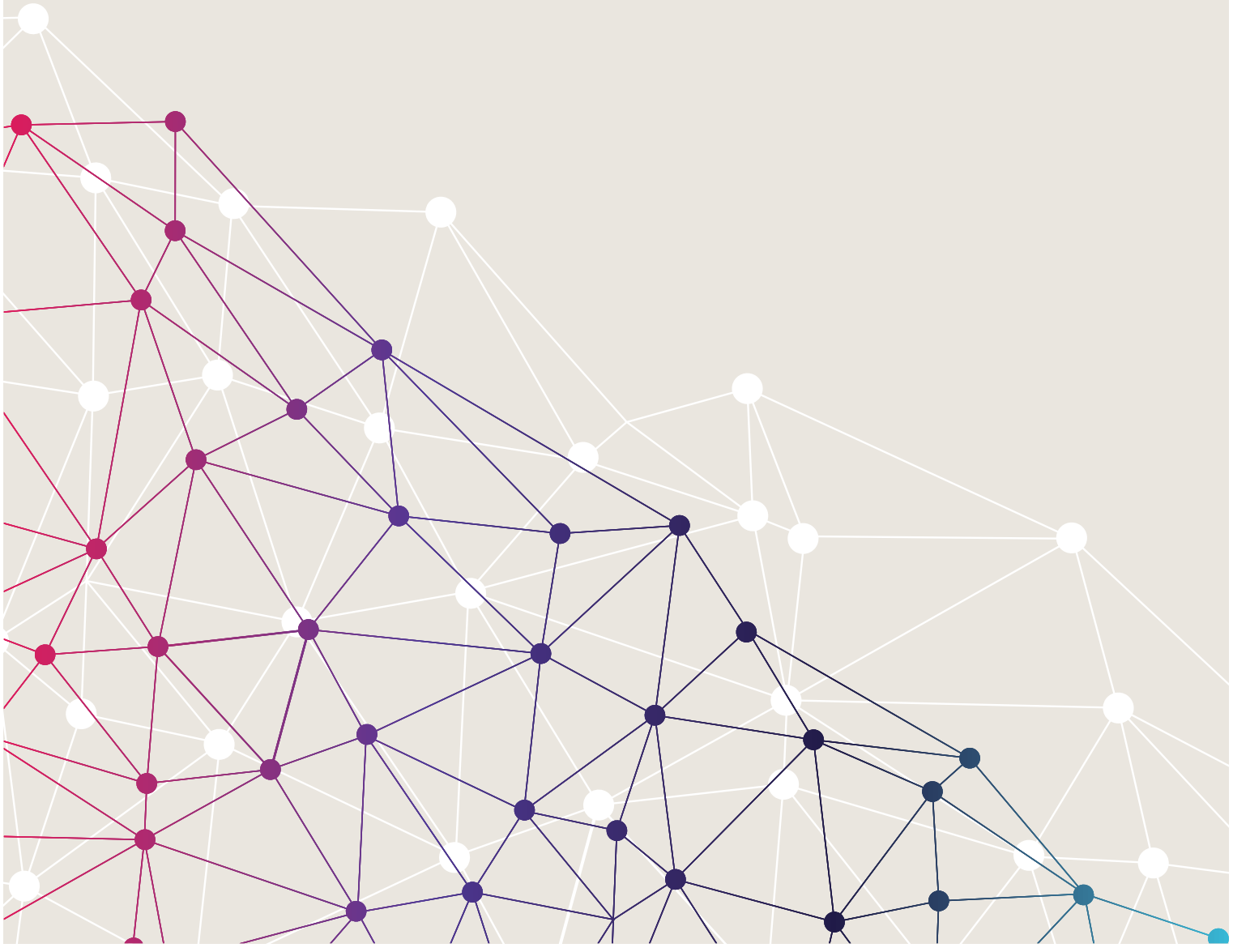
- at a society level, New Zealanders must be given both the scientific evidence and the opportunity to engage in an informed way in the key questions facing our society in the future, such as those around the use of natural resources
- public policy needs to be based on sound research-derived evidence
- skills including STEM skills are increasingly important for all New Zealanders. The pace of technological change and the nature of employment in the future mean that these skills will be important for everybody
- our science system, particularly the tertiary education organisations that undertake research-led teaching, has a vital role in educating a future generation of scientists, with a wide range of skills including advanced science skills, supplemented by industry investment and workplace learning, which will be used in high-technology businesses
- New Zealand has to be seen internationally as an 'innovation destination'. We must be able to attract the right talent at the right time to contribute to our vital science. Attracting overseas investment in our research is also important for our economic growth.

The Science in Society strategic plan, to be released in mid-2014, will set out in more detail how we propose to address these challenges across the science and education systems. However, science and society remain an important key theme for this document.

[ DRAFT FOR CONSULTATION ]

# Section 2:

# The current science investment system



# Introduction

This section of the report describes Government's main research investments and instruments in more detail. It provides information, where available, on funding profiles, performance, and recent and planned changes. This Statement also proposes some changes to Vote Science and Innovation investments managed by MBIE.

## PERFORMANCE-BASED RESEARCH FUND (PBRF) – TERTIARY EDUCATION COMMISSION

The PBRF provides financial and reputational incentives to support high-quality tertiary research and research-led teaching at New Zealand universities and other degree-granting institutions by:

- assessing research excellence
- publishing information on research performance
- allocating funding based on research performance.

By rewarding and encouraging research excellence and research-led teaching, the PBRF also supports wider government scientific, research and innovation priorities.

### Funding – around $300m per year from 2016/17

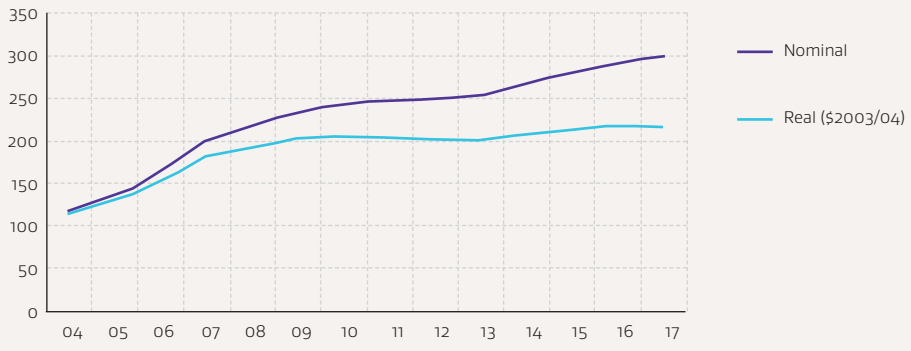
### Purpose

The PBRF was developed in 2002 to reward and encourage tertiary education research excellence. It complements tuition subsidy funding to enable New Zealand students and international students studying in New Zealand to receive degree and postgraduate qualifications that are truly world-class and internationally competitive.

The PBRF budget comes from Vote Tertiary Education. Chart 10 shows funding for the PBRF from 2003/04 through 2016/17 in nominal and real terms.

The PBRF appropriation was $250 million from 2007/08 to 2011/12. Budget 2012 included a commitment to increase funding to $300 million per year by 2016/17. It will then comprise 20 per cent of the Government's total support for research activity. Chart 10 shows that in real terms PBRF funding decreased slightly from 2009/10, but increased from 2013/14 with the introduction of new funding.

**FUNDING ($M, GST EX) ALLOCATED PER YEAR THROUGH THE PBRF** [ chart 10 ]



## Performance and monitoring

A review of the PBRF during 2012/13 considered policy and operational changes to maximise the value of the Government's investment.

The review found that the PBRF has supported a significant increase in the research performance and productivity of New Zealand tertiary education organisations. This included increases in the average quality of research, higher qualification completion rates for postgraduate research degrees, and growth in the share of world-indexed publications and citations by New Zealand tertiary education organisations.

The review did identify several areas for improvement, with public consultation on a set of proposals to improve the PBRF in 2013. Cabinet approved a final set of these changes in February 2014.

## Government's future direction

The objectives of the PBRF have been revised. Its primary objectives now are to:

- increase the quality of basic and applied research at New Zealand's degree-granting tertiary education organisations
- support world-leading research-led teaching and learning at degree and postgraduate levels
- assist New Zealand's tertiary education organisations to maintain or lift their competitive research rankings relative to their international peers
- provide robust public information to stakeholders about research performance within and across tertiary education organisations.

In doing so, the PBRF will also support:

- the development of postgraduate student researchers and new and emerging researchers
- research activities that provide economic, social, cultural and environmental value to New Zealand, including the advancement of mātauranga Māori
- technology and knowledge transfer to New Zealand businesses, iwi and communities.

Recent changes made to the PBRF align with the revised objectives and are designed to improve the effectiveness and efficiency of the Fund by:

- better valuing user perspectives of research quality and engagement in user-oriented research
- simplifying the PBRF Quality Evaluation to reduce transaction costs
- better supporting the sustainability of the tertiary education research workforce
- strengthening reporting on research performance.

The changes will be implemented between 2015 and 2018.

# CENTRES OF RESEARCH EXCELLENCE (CoREs) – TERTIARY EDUCATION COMMISSION

CoREs are inter-institutional research networks, with researchers from tertiary education institutions, Crown research institutes (CRIs) and other research providers working together to deliver commonly agreed research plans. CoRE funding is a fixed direct payment that supports these networks to operate.

## Funding – around $50M per year from 2015/16

## Purpose

The Centres of Research Excellence (CoREs) Fund was established in 2001 to encourage collaborative, strategically focused tertiary education-based research that creates significant knowledge transfer activities.

### WHY WAS IT CREATED?

CoREs provide research intensity and critical mass by consolidating high-performing researchers across different institutions. The CoREs Fund was designed to mitigate the disadvantages of a widely dispersed university system in a small country. The Fund drew on international evidence that research is more likely to be successful (measured by quality, relevance and impact) if there is a critical mass of researchers who work together to share skills, knowledge and resources.

### ALLOCATION

CoREs are selected through a competitive bidding process, with tertiary education institutions invited to submit proposals. Funding is only for operational expenditure.

### FUNDING HISTORY

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

In 2007, the Government announced the selection of seven CoREs to receive funding over a six-year period.

The 2013 Budget allocation increased the Fund by 10 per cent, bringing the total annual funding to just under $35 million per year. Additional funding in Budget 2014 took the total to around $41 million per year, rising to around $50 million per year in 2017.

In May 2014, the Government announced the selection of six CoREs to receive funding until 2020.

## Performance and monitoring

The Ministry of Education reviewed the CoREs Fund in 2012/13. The aim of the review was to consider the benefits of current CoRE policy and identify improvements that would further strengthen the performance of CoREs. It also looked at ways to strengthen the monitoring and assessment of CoREs and the CoREs Fund.

The review found that:

- the CoREs policy supports high-quality tertiary research, with positive social and economic value to New Zealand
- there is a need for greater clarity of expectations of what CoREs will achieve (their 'mission')
- there is a need to develop a more consistent approach to performance measurement to assist the CoREs to demonstrate, and government to assess, their contribution.

As a result of the review, the Government has confirmed the Fund's policy objectives and agreed to two changes to optimise the performance of CoREs.

The new mission statement specifies the characteristics and the high-level expectations of CoREs, including roles of the tertiary education institution hosts and partners, and the role, performance and achievements of CoREs.

A new performance monitoring framework for the CoREs policy will provide a set of common measures to assess the impact of the CoREs. The framework, which is being developed by the Ministry of Education, will include metric-based reporting and qualitative assessment and will be in CoREs' contracts in the upcoming selection round.

## Government's future direction

As part of Budget 2014, the Government is increasing the CoREs fund by $53 million over four years, increasing the CoREs Fund to $49.8 million per year from 2016/17. This will increase the number of CoREs that can be supported by the Fund from seven to ten.

The TEC will select three additional CoREs through a further competitive selection round, chosen from applications that were unsuccessful in the 2013/14 selection round. The TEC will also select a CoRE focused on Māori research.

Increasing the number of CoREs will support more of the best research networks working across tertiary education institutions to generate excellent research in areas that are important to New Zealand's future development.

# MARSDEN FUND – ROYAL SOCIETY OF NEW ZEALAND

The Marsden Fund is a contestable fund administered by the Royal Society of New Zealand on behalf of government. The Marsden Fund Council (the Council) is appointed by and responsible to the Minister of Science and Innovation. The Council develops the strategic direction of the Fund and recommends proposals for funding.

## Funding – around $52m per year

## Purpose

The Marsden Fund supports excellent investigator-led research aimed at generating new knowledge with long-term value to New Zealand.

### WHY WAS IT CREATED?

Established by the Government in 1994, the Marsden Fund supports excellent investigator-led research projects that advance and expand the knowledge base. The Marsden Fund supports research excellence in science, engineering and maths, social sciences and the humanities. The research is not subject to the Government's socio-economic priorities.

The primary objectives of the Marsden Fund are to:

- enhance the quality of research in New Zealand by creating increased opportunities to undertake excellent investigator-initiated research
- support the advancement of knowledge in New Zealand, and contribute to the global knowledge base.

