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

Q22.

Food and Beverage

Q23.
Medical Products

Q24.
Defence

Space and defence are increasingly intertwined strategic domains. Technologies such as secure communications, satellite-based remote sensing, and autonomous systems serving both civil and military missions. The Advanced Instrumentation and Technology Centre (AITC), hosted at ANUs Mount Stromlo Observatory, provides sovereign infrastructure and deep technical expertise in this sector. AITC's core capabilities in astronomical instrumentation—including adaptive optics, cryogenic vacuum systems, precision engineering, high-performance software and controls —are being applied to next-generation defence needs, particularly in quantum communication, ISR (Intelligence, Surveillance, Reconnaissance), and resilient space systems. AITC supports these capabilities through two key research assets: Highly skilled technical and engineering staff -The AITC as no recurrent engineering budget. The highly skilled workforce is supported by research project work and external contracts. Establishment of long-term funding stability (5-10 years stage-gated investments) across research and Defence activities would deliver stability in this highly specialised workforce and secure continuity of access to these highly specialised skill sets. National Space Test Facility (NSTF): NSTF is Australia's largest environmental qualification facility for space systems, with a growing role in defence payload testing. It enables critical validation of optics, electronics, and integrated systems through vibration, thermal vacuum, and EMC testing. Future defence demands will require upgrades including: A larger vibration test system allowing more capable (larger/heavier) satellites to be tested. EMI/EMC instrumentation to defence standards A solar simulator for extended mission testing Quantum Optical Ground Station (QOGS) AITC has established the Southern Hemisphere's first QOGS (Quantum Optic ground station), enabling secure, high-bandwidth communication between ground and space using adaptive optics and laser technologies. These capabilities—developed from astronomy adaptive optics technologies and control algorithms —are being adapted for quantum-encrypted communications, deep-space defence links, and resilient command and control (the AO is essential to achieve high bit-rates for deep space communications, and to allow low-signal intensities for quantum communications). To serve national security needs, QOGS must be scaled into a secure, multi-node network integrated with allied infrastructure and capable of supporting classified operations. Recommendation AITC recommends recognition of NSTF and QOGS as National Research Infrastructure as well as establishment of viable medium-term funding model for recurrent engineering efforts (via periodic review of stage-gated performance for identified priority projects in this sector). These assets are central to Australia's space-enabled defence capability—grounded in sovereign technology and informed by astronomical innovation.

Q25.
Recycling and Clean Energy

Q26.
Space

While overlapping with defence, the space sector also has distinct infrastructure needs to support research, commercial innovation, exploration, and international collaboration. The ANU Advanced Instrumentation Technology Centre (AITC) is playing a fundamental role in enabling Australia's rapidly growing space industry and science capability. Our foundation in astronomical instrumentation is enabling AITC to deliver national capability in spacecraft testing, quantum communication, and advanced optics—supporting research institutions, industry, and government missions as well as potential space-based astronomical observations. In the next 5–10 years, Australia's space sector will require infrastructure to support: • Qualification of spacecraft and payloads for orbital and deep-space missions • High-throughput, secure optical communication • Integration and testing of sensing and quantum payloads • Launch readiness and data-intensive science support • A pipeline of high-skill engineering and technical talent • Accessible infrastructure for startups, SMEs, and commercial missions The AITC's infrastructure enables these through: National Space Test Facility (NSTF) NSTF has supported the qualification of 22 spacecraft over the past five years, including almost all Australian led satellites currently in orbit. It provides open-access environmental testing services for research, government, and commercial users. However, it currently receives no NCRIS funding, limiting its ability to scale, support new mission profiles, or deliver national training outcomes. NCRIS investment would enable: • Expanded testing capacity (e.g. larger vibration system, solar simulator, EMI/EMC) • Workforce training and up-skilling • Affordable access for industry users • Strengthened sovereign launch-readiness and global competitiveness Quantum Optical Ground Station (QOGS) The QOGS will support secure, high-speed laser communication with satellites, lunar missions, and future science infrastructure. As data volume and security demands increase, national optical ground capability will become essential. NCRIS investment is needed to scale QOGS capacity, support interoperability with global networks, and ensure access for research and industry. Recommendation AITC recommends both NSTF and QOGS be recognised as National Research Infrastructure. NCRIS investment will support sovereign capability, industry access, and workforce development—ensuring Australia's long-term success in space.

Q27.

