Please note: the substantive content of the 2026 NRI Roadmap Survey begins at Question 20 (with prior questions dealing with administrative and other information).

As such all submissions that are published include the responses submitted from Question 20 onwards only.

Q20.

Part 2: Research themes

2.1 NRI comprises the assets, facilities and associated expertise to support leading-edge research and innovation in Australia and is accessible to publicly and privately funded users across Australia and internationally. We are seeking your input on possible directions for future national-level investment - i.e., where the requirements are of such scale and importance that national-level collaboration and coordination are essential.

The 2021 Roadmap used a challenge framework to support NRI planning and investment. With this in mind, consider likely future research trends in the next 5 - 10 years, and with respect to one or more of the 8 challenge areas identified in the 2021 Roadmap as listed below:

- describe emerging research directions and the associated critical research infrastructure requirements that are either not currently available at all, or not at sufficient scale and
- describe current national infrastructure requirements that you anticipate will no longer fit the definition of NRI in 5-10 years.

Do not limit your commentary to NCRIS funded capabilities.

Q21.

Resources Technology and Critical Minerals Processing

Research facilities for Extractive Metallurgy (mineral processing, reduction and smelting) will become important for Australia's research sector to add value to the resources sector as increasingly marginal and/or unusual ore bodies require treatment. Demand for rare earth metals such as neodymium, praseodymium, and dysprosium etc. will rise significantly over the decades ahead as the electrification revolution takes place. As more and more electric motors are needed for a wider range of technologies from drones to wind turbines to all manner of vehicles, Australia needs to have a research facilities and industrial capacity to leverage our natural resources. Critically, research facilities that enable alignment between Australian mine product to the manufacture of permanent magnets will be important. Automation will continue to develop rapidly to offset operating expenditure and enhance productivity in these industries. Compute, AI and prototyping of robotic technology will be important.

Q22.
Food and Beverage

Food and fibre production, processing, distribution and consumption are under increasing scrutiny. Positive digital technology and innovation will result in a competitive, transparent, resilient and profitable agriculture and food sector. This transformation will require considerable new investment and capacity in agricultural research and development.

Q23.
Medical Products

This is an enormous area deserving of careful analysis and consideration. Universities like Sydney are investing heavily in initiatives such as the Sydney Biomedical Accelerator (SBA), partnering with the Sydney Local Health District to deliver a 'bench to bedside' approach to medicine and medical products. There is strong interest in the SBA and beyond in personalised medicine, including patient-specific solutions. Research facilities that make these health paradigms scalable and economically viable will thrive. Thus, our facilities must support successful drug design, cyclic peptide development, and cutting-edge cell and gene therapies, which are pivotal for treating complex diseases. These facilities should be Good Manufacturing Practice (GMP)-compliant to enable Phase 1 and Phase 2 clinical trials, ensuring promising therapies can transition smoothly to industry partners who can drive them through higher trials, fostering innovation and economic growth in the medical sector. As is also referenced below, NCRIS has already spawned successful models for national grid of shared infrastructure and examples include Microscopy Australia, NIF and ANFF. These models work very well and Australian researchers are used to them. We need to leverage this model for research facilities for medical products (e.g. a national 'Molecular Foundry') or the like that leverages investments in the research facilities that will exist in the SBA and connects them to other nationally significant facilities with a view establish porous grid-type structure that gives researchers access to a wide variety of research capability. Connectivity will be key—a one-stop shop will not work.

Q24.
Defence

Alignment between defence priorities and research facility roadmapping will continue to be important. Some dedicated effort to facilitate this alignment is called for so that medium and longer term defence considerations can feed into the planning of what NCRIS facilities do and how they operate. For example, clarity on the security arrangements required to underpin the digital and physical research infrastructure will be helpful to enable partnerships that deliver more, together.

Q25.
Recycling and Clean Energy

Research facilities that enable Australia's net zero agenda will be critical. Specifically, research facilities that enable innovation in demand reduction (new products and processes that consume less energy or result in lower emissions), climate change risk (new approaches to the assessment of the risk posed by climate change to the built environment), and greenhouse removal (development of low-cost and effective processes to remove carbon dioxide from the atmosphere and securely store that carbon dioxide) will be important to plan for.

Q26.
Space

Space health is a burgeoning area that Australia could contribute to and an area where a careful analysis of the research facilities and the attributes of the study are needed. Over the decade ahead, it is easy to imagine that new space research facilities focused on enhancing sovereign capability in rocket design and manufacture will become critically important for Australia. Access by researchers to hot fire test facilities and launch sites will be of particular interest. Hot fire test facilities are critical for developing and refining rocket engines, allowing engineers to test propulsion systems under real-world conditions, troubleshoot designs, and ensure reliability—key for independent space technology advancement. Launch facilities, tailored for both suborbital and orbital missions, would enable rapid prototyping, testing, and deployment of domestically built rockets, reducing reliance on foreign infrastructure. These investments would bolster national expertise, drive innovation in materials and propulsion, and secure a strategic edge in space exploration and defense, all while fostering economic growth through a robust domestic space industry.

