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

Q25.
Recycling and Clean Energy

Substantial amounts of basic and translational research into clean energy generation and storage will be needed if Australia is to meet its clean energy goals. Theoretical and computational chemistry are critically important to the research and development pipeline, allowing for deep insight into the fundamental physical and chemical mechanisms underlying energy technology, while also feeding back into and guiding experimental and translational research. Theoretical and computational chemistry is becoming increasingly reliant on complex software and specialised high-performance computing infrastructure. Cutting-edge computational research requires specialised skills in software engineering, mathematical modelling and domain-specific research - frequently grouped together under the heading of “Research Software Engineering” (RSE). While there are some organisations such as the NCRIS facilities of Pawsey and NCI that can consult with researchers and provide short term RSE support, the lack of a national body to coordinate and train RSE professionals means that there is much duplicated work (“reinventing the wheel”) and there are few opportunities for institutional knowledge building. This is exacerbated by the fact that RSE skills are highly-sought-after in the private sector, making it difficult to retain talented professionals within the research sector. In the five years since the 2021 NRI roadmap was released, the fields of machine learning (ML) and artificial intelligence (AI) have exploded in prominence and opened a wide range of new capabilities within theoretical and computational chemistry, and have already proven themselves capable of accelerating the rate of scientific developments in this field by drastically reducing the time needed for complex computer simulations. AI and ML techniques also have the potential as well as provide new, first-principles insights into chemical processes which would not be possible with legacy computational modelling techniques. The lack of coordination of research software engineering efforts, lack of institutional knowledge among research organisations and relatively limited home-grown ML research in chemistry means Australia risks “missing the boat” on this field, and its impacts on basic and translational research in energy technology.

Q26.
Space

Q27.
Environment and Climate

Q28.

Frontier Technologies and Modern Manufacturing

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

Substantial amounts of basic and translational research into clean energy generation and storage will be needed if Australia is to meet its clean energy goals. Theoretical and computational chemistry are critically important to the research and development pipeline, allowing for deep insight into the fundamental physical and chemical mechanisms underlying energy technology, while also feeding back into and guiding experimental and translational research. Theoretical and computational chemistry is becoming increasingly reliant on complex software and specialised high-performance computing infrastructure. Cutting-edge computational research requires specialised skills in software engineering, mathematical modelling and domain-specific research - frequently grouped together under the heading of “Research Software Engineering” (RSE). While there are some organisations such as the NCRIS facilities of Pawsey and NCI that can consult with researchers and provide short term RSE support, the lack of a national body to coordinate and train RSE professionals means that there is much duplicated work (“reinventing the wheel”) and there are few opportunities for institutional knowledge building. This is exacerbated by the fact that RSE skills are highly-sought-after in the private sector, making it difficult to retain talented professionals within the research sector. In the five years since the 2021 NRI roadmap was released, the fields of machine learning (ML) and artificial intelligence (AI) have exploded in prominence and opened a wide range of new capabilities within theoretical and computational chemistry, and have already proven themselves capable of accelerating the rate of scientific developments in this field by drastically reducing the time needed for complex computer simulations. AI and ML techniques also have the potential as well as provide new, first-principles insights into chemical processes which would not be possible with legacy computational modelling techniques. The lack of coordination of research software engineering efforts, lack of institutional knowledge among research organisations and relatively limited home-grown ML research in chemistry means Australia risks “missing the boat” on this field, and its impacts on basic and translational research in energy technology.

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

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.

A major gap in the current National Research Infrastructure is the lack of support for research software development, especially maintenance of existing, mature computational tools. The lack of a pathway for sustainable research software development has substantially hindered Australian researchers' capabilities in this field and results in important development work being abandoned once short-term funding runs out. There are successful schemes for sustainable research software development overseas which could serve as a potential model for this, including the Software Sustainability Institute in the United Kingdom, as well as the Chan-Zuckerberg Initiative's "Essential Open Source Software for Science" in the United States. Building such a capability at the national level would establish Australian sovereign capacity in research software, especially in the emerging fields of machine learning and artificial intelligence (as applied to science), where currently Australian researchers are almost entirely reliant on software developed overseas. To meet the needs of the computational science community, such a body should: • Operate across all digital research domains in Australia, including both traditionally software-heavy fields like theoretical and computational chemistry, and emerging data-driven fields such as computational biology, • Provide policy advice and advocacy for research software in Australia, • Provide training and upskilling for researchers and students in both fundamental software, engineering skills and in emerging technologies such as AI and machine learning, • Coordinate with universities, the private sector and NCRIS facilities such as NCI, Pawsey, ARDC and ACCESS-NRI to ensure a cohesive national strategy around research software and sustainability, • Where possible, directly support the maintenance, governance and sustainable development of critical pieces of research software in such cases where existing schemes fail to meet the community's needs. Medium-term goals would be: • Provide training to researchers and capability-building programs in research software engineering practices, especially in emerging fields such as AI and ML for which there is limited institutional knowledge among research organisations, • Provide legal advice to research software developers, such as software licensing and compliance issues, as well as advice on sustainable governance practices, - Provide expertise and communication on research software policies and priorities across institutions in the university and research infrastructure sectors • Develop a scheme to identify and support critical pieces of open-source research software. Such a scheme should focus on sustainable development practices for existing, well-established research software and should include but not be limited to bug fixes, improving software engineering processes such as automated testing, improving documentation, or community management. The scheme could be modelled after successful approaches from the private sector and philanthropic organisations, such as CZI-EOSS or Google's Summer of Code program.

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:

- ☐ I did not know about it
- ☐ Other facilities suit my needs better
- ☐ I would like to, but cannot get access due to geographical location
- ☐ I would like to, but believed that access was only available to academic researchers
- ☐ I am not aware of any capability that meets my needs
- ☐ Other (please specify) [ ]

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.

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.