

Strategic Science Investment Fund Investment Plan 2017 – 2024

2017 Update



MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
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newzealand.govt.nz

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Foreword

The Strategic Science Investment Fund (SSIF) supports longer-term programmes of mission-led science and science infrastructure of enduring importance to New Zealand.

I am pleased to release this updated Investment Plan that outlines Government's intentions for the Fund, and Government's expectations for current and future investments until 2024.

The SSIF investments are critical to realising the 2025 vision for the New Zealand science system, set out in the National Statement of Science Investment (NSSI), of a highly dynamic science system that enriches New Zealand.

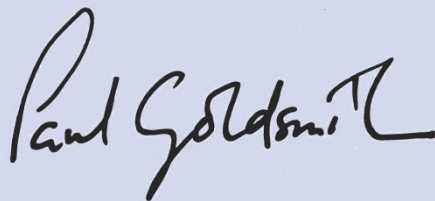
The SSIF research platforms provide a strong foundation for New Zealand's science system, complementing and enabling Government's other science investments. SSIF investments enable excellent, high impact science in priority areas and ensure New Zealand has access to the larger-scale research infrastructure that supports science priorities. Through the SSIF, Government can provide stability and plan strategically, targeting its science investments to maximise the long-term value to New Zealand's economy, environment and wellbeing.

This new version of the SSIF Investment Plan includes information about 2017/18 investments, including the \$40.5 million of new funding committed in Budget 2017. The Plan signals the following new investments:

- > \$19.5 million over four years to support natural hazards research and improve our ability to monitor hazards on a 24/7 basis
- > \$21 million over three years to support an Antarctic Research Platform that will explore the unique environment of Antarctica
- > \$21 million over seven years for a new strategic investment in the Research and Education Advanced Network New Zealand (REANNZ) to enable data-intensive research and high-performance science applications.

The SSIF investments form a significant portion of Government's total investment in science. By 2021, Government funding for science and innovation will reach \$1.66 billion, up from \$1.32 billion in 2015. Increased funding recognises the importance of a dynamic science and innovation system that lifts our productivity and living standards, and preserves and enhances what is special about New Zealand.

I expect the SSIF investments will continue to build capability, excellence and impact across the critical research platforms that underpin a high-performing, agile and responsive science system.



Paul Goldsmith
MINISTER OF SCIENCE AND INNOVATION

BACKGROUND

NSSI

The National Statement of Science Investment sets out Government’s ten year strategic direction for the science system.

The SSIF supports the NSSI by clarifying Government’s role in setting the direction for investments, by simplifying and stabilising funding arrangements and by increasing the transparency of negotiations with research organisations.

THE SSIF STRUCTURE

The SSIF comprises:

- SSIF Programmes**
Funding for research platforms to enable organisations to undertake long-term mission-led research programmes.
- SSIF Infrastructure**
Funding for national research infrastructure platforms that provide access to research technology, facilities, infrastructure, Nationally Significant Collections and Databases, and associated support services.

A science ‘platform’ is “a combination of people, facilities, information and knowledge that provide a particular, ongoing science and innovation capability for New Zealand”.

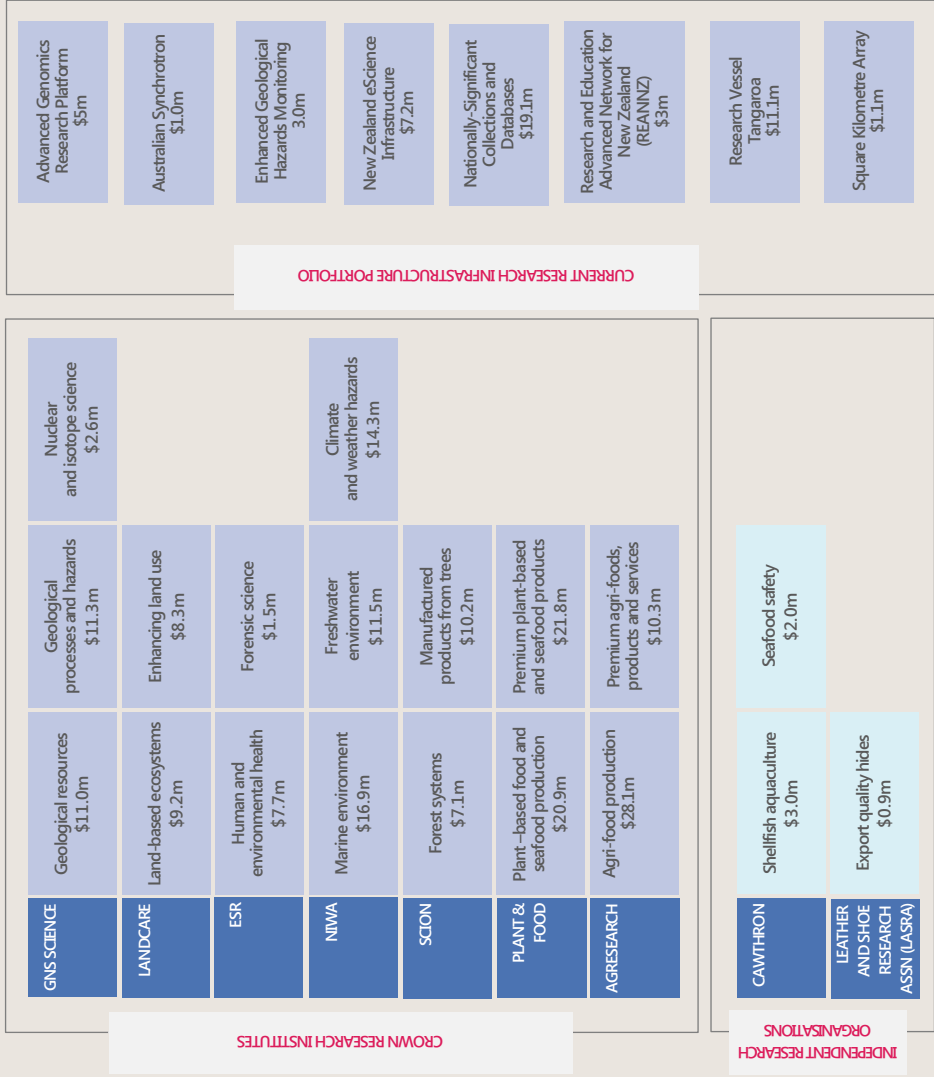
MISSION

To support longer-term underpinning infrastructure and programmes of mission-led science critical to the future of New Zealand’s economy, environment and wellbeing.

PRINCIPLES

- The SSIF is a strategy-driven investment.
- SSIF investments are primarily mission-led.
- The SSIF is a purchase mechanism.
- The performance of SSIF investments is clear.