A secondary objective of the Marsden Fund is to contribute to the development of advanced skills in New Zealand, including support for continuing training of postdoctoral-level researchers and support for early careers of emerging researchers.

### ALLOCATION

The Minister of Science and Innovation appoints the Council of 11 eminent researchers. Its selection criteria focus on the research merits of proposals, the potential of the researchers to contribute to the advancement of knowledge, and the enhancement of research skills in New Zealand, especially those of emerging researchers.

The Marsden Fund has two separate schemes. Fast-Start Grants are for early-career researchers, who are eligible for up to seven years after obtaining a PhD. The maximum grant under the Fast-Start scheme is $100,000 per year for three years. Standard Grants are for all researchers, with a maximum grant of approximately $250,000 per year for three years.

### FUNDING HISTORY

In the 2013 round, 109 research programmes were selected for funding. These total $59 million over the next three years. Sixty-nine are Standard proposals and 40 are Fast-Start. The table below shows the proposals received and grants given since 2009.

### PROPOSALS RECEIVED AND ACCEPTED 2009–2013

| PROPOSALS RECEIVED | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| Fast-Start | 259 | 295 | 296 | 305 | 330 |
| Standard | 675 | 808 | 783 | 820 | 837 |
| **PROPOSALS ACCEPTED** | **2009** | **2010** | **2011** | **2012** | **2013** |
| Fast-Start | 36 | 34 | 32 | 32 | 40 |
| Standard | 73 | 68 | 57 | 54 | 69 |

## Performance and monitoring

The Marsden Fund operates under a terms of reference issued by the Minister of Science and Innovation, updated in 2012. The Marsden Fund Council has a terms of reference, also updated in 2012. The Council oversees the Fund on behalf of the Minister. The Royal Society of New Zealand provides executive support to the Council in this role and monitors and evaluates the progress of research projects.

MBIE monitors the overall effectiveness and efficiency of the Marsden Fund. This includes monitoring the effectiveness of the implementation of the terms of reference for the Marsden Fund and the suitability of the memorandum of understanding between the Royal Society of New Zealand and the Marsden Fund Council for achieving the Fund's objectives.

The Royal Society and the Council collect financial information and other data in support of performance metrics for the Marsden Fund required by MBIE for monitoring. This includes:

- audited accounts: annual financial statements provided by an independent third party
- case for funding: the rationale for maintaining or (if relevant) increasing the payments or research contract management fees in future years
- quarterly financial reporting
- investment impact report: the Royal Society provides biannual investment impact reports that aim to demonstrate the effectiveness of Marsden Fund investments.

## Government's future direction

The Government intends to continue to support the Fund and may consider extending its reach further in the future. The $59.0 million awarded in 2013 is higher than the $47.7 million in 2012. This increase is accounted for by the $2.5 million in new funding in 2013/14 from the $20 million funding increase over four years announced in Budget 2013, and $7.3 million from the Marsden Fund's cash reserves. The terms of reference of the Marsden Fund were amended in 2012/13 to ensure that the research it funds is of 'long-term benefit to New Zealand' and to ensure the Royal Society communicates broadly with stakeholders on the value of Marsden Fund research investments.

# CROWN RESEARCH INSTITUTE CORE FUNDING – MBIE

Crown research institutes (CRIs) are mixed-objective Crown-owned companies required to undertake research of value to New Zealand. CRI core funding is a fixed direct payment to CRIs.

## Funding – around $202m per year

Core funding was created in part by reprioritising MBIE-managed contestable funding. Existing CRI capability funding was the other main source of the core funding.

## Purpose

CRIs' core funding supports the implementation of their strategies for achieving their core objectives through research and scientific collections.

### WHY WAS IT CREATED?

CRI core funding provides a stable funding base to encourage longer-term, strategic investments and research goals more aligned with sector needs. It was increased in 2011 following the recommendations of the CRI Taskforce. Shareholding Ministers can influence the direction of CRIs (including the use of core funding) through an annual letter of expectations and comments on a CRI's Statements of Corporate Intent (SCI).

CRIs receive $201.6 million of core funding to provide greater financial certainty in delivering outcomes of value to New Zealand and to assist the CRIs to contribute to the outcomes in their Statement of Core Purpose (SCP). CRI Boards are charged with investing core funding to:

- fund science research that supports the sectors they serve
- maintain nationally significant databases and collections
- maintain strategic capability to address future risks.

### CORE FUNDING BY CRI $M

| AGRESEARCH | PLANT & FOOD | SCION | LANDCARE | GNS | NIWA | ESR | TOTAL |
|---|---|---|---|---|---|---|---|
| 38.9 | 43.1 | 17.7 | 24.2 | 27.1 | 42.9 | 7.7 | 201.6 |

### CRI CORE FUNDING 10-YEAR FUNDING PROFILE $M

| FUNDING | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|
| CRI core funding | 201.6 | 201.6 | 201.6 | *201.6* | *201.6* | *201.6* | *201.6* | *201.6* | *201.6* | *201.6* |

Italics in the table above reflect the forthcoming five-year review of CRI core funding, at which time the Government's investment may shift in response to the objectives set out in this Statement.

## Performance and monitoring

Each CRI reports on its use of core funding through its SCI and its annual report, which specify where funding has been invested and the outcomes of those investments. CRIs must also use their quarterly reports to advise any significant changes to investment allocations that might occur during the year.

Through the annual SCI process each CRI, in consultation with MBIE and the Minister, sets its own annual performance measures that must be reported on in the annual report. In addition, MBIE reviews CRIs' performance against their SCP every four years.

A formal evaluation is scheduled in the fifth year of each CRI's core funding contract and will consider the annual performance measures as well as the results of the four-yearly reviews. This information will be used to determine funding levels in the future.

MBIE is developing a performance-based framework for reviewing CRI core funding. It will:

- specify appropriate core funding performance measures distinct from those used to measure overall organisational performance
- be durable in the changing science funding landscape
- align with CRI governance arrangements
- be transparent
- minimise compliance costs.

## Government's future direction

The initial CRI core funding contracts are for the five years to June 2016. MBIE will review the core funding in the final year of the contracts. The review will draw on the outcomes of annual CRI reporting and rolling four-year CRI reviews.

As the purpose of core funding is to provide a stable funding base for CRIs, the amount of that funding needs to be reviewed at the end of the initial five-year period in relation both to each CRI's performance and to its non-government revenue.

In 2013, Callaghan Innovation (CI) absorbed the CRI Industrial Research Ltd (IRL). CI funds research and development in the private sector and conducts its own R&D. IRL's core funding has been transferred to CI, along with additional funding.

In 2013, Cabinet agreed that where CRIs are part of a National Science Challenge collaboration, relevant core funding will be invested in the Challenges. CRIs will invest up to $641 million of core funding in the National Science Challenges over 10 years.

## CRI STATEMENTS OF CORE PURPOSE:

AgResearch's purpose is to enhance the value, productivity and profitability of New Zealand's pastoral, agri-food and agri-technology sector value chains to contribute to economic growth and beneficial environmental and social outcomes for New Zealand.

ESR's purpose is to deliver enhanced scientific and research services to the public health, food safety, security and justice systems and the environmental sector to improve the safety and contribute to the economic, environmental and social wellbeing of people and communities in New Zealand.

GNS Science's purpose is to undertake research that drives innovation and economic growth in New Zealand's geologically based energy and minerals industries, develops industrial and environmental applications of nuclear science, increases New Zealand's resilience to natural hazards and enhances understanding of geological and earth-system processes.

Landcare Research's purpose is to drive innovation in New Zealand's management of terrestrial biodiversity and land resources in order to both protect and enhance the terrestrial environment and grow New Zealand's prosperity.

NIWA's purpose is to enhance the economic value and sustainable management of New Zealand's aquatic resources and environments, to provide understanding of climate and the atmosphere and increase resilience to weather and climate hazards to improve the safety and wellbeing of New Zealanders.

Plant & Food Research's purpose is to enhance the value and productivity of New Zealand's horticultural, arable, seafood and food and beverage industries to contribute to economic growth and the environmental and social prosperity of New Zealand.

Scion's purpose is to drive innovation and growth from New Zealand's forestry, wood product and wood-derived materials and other biomaterial sectors, to create economic value and contribute to beneficial environmental and social outcomes for New Zealand.

## POTENTIAL 10-YEAR CONTRIBUTION OF CRI CORE FUNDING TO THE 10 CHALLENGES ($M)

| CHALLENGE | POTENTIAL CRI CORE FUNDING CONTRIBUTION ($M) |
|---|---|
| *High-Value Nutrition*<br>*Ko Ngā Kai Whai Painga* | 97.0 |
| *Resilience to Nature's Challenges*<br>*Kia manawaroa – Ngā Ākina o Te Ao Tūroa* | 142.0 |
| *The Deep South*<br>*Te Kōmata o Te Tonga* | 37.0 |
| *Ageing Well*<br>*Kia eke kairangi ki te taikaumātuatanga* | 0 |
| *A Better Start*<br>*E tipu e Rea* | 0 |
| *Healthier Lives*<br>*He Oranga Hauora* | 5.5 |
| *Science for Technological Innovation*<br>*Kia kotahi mai – Te Ao Pūtaiao me Te Ao Hangarau* | 10.5 |
| *New Zealand's Biological Heritage*<br>*Ngā Koiora Tuku Iho* | 143.4 |
| *Our Land and Water*<br>*Toitū te Whenua, Toiora te Wai* | 130.5 |
| *Sustainable Seas*<br>*Ko ngā moana whakauka* | 75.5 |
| **Total** | **641.4** |

## NATIONAL SCIENCE CHALLENGES – MBIE

National Science Challenges are mission-led programmes of work undertaken by collaborations of different researchers, organisations, end-users and business. They will address national challenges of significance to New Zealand. Funding is available for up to ten years. The Challenges will involve greater alignment and coordination of research to generate increased impact and value from the Government's science investment.

### Funding – around $127m per year

*(this figure includes expected contribution from relevant CRI core funding)*

### Purpose

The National Science Challenges align and focus research on the top 10 large and complex issues faced by New Zealand by encouraging scientists from different institutions and across disciplines to achieve a common goal through collaboration.

#### WHY WAS IT CREATED?

The Challenges are designed to achieve greater impact and value from the Government's science investment through a strategic approach that focuses on 10 mission-led Challenges that will create enduring benefit for New Zealand. The collaborations formed to address the Challenges will be inter-disciplinary partnerships representing the 'best team' to address each Challenge.

The Challenges will be supported with up to $633 million over 10 years, through a combination of new funding and transfer of MBIE-managed contestable funding. CRI core funding of up to $641 million and Health Research Council (HRC) funding of up to $277 million may also contribute to delivery of the Challenges.

The Challenges complement other science priorities and the business-led and investigator-led components of the science system. Cabinet approved 10 National Science Challenges in May 2013. Implementation of the Challenges is under way, with many of the Challenges expected to commence by end 2014.

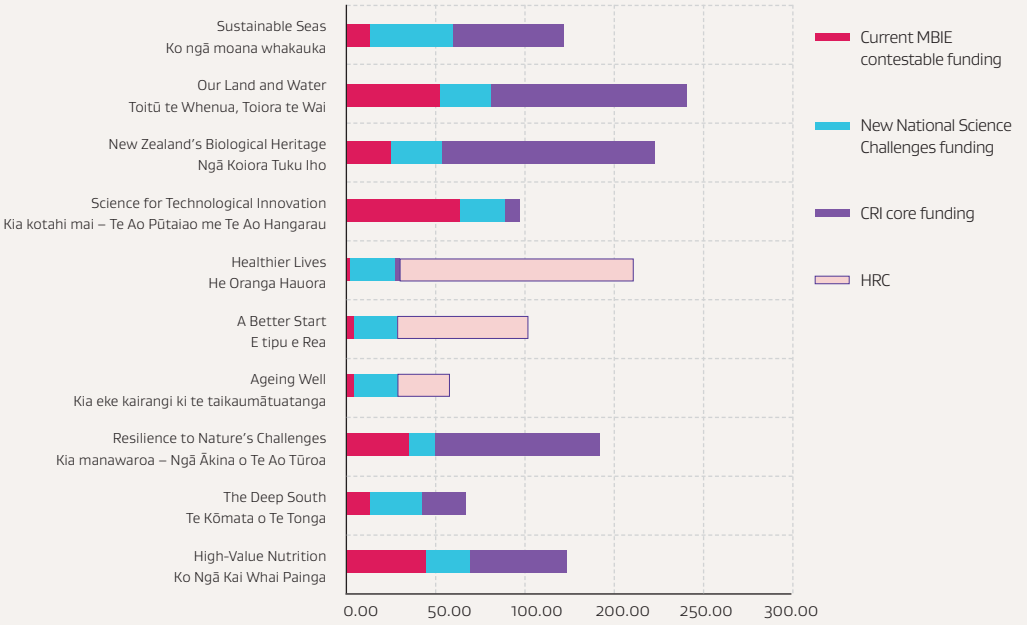
#### THE 10 AGREED CHALLENGES

| CHALLENGE | CHALLENGE OBJECTIVE |
|---|---|
| *A Better Start*<br>*E tipu e Rea* | Improve the potential of young New Zealanders to have a healthy and successful life |
| *Ageing Well*<br>*Kia eke kairangi ki te taikaumātuatanga* | Harness science to sustain health and wellbeing into the later years of life |
| *Healthier Lives*<br>*He Oranga Hauora* | Reduce the burden of major New Zealand health problems |
| *High-Value Nutrition*<br>*Ko Ngā Kai Whai Painga* | Develop high-value foods with validated health benefits |
| *Our Land and Water*<br>*Toitū te Whenua, Toiora te Wai* | Enhance primary sector production and productivity while maintaining and improving our land and water quality for future generations |
| *Sustainable Seas*<br>*Ko ngā moana whakauka* | Enhance utilisation of our marine resources within environmental and biological constraints |
| *New Zealand's Biological Heritage*<br>*Ngā Koiora Tuku Iho* | Protect and manage our biodiversity, improve our biosecurity, and enhance our resilience to harmful organisms |
| *The Deep South*<br>*Te Kōmata o Te Tonga* | Understand the role of the Antarctic and Southern Ocean in determining our climate and our future environment |
| *Science for Technological Innovation*<br>*Kia kotahi mai – Te Ao Pūtaiao me Te Ao Hangarau* | Enhance the capacity of New Zealand to use physical and engineering sciences for economic growth |
| *Resilience to Nature's Challenges*<br>*Kia manawaroa – Ngā Ākina o Te Ao Tūroa* | Enhance our resilience to natural disasters |

