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# Submission to the Science System Advisory Group – Phase 2

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## Royal Society Te Apārangi: our role in the system

Royal Society Te Apārangi is an independent, not-for-profit organisation established with the statutory objective of advancing and promoting science, technology, and the humanities in Aotearoa New Zealand. The Society appreciates the opportunity to provide input on the future of the Science, Innovation, and Technology (SIT) system, noting that the views of our members and stakeholders are many and varied. In this light, we have encouraged individual members and groups to make their own submissions.

The Society strongly supports the ambition that drives the Science System Advisory Group’s review. A well-designed system that prioritises research excellence, nurtures talent across all career stages, and creates an enabling environment for discovery and innovation will position New Zealand to address its most pressing challenges while also creating new opportunities for our nation to flourish.

The Society envisages a future SIT system in which:

- Human skills and capability, and intellectual capital in SIT are recognised, nurtured, prioritised, and enabled to flourish as the key assets that will drive all aspects of the system.
- Māori are actively involved across the system in accordance with the principles of Te Tiriti o Waitangi, including in developing the potential inherent in mātauranga Māori, and sharing in the benefits of science innovation and technology.
- We leverage existing capabilities to reinforce and grow every stage of the research pipeline, from the generation of new knowledge and the advancement of mission-led goals to the commercial deployment of innovation and technology.
- Science, innovation, and technology are major contributors to the nation’s prosperity, the cohesiveness of society, and a future Aotearoa New Zealand that is guided and inspired by science and research.

In this transformative period, we advocate for a pragmatic approach that builds upon the successful elements of the current system while implementing the necessary reforms that are of fundamental importance to the future of the SIT system.

The Society has a strong track record of delivery and excellence in a changing environment – for example, in the investments we manage on behalf of the Government through the prestigious Marsden Fund and a range of fellowships and scholarships. Our commitment to excellence and rigorous processes, along with our independence and longevity, position the Society well to take a substantial role in the delivery of future funding instruments. We look forward to continued engagement in this process as changes to the SIT system take shape.

## People are at the core of the SIT system

A thriving research, science, innovation, and technology system that delivers positive sustainable growth and prosperity for New Zealand is a long-term endeavour that requires consistent funding and sufficient certainty for the high-performing people and organisations working within it.

Building world-class capability in SIT and achieving impact from it can take decades. Such capability is lost much more quickly than it is gained, and unnecessary uncertainty in the system can lead to the loss of highly skilled researchers and their valuable expertise. While a system with flexibility and agility is an attractive prospect – and one we should aspire to – decisions that impact capability need to be made with care and a whole-of-system perspective.

To attract and retain the best and brightest minds within the competitive global labour market, and for our young people to aspire to careers in SIT, we need to offer:

Stability. Consistent funding enables researchers to pursue ambitious, long-term projects without the destabilising influence of precarious employment or funding cycles.

Internationally competitive conditions. New Zealand must provide compensation, resources, facilities, and intellectual opportunities that rival our global competitors. Top researchers have worldwide mobility and will choose environments where they can maximise their potential impact.

Career paths with opportunities for growth. Our future research/innovation leaders need clear progression pathways that reward excellence and offer increasing responsibility, recognition, and leadership opportunities. Fellowships and scholarships that support career development at various stages are an important part of strengthening our existing SIT workforce and attracting the best minds to work in New Zealand. For example, the Rutherford Discovery Fellowships, and now the wider range of Tāwhia te Mana Research Fellowships, have resulted in a strong cohort of future SIT leaders by providing our best emerging scientists with certainty of funding and help to establish their careers in New Zealand.

### **Fostering broad research expertise**

New Zealand has enduring research institutions that have supported the building of world-leading human capability and know-how in many areas of research that are essential to the country's wealth and wellbeing. To prepare for unpredictable challenges and opportunities in the future, New Zealand needs to invest across all disciplines, including the social sciences and humanities. This is especially important if we want to extract the most value from our SIT investment; after all, to build trust and social licence and to fully realise the benefits of innovation and new technology, we need to understand how they impact our unique cultural and social landscape.

The Society supports a te Tiriti-led, equitable science and research system that fully recognises, acknowledges, and values mātauranga Māori as a knowledge system unique to Aotearoa New Zealand. The sector should not treat mātauranga Māori as an add-on to an existing system. Ideally, mātauranga Māori will be interwoven where relevant for an SIT system that benefits from the unique strengths of our different knowledge systems.

## Research prioritisation and selection need a long-term, systematic approach

The New Zealand SIT system needs a balanced portfolio of discovery, translation, and implementation, and the right balance between agility and stability.