Environment and Climate

Q28.

Frontier Technologies and Modern Manufacturing

The ANUs Advanced Instrumentation Technology Centre (AITC) is one of the three nodes of the Astralis instrumentation consortium, established in 2019, and supported with NCRIS funding through instrumentation research contracts with major international partners. The astronomical instrumentation workforce in Australia is a critical research infrastructure. These highly skilled professionals—engineers, optical scientists, detector/electronics specialists, and precision manufacturing experts—form the foundation of world-leading technology development. Their expertise, originally developed for astronomy research, now drives innovation in space technology, quantum sciences, advanced manufacturing, and autonomous systems. A baseline investment in this workforce will ensure that this essential infrastructure remains strong, adaptable, and connected to industry needs. With sustained support, these specialists can continue to pioneer breakthroughs not just in astronomy but across a broad range of high-tech sectors, keeping Australia globally competitive in precision technology and innovation. The technical capabilities developed in astronomical instrumentation directly align with Australia's high-tech sectors, including: •Precision Optics and Photonics – High-resolution spectroscopy, optical coatings, and mirror fabrication drive quantum computing, satellite payloads, and AI-driven imaging systems. •Ultra-Sensitive Sensors and Detectors – Originally designed for low-light astronomical observations, these advanced sensors now support biomedical imaging, environmental monitoring, bushfire hazard mitigation, and space exploration. •Adaptive Optics (AO) and Autonomous Systems – AO, developed to correct atmospheric distortions in telescopes, enhances laser communication networks, robotics, and AI-assisted manufacturing. To fully leverage astronomical instrumentation expertise, a baseline National Research Infrastructure investment strategy would: •Retain and grow Australia's highly skilled workforce, ensuring long-term access to expertise in optical systems, sensors, and precision engineering. •Expand R&D service capabilities, ensuring critical staff are in place to directly support industry partners in space technology, quantum innovation, and advanced manufacturing. •Strengthen long-term industry connections, fostering structured collaboration between research institutions, space programs, and high-tech manufacturers. •Create structured pathways for knowledge transfer, enabling astronomy-driven innovations to advance satellite systems, autonomous technologies, and high-performance imaging applications. Astronomical instrumentation is not just a foundation for science—it is a driver of technological leadership. By investing in this workforce as a national infrastructure, Australia will secure its place at the forefront of space exploration, sovereign industry capability, and high-tech innovation.

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

Q31.

Supporting healthy and thriving communities

Q32.

Elevating Aboriginal and Torres Strait Islanders knowledge systems

Q33.

Protecting and restoring Australia's environment

Q34.

Building a secure and resilient nation

To build a secure and resilient future, Australia will need a highly skilled high-technology workforce. It is also clear that Australia should look to secure wider access to high performance sensing and analytics systems for use in industrial automation, for communications technologies and in remote sensing for civil applications such as agriculture and mineralogical surveys as well as sovereign defence capabilities. Purchasing these services from international vendors will be costly and will likely be increasingly unreliable. Investment in a national instrumentation workforce will not only provide a pipeline of highly trained and highly motivated individuals with these valuable skill sets. It will also ensure that these key technical experts are available for agile deployment to address national priorities as they change and evolve on short and often unpredictable timescales. There must be opportunities to develop and retain these individuals as part of critical research infrastructure with Australia.

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.

The missing capability is a mechanism to ensure a sustainable high technology research engineering work force. This investment need not necessarily be direct funding support of any individual university research groups. Rather via a strong strategic focus on enabling engagement with national and international initiatives through stable baseline funding for research instrumentation projects pursued by the Astralis consortium is required. This would ensure excellence in science productivity while securing the skilled workforce, ensuring they are available at short notice to address programs aligned with national priorities as they arise. The uncertainty around the availability of such funding inhibits engagement with major international initiatives and holds back investment in people and emerging technologies.

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.

This question was not displayed to the respondent.

Q39.

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

This question was not displayed to the respondent.

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.

Our submission here is somewhat repetitive across each sector we have addressed. This is deliberate. We believe that in addressing supporting the fundamental research needs of the national astronomical instrumentation capabilities, one also provides significant technology transfer opportunities across other critical sectors and ensures a highly skilled and agile scientific engineering work force is readily available to address priorities of national significance as they arise. This baseline funding for recurrent staff expertise is a critical national research infrastructure that Australis should not undervalue or overlook.

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.