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

The framing of this priority within the 2021 Roadmap points to a major gap in our understanding of what we need to build to be able to use the breadth of our national collections to address the problems currently facing Australia within this theme. If we take a wide lens on what it means to build sustainable communities that are resilient, can take an ecological approach to questions of bio-diversity conservation that are inclusive of Indigenous Knowledge and attentive to the knowledge of local communities with regard to the environment and places they live in, it becomes obvious that a siloed approach to building national research infrastructure has a limited life. Over multiple conversations between researchers across the HASS/STEM/Indigenous Knowledge divides and 51 industry partners from CSIRO, Australia's leading national and state museums and Indigenous community organisations, the Collections as National Infrastructure (CaNI) network built an argument for an ARC Centre of excellence premised on the need to break down discipline based silos. While not successful, that network still exists and has a developed research pathway towards building a national digital infrastructure for collections to enable cross-disciplinary connections to be made for researchers and members of the public. Some of our findings in building that network were: 1) Managers of Natural Science collections (flora and fauna but not geology) represented in the Atlas of Living Australia are working to figure out how to discover and represent the Indigenous Knowledge embedded in these collections. To do so they need to develop new protocols and ways of working which involve those that have cultural knowledge. Recognition is growing that collections knowledge is important in developing more insight into the significance of Australia's natural environment for Indigenous Communities and conversely that Indigenous knowledge is critical in knowing how to manage these natural resources for long term conservation needs. 2) Presently, conservation biologists in university settings can't access collections that have already been digitised because those collections contain Indigenous Knowledge and none of the protocols and governance settings have been put in place to manage that. The default position is to close off access to everyone, including Indigenous communities. 3)The same situation exists in libraries, museums and archives with regard to Indigenous material (see Thieberger N., Aird M., Bracknell C., Gibson J., Harris A., Langton M., Sculthorpe G. and Simpson J. (2024) “The New Protectionism: Risk). At the same time, there is literally, no infrastructure at the national level to make accessible to researchers our vast cultural collections (both Indigenous and non-Indigenous collections). There is no current way to connect the ALA to related knowledge knowledge in cultural collections and vice versa. A comparable Atlas of Cultural Australia would have such a potential.

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

A thriving community is, in part, one that has a strong sense of cohesion, understands its place in the world and is able to live with diversity. Social health is not just a question of healthy bodies. Healthy minds is not just a medical issue. It is also a cultural one. Knowing who we are, where we have come from, feeling we belong are all key factors in thriving communities. Collections held by the GLAM sector and in university collections hold many of the keys to answering these questions. A holistic national research infrastructure is required to make it possible to access these collections to address truth and reconciliation issues, understand the legacies of the past in the present, celebrate our achievements, work with communities to apply the knowledge contained within these collections at the local level whether for conservation reasons, cultural revitalisation and re-connection, fostering cross-cultural understanding

Q32.

Elevating Aboriginal and Torres Strait Islanders knowledge systems

While the ARDC is working to develop some of the data protocols and governance systems needed to manage Indigenous Knowledges and records pertaining to Indigenous peoples, Australia has no research infrastructure that is able to connect and govern access to collections across the GLAM sector for collections of Indigenous material let alone connect that to the ALA. Nor is there the ability to connect metadata for specific items to associated data for contextual sources which may be found within the archives of collecting institutions themselves or in collections in other institutions - often libraries. In addition, important collections of both natural science and Indigenous material culture exist overseas and we have no means of integrating those collections into our national system. Some of that knowledge exists in AIATSIS, but it is not publicly accessible, some through past research projects by members of the CaNI network and others (hosted in various data repositories), or by individual connections between GLAM sector institutions. Thus none of that knowledge is publicly available to other researchers. None of it can be used to initiate new research projects and new research questions in partnership with Indigenous Knowledge holders. The lack of integration of metadata also means that we have no possibility of working with communities to provenance material that is currently unprovenanced. There are vast possibilities to use carefully designed AI tools to build LLMs that would enable us to do some of that provenancing work with attention to the FAIR and CARE principles, but at the moment that remains a dream. Without this capability it is also impossible to connect Indigenous Knowledge to collections metadata framed within disciplinary silos. That makes it very difficult to realise the NSRPs's ambition to put Indigenous Knowledge at the centre of every other knowledge system, touching them all. To do that we need to enable the breaking down of disciplinary silos in the ways we build digital research infrastructure, including that pertaining to the collections sector. This all means that any digital research infrastructure investment in collections must work across disciplines, institutions, be multi-modal (that is, to combine object data, images, sound, digitised archival records) and be able to demonstrate the veracity of the source of the data records.

Q33.

Protecting and restoring Australia’s environment

As already argued under the Environment and Climate research theme, achieving this NSRPs priority will require the ability to bring together scientific and cultural knowledge. Working out how to use Australia's collections to help with this task by building a national research infrastructure system capable of breaking down disciplinary silos is therefore extremely important. Collections are significant data repositories that enable mapping across time and place to occur. Being able to create those maps at scale, with sufficient depth and with associated cultural knowledge will be key to achieving this research priority. Other kinds of collections will also hold important knowledge - for example, film and photographs will have visual records of particular environments over time. Those records could be connected with metadata from specimens, natural materials used in Indigenous material culture to create a holistic understanding of specific environments over time. Adding to that evidence from written sources in libraries and archives would also be important. That is not yet possible to do. Not being able to do that also means that it is difficult to develop cross-disciplinary teams able to address the major questions under this priority. Either within the university sector, inside the GLAM sector, or in partnership with the GLAM sector and Indigenous communities. This last point also indicates the need to develop cross-disciplinary capability within the GLAM and university sectors. Integrating collections metadata across multi-modal registers, disciplines and institutions would go a long way towards developing such a research workforce.

