SCIENCE & TECHNOLOGY AUSTRALIA POLICY SUBMISSION

26 March 2025

2026 NATIONAL RESEARCH INFRASTRUCTURE ROADMAP – RESPONSE TO INITIAL SURVEY

Science & Technology Australia (STA) thanks the Department of Education for the opportunity to respond to the initial survey to inform development of the 2026 National Research Infrastructure (NRI) Roadmap.

STA is the peak body for the nation's science and technology sectors, representing over 140 member organisations and more than 235,000 scientists and technologists. We connect science and technology with governments, business and the community to advance science's role in solving some of humanity's greatest challenges.

We are proud that Australian research punches above its weight in research, with 3-4% of publications annually for just 0.3% of the world's population. And this is just one key metric of our impact. This would not be possible without us having access to the state-of-the-art tools, with strategic investments ensuring we maximise returns by shared facilities, timely equipment upgrades, and high-quality research training.

STA acknowledges the Australian Government's deep investment in NRI across a wide range appropriations and programs, most notably NCRIS, MRFF, LEIF as well as Australia's publicly funded research agencies (PFRAs), including but not limited to CSIRO, ANSTO, Australian Antarctic Division, Geoscience Australia and the Bureau of Meteorology. We welcome the 2026 Roadmap explicitly recognising the NRI landscape beyond NCRIS.

The National Science Statement acknowledges NRI's essential role in supporting the breadth of Australian research. Government's strategic investments in NRI ensures Australian researchers have access to the state-of-the-art tools, facilities and services critical to maintaining our world-class research capability. It also maximises the investments made through the Australian Research Council, the National Health and Medical Research Council, Department of Defence and other research funding programs by ensuring researchers have the tools at hand to effectively carry out their research projects.

Also critical is supporting Australia's involvement in international research infrastructure organisations/consortiums. These are critical to Australian research needs and are not possible in Australia or with our budget alone. These include enabling access to large-scale global infrastructure (e.g. telescope arrays) or global-scale research endeavours (e.g. ocean exploration and sampling programs). These sorts of initiatives require long-term (10 years+) funding to deliver certainty for procurement of hardware and feasibility for long-term research programs.

While not often formally acknowledged as NRI, we also note the critical Government-funded longitudinal and administrative datasets that are clearly national research assets. These include but are not limited to: the Australian Census; the Household, Income and Labour Dynamics in Australia (HILDA) Survey; Building a New Life in Australia (BNLA); Longitudinal Study of Indigenous Children (LSIC); Longitudinal Study of Australian Children (LSAC); National Assessment Program – Literacy and Numeracy (NAPLAN); and the Australian Early Development Census (AEDC).

NRI delivers many benefits that extend beyond the research. The complex work in establishing and operating these facilities delivers jobs, supports communities and boost innovation. For example, while CERN is most famous discovering the Higgs boson, it also realised major innovations in magnets and super conductors that have revolutionised cancer treatment and high-field Medical Resonance Imaging (MRI).

NRI needs across Australia's research sector

STA acknowledges the survey's attempt to align NRI planning with established current Government frameworks and priorities. It is critical that planning for Australia's underpinning NRI has an eye to these, however we note that this approach may fail to recognise the truly underpinning and cross-cutting nature of many NRI capabilities. Research infrastructure is acknowledged in the National Science Statement as an 'underpinning capability' rather than a national science or research priority in itself – as such, it enables the research at the most practical level, and it is the research itself that aligns with the priorities.

Given the broad underpinning nature of NRI, we have taken the approach to focus on the breadth of NRI system needs and then mapped these to the survey's framework.

Characterisation

All STEM research depends upon an ability to examine and understand the physical, biological and chemical structure of our world at a variety of scales – from planetary scales through to the nanoscale. The underpinning NRI capabilities needed to enable this deep understanding includes microscopy, imaging, particle accelerators and medical tools crucial to developing cell therapies and drug development.

It will be critical for the Australian community to map the current and emerging modalities and resolution needed for emerging research and increasingly pivot NRI investments towards these.

It would be prudent for the Roadmap to explore Global Research Infrastructures (GRI). In some areas, accessing existing global infrastructure or partnering in emerging areas may be more cost effective for Australia than establishing these locally e.g. quantum microscopy, CERN, the potential forthcoming Future Circular Collider.

