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

Q26.
Space

Q27.
Environment and Climate

There is strong demand to increase the scale, speed and accuracy of environmental observation so that management decisions can be made with greater speed and confidence. Increasingly we are using biological molecules to measure and observe nature. The molecules ('omics) provide rich and detailed information about identity, condition and function of biological entities from intra-cellular to individual to whole of ecosystem. A trend I observe is the push to increase the scale at which these observations are made - through for example coupling molecular biology with automation, engineering and robotics. In addition, the large-scale biological data that is being generated is ripe for interrogation with sophisticated analytical and computational tools, including AI. Australia is fortunate to have invested in infrastructure to support these individual capabilities, since the vast scale of our environment and its complexity demands scalable solutions to environmental discovery, measurement and intervention. Consideration could be given to how interactions and synergies among infrastructure platforms can be encouraged or enabled, since I believe that is where innovation is most likely to occur.

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

Q31.

Supporting healthy and thriving communities

Q32.

Elevating Aboriginal and Torres Strait Islanders knowledge systems

Q33.

Protecting and restoring Australia’s environment

Trends: Scale, speed and accuracy of environmental observation. Intelligent integration of multiple data streams to inform decision tools Biomolecular-based nature observations (e.g. eDNA) Molecular-derived indices of environmental health, incorporating ML. FAIR and open data practices Automation, mobile devices for environmental observation Trends like the above would rely on existing NCRIS facilities such as Bioplatforms Australia, also computational resources. I envisage some of the trends becoming evident in NCRIS observational facilities such as IMOS and TERN, though they will need to be prepared to pick them up. Devices, sensors, and automation are not (as far as I know) explicitly supported by NCRIS facilities, but they may be (I am not an expert on this topic).

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 new way to measure the environment Australia's environment is our most precious asset. However, its size, complexity and high biodiversity mean that it has been expensive and difficult to gather information to manage it effectively. "eDNA" is changing that. In the past few years, eDNA (short for environmental DNA) has revolutionised environmental monitoring. Scientists take environmental samples like water or soil, purify the fragments of DNA present and sequence their four-letter codes. They use those sequences, known as DNA barcodes, to identify the species present. People have used eDNA in diverse ways. They have detected pests like the crown-of-thorns starfish on the Great Barrier Reef, looked for viruses like SARS-CoV2 in wastewater, searched for cryptic species like the platypus, and measured the productivity of fisheries. Worldwide, governments, industries and citizen scientists are adopting eDNA. It's highly accurate and works across the tree of life. It's also a safe and simple way to detect species without harming or disrupting wildlife. What is needed eDNA is poised to revolutionise the way we monitor Australia's natural environment. But using eDNA depends on having a reference library of DNA barcodes. To identify a species using eDNA, we need to know its unique DNA barcode. Yet we know the DNA barcodes for only a small fraction of Australia's half a million plants and animals. The shelves of Australia's DNA barcode library are almost empty. Some groups, such as fish, are relatively well covered. Other important groups, such as insects, marine invertebrates and plants are largely missing from the library. This means that during eDNA surveys, many species go undetected because their eDNA can't be identified. A full library of DNA barcodes is necessary for us to make the most of eDNA's amazing potential to provide simple, cost-effectively information on the environment. A complete DNA barcode library for Australia's most important species would create enormous national benefit. It would support multiple industries including biosecurity and agriculture, fisheries, tourism, and biodiversity management. We could detect invasive pests arriving from overseas or map the distribution of endangered or dangerous species, even if they cannot be observed. We could provide the highest assurance to consumers that the food they eat is correctly labelled. If we change the game Major DNA barcode library initiatives exist overseas and, at smaller scales, within Australia. Most DNA barcodes have been generated by a very hands-on, one-at-a-time process, which is slow and expensive. Different scientists also focus on different DNA barcodes. As a result, multiple DNA barcode reference libraries exist that can't be easily combined. At CSIRO we have created new technology to solve this. Our miniaturised high-throughput genome skimming platform can generate DNA barcodes for any type of organism, from microbes through fungi, to plants, insects, mammals, and birds. Not only that, our solution creates a full set of all DNA barcodes for each species. This ensures the results are compatible with existing DNA barcodes used by scientists worldwide – a DNA barcode library to rule them all. Let's go! For the first time we have the technology to create digital DNA infrastructure to match the next generation needs of environmental monitoring. We are working with biological collections around Australia, industry, philanthropy, and government to build this much-needed resource that will enable Australia to deploy world's best environmental monitoring. This infrastructure would would connect into multiple existing NCRIS and other infrastructures, including ALA, IMOS, Bioplatforms Australia, and museums and herbaria nationally. We believe that this, plus its anticipated impact across health, agriculture, fisheries, and biodiversity sectors, makes it an excellent candidate for inclusion in the NCRIS infrastructure portfolio.

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.

A landing page for the National Biodiversity DNA Library where the concept is expanded on: https://research.csiro.au/dnalibrary/