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.

As our answers to the previous questions indicate, the CaNI network across the university and GLAM sector has identified the need for a new national research infrastructure for the collections in the GLAM sector – one that breaks disciplinary silos, is able to connect collections that are multi-modal in nature and across institutions. As others have argued, Australia's collections are foundational to our society. Collections of natural science, archival records, historical and Indigenous materials reveal Australia's deep past and our human histories, preserve lost worlds and capture the nation's memories. As such they are critical infrastructure [1]. They allow us to address planetary survival, arrest loss of biological and cultural knowledge, and create new understandings of who we are. Our current collections infrastructure, however, is not fit for purpose. This infrastructure is divided by geography, discipline, culture, jurisdiction and material classification (e.g. object, natural specimen, document, artwork, born-digital item). Consequently, collections remain 'siloed' by institutions, professional routines, protocols and knowledge systems that were formed in the Enlightenment and embed the traces of colonial knowledge [4]. Disciplinary architectures built on distinctions between nature and culture, science and humanities are no longer fit for current needs. They cannot adequately include Indigenous knowledge, fail to address colonial legacies, and inhibit efforts to draw on Australia's rich past to address the problems of the future [5]. Who is this important for? Communities cannot discover material relevant to their history or region. The problem is particularly urgent for Indigenous communities: senior Indigenous knowledge holders may pass without being able to interpret information in collections, leading to irreversible knowledge loss. Although attempts have been made to connect social and cultural collections, these efforts remain isolated and vulnerable. The lessons learned are localised and the digital platforms rely on aging technologies [6] which are not user friendly and do not allow for natural queries [7]. Consequently, Australia's collections infrastructure does not support an ability to elicit relationships between collection objects, people, ecology and Country. While some collections have been catalogued, with data and images digitised and placed online, the existence of different metadata standards limits connections between collections across disciplines and at scale. This creates barriers to generating new forms of transdisciplinary knowledge and centering the user. Researchers and the public struggle to interlink archival, library and museum collections and connect these to specific people, places and events. Public access to these knowledge resources then, is limited – not by interest or public will but by arcane institutional arrangements and difficulties in navigating current data governance requirements, especially in relation to the use of Indigenous Knowledge [8]. A new digital research infrastructure could help to overcome these problems. While the long term need is to develop an interdisciplinary capability able to connect platforms such as ALA and TROVE with what we are calling an Atlas of Cultural Australia (ACA), the most immediate need is to enable the vast repository of knowledge held within the social and cultural collections within Australia's GLAM sector as TROVE and ALA already exist. Developing a prototype for how an ACA could be built, working across the multi-modal nature of these collections, their distribution over multiple institutions, and addressing the capacity building needs of the sector to engage in this work and that of researchers to use it to address pressing questions needs a step by step process. As long as the long term vision is agreed upon with the national roadmap, there is no reason why a step by step strategy to achieve the joint goals of building an ACA and eventually linking it to both the ALA and TROVE cannot be achieved. It might also be possible to connect such efforts to other national research infrastructure projects such as LDaCA. Our initial take would be to break this work down into the following steps: 1. Undertake a world-wide survey of initiatives elsewhere, ensuring Australia can be at the forefront of building digital research infrastructure for collections and doing so in a way that meets our needs as a settler colonial society by putting Indigenous Knowledge and Peoples at the centre of the endeavour. Doing so will require us to think in interdisciplinary ways. 2. Develop the social and technical foundations for a national, distributed digital platform to connect metadata on social and cultural collections across institutions and HASS and creative arts disciplines, including Indigenous Knowledge. 3. Do so with attention to the need to make these records accessible to speakers of Aboriginal and Torres Strait Islander languages, Indigenous languages in Australia's Pacific region, varieties of Australian English and migrant languages or at least to capture their languages when they are present in the archive. 3. Develop the appropriate governance protocols building on work done in the Indigenous ARDC. 4. Develop an Australian Collections Commons where tools and research into how to build digital research infrastructure for collections and how to use it can me made accessible to all researchers.

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.

Reference list: Thieberger N., Aird M., Bracknell C., Gibson J., Harris A., Langton M., Sculthorpe G. and Simpson J. (2024) “The New Protectionism: Risk Aversion and Access to Indigenous Heritage Records”, Archives & Manuscripts, 51(2), pp. 23-42. doi: 10.37683/asa.v51.10971. Gibson, Jason M., Gaye Sculthorpe, Alistair Paterson, and Andrea Witcomb. “Connecting Collections: Transforming Access to Museum Collections at Scale for Knowledge Generation in Australia.” Museum Worlds 12, no. 1 (July 1, 2024): 126–41. https://doi.org/10.3167/armw.2024.120111. Discussion in the media: https://search.app/2v54oPoKtSNBLJ2AA Reports on initiatives elsewhere in the world: https://dissco-uk.org/ -The Distributed System of Scientific Collections – UK (15 million plus records over 290 institutions) Map view of DISSCO-UK: https://dissco-uk.org/institution/1d808a7c-1f9e-4379-9616-edb749ecf10e/specimens?view=MAP Data view of DISSCO-UK https://dissco-uk.org/institution/1d808a7c-1f9e-4379-9616-edb749ecf10e/specimens?view=TABLE Europeana – funded by EU: 50 million plus records from across the EU. Eg. From Australia: more than 190K records: https://www.europeana.eu/en/search?page=1&view=grid&query=Australia US – Yale University Art Museums – extended linked open data: Eg. ‘Australia’ search: https://artgallery.yale.edu/collection?query=Australia

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.