PROFILE OF CURRENT SPENDING



The platforms funded within SSIF Programmes (2017/18 indicative funding)

The platforms funded within SSIF Infrastructure (2017/18 funding)

INVESTMENT INTENTIONS

SSIF PROGRAMMES

Under the SSIF, government and research organisations work together to ensure that long-term strategic research programmes deliver Government's priorities for science.

INVESTMENT SIGNALS

Each platform needs a strategy that includes:

- > The strategic plan and/or direction
- > The process to ensure the excellence of each platform
- > How the platform will deliver shorter and longer term impacts
- > How research effort will be distributed across horizons
- > Appropriate arrangements for contributions from industry and other end-users
- > How the platform will contribute to capability development
- > How the platform reflects the approach laid out in Vision Mātauranga
- > How the platform will leverage connections and be conducive to collaboration both domestically and internationally between research organisations and with sector end-users.

SSIF INFRASTRUCTURE

Government will invest strategically in the research infrastructure New Zealand requires to limit the potential for gaps, overlaps or limitations in serving strategic science priorities. The SSIF supports the few infrastructure projects that have high national benefits.

INVESTMENT SIGNALS

Each platform needs a strategy that includes:

- > The ongoing rationale for Government intervention, grounded in the NSSI and the SSIF Investment Plan.
- > How providing access to the infrastructure platform will serve Government priorities and the vision for a high-performing science system
- > An approach to the evolution of the infrastructure investment over time, explaining how the investment will be agile in responding to technological or scientific developments
- > Appropriate arrangements for co-funding, other contributions and/or a pricing model
- > Support for talent attraction, retention and development
- > How the development, access and use of the platform reflects the approach laid out in Vision Mātauranga
- > A plan to leverage international connections and collaborations to benefit the broader science system and New Zealand.

NEW INVESTMENTS AND NEW OPPORTUNITIES

ADVANCED GENOMICS RESEARCH

Government is investing in a new cross-institutional platform to respond to future opportunities in genomics and build capability across the research sector. The Call for Proposals is complete and the provider will be announced in 2017.

HAZARDS MONITORING

Government has committed \$19m over four years to support improved detection, monitoring and warnings about geological hazards for civil defence and emergency management response. Responsibility for delivering this may sit across a number of organisations. This will not be an open call for proposals.

ANTARCTICA

Budget 2017 included \$21m over three years through SSIF Programmes for an Antarctic science platform.

ANALYSIS/COMPUTING OF BIG DATA

Government is considering investing in a platform to deliver national research capability in big data and analytics.

CONTRACT RENEWALS IN 2017/18

For each platform they deliver, SSIF providers due for contract renewal will need to supply a plan that sets out how they will address the investment signals set out in this Plan. MBIE will release guidance on contract renewal and new investments.

SSIF Programme investments:

- > IRO contracts will transition to SSIF funding during 2017/18.

SSIF Infrastructure investments will be renewed as follows:

- > Transition arrangements will be managed for New Zealand Genomics Ltd, whose contract expired on 30 June 2017.
- > A new contract to purchase the activities that support data intensive research and high-performance science will be agreed with REANNZ.



Section 1:

The Strategic Science Investment Fund



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What is the Strategic Science Investment Fund?

This Investment Plan (the Plan) outlines the background and structure of the Strategic Science Investment Fund, describes the principles that will guide investment through the SSIF, and seeks to clarify the SSIF's role and fit within the science system.

The Plan provides guidance on the Government's directions for current and future investments made through the SSIF. It reflects the broad and long-term nature of investments made through the SSIF by focussing on strategic context and signals rather than specific investment intentions. We expect SSIF providers to respond to these signals as part of a strategic partnership with the Government.

The term of the Plan is seven years, from 2017 to 2024. This term reflects the length of contracts for SSIF Programmes. The Plan is updated annually to include new Government investments, and in 2021 will be fully refreshed in advance of the four year formal review point of the majority of SSIF Programmes contracts.

Background

The National Statement of Science Investment (NSSI) was launched in October 2015 by the Minister of Science and Innovation and sets out the Government's ten year strategic direction for the science system.

"A highly dynamic science system that enriches New Zealand, making a more visible, measurable contribution to our productivity and wellbeing through excellent science".

The Government's vision for 2025

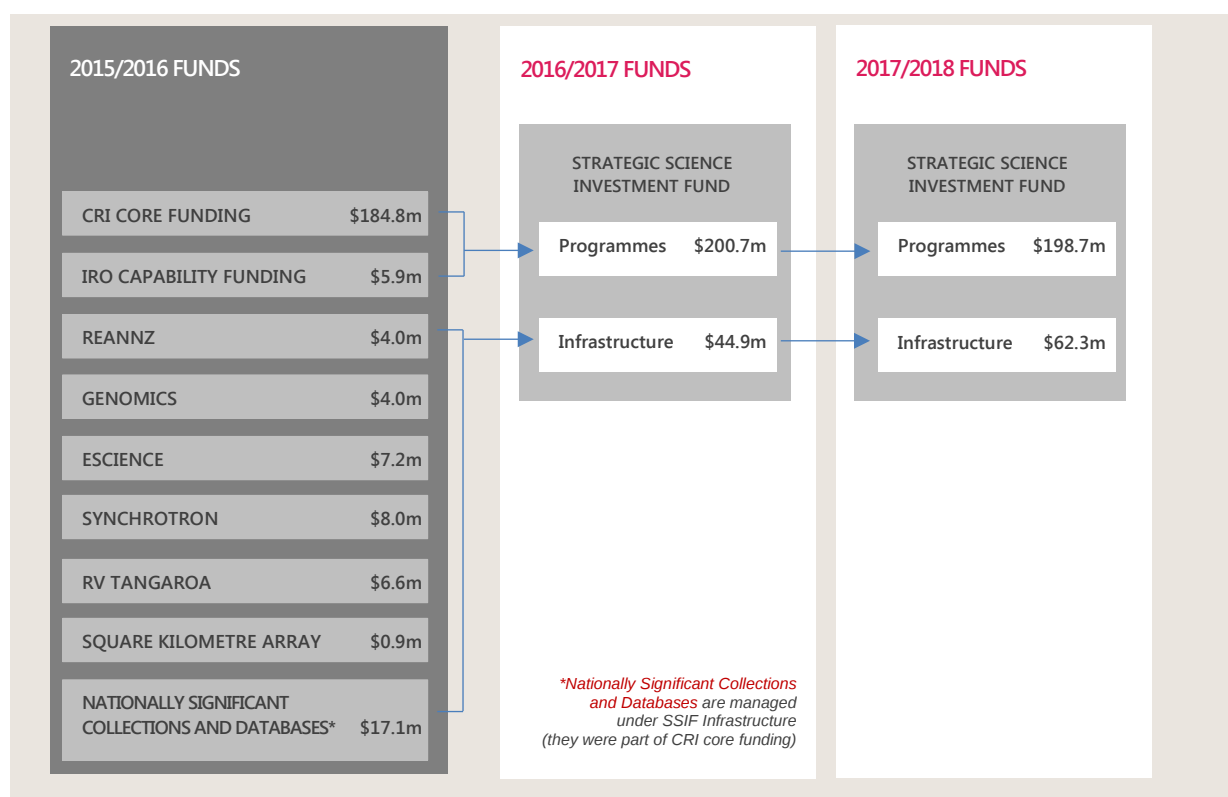
In April 2016, Cabinet agreed to establish the SSIF to support longer-term underpinning infrastructure and programmes of mission-led science critical to the future of New Zealand's economy, environment and wellbeing. The SSIF aligns with the principles in the NSSI because it:

- > supports an appropriate role for government in setting the strategic direction of the investment
- > ensures the science system is transparent and high-performing by creating a stronger performance framework
- > creates a simpler system by bringing together investments under a common approach with competitive neutrality between them
- > creates stability through long-term investments.