- To generate new knowledge through basic or discovery research, we need to retain broad capability in areas that offer value to New Zealand.
- For mission-led, public good research initiatives, we need systems that identify issues that matter for New Zealand and to establish a robust research network through the Public Research Organisations and other organisations.

Decisions on research priorities and delivery for these different types of research should be made where the information–advantage lies. We would expect the overall, high-level prioritisation to be directed by the Government, with specific funding agencies distributing funds within their independent remit:

- The Government’s main role should be translating societal priorities at a high level into broad allocations of investment, and monitoring performance at a system level.
- Research institutions should be enabled to set their own strategies and priorities in line with their mandates. For example, the Public Research Organisations will need to have clear mission statements and sufficient resources to deliver research outcomes for the long-term benefit of New Zealand. These organisations should be able to influence and inform strategies for the prioritisation of their research funds.
- Long-term underpinning infrastructure should be sustainably and directly funded, separate to project funding, with appropriate checks and balances.
- Strategic investments in projects and programmes should have a strong component of negotiation, in line with organisational mandates and informed by relevant stakeholders.

To select priority research areas, we need to consider the long-term value proposition for New Zealand society. The most significant benefits of research often accrue indirectly, over long timeframes and at the intersection of multiple projects and different knowledge systems. Shifting to a more systematic lens, with an emphasis on intermediate indicators for research selection, such as intellectual and human capital development, can help realise the full value of public research investments.

Rigorous standards for individual projects are vital. Basic research undertaken solely for knowledge advancement should still be assessed primarily on quality and novelty. Mission-oriented research should be evaluated against long-term measurable goals. Throughout the SIT system, indicators of skill development, social and ethical considerations, advances in research techniques, and tools, talent mobility, and collaborative networks can be used alongside traditional academic metrics.

## Mechanisms to fund the research pipeline from start to finish

### **A high-performing SIT system needs stability**

Public investment needs careful scrutiny, and research funding should be carefully allocated to maximise the benefit to our communities. The Society strongly encourages the SSAG to consider any changes to funding mechanisms for the SIT system with a long-term perspective. Disruptive change must be carefully considered at a time when the system is already under financial stress.

Research, science, and innovation are long-term endeavours and the research infrastructure to support them has been established over many years, but could be easily and irreversibly lost. People and organisations working within the system need continuity, certainty, and sufficient long-term investment to achieve agreed objectives.

Most importantly, in an environment of constrained research funding, major structural change would be a significant cost to the system. New Zealand has substantial existing assets, organisations, and capability for making rigorous funding decisions. Scarce resources should be directed towards enabling research for the public good, instead of expensive change processes.

### **Different funding agencies and instruments serve different purposes**

It is important that the Government is able to set high-level priorities for the SIT system, ideally following a non-partisan process and a long-term vision. An overarching entity with representation from across the relevant parts of the research system could set and monitor long-term research priorities. It should not operate funding mechanisms.

Decisions about the allocation of research funding need to be independent to enhance the credibility of research outcomes and ensure public trust in the research system. Funding agencies must maintain rigorous evaluation and selection processes, which should be tailored to the different goals of the research, whether fundamental or mission led. With the dissolution of Callaghan Innovation, funding instruments and processes are now primarily shared between MBIE and two independent agencies, and change to these would attract significant transition costs. The Society, which administers the Marsden Fund and a suite of prestigious fellowships, has an excellent track record and could offer solutions for the independent administration of additional funding instruments.

### **New Zealand needs a balanced portfolio of funding instruments to support different types of research**

Investigator-led discovery research is driven by a contest for ideas and creation of new knowledge across all SIT disciplines. Such basic research provides an essential foundation for development of human capital across the SIT system, especially in universities, ensuring excellence in SIT, international reputation for New Zealand, and connection to global, leading-edge science and engineering. Such research, and the infrastructure to support it, needs to be publicly funded as it will generally not be undertaken by the private sector until any potential economic returns have been quantified. In this context, contestability is a driver of efficiency and effectiveness in the system and has dominated many of the SIT investments. Contestability is useful when investing in short-term projects designed to generate new ideas, such as through the Marsden Fund. Competition in this context drives excellence, new participation, and new entrants. Competitive processes for awarding Fellowships and other types of individual career awards also drive excellence and add value.

The driver of research and innovation designed to generate innovative high-value products, technologies, services, or cost-savings is economic growth. This activity generally requires tax incentives and/or grants to incentivise R&D that would not otherwise take place, along with services to businesses that can be provided more efficiently and effectively by the Government. To grow the economy in this way, the Government also needs to enable a strong pipeline of human and intellectual capital, especially in engineering and technology, as well as in entrepreneurship, supportive regulatory reform for new industries, and policies that attract and make it easy for knowledge workers and their families to come to or return to New Zealand.