## Government's future direction

**POTENTIAL FUNDING AVAILABLE TO CHALLENGES OVER A 10- YEAR PERIOD ($M)**

[ chart 11 ]




Each Challenge will have a 10-year research plan setting out how the Challenge will be addressed and how the proposed research will link to current research relevant to the Challenge in New Zealand and internationally. The Science Board will allocate funding. Following Challenge reviews, funding may be reprioritised between Challenges or to other areas.

Challenge collaborations will have to provide evidence of a contestable allocation of a portion of research funding within the Challenge and of a transparent and robust process for prioritisation of research. This will ensure a refresh of research and researchers within the Challenge collaboration.

CRIs party to a Challenge collaboration have identified in detail the research they are already funding that relates to each Challenge, and how the proposed research plan for each Challenge would add further value. This could be through, for example, introducing new work streams to achieve a Challenge objective. The contribution of CRIs to the Challenges is covered in more detail under the section on CRI core funding.

### POTENTIAL FUNDING FOR CHALLENGES[9] (MBIE-MANAGED FUNDING)

| FUNDING | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|
| (financial year; GST exclusive) | $m | $m | $m | $m | $m | $m | $m | $m | $m | $m |
| **National Science Challenges** | | | $253m | | | | | $380m | | |

9 Estimate based on two multi-year appropriations.

## Performance and monitoring

For each individual Challenge, 'success' will mean the achievement of the Challenge objective and outcomes.

A performance framework for the National Science Challenges is currently in development. The framework will consider performance of the Challenge portfolio as a whole against the aims of the policy, as well as the performance of individual Challenges and their components. The draft framework covers monitoring, evaluation, audit and review. The performance framework for the Challenges is expected to:

- track progress of the Challenge programme against its objectives and the overall short-term policy aims, which include increased collaboration, coordination and focus on key issues for New Zealand
- identify factors that are contributing to the degree of success of the Challenge portfolio and the individual Challenges and where improvements can be made
- assess the performance of the National Science Challenges' funding and governance arrangements against that of other programmes.

The Challenges vary widely in scope, funding and topics, and different approaches will be needed to adequately assess them. The draft framework envisages that there will be a core set of indicators for all Challenges (e.g. measures of collaboration and research uptake) and specific indicators for individual Challenges. MBIE is leading the development of the core indicators and the Challenge collaborations will lead the development of Challenge-specific indicators. The performance framework will align with the overarching performance metrics set and impact framework for MBIE research investments in development.

# SECTOR-SPECIFIC RESEARCH FUNDS – MBIE

Researchers respond to requests for proposals from MBIE, applying to obtain funding for research activities. The Science Board makes funding decisions based on specific criteria used to assess these proposals, which vary depending on the funding mechanism used (see below). Research contracts are awarded to the highest-scoring proposals, with no commitment to renew funding after the initial contract period.

Contracts are held by research teams from universities, CRIs and other public and private research organisations. Co-funding from industry or non-government sources is sometimes a requirement of funding.

The current structure of the funds was created in Budget 2010. Core funding for CRIs and Callaghan Innovation, and funding for the National Science Challenges, has subsequently been transferred from these funding pools.

## Funding – around $189m per year

*(this figure excludes expected National Science Challenges contributions)*

## Purpose

MBIE's sector-specific funds are Government's largest mechanism for investing in mainly mission-led research – mostly through contestable mechanisms. They are distinct from other funds because Government sets priorities for them (effectively defining the mission) and these priorities can change from time to time. They can therefore be flexible to emerging opportunities.

### WHY WAS IT CREATED?

The general policy objective of the sector-based funds is to fund research, science or technology, or related activities that have the potential to:

- enhance the productivity of established industries
- generate new industries for New Zealand
- improve management of natural capital for sustainable economic development
- ensure effective management and mitigation of environmental risks
- add new value to public services in New Zealand
- contribute to improved health and social wellbeing outcomes for New Zealanders
- develop world leading technological capabilities to develop technology able to support a range of applications products and services
- give effect to the Vision Mātauranga policy.

The general focus of these objectives is to generate mission-led and industry-led research.

### ALLOCATION

Funding is allocated on an annual basis. Funding is usually provided for multi-year contracts – contract lengths vary within and between funds. The amount of funding available for allocation in any given year is determined by the amount freed up for reallocation as contracts expire. This means that funding available for new projects varies by year.

This funding is divided into six sector-specific funds (2013/14 values):

- Biological industries ($94m)
- High-value manufacturing and services ($59m)
- Energy and minerals ($11.6m)
- Environmental research ($32.4m)
- Hazards and infrastructure ($15.9m)
- Health and society ($5.4m).

### FUNDING MECHANISMS

The sector-based funds use a combination of investment mechanisms to make investment decisions. Each mechanism has specific policy objectives and eligibility criteria, and directs specific outcomes.

We are considering reducing the complexity and rigidity of these funds by having fewer, larger funding pools and using fewer funding mechanisms, or by more flexible use of existing mechanisms. This will make the system more flexible and easier to operate and should reduce transaction costs.

The current funding mechanisms are:

- **Smart Ideas** – basic or applied research into novel, promising ideas which are investigative and applied to market potential and require mentoring or connection to an entrepreneur or commercialisation specialist
- **Enabling Technologies** – accelerate the development of technology platforms that are useful for scientific, business or community interests. These are purpose-driven and must align with national priorities and be closely aligned, or done in partnership with end users
- **Targeted Research** – addresses New Zealand's strategic needs, challenges and opportunities and needs to exhibit credible pathways to implementation
- **Partnership Funding** – an additional funding mechanism to establish partnerships between research organisations and research users. Partnerships must include researchers and firms or at least one representative industry body, and partnership members must invest cash co-funding that represents at least 50 per cent of the total cost. The nature of such research projects, being more industry-led, means they are more likely to be directly linked to commercial application. Partnership funding is an on-demand funding mechanism. This creates flexibility and responsiveness to demand as there are no fixed application deadlines
- **Independent Research Organisation (IRO) Capability Funding** – introduced as a new tool in 2013. Its objective is to fund IRO research, science and technology, and related activities that will support nationally significant capability. Proposals were considered for the Biological Industries and High-Value Manufacturing and Services Research funds in 2013
- **Envirolink** – a separate funding mechanism of $1.6 million (excluding GST), available each year for Crown research institutes, universities and private research organisations to provide regional councils with advice and existing research on environmental projects.

## Performance and monitoring

### PROPOSAL ASSESSMENT AND FUNDING DECISIONS

Research proposals undergo independent review for science quality, and assessment and moderation by an independent panel of experts.

The Science Board, appointed by the Minister of Science and Innovation, makes the final funding decisions, selecting the proposals with the most merit and greatest potential to deliver on programme objectives.

### MONITORING

Under the Performance Management and Reporting Requirements in each contract, research providers are required to provide an annual report that covers the delivery of the work programme for each Work Programme Agreement. Monitoring includes:

- the assessment of annual reports
- carrying out of ad hoc or regular reviews
- observer status on governance bodies
- investment stage-gate reviews carried out by external expert panels.

The contracts are increasingly emphasising outcomes and system impact.

### EVALUATION

A performance framework to strengthen monitoring and assessment of research programmes under contract, and at an investment portfolio level, is under development. This will review, redevelop and consolidate existing performance measures and identify methods for measuring research contracts' contribution to impacts across the science and innovation system.

Currently, expiring contracts are assessed against contract outputs, and, increasingly, outcomes. Because evaluation normally occurs after completion, immediate corrective action is not a part of the process. Evaluation generates important lessons for the future, i.e. improvements to future programme design and implementation.

MBIE will focus efforts on evaluating individual programmes or contracts that delivered beyond expectations (gold contracts under the current rating system) and those that failed to meet expectations (amber and red) in order to discern underlying factors of success or failure and share what is learned across the range of actors in the system.

## Issues and opportunities

### AVAILABILITY AND LIQUIDITY OF CONTESTABLE FUNDS

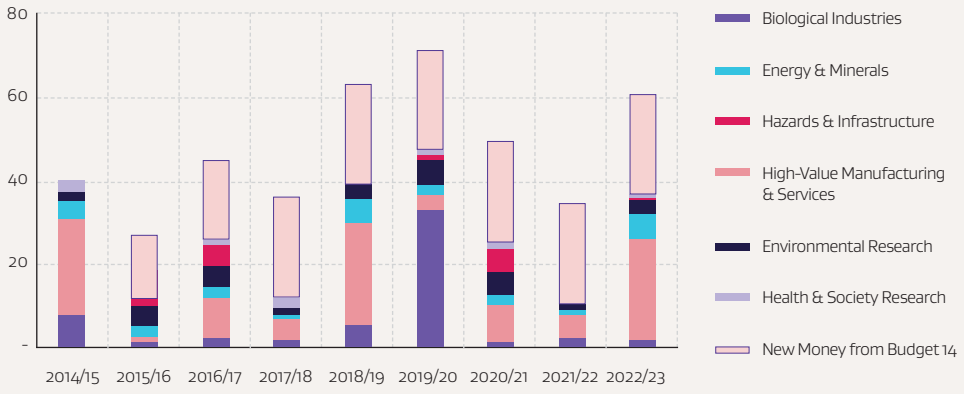
The structure and operation of the sector-specific funds were put in place in 2010. Since then, some funding has been transferred out of the funds to create CRI core funding, and to support the National Science Challenges.

While the amounts of contestable funding have changed, the main mechanisms used to distribute funding have not.

One effect of this is that the projected amounts of contestable funding available to allocate in funding rounds for the next 10 years vary considerably from year to year.

**FUTURE AVAILABILITY OF CONTESTABLE FUNDING, AVAILABLE TO ALLOCATE PER YEAR ($M)**

chart 12




This means that in some years there may be no funding available to allocate to a particular sector, meaning missed opportunities to make investments, some of which may be time-critical. The large number of funding mechanisms available under each sector-specific fund also imposes rigidity on the system, as the amounts available under each mechanism are pre-determined prior to application. We propose some possible solutions to these problems below.

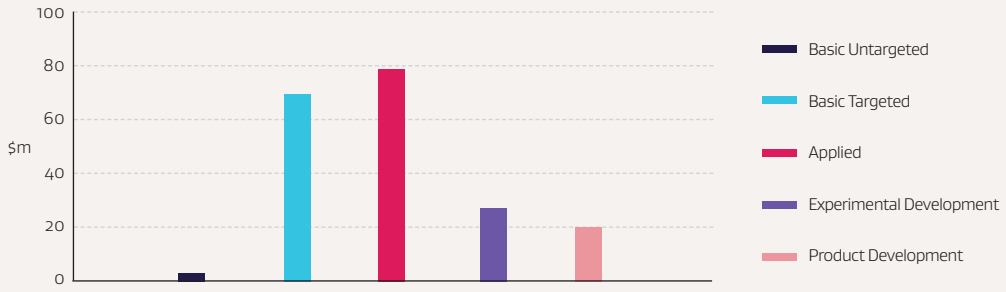
This large number of mechanisms also adds complexity to the system, limits its responsiveness to emerging ideas, and may be increasing administrative and transaction costs for science organisations and government. In some cases, it may not be allowing for genuine 'contest', but instead be emphasising a status quo approach to projects and limiting the emergence of new ideas.