The SSIF was announced publicly in Budget 2016. It brought together Crown Research Institute (CRI) core funding, Independent Research Organisation (IRO) capability funding, and several investments in research infrastructure. The SSIF comprises:

1. SSIF Programmes
Funding for research platforms to enable organisations to undertake long-term mission-led research programmes.
2. SSIF Infrastructure
Funding for national research infrastructure platforms that provide access to research technology, facilities, infrastructure, Nationally Significant Collections and Databases, and associated support services.

The SSIF is managed as a portfolio of investments.



Moving from multiple funds to two fund categories -
investments managed under the SSIF.

Totals do not match because the figures are from different years.
2016/17 and 2017/18 figures include additional funds announced as part of Budget 2016 and 2017.
2016/17 Programmes funding included one-off earthquake recovery funding of \$2m.
Between 2016 and 2018 some SSIF funds were reprioritised for short-run science priorities including earthquake recovery.

SSIF Investments will be Structured Around Science 'Platforms'

A science platform is: "a combination of people, facilities, information and knowledge that provide a particular, ongoing science and innovation capability for New Zealand".

Investing in science platforms reflects the longer-term, capability-supporting purpose of the SSIF. It also enables the Government to send investment signals about the evolution of the platforms in order to advance strategic goals. SSIF providers will need to consider and set out their strategic intent for each platform they provide (or contribute to).

The key interest for the Government will be how new knowledge and opportunities for New Zealand will be developed from the platforms, and how the direction set in the NSSI will be reflected in SSIF investments – including the pillars of excellence and impact, the horizons-based model, and future investment by the sector(s) that will benefit from the research.

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SSIF Programmes

SSIF Programmes brought together CRI core funding and IRO capability funding. Bringing these investments together provides an opportunity to develop a more active partnership between the Government and providers of strategically-important research capability. It also acknowledges that a range of research institutions could hold capability of strategic importance to New Zealand. This reflects the principle that SSIF investments should be provider-neutral.

Under the SSIF, government and research organisations focus on ensuring that long-term, strategic research programmes deliver the Government’s priorities for science. Critical capabilities within and between research organisations remain dynamic and must continue to evolve to maximise outcomes for New Zealand – such as economic opportunities from new products or production methods, natural hazard preparedness, or new ways to protect and enhance our environment. This dynamism means that platforms may change, grow and shrink over time.

SSIF Infrastructure

National research infrastructure investment can also benefit from greater coordination and alignment with the NSSI. Access to high quality research infrastructure is a critical input into excellent science.

The bulk of infrastructure investments are made by research organisations, paid for as part of the regular costs of conducting research. The SSIF supports the few infrastructure projects that have high national benefits that will not emerge in the course of usual business because of the public nature of the benefits, and the scale, complexity, long duration and multi-user nature of the investment.

Prior to the introduction of the SSIF, national research infrastructure investments were often performing well against their original purpose. However, Government’s decisions to invest in national-scale research infrastructure were planned and implemented on a case-by-case rather than as part of a deliberate portfolio. This limited our ability to compare and contrast the performance and relative value of current infrastructures, to make changes across the suite of infrastructures, and to generate good decisions about future spending priorities.

Investing more strategically in the research infrastructure New Zealand requires limits the potential for gaps, overlaps or limitations in serving strategic science priorities. It enables our researchers to access large-scale, cutting-edge infrastructure, including overseas infrastructure, to do excellent research. A consistent approach to assessing the performance of investments allows comparisons between them and ensures that the investments government makes in infrastructure are optimised and support excellent science.

The Role of the Strategic Science Investment Fund

Wider Strategic Context

The priorities of the NSSI determine the overall direction for the SSIF. This Plan was developed with regard to relevant government strategies (a non-exhaustive list follows). Some of these strategies are broadly applicable to research proposals, others are specific to sectors or areas of research. We expect SSIF research providers to have regard to all government strategies relevant to their research area.

RELEVANT GOVERNMENT PRIORITIES AND STRATEGIES

The National Statement of Science Investment: The NSSI sets out the Government's strategy for the public science and innovation system over the period 2015-2025.

Business Growth Agenda: The Business Growth Agenda applies across research funds with an economic development focus or a focus on resource development and management. Goals of particular relevance to the SSIF include growing exports, improving the quality of our natural resource base, harnessing Māori resources, encouraging more business expenditure on research and development, and building international linkages.

He kai kei aku ringa: The Crown-Māori economic growth partnership aims to grow the Māori economic sector and deliver prosperity to Māori and resilience and growth to the national economy.

Vision Mātauranga: The Vision Mātauranga policy aims to unlock the science and innovation potential of Māori knowledge, resources, and people for the benefit of New Zealand. The policy applies across, and is integrated within, all MBIE science investment mechanisms.

Research, Science and Innovation Domain Plan: The domain plan sets out the enduring questions for the science system, the current status of data holdings, and a strategic five year plan for improving the quality of data on the science system. Over time, research organisations will need to meet minimum standards.

New Zealand Antarctic and Southern Ocean Science Directions and Priorities 2010-2020: This strategy sets the framework for New Zealand's Antarctic science during this decade and identifies three high-level research outcomes encompassing climate, ice and atmosphere; inland and coastal ecosystems; and the broader marine environment.

The New Zealand Biodiversity Strategy: The strategy provides a framework for action to conserve, sustainably use, and manage New Zealand's biodiversity in response to New Zealand's obligations as a signatory to the United Nations Convention on Biological Diversity.

Biosecurity 2025: This strategy outlines how New Zealand will strengthen its biosecurity system to continue to protect against pests and diseases.

Environment Domain Plan 2013: This Plan is an initiative to address our environmental information needs.

The Conservation and Environment Science Roadmap: This roadmap identifies critical goals for environmental research and conservation.

Primary Sector Science Roadmap Te Ao Tūroa: This roadmap identifies future science needs and opportunities of most importance to protect, grow and enhance New Zealand's primary sector, strengthen New Zealand's bioeconomy and support the wellbeing of New Zealanders.