Environmental, planetary and space monitoring and exploration

Understanding our world

Understanding our planet and its atmosphere, hydrosphere, biosphere and cryosphere is essential to tracking and understanding environmental change, climate and weather forecasting, disaster preparedness and mitigation, agricultural applications and biosecurity. There is a clear national need for sustained, accurate, and broadly distributed infrastructure including sensing arrays and monitoring devices on a variety of scales and perspectives – ranging from systems enabling satellite observations of the planet and observations of Earth's interior, to weather stations and stream gauges and the fleet of marine vessels that supports atmospheric and marine research.

Australia is also reliant on global data and infrastructures, such as deep ocean vessels. Given uncertainties in investments, especially by the US and China, Australia must consider alternatives to support its planned research activities.

Understanding beyond our world

The range of infrastructure required to look beyond our own planet and better understand the universe is often of a global scale. Australia plays a key role in several global collaborations, due to our unique geography and research capabilities. These include optical and radio telescope arrays and gravitational and cosmic sensing equipment.

High performance computing (HPC) and data

HPC and data capability underpins research across all STEM disciplines, and as applications deploying ever-growing datasets and artificial intelligence (AI) processes continue to expand across research fields, this need is only going to grow. HPC is also critical to several areas of Government business, with deep capability embedded in the work of several Government departments, including the Bureau of Meteorology and Geoscience Australia.

Some research is unique in that it requires significant compute/software capability collocated with enormous datasets. The complexity of work means it can not be done on institutional or commercial systems (Tier 2 systems) and requires an NRI-scale high-performance computing (HPC) and data capability, known as Tier 1. These areas include high-resolution climate modelling, atomic-scale modelling (e.g. particle physics, drug discovery) and fluid/aerodynamics modelling.

Both Tier 1 and Tier 2 systems are required to effectively support Australia's research sector. Combined with AI they can both be transformative, and required, for Australia's future research capability, from astronomy to complex, multi-modal modelling in health, agriculture and medical.

Like many IT systems, HPC systems have a 4–5 yearly lifecycle, requiring mid- and full-cycle capital injections to maintain capability. This is in addition to operating costs, e.g. people and significant volumes of water and power (i.e. at the scale of suburbs).

It is critical we maintain sufficient, predictable and capable underpinning HPC and data capability - separate to consideration of digital research infrastructure - as it is ubiquitous to Australian research.

Digital research infrastructure

As AI extends to nearly every endeavour of research, the need for bespoke, tailored applications will continue to expand. Similarly, all areas of research are becoming increasingly data-intensive, creating the need for streamlined and consistent data management systems, as well as the expertise to manage them.

Future NRI data engineering capability should be positioned help to manage and synthesise national and global large data sets, such as omics data, to effectively leverage advances offered by AI. This will be enabled by the deployment of relevant models and software, often adopted from global sources and collaborators.

As data and digital tools become increasingly critical to research, investments to continue to develop consistent data standards and metadata will be critical to leveraging large datasets as individual research projects is insufficient to consistently support this.

While researchers and their projects must develop their own code and algorithms for projects, a level of coordinated code optimisation support would ensure code runs most efficiently, from a speed and energy-utilisation perspective, and leverages AI where possible. While there should be a level of user-pays in this capability, steady capital is needed to ensure a stable workforce.

Prototyping and testing

Research can often call for unique and specific equipment and devices, tailored to experimental purpose and design. Research infrastructure to meet this need is another critical capability for Australia's research sector – facilities supporting the ability to design and build these highly specialised tools and equipment. It's also critical to be able to develop prototype materials and devices and test them under a variety of extreme parameters.

Medical research and the development of new drugs and therapies also depends on having the capability to test disease models and drug development on both animal (and non-animal) models, develop and test new med-tech devices and applications as well as explore potential drug and therapy pathways.

Boosting industry development

Another aspect of research infrastructure the 2026 Roadmap development process should explore is how research infrastructure supports early-stage industry development. In this context, the term 'research' infrastructure can be superficially somewhat of a misnomer, as 'research' is often taken to mean fundamental, discovery-stage research. However, research infrastructure often extends into the development end of the research and innovation spectrum. When considered in the broader concept of research and development (R&D), it's clear that there is huge opportunity to deliver a stronger focus on the 'D' end of R&D as to complement the support given to discovery research.

A specific standalone funding program for this – akin to an 'industry-focused NCRIS' – would be transformative for boosting Australia's industrial base. This is particularly pertinent given the Strategic Examination of R&D's strong focus on ways to boost business R&D investment.

The types of infrastructure required would include the targeted provision of early-stage prototyping capabilities, digital modelling/AI capabilities and med-tech, drug and therapeutics development.