### TYPE OF SCIENCE UNDERTAKEN

Forty per cent ($78m)of 2013/14 contestable funding is supporting applied research, 14 per cent ($26.7m) experimental development research, and 10 per cent ($19.7m) product development (Chart 13). There are opportunities to gear this funding more towards industry-led application. Partnerships in particular have been a successful mechanism to attract industry co-funding, and the use of similar mechanisms could be increased. However, such a move would need to be balanced by mechanisms to ensure Government's investment is not replacing industry investment.

**CONTESTABLE SCIENCE FUNDING BY RESEARCH TYPE 2013/14 ($M)**

chart 13




## Future direction

It is the Government's intention to undertake reforms, starting with the 2015 funding round, to align contestable funding with the objectives set out in this Statement and increase its flexibility by addressing some of the issues identified above. In order to do this we will move to a five-year, rather than one-year, funding envelope for these funds, enabling a greater degree of flexibility and responsiveness to emerging opportunities.

The 2014 Budget provided $56.8 million in new funding to the sector-specific research funds. The money will be phased in over a three-year period, beginning in 2015/16.

We also propose to:

- consider the role of 'contest' in refreshing and supporting emerging opportunities now that we have a significant proportion of Vote Science and Innovation funds allocated to long-term, strategic investments via CRI core funding and the National Science Challenges
- increase flexibility and ease of operation by having fewer, larger funding mechanisms, and more flexible use of mechanisms to adjust the degree of contestability of funding. We will aim to reduce and minimise compliance costs in doing so
- increase the focus of the funds on research with direct relevance to the most pressing industry, environmental and social needs
- implement measures to place greater emphasis on impact in assessment of applications, new contracts and existing contracts, including potentially separating assessment of impact from assessment of quality of science, as per the Irish model
- where possible, emphasise investment in sectors of future growth, value, and critical need.

Following consultation on this draft Statement, we intend to continue to engage with the science sector in more detail on the operational detail of redesign of the contestable funding system.

# HEALTH RESEARCH FUNDING – HEALTH RESEARCH COUNCIL

The majority of the Health and Society Research Fund is allocated to the Health Research Council to manage. The Council is responsible to the Minister of Health, and has annual funding agreements with the Minister of Science and Innovation and the Minister of Health. Vote Science and Innovation provides more than 99 per cent of the HRC's funding, with the balance from Vote Health. The HRC provides time-limited funding to researchers for specific projects.

## Funding – around $77m per year

## Purpose

The purpose of these funds is to build the capability and knowledge needed to support and improve New Zealanders' health and social wellbeing.

### WHY WAS IT CREATED?

The Health and Society Research Fund's focus is on supporting New Zealand's research strengths and knowledge, including successful and distinctive approaches and solutions to health and social needs, issues and priorities. This includes the promotion of innovation in the delivery of public policy and services, particularly in the health, disability and social sectors.

### ALLOCATION

The HRC consults MBIE on its investment framework or any substantive changes to investment signals developed for each of its four research investment streams.

### FUNDING HISTORY

HRC receives Crown funding through the Health and Society Research Fund appropriation from Vote Science and Innovation under an output agreement with MBIE for investments in health research and for research contract management.

HRC allocates most of the Health and Society Research Fund ($77 million for 2013/14), with the remainder ($5.6 million) allocated by MBIE.

HRC also received $3.2 million for research contract management in 2013/14.

### RESEARCH INVESTMENT FUNDS WILL BE ALLOCATED TO THE FOLLOWING HRC OUTPUTS

| CROWN FUND | OUTPUTS | HRC OUTPUTS | TOTAL ($M) |
|---|---|---|---|
| Health and Society Research<br><br>Research and research applications to improve the health and social wellbeing of New Zealanders | Health Research | Health Research Contracts | 68.23 |
| | | Career Development Contracts | 5.67 |
| | Health Services | Co-Funding Relationships | 3.28 |

## Performance and monitoring

The HRC invests Health and Society Research funds in research that meets New Zealand health and social needs and supports research that has international impact. The Minister's Output Agreement with the HRC is updated every financial year and sets out:

- the outputs to be delivered by the HRC
- the applicable performance measures and standards
- the amount and basis on which the HRC is to be funded for delivery of those outputs.

MBIE monitors the overall effectiveness and efficiency of HRC's funding activities. This includes monitoring the effectiveness of the implementation of the Statement of Performance Expectations against four key outputs – health research contracts, career development contracts, domestic and international co-funding relationships, and contribution to policy, regulatory and ethical frameworks. MBIE also monitors the continued suitability of the memorandum of understanding between the Minister of Health and the Minister of Science and Innovation.

HRC makes provisions for the collection of financial and non-financial information and other data in support of performance metrics required by MBIE in its monitoring role. This includes:

- an annual Vote Science and Innovation data report to enable MBIE to monitor HRC funding contracts
- an annual investment impact report to demonstrate the effectiveness of investments made by the HRC, and provide advice on the anticipated future effectiveness of these investments
- six-monthly reports on HRC's four investment streams
- quarterly financial reports
- Statement of Intent and annual report (approved by the Minister of Health).

## Government's future direction

HRC is working with MBIE on implementation of the National Science Challenges. This will include high-level strategic input and participating in MBIE's governance processes for the health-related Challenges. HRC has also identified the extent to which current HRC-funded projects overlap with the health-related Challenges.

## PRIMARY GROWTH PARTNERSHIP – MINISTRY FOR PRIMARY INDUSTRIES

Primary Growth Partnership (PGP) programmes are primarily business-led and market-driven innovation programmes that work along the primary industry value chain. They are managed by the Ministry for Primary Industries (MPI).

PGP programmes are open to almost any entity, including firms, industry bodies, private research organisations, individuals, Crown research institutes and local government businesses.

PGP investments cover education and skills development, research and development, product development, commercialisation, commercial development and technology transfer. While many PGP programmes have a science component, PGP is not mainly a science fund.

### Funding – around $65m per year (multi-year appropriation)

### Purpose

The PGP is a government-industry initiative investing in significant programmes of primary industry research and innovation.

The PGP aims to boost the productivity and profitability of the primary sector, and deliver long-term economic growth and sustainability across the primary sectors, from producer to consumer. It achieves this through government-industry investments in significant programmes of primary industry research and innovation.

#### WHY WAS IT CREATED?

A key goal is to encourage more private investment in primary sector research and development in New Zealand. Core to the idea of the partnership approach is matched funding by industry, which must contribute 50 per cent or more of the programme funding.

#### ALLOCATION

Funding is allocated through regular rounds. MPI issues a call for proposals and a six-person Investment Advisory Panel (IAP) advises MPI on PGP investment decisions and, along with MPI, monitors contracted programmes. Nine funding rounds have been completed since the establishment of PGP in 2009, with a tenth round due to close on 25 June 2014.

Government funding is released in stages on the receipt of invoices for work in accordance with each programme's contract and work plan. Total government funding paid to programmes under way as at 30 April 2014 is $99.8 million.

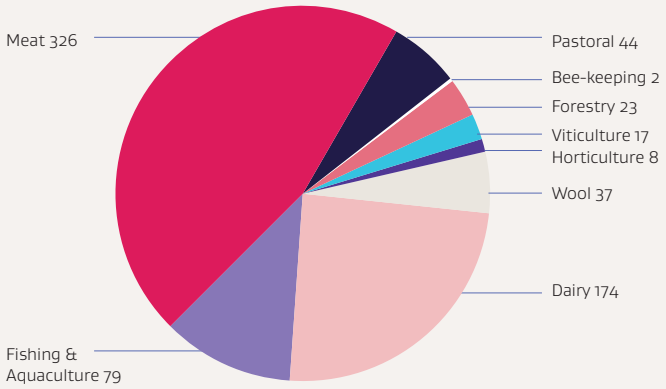
#### FUNDING HISTORY

The overall funding provision through Vote Primary Industries was established in Budget 2009, with $30 million for 2009/10, $40 million for 2010/11 and $50 million for 2011/12. In Budget 2012, PGP was moved from an annual to a multi-year appropriation. This equates to programme funding of approximately $65 million per year out to June 2017, and reverts to annually thereafter.

Over the nearly four years the PGP has been operating, 18 programmes have been announced. These range across the primary sector and vary in size from $2.89 million to $170 million for the total length of the programme, with the length of each ranging from 14 months to seven years. The total committed investment in these programmes over all years is $708 million (as at 30 November 2013), including $333 million Crown funding (Chart 14).

**CROWN/CO-INVESTOR INVESTMENT BY SECTOR ($M) (AS AT 1 APRIL 2014)**

[ chart 14 ]




## Performance and monitoring

Governance, assurance and monitoring consist of five key elements:

- Monitoring of progress by MPI and the independent Investment Advisory Panel using annual plans and quarterly reports.
- Programme planning, risk management and review, through Programme Steering Groups (MPI has at least two representatives on each).
- Auditing of financial management through programme audits (as well as each participating organisation's existing auditing or annual reporting requirements).
- Mid-term independent progress reviews of each programme, which focus on how the programme is tracking towards achieving its outputs and outcomes as well as programme governance and management.
- Programme evaluation through an outcome model.

In addition to programme-level monitoring, MPI is tracking the benefits to be delivered at a portfolio investment level.

## Government's future direction

The potential benefit to the wider economy from the Primary Growth Partnership (from current and potential future programmes) is estimated at approximately $11 billion per annum from 2025 (NZIER, May 2014). The net estimated impact on GDP for the government investment alone, reduced for risk, is $2.2 billion per annum from 2025.

## ANNOUNCED PGP PROGRAMMES AS AT 1 APRIL 2014

| SECTOR | PROGRAMME NAME AND CO-INVESTOR | TOTAL INVESTMENT $M | SECTOR TOTAL $M | ESTIMATED BENEFITS $M |
|---|---|---|---|---|
| Wool | NZ Merino<br>NZ Sheep Industry Transformation | 37 | 37 | 250 |
| Dairy | Transforming the Dairy Value Chain<br>Dairy NZ/Fonterra | 170 | **173** | 2,700 |
| | New Dairy Products and Value Chains<br>Whai Hua Limited Partnership | 3 | | 9 |
| Fishing & Aquaculture | Shellfish – The Next Generation<br>Shellfish Production and Technology NZ (SPATnz) | 26 | **79** | 81 |
| | Precision Seafood Harvesting<br>Precision Seafood Harvesting (PSH) | 53 | | 44 |
| Meat | FoodPlus – Redefining Meat Horizons<br>ANZCO | 87 | **325** | 630 |
| | Marbled Grass-fed Beef<br>Grass-fed Wagyu Ltd | 23 | | 80 |
| | Red Meat Profit Partnership<br>Red Meat Profit Partnership (RMPP) | 64 | | 190 |
| | Integrated Value Chain for Red Meat<br>FarmIQ | 151 | | 1,100 |
| Pastoral | A New Vision for Pastoral Agriculture<br>PGG Wrightson Seeds | 15 | **44** | 200 |
| | ClearView Innovations<br>Ballance AgriNutrients | 20 | | 348 |
| | Precision Application of Fertiliser in Hill Country<br>Ravensdown Fertiliser Co-op Ltd | 10 | | 120 |
| Bee-keeping | High Performance Manuka Plantations<br>Manuka Research Partnership (NZ) Ltd (MRPL) | 2 | 2 | 925 |
| Forestry | Innovative Steep-land Tree Harvesting<br>Future Forests Research (FFR) | 7 | **23** | 100 |
| | Use of Fumigants for Log and Wood Product Exports<br>Stakeholders in Methyl Bromide Reduction (STIMBR) | 3 | | – |
| | From Stump to Pump Phase 1 (feasibility study)<br>Norske Skog Tasman Ltd (NSTL)/Z Energy | 14 | | – |
| Viticulture | Lifestyle Wines<br>New Zealand Winegrowers | 17 | 17 | 290 |
| Horticulture | Go Global<br>Avocado Industry Council | 8 | 8 | 100 |

# BUSINESS RESEARCH AND DEVELOPMENT – CALLAGHAN INNOVATION

Callaghan Innovation is a new Crown entity, which commenced operations on 1 February 2013.

Callaghan Innovation is a business-facing organisation which:

- provides research and technical services to support near-to-market innovation by firms and acts as an intermediary to help link firms to the commercialisation services and funding they need
- awards and administers R&D grants to firms
- manages the incubator and accelerator programmes that work with firms to address barriers to their growth
- supports and coordinates national technology networks to promote collaborative research projects in high-priority areas of science, engineering, technology and design
- helps firms to acquire the skills and expertise needed to successfully take ideas to market
- fosters a culture of innovation and business growth potential among current and future business leaders.

## Funding – around $141m for business research and development and $79M for Callaghan Innovation, plus capital funding for 2014/15 and 2015/16

## Purpose

Callaghan Innovation's main objective is to work with businesses to help them turn their knowledge into successful commercial products and services and improve their growth and competitiveness.

### WHY WAS IT CREATED?

Callaghan Innovation was created to concentrate the Government's key tools for driving business R&D investment and innovative business growth in one organisation. It focuses on businesses in the high-value manufacturing and services (HVMS) sector. International experience shows that growing the HVMS sector offers a pathway to higher productivity, is a means of industrial diversification and adding value to exports, and contributes to the acquisition of new skills and capabilities.