Mission-led research is increasingly multi-disciplinary. Any funding changes would need to support the development of productive, genuinely integrated teams, while recognising the distinct characteristics that vary according to field:

- Research on environment and hazards aims to understand and protect our natural environment, and to ensure sustainable use of our land, water, and natural resources, including in relation to our primary sectors and management of our exclusive economic zone. This type of research offers an opportunity to build on New Zealand's core strengths in climate, energy, resilience, and a range of high-tech sectors. End-users include local, regional, and national governments, iwi, Pacific Island countries, and organisations focused on emergency management, biodiversity climate change, and other environmental risks. This research, and the infrastructure to support it, should be primarily publicly funded since the private sector will not undertake this work.
- Research on social issues, education, health, and clinical practice aims to improve the health and wellbeing of our population through improved public policy and guidelines. End-users sit in government, the health sector, iwi, non-government organisations, and the broader community. This research, and the infrastructure to support it, should be primarily publicly funded as the private sector will not undertake all the necessary work.
- Primary sector research aims to provide efficiency and effectiveness in developing and distributing valuable intellectual property where individual industry players are unlikely to be willing or able to fund all the necessary research themselves. Primary-sector industries should contribute some of the cost of this R&D given that they capture value from its ultimate use.

## How can we identify high-risk/high-reward research?

Given the rapid and non-linear pace of developments in research, technology, and innovation, high-risk/high-reward research can rarely be identified in advance. New Zealand's current research investment environment is risk averse, but we need to invest in early-stage innovation to create high-value opportunities. Not all high-risk research will yield high rewards, and the rewards differ for different types of research investment.

Investigator-led research taps into the direct understanding of emerging opportunities from researchers who have the connectivity and networks to recognise the most promising research avenues. The best new ideas should be identified through a highly competitive process with independent assessment of proposal quality by means of peer review and careful evaluation of quality and track record.

In contrast, strategic investments in mission-led research to serve the public good should be driven by organisations (e.g., Public Research Organisations and other research entities) according to their specific mandates, and be informed by negotiations with relevant stakeholders and potential end-users of the research.

## National infrastructure and data underpins the SIT system

Investment in our SIT system should be reinforced by long-term monitoring and evaluation at a system level to ensure we recognise opportunities and risks as they emerge. This needs to be supported by freely available, comprehensive, high-quality data. We need consistent planning and a long-term investment mechanism for valuable infrastructure, data, and monitoring projects.

Infrastructure. Coordinated, strategic investment in national research infrastructure is an absolute necessity. New Zealand has limited research resources and, if we invest in valuable tools and infrastructure, we need to extract the most value from that investment. To do so, we need a mechanism to identify, fund, and share high-value equipment. This could be in the form of service cores or hubs that provide critical instrumentation and technical expertise that can be accessed by all researchers, not just those from the host institution.

To further extend our research capability, contributions to large, international infrastructure projects to ensure access for New Zealand researchers should be part of the system-wide approach to infrastructure investment.

Data storage. A national framework and approach to data would be highly beneficial. Within this context, there needs to be careful thought given to data storage and its resourcing to ensure we don't lose critical digital and non-digital data. Data and information acquired through Crown funding should be made publicly available unless there is a good reason otherwise (e.g., personal privacy, iwi/hapū-owned data, or national security).

Databases and collections. Biological collections, taxonomic research, and their associated databases provide the scientific baseline for New Zealand's unique biodiversity of both native and introduced species. They allow New Zealand to sustainably manage and protect its natural resources and economic opportunities, and define our nation's unique cultural icons. Museums, archives, and libraries preserve and facilitate access to their collections of artworks, objects, and documents, which are often managed through databases for long-term investment and access.

Long-term monitoring. To make informed policy decisions, respond to trends, and plan for the future, we need to invest in longitudinal studies. The world-leading '[Dunedin Study](#)', which has tracked health, development, and wellbeing of New Zealanders for 50 years, shows what can be achieved with

consistent funding. Investment in long-term monitoring of our health, climate, environment, natural hazards, and communities would provide evidence for decision-makers and help ensure we are prepared for the future.

## The future of SIT in New Zealand

Structural change is expensive and disruptive and, in the short term, will reduce productivity and our ability to retain our best and brightest scholars and innovators. If SIT funding is to be rationalised, it is important that the long-term improvements justify the short-term risks, and that inevitable costs are not funded using existing science and research budgets that would otherwise be invested in excellent research.

Change must be introduced carefully to ensure human capital and valuable expertise are protected throughout the change process. The SIT system needs to make good use of existing assets and capability to minimise transition costs. The Society has a strong track record of delivery and rigorous processes. Our commitment to excellence, and our independence and longevity, positions us well to take a substantial role in the delivery of future funding instruments.