Predator Free New Zealand 2050: The Government's initiative to achieve a predator-free New Zealand by 2050. This is an ambitious target and will require novel approaches to pest eradication.

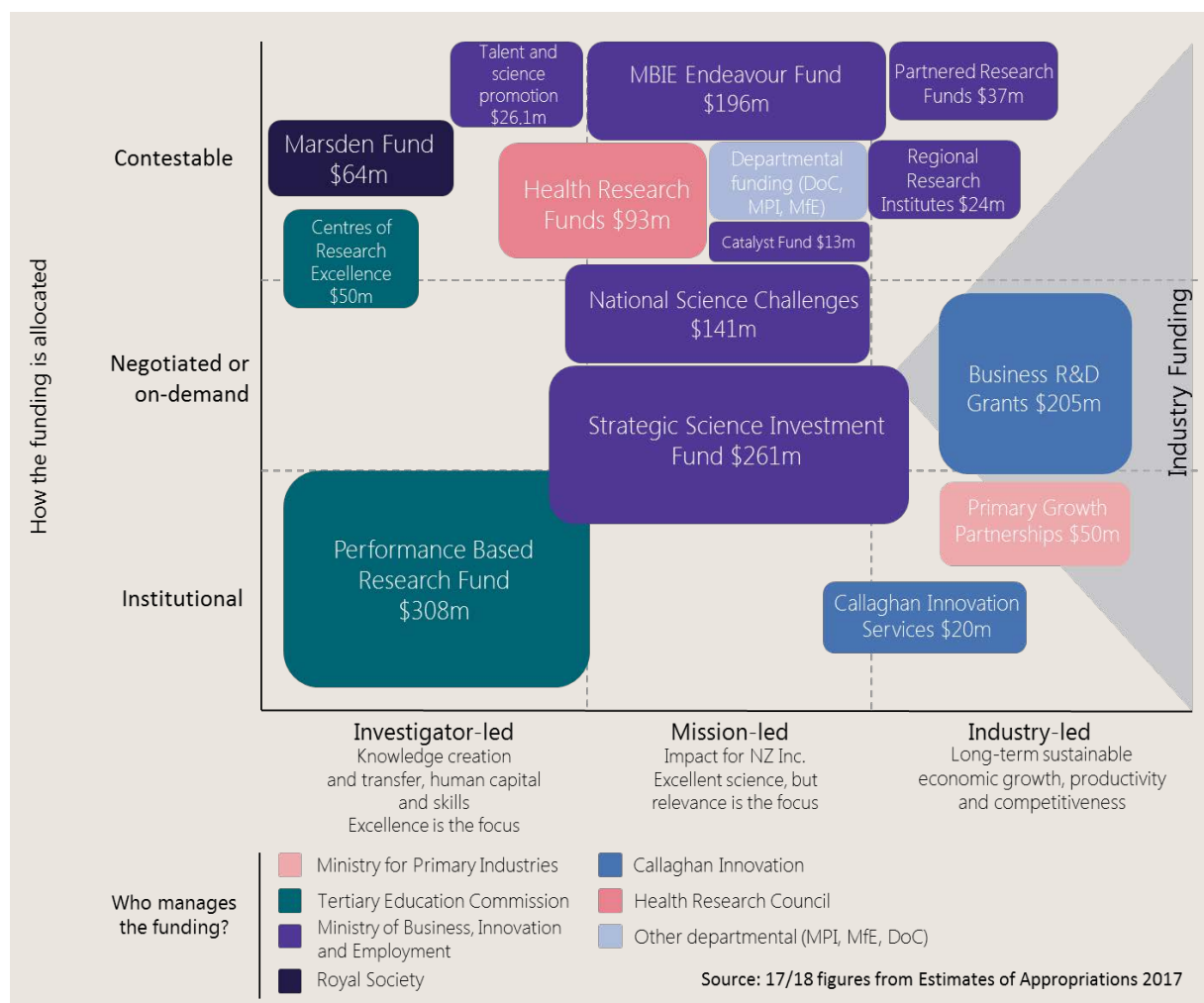
Role of the SSIF within the Science System

The SSIF is part of a suite of three funding instruments targeting mission-led or applied research that is expected to lead to impact over time.

Endeavour Fund. The Endeavour Fund supports discrete science projects through a contestable process that provides agility to respond to new opportunities. Through this Fund, the Government invests in excellent science that could be high risk but has potential impact in areas of future value, growth and critical need for New Zealand.

National Science Challenges (NSCs). The Challenges target eleven big challenges in New Zealand which, if successfully addressed by science, will have major and enduring benefits. They are cross-organisation, cross-disciplinary programmes. CRIs continue to use some SSIF funding to contribute to Challenges.

Strategic Science Investment Fund. The SSIF supports longer-term investment in underpinning science platforms. It is non-contestable and stable (in contrast with the agility provided by the contestability in the Endeavour Fund), and focussed on long-term capability to support priorities across the New Zealand science system.



The role of the SSIF in relation to wider government-funded science and innovation investments, by allocation method and type of investment. The diagram highlights the SSIF's relationship with other mission-led funds.

Principles Underlying the Design of the SSIF

A set of four principles guides the management of the SSIF. These principles frame the Government's objectives and key design features of the Fund.

Principle 1: The SSIF is a Strategy-Driven Investment

This principle reflects the strategic focus of the SSIF – that government is taking a stronger role in the management of this investment, and that the science sector can expect more clarity about what government is seeking.

The principle has three parts:

SSIF is strategy-driven. All investments align with this Investment Plan, which reflects a whole-of-system strategy (including the NSSI and other government strategic goals).

SSIF investments deliver a portfolio that meets strategic priorities, balancing across relevant spheres of impact, horizons and types of investment within the SSIF.

SSIF is a stable, longer-term investment to support capability that builds science strength and depth. SSIF investments provide sufficient surety of future funding to plan long-term for scientific activity to support New Zealand's economy, environment and wellbeing in priority areas.

Principle 2: SSIF Investments are Primarily Mission-Led

SSIF investments focus primarily on mission-led science. As described in the NSSI, mission-led science supports a clear goal, agreed between government and the research provider. Mission-led science is focussed on impact for

New Zealand, delivering excellent, relevant science.

The principle has three parts:

SSIF investments are primarily mission-led. The bulk of SSIF investment focuses on mission-led research, although provide some room for a 'pipeline' of investigator-led research, extension into industry-led research, and underpinning scientific services as appropriate.

SSIF investments deliver national benefit by enabling research, and supporting access to research and infrastructure across the science sector and to end users.

SSIF investments leverage an appropriate contribution. In particular, co-funding or other forms of contribution are required for investments with economic benefits where the beneficiary is clear, at a level comparable to other funding instruments in the system.

Principle 3: The SSIF is a Purchase Mechanism

The SSIF seeks to support critical mass and depth of scientific expertise, which requires stable investment streams and a strategic approach to managing the provider base, but also the ability to adapt as priorities change. This calls for a purchase-based approach, managed through a partnership between the government and SSIF providers.