Over the past year, in addition to the establishment of Callaghan Innovation, the Government has made a number of changes to funding for business R&D support. These include:

- a review of the business R&D grants programmes with the aim of stimulating greater private investment, simplifying the mix of programmes and generating greater total value to New Zealand from public support for business R&D. The outcome of this review included a reconfigured programme of business R&D grants. It is more market-led, has lower public co-funding rates and reduces the number of funding tools
- the transfer of the government's business incubator support programme from New Zealand Trade and Enterprise (NZTE) to Callaghan Innovation, with a new programme to assist new start-up firms to commercialise intellectual property (IP). This is discussed below.

**Callaghan Innovation receives funding from the following annual appropriations (2014/15):**

### BUILDING INNOVATION POTENTIAL ($9.078M)

This funds activities that build innovation potential by providing and enhancing access to information, training, mentoring and leadership across the innovation system, and facilitating human capital mobility, for both businesses and research, science and technology providers.

### REALISING THE BENEFITS OF INNOVATION ($23.3M)

This funds activities that build the level of, and returns from, science and technology-driven innovation through providing tailored access to advice, technical services and facilities, and creating projects and collaborations between business and industry and research, science and technology providers.

### CALLAGHAN INNOVATION STRATEGIC INVESTMENT ($19.523M)

This funds the development and maintenance of science, engineering, design and other strategic capabilities required to deliver services that meet the needs of business and industry, and to facilitate its interactions with research, science and technology providers. Services include applied research and product development, technical analysis, pilot facilities and infrastructure, and Open Labs. Current services are heavily focused on underpinning R&D in support of existing competitive contracting in Callaghan Innovation.

### NATIONAL MEASUREMENT STANDARDS ($5.764M)

This provides funding for the provision of specified standards to satisfy the need for traceable physical measurement in New Zealand. This supports certainty in the accuracy of measurement through the provision of uniform units of measurement of physical quantities, and for the establishment and maintenance of standards of measurement of physical quantities.

### BUSINESS RESEARCH AND DEVELOPMENT CONTRACT MANAGEMENT ($6.831M)

This funds the selection of businesses or individuals for R&D growth, student or project grants, and to negotiate, manage and monitor appropriate contracts with these businesses or individuals.

### ADVANCED TECHNOLOGY INSTITUTE ($48.1M)

This is for capital expenditure by Callaghan Innovation, as set out in the Callaghan Innovation Business Case.

**Callaghan Innovation administers the following funding:**

### RESEARCH AND DEVELOPMENT GROWTH FUND ($96.6M MULTI-YEAR APPROPRIATION; 1 JULY 2013–30 JUNE 2017)

This provides a flexible funding tool (R&D Growth Grants) to support business R&D activity by funding 20 per cent of a business's R&D costs for three years. It is a key tool to address the under-investment in R&D that occurs due to businesses being unable to capture the full value of their innovation activity. To be eligible, businesses must have a two-year track record of spending at least 1.5 per cent of their revenue on R&D, with annual expenditure of at least $300,000.

### TARGETED BUSINESS RESEARCH AND DEVELOPMENT ($44.9M MULTI-YEAR APPROPRIATION; 1 JULY 2013–30 JUNE 2017)

This includes R&D Project Grants and support for students to work in R&D-active businesses. The R&D Project Grants are a flexible funding tool to provide support typically for individual projects. This programme addresses coordination failures and information gaps for new-to-R&D firms. The R&D Student Grants provide specific support to undergraduate and postgraduate students to work within R&D-active businesses.

### REPAYABLE GRANTS FOR START-UPS ($14M) AND INCUBATOR SUPPORT PROGRAMME ($4.556M)[10]

These grants are a recent enhancement to the incubator support programme. The objective is to help more technology-based firms with export potential get start-up funding and provide a route for commercialisation of publicly funded IP. The grants of up to $375,000 provide up to two years of funding. Incubators have to match this funding at a rate of one dollar for every three grant dollars and will use the grants to take an equity stake in incubated firms. The funding can be used for any of the costs associated with further developing or commercialising IP and is repayable at a rate of three per cent of sales.

10 The repayable grants are not considered 'Business R&D' support as they do not directly fund research and development activities

## Performance and monitoring

The success of Callaghan Innovation will be measured by the contribution it makes to supporting HVMS firms to innovate and increase productivity, whether through enabling increased exports, reducing the cost structure of industry, or expanding the productive capacity of the economy. The key measures of performance, in addition to financial measures, relate to Callaghan Innovation's contribution to the following outcomes:

- Broaden the base of technologically aware and innovation-ready companies.
- Stimulate existing businesses to increase their expenditure on R&D.
- Build firms' innovation and commercialisation capability, including putting firms in touch with the right expertise and capability.
- Improve information about and access to the science, engineering, design and technology development capability within public research organisations.
- Improve the transfer of knowledge and technology in the innovation system by facilitating improved connectivity and networks between firms and knowledge-generating institutions .
- Encourage greater mobility of workers between knowledge-generating institutions and business.

Work on Callaghan Innovation's performance measurement framework is being progressed as part of the statement of intent and performance contract processes. Callaghan Innovation is required to report annually against these measures in its annual report. Callaghan Innovation will also have a review process for its Research and Technical Services Group to provide confidence that these teams and projects are meeting the needs of industry.

## Government's future direction

The Government has increased overall funding for Business R&D. Budget 2014 provided $141 million in 2014/15; this is made up of Research and Development Growth Grants ($96.6 million) and Targeted Research and Development funding ($44.9 million).

Government is taking steps to encourage New Zealand's business sector to meet the 2012 BGA target of increasing expenditure on R&D to more than one per cent of GDP. Business expenditure on R&D increased by 17 per cent between 2010 and 2012 – from 0.51 per cent of GDP to 0.58 per cent of GDP – topping $1 billion for the first time. Recent data released in the Business Operations Survey 2013 also shows seven per cent nominal growth in business expenditure on R&D between 2012 and 2013.

Callaghan Innovation has a key role in incentivising firms to reach this goal. It is working closely with businesses and sectors to identify the areas where they have the greatest R&D and technology needs. The development of the new National Technology Networks will bring together key skills, technologies and support services, enabling firms to obtain the knowledge they require for innovation-led growth. Over time, the range of services Callaghan Innovation provides and how those services are delivered will evolve to meet the changing needs of clients and to capitalise on new business opportunities. Callaghan Innovation is just at the start of this process of service and product development.

Stronger collaboration between public research providers and business, and between businesses with similar R&D and technology requirements, will be required to overcome the fragmentation of science and technology services in the HVMS sector. Callaghan Innovation has an important role in linking firms with research institutions in New Zealand and offshore and will need to continue to work closely with NZTE to make the most of the offshore opportunities.

MBIE is developing a comprehensive framework to underpin an ongoing evaluation programme. This will inform a review after three years of operations that will include the capability, operations, financial sustainability and overall contribution of Callaghan Innovation.

## COMMERCIALISATION – MBIE/CALLAGHAN INNOVATION

MBIE Science Investments manages three initiatives aimed at supporting the commercialisation of research. These are the Pre-Seed Accelerator Fund, the Commercialisation Partner Network and the Technology-Focused Incubators.

### *Pre-Seed Accelerator Fund*

#### Purpose

The Pre-Seed Accelerator Fund (PSAF) was created in 2003 to attract investor interest to publicly funded research and development and bridge the gap between completed research projects and a project that an external investor would be interested in investing in. PSAF provides 50 per cent co-funding to accelerate commercialisation projects to a point of 'investor readiness'.

#### Funding – around $8.3m per year

PSAF is funded from the MBIE-managed High-Value Manufacturing Research output expense.

Five devolved contracts (University of Auckland, KiwiNet, University of Otago, Scion and the Health Innovation Hub) were awarded in 2013.

**PSAF CONTRACTS 2013**

| ORGANISATION | THREE-YEAR FUNDING ($M, EXCL GST) |
|---|---|
| KiwiNet | $7.5 |
| University of Auckland | $3.6 |
| University of Otago | $2.4 |
| Scion | $0.9 |
| Health Innovation Hub | $0.75 |
| Non-devolved contracts (for R&D not under the ambit of one of the above PSAF contract holders) | $0.75 |

#### Performance and monitoring

Independent reviewers have concluded that PSAF is fulfilling the goals set forth at the commencement of the programme and that PSAF is the key driver of commercialisation of early-stage research from universities and CRIs.

PSAF has supported the spin-out of 30 new companies since 2008, revenue generated from licensing deals, royalties and, in some cases, sales. In addition, non-financial benefits including industry partnerships and increased commercialisation capabilities of the public research organisations have been observed.

Performance on current contracts is tracking well, with over 200 active projects in the national pipeline, and commercial successes for companies based on PSAF-supported technologies, such as Halo IPT, Power by Proxi, FireDroid, Arc Active, Invert Robotics and Aldera.

#### Government's future direction

PSAF and Callaghan Innovation's incubator support programmes may be synergistic by helping to narrow the 'valley of death' inherent in early-stage commercialisation by increasing the quality of technology from public research organisations and increasing investor appetite for early-stage technology.

## *Commercialisation Partner Network*

### Purpose

The Commercialisation Partner Network (CPN) was established in 2010 with the aim of developing centre(s) of excellence in technology transfer to consolidate and integrate the technology transfer activities of New Zealand's public research organisations, increasing the rate of commercialisation of publicly funded research.

The outcomes of the CPN are to:

- increase rates of formation of technology or IP that firms can use
- increase rates of formation of investable entities
- form stronger links between research organisations and individuals, organisations and firms with capabilities and interests in commercialisation
- improve commercialisation capabilities in commercialisation units
- increase visibility, transparency and access to information about R&D projects, organisations and personnel.

There are three partners in the CPN: Return on Science, KiwiNet and the Canterbury Regional Innovation System (CRIS). All three partners work together to deliver results in terms of improved and increased commercialisation of publicly funded research.

### Funding – around $3m per year

Decision making for the CPN sits with MBIE. The CPN is funded from the High-Value Manufacturing output expense to fund the CPN contracts.

### Performance and monitoring

Performance is evaluated by regular meetings with MBIE staff where performance against defined deliverables is assessed. Quarterly and annual reports are also produced by the partners for MBIE.

There has been significant and positive change in the ecosystem since the inception of the CPN:

- There is now an integrated and national approach to the investment of Pre-Seed Accelerator Funding.
- Standards on the quality of commercialisation projects are being lifted through CPN investment committee involvement.
- There is unprecedented sharing of information and decision making amongst the research organisations.
- Commercialisation capabilities within the research organisations are being built.
- Commercialisation of science is being promoted to researchers.
- Links to business and market opportunities are being built.

### Government's future direction

The CPN has made a significant difference in the commercialisation eco-system to date. The CPN will continue to accelerate and improve commercialisation by providing more private sector and international links, as well as more focused advice on commercialisation issues. In addition to these efforts, the CPN has begun to contribute to the Smart Ideas Assessment Process and may contribute to the National Science Challenges assessment or evaluation process. Furthermore, both PSAF and the CPN may serve as an important link between MBIE and Callaghan Innovation.

## *Technology-focused incubators*

### Purpose

There remains a small, but critical, gap in the Government's support for some start-ups which are commercialising IP and have immediate capital needs. MBIE evaluations have found improved business outcomes for some firms incubated under the existing Incubator Support Programme, but comparatively low numbers of high-growth potential incubator graduates and low rates of technology transfer between universities and Crown research institutes and the incubators persist.

To address these issues, Cabinet agreed to a new Repayable Grant tool for capital-intensive start-ups that are resident in certain incubators. These grants are intended to help more innovative, complex technology-based start-ups get off the ground and provide a route for the commercialisation of IP (and in particular publicly funded IP) while requiring the businesses to repay the grants when they begin to generate revenues.

### Funding – $31m per year over four years

These repayable grants will be funded by an appropriation of $31 million under Vote Science and Innovation through Budget 2013 over four years. Budget 2014 allocated $14 million for 2014/15. Each individual repayable grant will be for up to $375,000 (75 per cent of $500,000, excl GST) per start-up over two years. The technology-focused incubator owners will fund at least the other $125,000 (25 percent of $500,000) of the start-up's capital costs. The grant can be used to fund any costs associated with further developing or commercialising IP. The $125,000 funding that incubator owners invest must not be made up from other sources of central government funding. As part of the primary grant, the programme will include pre-incubation grants of up to $35,000 for technology-focused incubators to determine if a start-up idea may be viable.

### Pilot programme criteria

To ensure the repayable grant is targeted at firms which fall within the identified gap in government assistance and are experiencing capital constraints, firms will be assessed against criteria based on the following characteristics:

- IP and capital-intensive product or service.
- Prospects for high-value export growth and a 'born-global' outlook.
- Commercial viability and identified markets.
- Novel, complex technology with potential for 'new-to-world' innovation.
- Entrepreneurial ability.

