

1. What is your occupation?

- Researcher
- University Staff
- Business / Industry
- Government
- Higher Education Peak Body
- Industry Peak Body
- **None of the Above**

None of the above

2. Are you responding as an individual or an organisation?

- Individual
- **Organisation**
- None of the above

Organisation

3. What organisation do you work for?

National Committee for Astronomy (Australian Academy of Science)

4. Are the recommendations appropriate to the current NRI environment?

The second dot point on p.35 currently reads:

"Optical and radio astronomy infrastructure includes both domestic infrastructures and participation in international projects such as the Square Kilometre Array. It also includes large-scale data storage"

In the context of optical and radio astronomy, it would be more appropriate to mention both international projects in which Australia is a major partner/member (and also to include HPC alongside data). For example:

"Optical and radio astronomy infrastructure includes both domestic infrastructure and participation in international megascience projects such as the European Southern Observatory and the Square Kilometre Array Observatory. It also includes large-scale data storage and HPC facilities"

5. Do the principles articulate the vision and key elements required of NRI, including investment?

6. The NRI Roadmap has a clear focus on identifying the NRI investments required to support Australian research over the next 5 to 10 years. Are there any national research infrastructure needs missing in the draft Roadmap?

As mentioned in our response to 4), we are surprised that one of the major international megascience projects with which Australian astronomers are currently engaging is not explicitly mentioned, namely the European Southern Observatory (ESO).

We are almost half-way through a 10-year Australian–ESO partnership which was supported by an act of parliament, and the NRI process soon needs to determine whether to further continue with this landmark/global scientific engagement beyond 2027. The Academy's recent (2020) Mid-Term Review of the Decadal plan for Australian astronomy 2016-2025 strongly endorses a continuation of the ESO partnership with a transition to full membership at the earliest opportunity.

Such a mention of ESO would be most appropriate in Section 2.4 (p.21) and/or Section 3.6 (p.35 - see answer to Q4).

7. A key priority for Australia is to enhance research translation. The 2021 NRI Roadmap identifies some reforms and investments to achieve this. What other reforms would help deliver this priority?

8. The Roadmap proposes that Australia could make landmark investments to drive step changes in research and innovation over the next 10 to 15 years. Do you agree with the assessment of potential areas for investment in the report? What other areas do you consider might fit the definition of landmark investment?

Astronomy has always been a hotbed for translation opportunities due to the advanced design, engineering, manufacturing, data collection and analysis techniques required to deliver the exquisite measurements necessary. The Academy is proud of the numerous translation pathways created by astronomers (see AAL response), and reminds the Expert Working Group that WiFi was invented following an experiment to detect exploding black holes.

In term of translation training opportunities, one thing that has struck the Academy in recent times is the usefulness of industry internships in helping to bridge the gap with academia. We suggest that it would be useful for the Expert Working Group to consider the expansion of postgraduate internship schemes and whether such schemes can be expanded to include EMCR researchers.

The NRI is forward looking in terms of highlighting research software and research software engineers (p.57) as a key component of infrastructure (p.57). But there is no clear career pathway for research software engineers in most university environments, which means that there is no stable long-term workforce that provide the high level of skills required, despite the fact that such engineers are often able to work across multiple facilities. We suggest that the

Exposure Draft could further highlight the current lack of long-term support and career pathways for such staff.

9. Please add any other comments you would like to provide to the Expert Working Group.

The NRI in Section 6.1 (p 59) is focussed on the data but there is deeper concern around the quality and sustainability of the research software used to examine and infer from the data. Even within Australia, the ARDC is leading the national research software agenda to recognise the critical role of research software within modern research.

10. If you have a PDF (.pdf) or Word document (.doc or .docx) to share as part of your feedback, you can upload your file here. Please keep documents brief.

Additional document text:

We thank the Department of Education, Skills and Employment and the Expert Working Group for the opportunity to respond to the National Research Infrastructure Roadmap 2021 Exposure Draft.

The National Committee for Astronomy is responsible for the Australian Academy of Science's Decadal plans for Australian astronomy. We survey the national and international research landscape and recommend key research and investment opportunities for mid- and large-scale astronomical facilities.

Our recommendations have previously led to important NRI investment in domestic facilities such as optical and radio telescopes and supercomputing facilities. For example, DESE requested, and was delivered, a confidential preview of our committee's 2020 Mid-term Review of the 2016-2025 Decadal Plan in order to inform recent NCRIS investment decisions in radio astronomy, data and gravitational wave infrastructure via Astronomy Australia Limited.

Our recommendations have also been key in demonstrating community support for participation in global megascience projects such as the Square Kilometre Array Observatory, the European Southern Observatory, the Giant Magellan Telescope and the Laser Interferometer Gravitational-Wave Observatory. Partnership in international projects has been important in delivering the best research and industry outcomes, the best training opportunities, and the best value to the government.

The NRI process has been an invaluable aid in facilitating major infrastructure investments, so we wish to provide a number of succinct responses in your request for feedback. We note the other astronomy organisations such as the Astronomical Society of Australia and Astronomy Australia Limited will also be providing input.