NRI Workforce

While researchers' own skills and training should continue to be borne by researchers and institutions, especially data and digital skills, there is a level of training and support needed for researchers to effectively access NRI.

Mapping NRI needs to the 2021 Roadmap Challenge Framework and National Science & Research Priorities

		Prototyping and testing	**Digital research infrastructure**	**HPC and data**	**Environmental, planetary and space monitoring & exploration**	**Characterisation**
2025 National Science & Research Priorities	Transitioning to a net zero future	X	X	X	X	X
	Supporting healthy and thriving communities	X	X	X	X	X
	Elevating Aboriginal and Torres Strait Islanders knowledge systems		X		X	
	Building a secure and resilient nation	X	X	X	X	X
	Protecting and restoring Australia's environment		X	X	X	X
2021 Roadmap Challenge Framework	Resources Technology and Critical Minerals Processing	X	X	X	X	X
	Food and Beverage	X	X			X
	Medical Products	X	X	X		X
	Defence	X	X	X	X	X
	Recycling and Clean Energy	X	X	X	X	X
	Space	X	X	X	X	X
	Environment and Climate		X	X	X	
	Frontier Technologies and Modern Manufacturing	X	X	X	X	X

Securing NCRIS sustainability and integrity

Finally, we note the criticality of this Roadmap for the future of NCRIS. The significant 11-year investment for capital uplift provided in 2018 is due to end in the coming years. This Roadmap will be key to building the business case for another significant injection of capital investment – the ongoing base funding established through the 2015 National Innovations and Science Agenda (NISA) will not be sufficient to even keep the lights on in the current suite of NCRIS-funded facilities.

The Roadmap must also be sufficiently forward-looking and expert-informed to deliver a confident and robust plan for the next decade – and stick to it. NCRIS is a highly successful grants program, and the envy of many other countries. Its process of developing Roadmaps to set strategic direction to guide regular Investment Plans to allocate funding accordingly works well – in theory.

In practice, the process has resulted in a near-constant cycle of consultation with the sector, with priorities and decision-making seeming to be in an almost constant state of flux. Delays to 3-year Investment Plan cycles, scoping studies not undertaken and decisions to postpone certain NRI investments (notably for HPC) have resulted in a lack of certainty and sustainability for facilities. This has disrupted facilities' ability to plan and conduct long-term procurement of capital and secure the highly trained technical workforce essential to run facilities and equipment. Parcelling NCRIS funding in separate streams to fund 'step-change' capabilities has not delivered an efficient funding boost to secure leading-edge capabilities – rather, the original Roadmap intent and strategy is diluted and the available funding is distributed in a piecemeal manner. Additionally, the current NDRI process has led to competitive bidding for grants which goes against the collaborative intent of the program and impacts strategic planning. Ultimately this compromises the scheme's overall efficacy and level of support delivered to the research sector.

A key challenge for the Roadmap, and the subsequent Investment Plan, will be balancing the ongoing current and foundational NRI capabilities, e.g. Tier 1 HPC, while responding to emerging areas of research opportunities and advances in NRI equipment, e.g. new forms of microscopy. As noted, it's also the opportunity to secure a new investment in an industry aligned stream of research infrastructure to transform Australia's industrial base and boost business R&D investment.

A strong way forward would be for the Roadmap to identify the functional capabilities Australia's research sector requires, articulate what Australia's current NRI landscape offers, and identify any gaps between those research needs and the current capabilities. These should be at a sufficient level of detail to inform investment and implementation discussions. Future Investment Plans should be directly correlated to the needs articulated in the Roadmap, and simply lay out the specific investment details for capabilities to relevant research infrastructure facilities / organisations – not seek to identify new capabilities beyond those identified in the Roadmap. We need to stop consultation fatigue and unnecessary competition.

While the Roadmap should indeed look beyond NCRIS funded entities to the broader NRI landscape, it must also be clear on the delineation between the various NRI funding sources. Seeking to fund all things identified in the roadmap through Investment Plans, which have primarily focussed on NCRIS, creates a tension between the strategic document and its implementation – and runs the serious risk of seeking to allocate NCRIS funding overly broadly and thinly than is sensible or efficient.

Equally, the Roadmap should be the 'guiding star' for investments across other portfolios, agencies and NRI funding programs, including, but not limited to, the public funded research agencies and the MRFF's National Critical Research Infrastructure initiative.

We look forward to working closely with Government on the important Roadmap work during 2025.

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