The principle has four parts:

SSIF is focussed on purchasing science. The SSIF purchases science that advances strategic goals (which also build strength and depth in key areas). Whilst contracts are with organisations, it is the science or science platforms, not the organisation, that is being invested in.

SSIF is primarily a non-contestable, partnership-based mechanism. Investments are managed through a partnership between government and SSIF providers. However, where Government decides to invest in a new strategic priority, competitions may be used to test the market, in order to identify the best capability and fit for delivering the new priority.

SSIF is provider-neutral. Purchase decisions are made on the basis of best fit or best proposal rather than the organisation or individual providing the science. This drives the approach to investing in a new priority.

SSIF provides a mechanism to adapt the investment portfolio. The SSIF provides Government with the flexibility to adapt the portfolio as priorities change and opportunities emerge. Individual investments may be grown, shrunk, or halted altogether, and new investments may be made through the mechanism.

Principle 4: The Performance of SSIF Investments is Clear

Clear, comparable performance information is required to support the operation of a purchase mechanism, and to provide accountability for the use of the funds.

SSIF investments are transparent and high-performing. It allows Government to understand clearly what it is investing in, and to assess the overall size and performance of those investments.

Section 2:

Investment Signals



SSIF Programmes

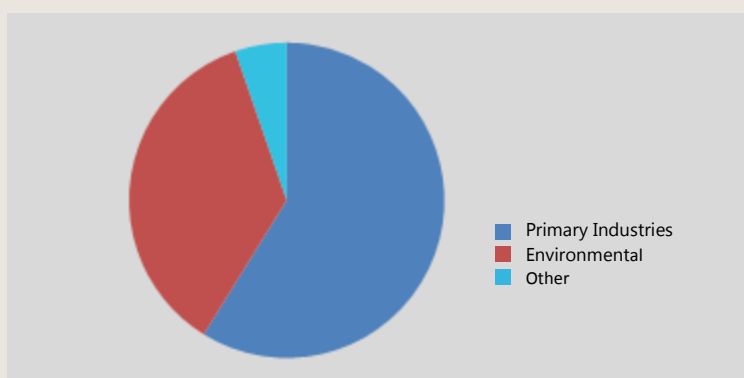
The SSIF investments deliver stability and the development of research capability in line with the Government's priorities for the science system. Therefore, the SSIF investment signals aim for gradual shifts in focus rather than quick, large-scale change.

Current Portfolio

The table on the following page describes the CRI and IRO-based platforms within SSIF Programmes for 2017/18. Each platform is defined by a title and a description. The examples that follow illustrate the unique contribution of each platform.

The funding identified is for 2017/18 (\$m, GST exclusive), and is supplied for information and monitoring purposes. Within the contract period, SSIF providers have the flexibility to shift funding between platforms, although the implications of substantial shifts will be explored as part of annual monitoring processes. Accountability focuses on achievement of the strategy set out for each platform, and the overall alignment of investments with the signals in this Plan.

Current investments are concentrated in the primary industries and environment sectors.



SSIF Programmes investments by sector. The diagram represents approximate allocation of research activity. There is overlap across these categories.

Each CRI has a Statement of Core Purpose that defines its scope of operations, and hence guides the scope of all investments in CRIs. The CRI platforms make significant contributions to their Core Purpose by supporting unique and deep capability in key research areas.

Whilst these platforms describe distinctive capabilities that exist in each research organisation, research is an interconnected activity, and organisations are expected to continue collaborating on areas of shared interest. For example, multiple research organisations have interests in biosecurity, freshwater management, climate change and understanding consumers, markets, and access issues.

In particular, as was previously the case for CRI Core Funding, CRIs must strategically align SSIF funding with National Science Challenges (NSCs) where NSC outcomes align with outcomes in the CRIs' Statement of Core Purpose.

CROWN RESEARCH INSTITUTES

INDEPENDENT RESEARCH ORGANISATIONS

AGRESEARCH	ESR	GNS SCIENCE	LANDCARE	NIWA	PLANT & FOOD	SCION	CAWTHRON	LASRA
Agri-food production Integrated platform of farm biome genomics, biosecurity, and decision-centric farm systems for sustainable livestock production eg genomics for improving performance while reducing emissions to the environment; supporting uptake of new practices and technologies \$28.1 m	Human and environmental health Prevent and mitigate infectious diseases, improve food safety, reduce water-borne contaminants, and improve the safe use of bio-wastes eg investigating the source of the drinking water contamination in Havelock North \$7.7 m Forensic science Advance the specialist expertise required to deliver reliable and independent science to the justice sector eg developing new forensic techniques, exploring the use of genomics in forensics \$1.5 m	Geological resources Sustainable management of geological resources for growth eg modelling geothermal and hydrological systems for sustainable use \$11.0 m Geological processes and hazards Understanding geological processes and educating risks and strengthening resilience to geological hazards eg improved earthquake risk models and mitigation \$11.3 m Nuclear and isotope science Nuclear science for industrial and environmental benefits eg air quality testing, creating new materials for enhanced sensor technology \$2.6 m	Land-based ecosystems Sustainably managing terrestrial species, habitats and ecosystems eg precision possum control, new ways to protect land-based biodiversity \$9.2 m Enhancing land use Measuring and managing land resources, and mitigating greenhouse gases and other environmental impacts of land use eg developing tools to manage soils and soil contaminants mitigating greenhouse gas impacts from land management practices \$8.3 m	Marine environment Deep understanding of coastal and oceanic environments, fisheries, seafood resources and aquaculture eg stock assessments, biodiversity and biosecurity \$16.9 m Freshwater environment Deep understanding of freshwater environments and the effect of human use and other factors on their quality and quantity eg setting nutrient limits, predicting water availability, biodiversity \$11.5 m Climate and weather hazards Understanding large scale weather and climate systems through numerical prediction techniques, monitoring and advanced measurement eg predicting extreme weather events and impacts, climate adaptation and mitigation \$14.3m	Plant-based food and seafood production Deep understanding of the biology and physiology of key economic plant and seafood species, their pests and diseases and interactions with the environment eg precision seafood handling and harvesting regimes, fast fruit-fly detection \$20.9 m Premium plant-based and seafood products Combining genetics, food and consumer science, and postharvest technologies to create value-added foods, beverages and other premium products eg new kiwifruit varieties, protecting consumers from seafood-borne illnesses \$21.8 m	Forest systems Sustainable intensification of tree production eg genetic improvement of trees, afforestation for marginal lands to store carbon and reduce erosion, managing fire risks \$7.2m Manufactured products from trees Developing high-value products from trees eg engineered wood products to improve building performance; polymers, chemicals and energy from trees \$10.2 m	Shellfish aquaculture Enabling, growing, and securing NZ's shellfish aquaculture sector \$3.0 m Seafood safety Managing pre- and post-harvest risks for seafood (market assurance and access) \$2.0 m	Export quality hides Improving cow and deer hides for export markets \$0.9 m

The CRI and IRO-based platforms within SSIF Programmes. The examples illustrate the unique contribution of each platform. 2017/18 funding is shown.