Q27.

Environment and Climate

Notwithstanding the above comments on net-zero and clean energy, research facilities that enable studies of the environment and climate will remain critical. From desert ecology to rainforests, we need ongoing access to data and facilities that enable temporal analysis at increasingly higher geospatial and analytical resolution. TERN, IMOS and Auscope are particularly important in this regard.

Q28.

Frontier Technologies and Modern Manufacturing

Open facilities that enable researchers and end-users to access facilities at low-medium TRL will be critical to develop a capable workforce, and drive innovation in this area. Using either the Microscopy Australia model or the ANFF model, we need a new research facility for modern manufacturing that provides access for researchers to a mix of industrial grade and research grade 3D printers and post-processing workflows. Such a national facility could come together relatively easily, leveraging the recent investments by universities and creating a national grid that, like the aforementioned facilities enables porous access by research across the higher ed sector, PFRA's, and industry. Ongoing support of facilities that are working well in this area such as ANFF and Microscopy Australia will be important.

Q29.

2.2 The 2024 statement of National Science and Research Priorities (NSRPs) includes outcomes linked to each priority to assist in identifying critical research needed in the next 5 to 10 years.
Consider the priority statements and, with respect to one or more of the 5 priority areas as listed below:

- describe emerging research directions and the associated critical research infrastructure requirements that are either not currently available at all, or
- not at sufficient scale and describe current national infrastructure requirements that you anticipate will no longer fit the definition of NRI in 5-10 years.

Do not limit your commentary to NCRIS funded capabilities, and where relevant, refer to the underpinning outcomes and research identified in the NSRPs document.

Q30.

Transitioning to a net zero future

Transitioning to a net zero future hinges on advanced research infrastructure to support critical areas like demand reduction, climate change risk, and greenhouse removal. As noted, facilities enabling innovation in demand reduction (new products and processes that consume less energy or result in lower emissions), climate change risk (new approaches to assessing risks posed by climate change to the built environment), and greenhouse removal (development of low-cost, effective processes to remove and store carbon dioxide) are essential. These require specialised infrastructure, much of which is absent or under-scaled in Australia, while some current national research infrastructure (NRI) may not fit future needs in 5-10 years. For demand reduction, infrastructure must support research into energy-efficient products and processes. High-throughput materials synthesis labs are needed to develop low-energy materials paired with pilot-scale manufacturing plants to test scalable production. Hot fire test facilities, expanded for low-emission propulsion (e.g., hydrogen or biofuels), are critical but scarce. These require integrated emissions analysis suites and high-performance computing for process optimisation—capabilities beyond most existing NRI, which often lacks industrial-scale testing. In climate change risk, assessing built environment vulnerabilities demands large-scale environmental simulation chambers to replicate extreme weather—floods, heat, and fire—on full structures. These facilities, absent at sufficient scale, need coupling with digital twin platforms and real-time climate data feeds for predictive modeling. Current NRI, like basic sensor networks or small testbeds, falls short of this integrated, dynamic capacity and may become obsolete as multi-hazard simulation becomes standard in a decade. For greenhouse removal, infrastructure must enable CO_2 capture and storage research. Pilot-scale direct air capture (DAC) plants with high-capacity sorbent testing rigs are vital for low-cost removal, yet unavailable nationally. Geological storage labs with accelerated mineralisation testing are equally critical for secure sequestration, requiring advanced spectroscopy and subsurface modeling tools not yet at scale. Existing CO_2 monitoring stations, while useful now, may not qualify as NRI in 5-10 years as automated, decentralised systems emerge. Current NRI, such as generic labs or static compute resources, risks irrelevance without adaptation to these specialized, scalable needs. Future facilities must offer flexibility, industrial integration, and cross-disciplinary capacity to drive net zero progress, positioning Australia as a leader in sustainable innovation.

Q31.