### Applications

During April 2014, Callaghan Innovation invited applications from organisations and investors wishing to establish new technology-focused incubators. The initial appointment process took place in mid May 2014. The first incubators will receive funding from 1 July 2014, subject to quality of proposals. These incubators will have access to the new repayable grants programme on behalf of the start-up companies they incubate. This should help to remove much of the risk currently preventing private sector investment in early-stage, IP-rich start-ups. This more targeted and sophisticated approach to increasing the rate of formation and success of early-stage start-up firms supports the growth of emerging sectors and technologies and fosters business innovation.

### Government's future direction

The programme will run as a three- to five-year pilot following an initial request for proposals. Following an initial baseline survey, annual operational reviews will also ensure the programme is functioning operationally as intended. Annual indicators for both the incubators and the firms receiving payable grants will be developed in consultation between MBIE, Callaghan Innovation, NZTE and the incubators.

## INTERNATIONAL RELATIONSHIPS FUND – MBIE

The International Relationships Fund (IRF) supports international science and innovation engagement through a range of initiatives with a set of priority partner countries. The types of investment activities are:

- pre-research collaborative ideas and people exchange, and sharing of research infrastructure
- joint research collaboration
- commercialisation and innovation facilitation
- international scientific memberships.

### Funding – $9.5m per year

### Purpose

The IRF supports activities that initiate, develop and foster collaborations leveraging international science and innovation for New Zealand's benefit.

#### WHY WAS IT CREATED?

International science and innovation links are a key part of the Government's plan to improve economic performance and increase New Zealanders' wealth and wellbeing. New Zealand is small and distant, and our science sector needs to be well connected to the international science and business communities. By being well connected in key parts of the world the New Zealand science sector is able to:

- participate in the best international research and access international research infrastructure
- maintain a critical mass of science and innovation capability in selected thematic areas
- understand international export markets
- realise opportunities for knowledge advancement and technological development in New Zealand
- be aware of international science and innovation developments and potential for New Zealand's involvement
- promote New Zealand's science interests and capabilities.

New Zealand is party to a number of formal international science agreements that require ongoing investment and participation, which are supported through the IRF. The objectives of the IRF are to:

- influence regional or international research
- support science- and technology-linked activities that advance New Zealand's national interests
- promote international recognition for New Zealand as a centre for innovation
- co-invest with international partners in research programmes of joint interest that will involve researchers based in New Zealand
- increase the level of funding/scientific skills and technological capabilities that New Zealand is able to source from other countries
- enable New Zealand researchers to respond to opportunities for international collaboration that arise out-of-cycle
- assist world-leading researchers to establish key research programmes in New Zealand in key areas of strategic interest to New Zealand
- facilitate the connection of New Zealand science and innovation with international expertise and with knowledge that supports commercial outcomes.

### ALLOCATION

The IRF allocation is spread across a range of mechanisms and the proportional budgeted spend for the 2014/15 year across the aforementioned types of investment activities is:

| INVESTMENT ACTIVITY | PROPORTION OF IRF BUDGETED SPEND 2014/15 [11] |
|---|---|
| Pre-research collaborative ideas and people exchange, and sharing of research infrastructure | 50% |
| Joint research collaboration | 40% |
| Commercialisation and innovation facilitation | 5% |
| International scientific memberships | 5% |

## Performance and monitoring

IRF funding and contracts are issued using established eligibility and assessment criteria, appropriate to the funding mechanism being used. Contracts are assessed at various stages, according to IRF contract management guidelines. Contract assessment focuses on progress toward and achievement of objectives and critical steps.

MBIE is evaluating the IRF in the second half of the 2013/14 financial year. The evaluation will review the strategic policy alignment and continued appropriateness of the IRF, and its effectiveness and efficiency. MBIE expects to complete the evaluation by 30 June 2014.

## Government's future direction

The long-term outcomes sought by MBIE's international science activities and the International Relationships Fund are:

- New Zealand's science and innovation capacity increases.
- New Zealand science and innovation effectively and efficiently supports New Zealand's economic, social and environmental goals.
- New Zealand's international influence is enhanced.
- New Zealand successfully pursues its trade and diplomatic goals, and is regarded as a good international citizen.
- New Zealand businesses export more, and higher-value, goods and services.

The evaluation will provide insights as to what adjustments and refocusing might be required for the IRF. The outcomes of the evaluation will also contribute to the development of a wider international science and innovation strategy in 2014, which will guide delivery of the IRF.

Given the increased emphasis on supporting innovation in recent years, we anticipate that IRF expenditure on commercialisation and business-led innovation activities will increase. The final IRF objective listed above was added this year to enable a greater level of activity in this area.

Increasingly, the Government works with a range of international partners, basing its engagement on a range of factors, including international standing in science output, robustness of science and innovation infrastructure and policy settings, opportunity to leverage government policy and diplomatic interests, ability to leverage skills and resources to complement New Zealand's capabilities, commercialisation prospects through links with industry and investment partners, and the level of existing engagement. New Zealand's relatively small scientific output relies on international collaboration with well-recognised and sophisticated international partners to be at the cutting edge of new knowledge. To attract foreign partners, for both science collaboration and investment, New Zealand must continue to focus on the quality and standing of its scientific output.

11 A number of initiatives will contribute to multiple activity types, so these figures represent the primary purpose of any initiative.

The government is party to a suite of bilateral and multilateral mechanisms that guide each relationship, from non-binding memoranda of understanding through to treaty-level binding obligations. The nature of the government's engagements will mature over the length of these partnerships. Current partnerships are supported with the International Relationships Fund through a range of targeted mechanisms.

In addition to the above, we propose to develop a new international science and innovation strategy in the 2014/15 financial year. This strategy will frame the priorities for engagement and investment to maximise activities that initiate, develop and foster collaborations leveraging international science and innovation for New Zealand's benefit.

## LARGE-SCALE RESEARCH INFRASTRUCTURE – MBIE

Large-scale research infrastructure is defined by its size, its ability to enable advanced experimentation and enhance research productivity, and a capacity to serve research needs at a national or international level rather than those of a single institution. From time to time, government may invest directly to support infrastructure acquisition, maintenance or operation.

### Purpose

New Zealand researchers and innovators need access to large-scale research infrastructure to:

- meet current and future research requirements of key sectors and users
- ensure New Zealand's science and innovation system is internationally competitive and can attract and retain top talent
- enable and support research innovation and increased collaboration.

### Funding

Research institutions are generally responsible for their own research infrastructure requirements. New Zealand operates a full-cost funding system for research in general. Indirect costs, including infrastructure requirements and their associated operating costs, are provided for in research funding. In some cases, research institutions negotiate access to infrastructure elsewhere via paid access or through collaborations. However, most research infrastructure is:

- paid for through full-cost funding from other science funding mechanisms (such as MBIE contestable funds, CRI core funding, the PBRF or other institutional funding)
- operated and managed directly by research institutions.

This approach can be limiting for large-scale research infrastructure where a combination of factors, including high capital and operating costs, can put it out of reach of institutions. In recognition of these factors, the Government has, on a case-by-case basis, supported the investment in large-scale research infrastructure.

Over the past five years, the government has directly invested around $90 million to support the development and maintenance of large-scale research infrastructure. In 2013/14, $28 million was invested through Vote Science and Innovation to support research infrastructure initiatives. A portion of this investment is matched by institutional co-funding.

Current investments in large-scale research infrastructure include:

- RV Tangaroa, a deep water marine research vessel with multiple scientific capabilities
- Research and Education Advanced Network New Zealand Limited (REANNZ) providing high-performance data connectivity and services between research organisations, with national and international connectivity
- Australian Synchrotron (located in Victoria, Australia), which provides a source of highly intense light for a variety of research purposes through the New Zealand Synchrotron Group Limited
- New Zealand Genomics Limited, which provides national genomics technology and bioinformatics services
- New Zealand e-Science Infrastructure, which provides national high-performance computing facilities and e-research services.

Nationally significant databases and collections are funded through CRI core funding or through a separate appropriation.

A common theme across recent investments is the development of infrastructure to support collaborative, highly distributed computational and data-intensive research.

## Performance and monitoring

Large-scale research infrastructure investments are long-term and based on delivering fit-for-purpose services that enhance the science and innovation system. Infrastructure and associated services often involve significant lead-times for their full adoption and benefits to be realised. New and existing infrastructure needs to show how it will respond to changes in core technologies and service demand over the lifecycle of the investment.

Investments are monitored according to the performance measures of their appropriations, provisions of each infrastructure's investment case, funding and governance arrangements, and expectations for key deliverables.

Infrastructure performance is assessed through regular reporting to MBIE, observer status on governance bodies and investment stage-gate reviews carried out by external expert panels. There is an increasing emphasis on outcomes and system impact as the infrastructure and related services mature.

## Future direction

The Government sees a role in supporting the development of large-scale infrastructure that provides research capability and capacity at a national level. While projects may involve a long-term funding commitment from the Government, collaborators will need to demonstrate a significant self-funding contribution and a commitment to put in place appropriate cost-recovery mechanisms.

Proposals for government support for new research infrastructure will be required to develop a business case using the Treasury's Better Business Case guidelines. When considering proposals for new infrastructure, the Government will in the first instance look to reprioritise expenditure from within existing baselines.

Consistent with the goal of promoting efficient and strategic investments, the Government will use the following criteria to guide its consideration of proposals to support access to large-scale research infrastructure:

- Size and cost – it is demonstrably not possible for a single institution to fund the infrastructure, or for several institutions to fund it collectively, and other options such as lease or hire are not cost-effective.
- Value and impact – access to the research infrastructure will enable cutting-edge research in areas that contribute to national science and innovation priorities.
- National science ability – New Zealand has existing or emerging scientific capability and capacity to utilise the infrastructure successfully.
- Multi-user or multi-disciplinary – the research infrastructure will be used by a large number of institutions and/or large number of science disciplines.
- Coordination and collaboration – institutions will contribute, with appropriate co-investment rates determined on a case-by-case basis, and coordinate their activities to ensure access to and use of the infrastructure are optimised.

Sector-led proposals that meet the threshold for government involvement will need to demonstrate how they will address the following implementation considerations:

- Governance, management and funding arrangements.
- Management of the assets (including depreciation and reinvestment).
- Access and participation by users.
- Apportionment of cost, risks and benefits between the Crown, users and collaborators.
- A business model reflecting the evolving nature and maturity of the investment and the technology.
- Financial viability over and beyond the term of the investment.
- Transparent pricing structures and policies.

The Government will establish regular review points for large-scale research infrastructure investments to inform future funding decisions. Reviews will consider how the investments are delivering on the outcomes set out in the business case and Crown Funding Agreement. These reviews will enable funding to be allocated to the highest-priority research infrastructure proposals.

## SCIENCE IN SOCIETY – MBIE

Vote Science and Innovation contains a number of funds that engage New Zealanders with science and technology and support the development of a talented and skilled science workforce. These funds meet needs that are not directly supported via other funding mechanisms. The Engaging New Zealanders with Science and Technology fund is a key mechanism to support these goals. The Science in Society strategic plan will set the future direction for the Engaging New Zealanders programme and other initiatives in this area.

### Purpose

In this area the Engaging New Zealanders programme aims to encourage greater engagement between the science and innovation sector and the broader community to ensure that the general population benefits from advances in science and technology.

#### WHY WAS IT CREATED?

The Engaging New Zealanders programme was created to ensure:

- New Zealanders are able to make informed decisions about science-based issues
- top-quality students are attracted into science and technology careers.

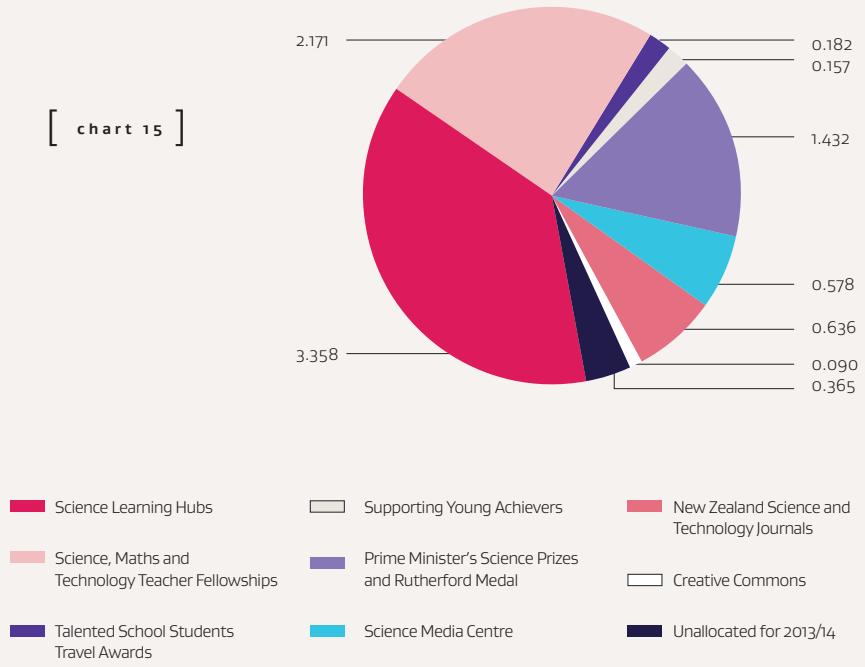
### Funding – around $9m

There are currently eight programmes funded under the Engaging New Zealanders appropriation in 2013/14. Their cost is detailed in Chart 15.