Investment Signals

This section sets out the investment signals that the strategies of existing and future SSIF providers should address.

Excellence and Impact

The strategies of SSIF providers should set out how they will deliver excellent science with impact. The following tables, from the NSSI describe excellence and impact.

WE UNDERSTAND IMPACT AS....

ECONOMIC	ENVIRONMENTAL	HEALTH & WELLBEING	SOCIAL
New/improved products and services	Reduced or mitigated environmental impact	Improved population health and health status for disadvantaged groups	Increased knowledge and interest in science
Reduced operating costs or commercial risk	Reduced or mitigated environmental risk	Reduction in health maintenance costs	Understanding of and resilience to real or perceived communal risk
New job opportunities	Improved condition of an environmental asset	Early detection and mitigation of health risks	Stronger social and infrastructure systems and improved techniques for delivery of public services
Improved business and industrial processes	Better understanding of the environment, and characterisation and management of natural capital	Improved wellbeing through development of human and social capital, and removal of institutional barriers	
Value extraction from existing science			
Improvements in public policy advice			
VISION MĀTAURANGA			
Indigenous innovation: economic growth through distinctive R&D	Taiao: Sustainability through iwi and hapu relationships with land and sea	Hauora/Oranga: improved health and social wellbeing	
Mātauranga – explore indigenous knowledge for science and innovation			

The NSSI framework for the evaluation of impact across the science system.

This impact framework will form the basis of a performance framework for SSIF platforms. It describes some of the areas in which we expect to see impact from science investments and will guide future investment decisions across all science investments. No ranking is implied.

WE UNDERSTAND EXCELLENT SCIENCE AS....

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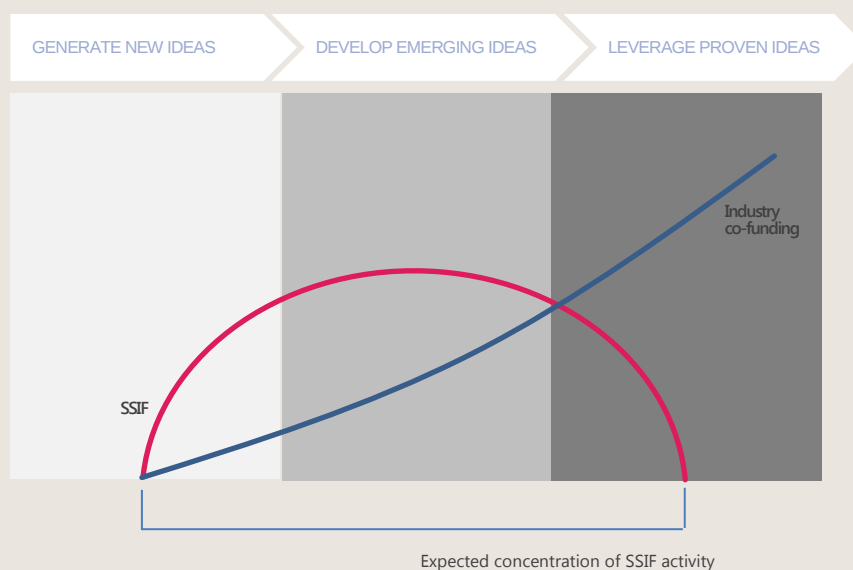
THE BEST PEOPLE	A RIGOROUS APPROACH	OPTIMUM RESULTS
Individuals, teams and institutions well placed and sufficiently skilled to do the research, who are sought after practitioners in their field, with reputations for high-quality work, and linked internationally and domestically.	Well-defined, repeatable methodologies and careful implementation. Transparency and stringent peer review. Best-practice approaches. Builds on existing approaches. Risks identified and managed.	Expansion and application of knowledge, wide knowledge dissemination, high reliability and repeatability, strong application. International reputation enhanced.

The NSSI description of science excellence. SSIF providers should have robust internal processes to ensure science excellence.

Horizons and Co-Funding

The NSSI also considers government-funded science investments across a horizons framework. Mission-led research can be delivered across a range of horizons to generate new ideas, develop emerging ideas, or leverage proven ideas.

Each platform will be managed as a portfolio of research, ensuring a strong pipeline so that new ideas can be developed into applied research that solves problems, often for near-term application. SSIF providers will set out how they will distribute their research effort across horizons, with a portion of this research effort directed to future-focussed research, disruptive technology and discovery science that create future opportunities for new and existing industries.



The NSSI horizons model as it applies to SSIF. SSIF funding will be targeted primarily at development of emerging ideas.

Appropriate arrangements should be in place for contributions from users of research. This will ensure that government investment is focussed on public benefit, to avoid displacing sector investments and to increase business investment in R&D.

Where the benefits accrue to individual firms or other end-users they are expected to meet an appropriate proportion of the cost. In particular, SSIF providers should ensure that industry-focussed research is appropriately co-funded.

SSIF providers should set out areas of SSIF investment that link to sector benefit, and a proposed approach to leveraging sector contributions.

Investing in People

SSIF platforms underpin the attraction, development and retention of talent and critical capabilities in the science system. The NSSI identifies investment in the best people as critical to the science system. Research organisations hold the primary responsibility for attracting, developing and retaining high-performing scientists and teams.

We expect SSIF providers to outline how each platform will contribute to capability development.

Vision Mātauranga

SSIF providers should outline how each platform reflects the approach laid out in Vision Mātauranga. The SSIF is a key opportunity for research providers to build a partnership with Māori based on meaningful engagement towards shared outcomes. This may include capability development within a platform as well as research and knowledge dissemination relevant to the interests of Māori partners.

Domestic and International Collaboration

SSIF providers should outline how platforms will leverage connections and be conducive to collaboration both domestically and internationally between research organisations and with sector end-users.

Domestically, there are multiple platform interdependencies, and some platforms have multiple contributors and areas of impact. Research organisations should collaborate frequently on areas of shared interest through arrangements such as joint projects or sub-contracting.

Summary of Investment Signals for SSIF Programmes

In summary, the strategy for each platform addresses:

- > The strategic plan and/or direction
- > The process to ensure the excellence of each platform
- > How the platform will deliver shorter and longer-term impacts
- > How research effort will be distributed across horizons
- > Appropriate arrangements for contributions from industry and other end-users
- > How the platform will contribute to capability development
- > How the platform reflects the approach laid out in Vision Mātauranga
- > How the platform will leverage connections and be conducive to collaboration both domestically and internationally between research organisations and with sector end-users.

SSIF Infrastructure

SSIF Infrastructure investments support national infrastructure platforms that provide access to research technology, facilities, infrastructure, Nationally Significant Collections and Databases, and associated support services.