Supporting healthy and thriving communities

Supporting healthy and thriving communities demands a robust, interconnected health research ecosystem that bridges innovation and practical outcomes. At the heart of this is connectivity—both within research infrastructure and between it and clinical practice. Progress in the development and implementation of a single digital patient record (SDPR) is a transformative step, creating a unified digital platform that integrates patient data across hospitals, clinics, and research institutions. By providing real-time access to comprehensive health records, SDPR empowers clinicians with better decision-making tools and equips researchers with rich datasets to uncover trends, refine treatments, and accelerate medical breakthroughs. This connectivity fosters collaboration among health professionals, policymakers, and scientists, ensuring evidence-based solutions reach communities efficiently. This must be done in a research-friendly way. Biobanking is another cornerstone, with its highly specialised requirements for physical and digital infrastructure. Physically, biobanks need cryogenic storage and stringent environmental controls to preserve biological samples like tissues and DNA. Digitally, they require secure, interoperable systems to catalog and share data, ideally linking with SDPR for a holistic view of patient health. These repositories are vital for advancing personalised medicine—tailoring treatments to individual genetics—and for tackling population-level challenges like disease prevention, making them indispensable for community well-being. This is an example where the success story of NCRIS—creating national facilities that link or network a number of local facilities into something larger the sum of its parts should be examined. Equally critical are pre-clinical and clinical imaging capabilities, which translate lab discoveries into tangible health benefits. The National Imaging Facility (NIF) stands out as an exemplar, offering cutting-edge tools like MRI, PET, and CT for detailed visualisation of biological processes. In pre-clinical stages, NIF supports animal models to study disease mechanisms; in clinical phases, it aids diagnostics and treatment planning. Integrating NIF's imaging prowess with SDPR and biobanks creates a powerful triad: imaging identifies conditions, biobanks provide biological context, and SDPR delivers patient history—unlocking precision healthcare. To fully realise this potential, Good Manufacturing Practice (GMP) facilities are essential for pioneering cell and gene therapies, mRNA technologies, and advanced drug design, including cyclic peptides. GMP-compliant labs ensure these therapies—such as CAR-T cell treatments or mRNA vaccines—meet rigorous safety and efficacy standards for Phase 1 and 2 clinical trials. They also support cutting-edge drug design, where (e.g.) cyclic peptides offer stable, targeted solutions for complex diseases, and mRNA platforms promise rapid therapeutic development. These exciting

Q32.

Elevating Aboriginal and Torres Strait Islanders knowledge systems

Sensitive and culturally appropriate efforts are required to better identify current indigenous knowledge systems. This scene-setting is an important reference for the ultimate task of roadmapping for the elevation of these knowledge systems. Moreover, without quality information on where we presently are, we will encounter challenges moving forward.

Q33.

Protecting and restoring Australia's environment

The science and technology roadmaps for TERN, IMOS, Auscope, and the various other environmentally oriented NCRIS facilities are well aligned to the strengths and aspiration of the national research community. They have served us well and will be crucial in achieving the underpinning outcomes and research identified in the NSRPs document.

Q34.

Building a secure and resilient nation

There are increasing calls for a national facility for additive manufacturing that could span manufacturing for polymers, ceramics and metals enabling research and translation across the biomedical, agricultural, oil and gas, energy, transport and defence sectors.

Q35.

2.3 The case for a new NRI capability, or enhancements to existing capabilities, typically emerges through advocacy from research communities clustering around rigorously identified needs and goals. Such a concept could respond to a requirement for novel or expanded capacity within a domain, or across domains, and must be such that it could only be made available with national-level investment.

If you have identified such a requirement, briefly describe the need, the proposed infrastructure capability, the medium-term goals, impacted research communities, and the timeframe over which you advocate its establishment. Your response can include links to relevant existing reports.

Australia's scientific landscape thrives on collaboration, yet lacks a unified national facility for Nuclear Magnetic Resonance (NMR), a cornerstone of modern research. NMR unlocks molecular insights critical to chemistry, materials science, and biomedicine—from drug design to renewable energy materials. The Australian NMR community is a powerhouse, boasting world-class expertise, cutting-edge applications, and a proven track record of innovation across universities and institutes. This community is primed to unite, ready to partner in a cohesive network mirroring the success of Microscopy Australia (MA). MA's model—linking dispersed facilities into a shared, accessible resource—has amplified impact through collaboration, training, and infrastructure optimization. A similar trial or pilot for NMR would suit this community well, leveraging existing strengths, enhancing access to high-field instruments, and fostering cross-disciplinary breakthroughs. A national NMR facility is overdue—now is the time to build it. A national facility for modern manufacturing, focused on additive manufacturing (AM), would boost Australia's innovation and economy. AM's ability to create complex, low-waste products—like aerospace parts or custom implants—demands advanced infrastructure: high-precision printers, materials labs, and pilot plants. Linking universities, CSIRO, and industry in a Microscopy Australia-style network, would democratise access, drive R&D in 3 and 4D printing and bioprinting, and attract investment. It supports net zero goals with localised, sustainable production, enhancing resilience and jobs. Australia's AM community is ready—a national facility would leverage significant recent existing investment in the higher education sector and beyond. The Stawell Underground Physics Laboratory (SUPL) merits consideration as National Research Infrastructure (NRI) for its unique potential to advance diverse fields. Located 1 km underground, SUPL's low-radiation environment is ideal for dark matter detection, quantum physics experiments, and neutrino studies. Beyond physics, it can support biology—probing radiation effects on life—and geoscience, like seismic monitoring. As NRI, SUPL would unite researchers, enhance Australia's global standing, and drive breakthroughs across disciplines. NCRIS has bolstered Australia's research by funding staff (many of whom are necessarily PhD-trained) to operate our research facilities, partnering with users to maximise impact. This human infrastructure is vital. In new facilities such as those mentioned above, or in existing research facilities, these staff will integrate AI, scale our tech, navigate clinical trials, and sustain collaborations and partnerships. Continued investment in these skilled professionals ensures all facilities remain cutting-edge, driving innovation and research excellence. The human resources are the most important component of NCRIS.