[ chart 15 ]

**FUNDING SCIENCE IN SOCIETY 2013/14** ($M)

TOTAL 8.969



**OVERVIEW OF THE ENGAGING NEW ZEALANDERS PROGRAMMES AND THEIR KEY GOALS**

| ENGAGING NEW ZEALANDERS PROGRAMMES | KEY GOALS |
|---|---|
| Science/Biotechnology Learning Hubs | • Build teacher knowledge and confidence in teaching science to students.<br>• Increase the connectivity between scientific research (scientists) in New Zealand and teachers, students and the New Zealand curriculum. |
| Science, Maths and Technology Teacher Fellowships | Develop the future human resource in science, mathematics and technology:<br>• Promote the importance of science, mathematics and technology in society<br>• Enhance the delivery of science, mathematics and technology curricula in schools. |
| Talented School Students Travel Awards | • Support the development of people with knowledge, skills and ideas by providing funding to help cover the travel costs for high-achieving school students to science and technology events outside New Zealand. |
| Supporting Young Achievers | • Identify, encourage and support talented young New Zealand school students in science and technology (science, mathematics, social sciences, and technology). |
| Prime Minister's Science Prizes and the Rutherford Medal | • Raise the profile and prestige of science in New Zealand. |
| Science Media Centre | • Bring about a culture change in the media that leads to an improvement in the quality, depth and breadth of coverage of science-related issues, and particularly coverage of New Zealand science and innovation. |
| New Zealand Science and Technology Journals | • Enhance dissemination of research relevant to New Zealand, provide opportunities for New Zealand authors to publish their research, and make such information readily available. |
| Creative Commons Aotearoa New Zealand | • Act as an information and organisational hub to promote open licensing across four key sectors – education, government, culture and science – to allow the New Zealand public to access and reuse publicly funded data and information.<br>• Improve transparency and openness of Government through Creative Commons licenses. |

## Performance and monitoring

MBIE has contracts with Fulbright New Zealand, the Royal Society of New Zealand and the University of Waikato to administer schemes. MBIE monitors the overall effectiveness and efficiency of each scheme on a six-monthly basis.

In 2012, the former Ministry of Science and Innovation commissioned the New Zealand Council for Educational Research (NZCER) to review Engaging New Zealanders to identify whether the various contracts within the work programme were aligned with the current purpose and objectives of the programme.

The key findings from the review were that the Engaging New Zealanders contracts are performing well and achieving their objectives. It recommended that activities within the programme need both maintaining and growing/developing and that MBIE needs to balance the cost of maintaining the current activities with the cost of growing/developing new activities within the work programme.

However, the review also concluded that Engaging New Zealanders lacks a clear strategic direction. Its purpose and objectives are broad and loosely shaped around the current programme of work, but do not strongly reflect all of the activities contracted within this output expense.

It recommended that MBIE revisit the purposes and objectives of Engaging New Zealanders in order to develop a clear strategic direction. Further, MBIE should identify a process to ensure there is long-term strategic oversight of the work within this budget appropriation so the work programme can grow and adapt to meet changing needs.

## Government's future direction

Science has a critical role to play in society as a whole. Our tertiary education institutions where research-based teaching takes place are key to training the highest-skilled part of our future workforce. More importantly, the increased engagement of all New Zealanders with science and scientific development has the potential to improve our national wellbeing enormously.

There is a general acknowledgement of the growing centrality of science and technology in assisting societies to progress economically and to enhance their environmental and social wellbeing. In turn, this requires a society that is well equipped to capitalise on the opportunities posed by scientific innovation. At the same time, society must decide whether a particular technology is appropriate and fits its values, drawing on accurate evidence and balanced comment.

Other countries are increasingly putting emphasis on enhancing their national capacity in science, given its importance for understanding our rapidly changing world and the many complex decisions that are required. As scientific and technological innovation become central to responsible development and economic growth, meeting the science and technology educational needs of the future and current workforce becomes critical.

Relative to comparable countries, New Zealand is considered to have comparatively low public 'science capital', in terms of both specific skills and general expertise.

The Science in Society strategic plan will set the future direction for the Engaging New Zealanders programme and other initiatives in this area. Over the next 10 years, we expect an increase in opportunities for New Zealanders to engage with, and extend their knowledge of, science and its application.

## THE SCIENCE WORKFORCE – MBIE

Vote Science and Innovation contains a number of awards and fellowships that support human capital development. The various awards are intended to accelerate our top researchers to become research leaders, and to help New Zealand retain its best research talent and remain internationally competitive.

### Purpose

The Awards and Fellowships programmes aim to support emerging and established researchers with recognised research excellence and leadership potential.

#### WHY WAS IT CREATED?

Awards and Fellowships allow researchers with proven excellence in research and those with leadership potential to generate excellent research supporting growth and innovation and benefiting New Zealand. The value of postdoctoral fellowships to the science sector is that they perform the translational and interdisciplinary work in the university system that underlies and generates innovation.

### Funding – around $11.6m

Awards and fellowships support the career development of New Zealand scientists. The Awards and Fellowship programmes are listed below, along with their key goals and costs.

| AWARDS AND FELLOWSHIP PROGRAMMES | KEY GOALS | COST |
|---|---|---|
| Fulbright New Zealand and Innovative Graduate Awards | These awards support promising graduate students to complete a postgraduate degree (Masters or PhD) at a US university in a research area targeted to support growth and innovation in New Zealand. | $533,000 per year (RCM separate)[12] |
| James Cook Fellowships | The primary objective of the James Cook Fellowships is to support researchers with knowledge, skills and ideas and to recognise research professionals of excellence. | $720,000 per year (RCM separate) |
| Rutherford Discovery Fellowships | The aim of these fellowships is to develop and foster future leaders in the New Zealand science system by supporting excellent early- to mid-career researchers. | $6 million for 2013/14 increasing to $8 million in 2014/15 |
| Rutherford Foundation Trust | This Trust supports early-career researchers, funds PhD scholarships and postdoctoral fellowships and helps bring outstanding New Zealand researchers back home.<br><br>The Ministry grants $1 million per year to the Trust, which leverages this funding with co-funding. | $1 million grant per year |

12 Research Contract Management

## Performance and monitoring

The awards and fellowships are regularly reviewed to ensure they are fulfilling their stated objectives.

For example, in 2010 an evaluation was conducted on the Foundation Postdoctoral Fellowships. The evaluation concluded that the primary issue for emerging researchers was establishing long-term research careers. It was therefore advised that funding for the Postdoctoral Fellowships would be better spent on a scheme supporting early career establishment on the basis of excellence.

This led to the creation of the Rutherford Discovery Fellowships, which after its first year, in 2011, had a preliminary review conducted.

Changes were subsequently made to address issues like career breaks for parental leave, applied research eligibility and to increase the potential for applicants without permanent employment to be selected, as the review identified these as issues of concern.

A full review of the Rutherford Discovery Fellowships was subsequently carried out in 2011, which noted that some Fellowships are being awarded to researchers with permanent academic positions and several years' experience, potentially leaving early-career researchers disadvantaged. In response, the two-tier system of fellowships was removed, and the focus of the fellowships was changed to researchers who have completed their PhD within three to eight years. In addition, applicants were no longer expected to have a permanent employment position. There is no consistent data on postdoctoral numbers in New Zealand although it is possible to point to an increase in the number of doctoral graduates in New Zealand.

In addition, direct support for postdoctoral researchers is available through:

- the Rutherford Foundation, which offers two postdoctoral fellowships per year
- the Health Research Council, which provides funding for up to three postdoctoral researchers per year through the Sir Charles Hercus Health Research Fellowships
- opportunities embedded in other government research contracts.

# VISION MĀTAURANGA CAPABILITY FUND – MBIE

Formally established in 2011, the Vision Mātauranga Capability Fund (VMCF) is designed to assist research funders, researchers and research users when they consider research of relevance to Māori. It aims to discover the distinctive contributions and creations relevant to research, science and technology that may arise from Māori knowledge, resources and people.

## Funding – around $6.6m

## Purpose

Vision Mātauranga is a policy to unlock the innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future.

### WHY WAS IT CREATED?

This fund seeks to develop skilled people and organisations undertaking research that supports the four themes of the Government's Vision Mātauranga policy:

i. Indigenous innovation: this theme concerns the development of distinctive products, processes, systems and services from Māori knowledge, resources and people. It aims to contribute to economic growth through distinctive R&D.

ii. Environmental sustainability: this aims to achieve environmental sustainability through iwi and hapū relationships with land and sea.

iii. Health and social wellbeing: research is targeted toward distinctive challenges to Māori health and social wellbeing.

iv. Exploring indigenous knowledge.

The Fund's objectives are to increase connections and collaborations between Māori organisations, individual researchers and research organisations so that:

› researchers and research organisations can improve their understanding of Māori research needs and effective ways to transfer knowledge to Māori

› Māori users of research can understand better what research can do for them, and increase user uptake and application of research results

› research capacity in Māori organisations increases

› levels of Vision Mātauranga-relevant research within research organisations increase

› support is provided for the development of individual researchers who undertake work that has the potential to deliver the objectives outlined in the Vision Mātauranga policy.

## Funding mechanisms

MBIE invests $4.585 million of this fund per year through the:

› **VISION MĀTAURANGA CAPABILITY FUND PLACEMENT SCHEME:**

This scheme is for the full- or part-time placement of skilled researchers into a Māori organisation for up to two years. The Ministry contributes up to $180,000 per placement. Participating organisations are expected to provide co-funding.

› **VISION MĀTAURANGA CAPABILITY FUND CONNECT SCHEME:**

The Connect Scheme funds work programmes of up to three years that build skills, network and capacity for Māori organisations, research organisations or individual researchers in areas contributing to the four themes of Vision Mātauranga (indigenous innovation, environmental sustainability, health and social wellbeing, and exploring indigenous knowledge).

The Ministry contributes a total of $75,000 per year. Participating organisations are expected to contribute co-funding.

The Health Research Council invests $1.982 million of the Vision Mātauranga Capability Fund through various scholarships and project grants.

## Performance and monitoring

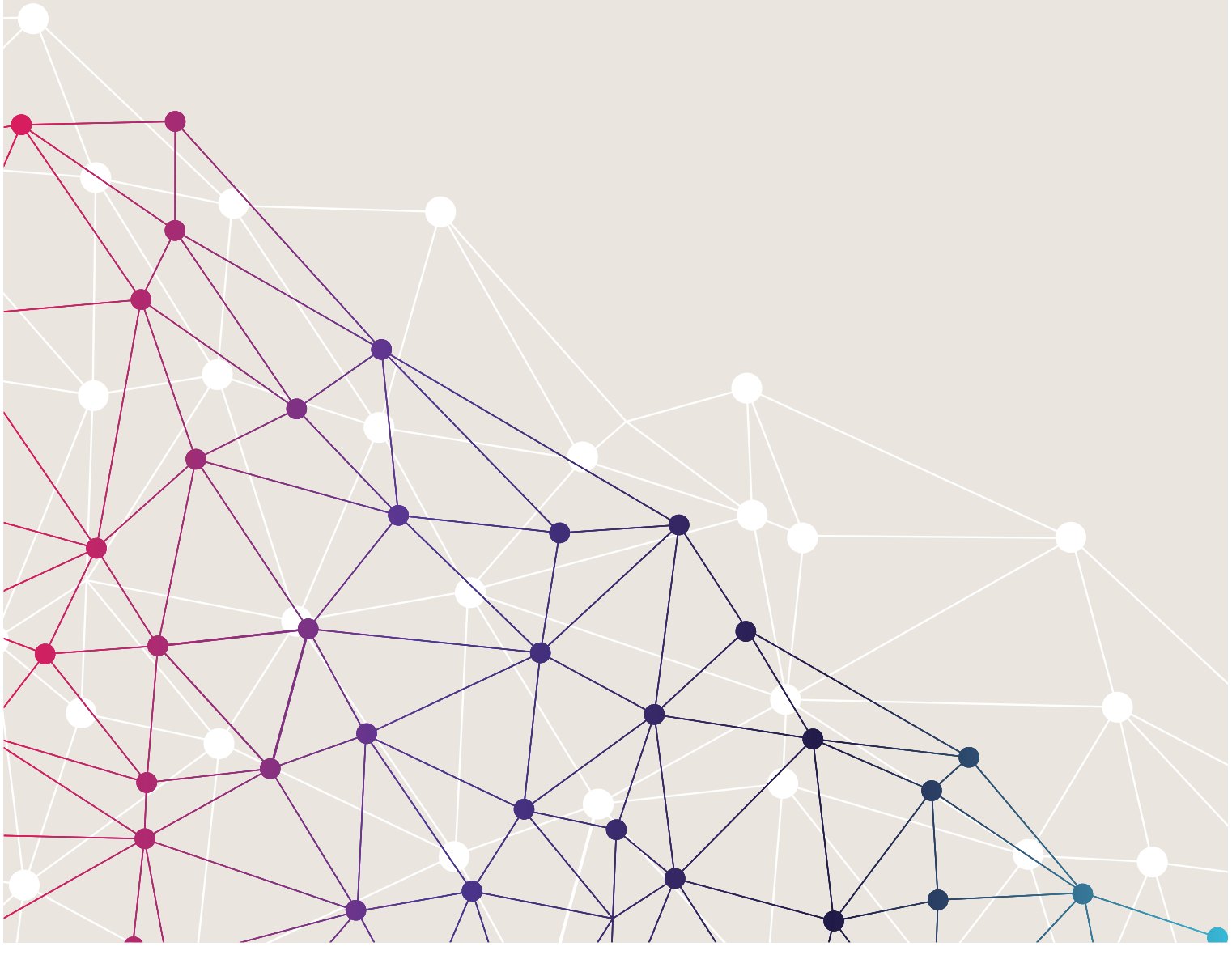
In 2013, MBIE redesigned the VMCF, with the subsequent inaugural funding round using a contestable process. Eighteen programmes received over $2.4 million in funding. MBIE has contracted the successful applicants and will monitor the success of the individual programmes and the overall effectiveness of the Fund over time.