Contracts with research infrastructures vary in approach and duration. This Investment Plan sets out next steps for current and planned infrastructure platforms.

In future, the Government will seek to inform research infrastructure capability development over a ten year horizon with a research infrastructure roadmap that will draw on the NSSI, other government strategies, and scientific or technological developments. The roadmap will consider research infrastructure demands in priority areas, cross-cutting issues such as data infrastructures, and inform future development of the SSIF Investment Plan.

Rationale for Direct Government Investment in Infrastructure

Government seeks to ensure sufficient access to infrastructure to support its vision for the science system and New Zealand's science and innovation priorities.

In general, investment in research infrastructure will continue to be supported through full-cost funding of science contracts, with institutions primarily responsible for developing and maintaining research capability. However, this approach does not always optimise development, access and use of large-scale research infrastructure. There are three general areas where there is rationale for specific government investment:

- > **Coordination failure:** there are challenges in coordinating the effort because of a high number of users
- > **Strategic investments:** infrastructure can be used to address path dependency problems – where an early investment can unlock new opportunities for New Zealand
- > **Positive externalities:** there are public benefits of infrastructure that extend beyond those who use it.

Investment Approaches

The Government has committed to a series of investment priorities in the NSSI and NSCs. The delivery of many of these is contingent upon ongoing access to high-quality research infrastructure. To serve these priorities, SSIF investments will be focussed first and foremost on ensuring this access to infrastructure.

The rationale for government investment in research infrastructure will be applied to the SSIF as follows:

- > Where investments address a **coordination failure**, the Government prefers to:
 - invest in partnership with as much of the relevant sector as possible
 - invest in seed activity and operations
 - exit investment once the sector is able to capture the benefits of the infrastructure, and a sustainable business model is developed.
- > Where **strategic investment** opportunities are identified, the Government prefers to:
 - invest in partnership with the sector
 - provide long-term co-funding for infrastructure access
 - revisit investment regularly to determine whether the strategic case remains or has changed.
- > For infrastructures that deliver **broader public or common benefits**, the Government prefers to:
 - invest in making the benefits of the infrastructure as widely available as possible.
 - require minimal direct cost recovery except that co-funding is required if value is captured by one or more parties.

Current Research Infrastructure Portfolio

NAME	DESCRIPTION	AMOUNT	
		2016/17 ACTUAL	2017/18
Advanced Genomics Research Platform	New research centre for the whole science sector that also grows excellent genomics research capability in New Zealand	-	\$5m
Australian Synchrotron	A particle accelerator that generates high-energy light, used for imaging and experimentation across many research disciplines. Located in Melbourne, Australia.	\$0.9m	\$0.9m + capital development
Enhanced Natural Hazards Monitoring	Geonet's hazard monitoring and warning capability.	\$3m	\$3m
Nationally-Significant Collections and Databases	26 long-term research resources including longitudinal climate data, herbaria, geological samples, land information and biobanks.	\$19.1m	\$19.1m
New Zealand eScience Infrastructure (NESI)	Supercomputing and support services for New Zealand research projects and programmes.	\$7.2m	\$7.2m
New Zealand Genomics Ltd (NZGL)	Genomics, bioinformatics and bioIT services for New Zealand research projects and programmes.	\$2.2m	-
Research and Education Advanced Network for New Zealand (REANNZ)	A high-performance broadband network designed to send large amounts of research data between researchers, without loss and at very high speed (1-100 Gb/s).	\$4m	\$3m
Research Vessel Tangaroa	A deep-water research vessel capable of operating in the EEZ and Antarctic ocean; enables New Zealand's offshore marine research.	\$4.6m	\$11.1m
Square Kilometre Array (SKA)	A proposed radio-telescope array (to be constructed in the Southern Hemisphere over the next decade).	\$1.1m	\$1m

Government Intentions for the Current Portfolio

The following investment signals focus on the current suite of national-scale research infrastructure investments. Investments will be reconsidered in line with these signals when contracts allow, and be informed by the planned roadmap for research infrastructure.

These signals will be maintained to ensure ongoing alignment with the NSSI, the Vision Mātauranga Policy and other relevant Government strategies.

Advanced Genomics Research Platform	Make a new SSIF investment in advanced genomics research capability. The Government is investing in a new cross-institutional research platform that will produce high quality research capability for the whole science sector.
Australian Synchrotron	Continue SSIF support: on the basis that it is fundamental research infrastructure and provides access to international facilities via collaboration with Australia. We will also engage with Australia on future opportunities to invest in growing the capacity or capability of the facility.
Enhanced Natural Hazards Monitoring	Make a new SSIF Investment: In early 2017, Government made an interim investment to enhance GeoNet and to prepare a case for a long-term geological hazards monitoring and advisory system. Budget 2017 includes \$19.5 million over four years to fund the implementation of a 24/7 national hazards monitoring service.
Nationally-Significant Collections and Databases	Continue SSIF support: consider future development and role in the science system. Contracts for the current set of Nationally Significant Collections and Databases hosted by CRIs expire on 30 June 2017. These contracts were renewed at 2016/17 investment levels. In late 2017, MBIE will begin a review of the scope and role of collections and databases in the science system.

New Zealand eScience Infrastructure (NESI)	Continue SSIF support on the basis that there is continued demand for supercomputing services from the science sector, and that it remains more efficient to co-fund fewer, high-performance, highly utilised facilities.
Research and Education Advanced Network for New Zealand (REANNZ)	Refocussed SSIF investment: Government has made a new investment in REANNZ that is strategic, science-focussed and targeted. It focuses on the specialist services and activities that enable data-intensive research and high-performance science applications.
Research Vessel Tangaroa	Continue SSIF support: the Crown provides funding for <i>RV Tangaroa</i> to operate for a number of days each year to support research that is assessed and funded elsewhere. The funding for <i>RV Tangaroa</i> enables NIWA to deliver voyages that meet multiple research demands, and to deliver strategic voyages for high-priority research.
Square Kilometre Array (SKA)	Participate in negotiations: The New Zealand Government is currently participating in negotiations to establish the Square Kilometre Array as a joint investment with other governments.

Excellence and Impact

Research infrastructure enables excellence and impact across the science system, including improved productivity and operation at greater scales.

Excellence and impact are defined as set out in the NSSI (see the SSIF Programmes section on page 14). The particular focus for each area is set out below.

EXCELLENCE

Expanding on the concept of “best people” in the NSSI definition of excellence, we wish to ensure that the investment is fit-for-purpose for users and builds valuable capability in the sector or industry.

IMPACT

Expanding on the definition of impact in the NSSI, impact for infrastructure will be assessed in terms of uptake by, usefulness to, and the impact and excellence of science done. Contributions to capacity development, international standing and broader economic goals are also relevant.

Co-Funding

Researchers and other users should typically expect to pay to access infrastructure so SSIF Infrastructure providers need to have appropriate pricing models. For new investments, co-funding and pricing models will be part of negotiations with MBIE.