Q36.

Part 3: Industry perspectives

This section is seeking input specifically from industry-based respondents. Other respondents can skip this section.

Recommendation 6 of the 2021 Roadmap related to improvements in industry engagement with NRI. To complement work on this topic that has occurred since then, we are seeking additional advice on NRI requirements as perceived by current or potential industry-based users.

Q37.

3.1 Have you (or your organisation) interreacted with or used Australia's NRI?

- (●) Yes
- ( ) No

Q38.

3.2 If so, please briefly outline the NRI capabilities you (or your organisation) have interacted with or used. Do not limit your response to NCRIS capabilities.

Most of the NCRIS facilities.

Q39.

3.3 Please indicate your (one or more) primary reasons for interacting with NRI:

- [x] For expertise or advice
- [x] Access to research resources or products
- [x] Access to equipment for research
- [x] Access to equipment for operational reasons
- [x] Help in translating research

- [x] Access to data
- [x] Support for clinical trials
- [ ] Other (please specify)

Q40.
3.4 If you answered no, please indicate your (one or more) primary reasons:

This question was not displayed to the respondent.

Q41.
Part 4: Other comments
4.1 Please elaborate on any of your above responses or add any other comments relevant to the development of the 2026 Roadmap. Your response can include reference or links to existing reports that you recommend be considered during the 2026 Roadmap development process.

Digital research infrastructure underpins Australia's ability to lead in a data-driven world, supporting fields of research. As research complexity grows, a tiered compute framework and a national data strategy are essential. Current systems lack the scale, integration, configurability, security and accessibility needed for future challenges. Investments in Tier 0, Tier 1, and Tier 2 compute, alongside robust data solutions, will bridge these gaps, ensuring Australia's global competitiveness. Tier 0 Compute—Exascale Capacity: Tier 0 exascale compute—capable of quintillions of calculations per second—is a game-changer for grand challenges. It could simulate climate systems with unmatched detail, optimize quantum materials for renewables, or accelerate genomic analysis. Australia lacks such capacity, relying on foreign systems like the U.S.'s Frontier or Japan's Fugaku. A national exascale facility would reduce latency, secure sensitive data, and empower researchers in physics, engineering, and beyond, cementing Australia's role in high-impact science. Tier 1 Compute—Cloud-Based GPU/TPU Power: Tier 1 requires powerful cloud-based compute with GPUs, TPUs, and AI-optimized hardware. These tools drive machine learning, enabling rapid insights from vast datasets—from AI-supported drug design to real-time bushfire modelling. Current cloud resources are fragmented, often missing specialised accelerators. A national Tier 1 platform, integrated with global providers that is research-focused, would offer scalable, accessible compute power to universities, startups, and labs, fostering an AI innovation hub that rivals international leaders. Tier 2 Compute—Trusted Research Environments: Tier 2 hinges on trusted research environments (TREs) and similar systems for secure, mid-tier compute. TREs safeguard sensitive data—like health records or defence designs—while supporting collaborative analysis. Adding distributed clusters and virtual labs would enhance flexibility, ensuring researchers tackle complex questions securely without needing exascale resources. Data—National Storage and Curation Solution: A national data storage and curation solution is critical to complement compute tiers. Research produces petabytes—genomics, climate logs, sensor data—that require scalable, long-term storage and curation. Current silos hinder access, and poor curation risks data loss. A distributed yet unified system that supports FAIR and CARE data governance/compliance principles and links seamlessly with compute tiers. This would unlock historical data for new discoveries, from biodiversity shifts to material innovations, benefiting science, industry, and policy. This digital ecosystem—exascale Tier 0, AI-ready Tier 1, secure Tier 2, and a national data framework—addresses current shortfalls. It equips Australia to lead in computation and data management, driving economic growth, scientific breakthroughs, and societal resilience in a rapidly evolving research landscape.

Q49.
4.2 Optional Document Attachment.
Note: Our strong preference is that answers are provided against the relevant questions in the survey. However, this file upload option is available for submissions in file format, where needed. Please ensure the document includes your name or organisation.