## Government's future direction

Following the 2013 investment round for the VMCF, it was announced that 18 programmes will receive over $2.4 million in funding.

[ DRAFT FOR CONSULTATION ]

# Consultation



# Introduction

## Government is seeking your feedback on this draft National Statement of Science Investment.

The draft National Statement of Science Investment provides an overview of the current state of the public science system and a statement of strategic intent. As such, it serves as a key point of reference for looking at where we stand, compared to where we want to be.

We are seeking your feedback on the aspiration and directional changes proposed in this document, as well as the overall science investment outlook it describes.

The general directional changes described will inform a more detailed revision of the underlying settings of the sector-specific research funds administered by MBIE. We expect to develop reforms to the sector-specific research funds in cooperation with the science sector, following the feedback on this draft Statement. At this stage, we are therefore seeking your general comment on the structural issues identified with those funds, and the general direction of treatment.

### FEEDBACK ON OVERALL SCIENCE INVESTMENT OUTLOOK

The Statement provides an overview of Government's investment in science. We are interested in your reactions to the comparative scale of various funds, their purposes, and their current or potential relationship with one another.

Questions you might consider when providing feedback on the wider context of Government's wider investment in science include:

1. What is your reaction to the overall balance of Government investment in science? In particular:
    a. Do we have the right balance of direct funding for institutions versus more contestable funds? If not, what should it be and why?
    b. Do we have the right balance of funding between CRIs, universities, independent research organisations, and industry? If not, what should that balance be and why?
    c. Do we have the right balance of funding between investigator-, mission- and industry-led funding? If not, what should that balance be and why?
2. Are there parts of the Government's wider objectives and system for investing in science that are over- or under-emphasised in terms of scale or scope? If there are parts that are under-emphasised and need to grow, can you identify other parts of the system that are less important, that could be scaled back over time?
3. How well do the different parts of Government's overall investment system perform, both individually and in combination? Could settings be changed to improve their performance? If so, how?
4. Do we have the right mix of public research institutions in New Zealand?
5. How could we improve the way we monitor and evaluate the performance of:
    a. research institutions in the science and innovation system?
    b. our policy instruments for making investments in science and innovation?
    c. the science and innovation system overall?
6. Are there any features of our institutions, policy instruments or overall system that are particularly relevant or useful for benchmarking or monitoring performance?

7. To what extent does the current set of Government-wide investment policies and processes, and balance of investment in different mechanisms, address critical problems either in the science system or to New Zealand as a whole? What changes could be made to ensure those problems are being addressed?
8. To what extent do Government's different science mechanisms work together? Could they be made to work together more coherently? If so, how? Do we have enough investment mechanisms, or too many? If too few, where are the gaps? If too many, which could be combined, changed or removed to simplify the system?
9. How can New Zealand achieve more international collaboration and cooperation? How well do existing mechanisms support this objective? What policy changes or new mechanisms could advance this goal?
10. Is there anything else we should consider about Government's overall mix of investment in science?

## GENERAL FEEDBACK ON THE DIRECTION

Section 1 of this Statement sets out some proposed objectives for Government's science investment. These are:

1. **Producing excellent science of the highest quality**
2. **Ensuring value by focusing on relevant science with highest potential for impact for the benefit of New Zealand**
3. **Committing to continue increasing investment over time**
4. **Increasing focus on sectors of future need or growth**
5. **Increasing the scale of industry-led research**
6. **Continuing to implement Vision Mātauranga**
7. **Strengthening and building international relationships to strengthen the capacity of our science system to benefit New Zealand.**

These objectives signal a new direction for Government's science investment. Your feedback might consider the following questions.

### QUESTIONS ON THE CHANGES IN DIRECTION PROPOSED IN THIS STATEMENT:

11. Should our funding mechanisms have a greater focus on the quality and on the relevance and impact of research? If so, why, and how could it be achieved? For example, should investigator-, mission- or industry-led, funded investments, across most mechanisms, have a sound pathway to impact and application, even if long term?
12. Do you support a greater orientation of public science investments towards a stronger contribution to business innovation and economic growth?
    a. If not, towards what high-level outcomes or orientation would you direct shifts in our science investments?
    b. If yes, what, if any, key enabling technologies or industry sectors would you place as priorities for our science investments?
13. How should collaboration between scientists and institutions feature in our science investments? What can we learn from the collaborative approaches taken to date? What is the appropriate balance in the system between collaboration and competition?

14. How might the current set-up of New Zealand's research institutions either encourage or discourage across-research institution collaborations, international researcher collaborations, or user collaborations?
15. How should knowledge users engage in improving the impact of our science investments? What can we learn from how they have been engaging to date?
16. Is there anything else we should consider about the proposed general direction of change?
17. How can we continue to improve the quality and impact of the science we fund?
18. Should quality be assessed differently in investigator-led, mission-led, and industry-led research? If so, how?
19. How can we improve the international connectedness and engagement of our research community and research-active companies?

## FEEDBACK ON STRUCTURE OF MBIE SECTOR-SPECIFIC RESEARCH FUNDS

We want to refine the funding architecture so that it is best suited to meet New Zealand's science needs into the future. We want to know whether funding tools are appropriate to deliver on the NSSI objectives, and in particular whether further reforms to, and simplification of, sector-specific funds are necessary. This draft Statement proposes work to:

- consider the role of 'contest' in refreshing and supporting emerging opportunities now that we have a significant proportion of Vote Science and Innovation funds allocated to long-term, strategic investments via CRI core funding and the National Science Challenges
- increase flexibility and ease of operation by having fewer, larger funding mechanisms, and more flexible use of mechanisms to adjust the degree of contestability of funding. We will aim to reduce and minimise compliance costs in doing so
- increase the focus of the funds on research with direct relevance to the most pressing industry, environmental and social needs
- implement measures to place greater emphasis on impact in assessment of applications, new contracts and existing contracts, including potentially separating assessment of impact from assessment of quality of science, as per the Irish model. Where possible, emphasis should be on investment in sectors of future growth, value, and critical need.

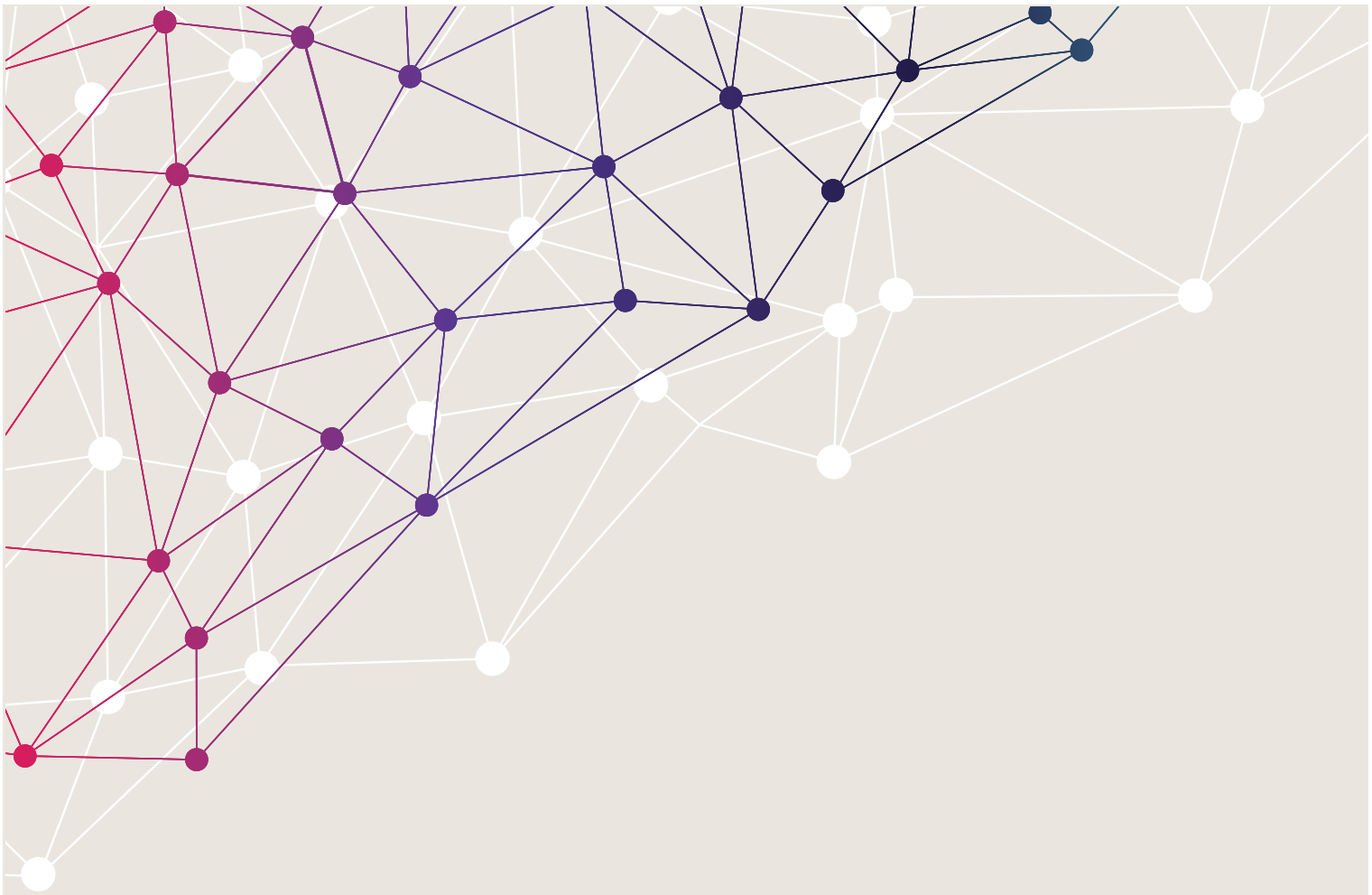
### YOUR FEEDBACK ON THESE MATTERS MIGHT ADDRESS THE FOLLOWING QUESTIONS:

20. Are the current sector-specific research funds in need of change? If so what direction of change is desirable? Issues that you may want to consider are:
    a. the multiplicity of funds and whether there is a need to reduce the number of funds and the complexity of funds
    b. the accessibility of funds to different types of researchers: university, CRI, established or new entrants into the system
    c. the sector-based nature of funding tools
    d. the length of funding allocation
    e. the form and processes of peer review
    f. the relative significance in award assessment of relevance and potential for impact, past performance and the quality of the research proposal and research team.

21. Should the assessment of quality be differentiated across the spectrum of MBIE sector-specific research funds?
22. What indicators of scientific quality should we use in our assessment processes? Should these be the same across all MBIE sector-specific funding tools?
23. How targeted should Government be in seeking outcomes from MBIE research funding investments?
24. Are there gaps or deficiencies in the current range of funding mechanisms available?
25. How could we improve the way we monitor and evaluate the performance of MBIE's research contracts? Are there any features that are particularly relevant or useful for benchmarking or monitoring performance of contracts?
26. What are the best ways to encourage industry to make greater co-investments in R&D, where appropriate, and ensure an appropriate focus on research of relevance to industry, social and environmental needs?
27. What are the implications of increasing the proportion of industry-led research in MBIE funds?
    a. Should leveraging private investment be a more heavily weighted goal for our science investments? Why or why not?
    b. If so, what are the current barriers to increased private investment and how might they be overcome?
28. What could be done to improve uptake of research outcomes with users?
29. Is there anything else we should consider about proposed changes to the structure of MBIE's sector-specific research funds?

Thank you for taking the time to provide your thoughts. We value your contribution.

**Consultation closes on 22 August 2014. Please email your feedback to NSSI@mbie.govt.nz**



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