Co-funding for research infrastructure is context-dependent; different cost-recovery and pricing models are appropriate depending on how the infrastructure delivers value to users and who the users are.

- > If government is investing to address a **coordination failure**, users would generally be expected to pay for services. Government would fund the coordination activities.
- > Where government investment is designed to address a **strategic opportunity**, government would support infrastructure services for a finite period to give the sector time to develop the capabilities and capacities to make full use of the infrastructure.
- > Where government is investing because there are significant **public good benefits**, users would generally be expected to pay a contribution.

The Future of International Research Infrastructure Partnerships

Future investments through the SSIF will be provider-neutral, meaning that the best way for the Government's investment to deliver research infrastructure needs may sometimes be through international partnerships and access arrangements.

The Government's aim is to form international partnerships that pursue flexible access terms beneficial to New Zealand and that support the ongoing development of New Zealand's international standing as an R&D destination. International research infrastructure partnerships should build on and support existing relationships as well as provide platforms for better connections with international science.

International partnerships will be particularly important for delivering future access to research infrastructure. However, all SSIF platforms should seek to leverage international connections and collaborations for maximum impact.

Summary of Investment Signals

In general, the strategy for each new and existing infrastructure platform will address:

- > The ongoing rationale for Government intervention, grounded in the NSSI and this Investment Plan. This will also be informed by a roadmap currently being developed for research infrastructure
- > How providing access to the infrastructure platform will serve Government priorities and the vision for a high-performing science system over the life of the investment
- > An approach to the evolution of the infrastructure investment over time, explaining how the investment will respond to technological or scientific developments. This may include provision for refreshed funding or a gradual or staged reduction in Government funding
- > Appropriate arrangements for co-funding, other contributions and/or a pricing model depending on type of infrastructure and expected end-users
- > Support for talent attraction, retention and development
- > How the development, access and use of the infrastructure platform reflects the approach laid out in the Vision Mātauranga Policy
- > A plan to leverage international connections and collaborations to benefit the broader science system and New Zealand.

Managing the SSIF Portfolio

New Platforms Under Development

The following platforms will be established over the term of this Plan.

The Advanced Genomics Research Platform

The Government is investing in a new cross-institutional research platform that will produce high quality research capability for the whole science sector. The Call for Proposals for this investment is now closed and the provider will be announced in 2017.

The new platform will grow excellent genomics research capabilities in New Zealand by building on and growing links to other world-leading genomics research centres around the world, maintaining effective relationships with New Zealand's genomics scientists and stakeholders, and by generating world-leading excellent research on genomics.

New Zealand has significant capability in bioinformatics and the interpretation of genomic information; we expect this capability to be leveraged into valuable outcomes including international collaborations.

Enhanced Natural Hazards Monitoring

During 2017, MBIE reprioritised \$3 million to invest in interim improvements to GeoNet's hazard monitoring capability. An additional \$19.5 million over four years was announced in Budget 2017, to enhance New Zealand's earthquake, tsunami and volcano monitoring capability. These investments will improve New Zealand's resilience and reduce the risk to life from tsunami, volcanoes, earthquakes and other hazards.

A Cabinet decision on how to deploy the additional \$19.5m funding will be informed by the outcome of a Business Case process currently underway, and by extensive discussion with science sector, civil defence and emergency management stakeholders. The likely outcome is investment in research, models, tools, expert staff and the development of operating procedures.

Responsibility for delivering this may sit across several organisations. There will not be an open Call for Proposals.

Upcoming Funding Opportunities

MBIE will explore options for the following additional SSIF investments over the term of this Investment Plan and will consider the most appropriate mix of programmes and infrastructure investments as part of this process.

Analysis and Computation of Big Data

The pace of data generation is vastly outpacing our ability to analyse and make good decisions. There are promising developments in artificial intelligence and autonomous data-based decision making, but these need to be adopted across complex systems in order to create social and economic benefits.

Creating value from this flood of data requires novel capability and breakthrough research, and connections to global centres of data innovation. New Zealand has strengths in some of the required disciplines, but more progress could be made through long-term investment in a coordinated national approach.

The Government will consider investing in a platform that delivers national research capability in big data and analytics. Current thinking is that the work will consider an approach focussed on analytics and computational developments needed for opportunities ten to fifteen years from now, and enhancing adoption in both the public and private sector.

Antarctic Science

Antarctic science is strategically valuable to New Zealand for international relationships and because it is a critical part of understanding climate change and how it will affect New Zealand. Antarctic science also supports international relationships such as the Antarctic Treaty System which requires members to contribute excellent science.

For these reasons, the Budget 2017 Innovative New Zealand package included \$21 million over three years, starting in 2018/19, for an Antarctic science platform managed through SSIF Programmes. The main purpose of the platform is to provide a stable funding environment for Antarctic research that safeguards New Zealand's strategic priorities in that area. MBIE has begun work to implement the platform.

Transition of Existing Investments

MBIE will release guidelines for contract renewals, monitoring and conducting reviews when required.

Contract Renewals

SSIF Programme investments: Capability funding contracts with IROs will transition to SSIF contracts that will end in 2024, in line with CRIs' SSIF investments. IRO SSIF contracts will begin on 1 July 2018.

SSIF Infrastructure investments:

- > MBIE will manage transition arrangements for NZ Genomics Limited, the contract for which ended on 30 June 2017.
- > A new contract with REANNZ will be developed to reflect the refocussed strategic investment.

In late 2017, MBIE will review the Nationally Significant Collections and Databases to consider their scope and role in the science system.

Further signals about investment in the Square Kilometre Array will be included in a future SSIF Investment Plan.

New Investments

New investments will be made when funding is reprioritised or when Cabinet makes new funding available.

The process for making new investments will be tailored to the nature of the investment. Most new investments will be made through a provider-neutral process to seek proposals from all parties with relevant expertise. The process would typically begin with a Call for Proposals and/or a call for Expressions of Interest.

Reviewing or Renewing Investments

SSIF investments will be reviewed prior to renewal or at stages specified in the contract. The process for these reviews will be agreed as part of contract negotiations. MBIE will issue further guidance on the review process when required.

SSIF Programme contracts will be reviewed after four years. The timing of these reviews may be coordinated if this creates efficiencies for providers. The reviews will assess strategic alignment and performance against the contract.

Performance Management of SSIF Investments

25 —

The fourth principle guiding the management of the SSIF requires that investments are transparent and high-performing. Performance monitoring of individual investments is set out in the funding agreements with providers.

During the process of finalising contracts MBIE works with SSIF providers to develop KPIs that enable governing bodies and MBIE to measure progress against the strategies for each platform. These KPIs set out measurable indicators at a platform level. The KPIs reflect the investment signals in this Plan.

MBIE and SSIF providers meet annually to discuss progress towards achieving the strategy for each platform and any changes to that strategy.



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