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

Ensuring that minerals are extracted and processed without airborne dust, processing emissions, and quantification of environmental, cultural and human health implications with resilient and strong environmental and cultural protections from air and water pollution.

Q22.

Food and Beverage

Q23.
Medical Products

Q24.
Defence

Airborne transmission threats, climate change threats as well as sovereign risks to atmospheric compositional data collection due to a heavy reliance on international satellite programs and instrument manufacturers.

Q25.
Recycling and Clean Energy

Q26.
Space

Ground-based validation of atmospheric chemistry including pollutants, aerosols, greenhouse gases, ozone precursors and oxidants in the atmosphere means we have limited spatial knowledge of these short-lived climate forcers and human & environmental health indicators in our region

Q27.
Environment and Climate

A well resourced and nationally consistent and research grade network of atmospheric observables is lacking in Australia across both regional, industrial and urban settings. Our ability to test and validate our regional climate model projections is hampered, with the largest source of uncertainty coming from background aerosol observations. With air pollution estimated to cause >4000 premature deaths per year in Australia and major crop yield losses - targeted efforts to move de-combustionize our energy system will reap rewards quickly. In addition to combining satellite and climate models, systematic ground-based observation is required. As outlined in Kahn et al., https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2022RG000796 to reduce the 20 year dominance of aerosols in climate forcing predications aircraft in situ measurements capturing the particle optical, microphysical, and chemical properties and meteorology is required. Additionally cloud-scale microphysics, optical properties, and in cloud vertical velocities characterisation of the aerosol-cloud interactions is also required. Many experts and instruments and platforms exist across the Australian atmospheric observing community, but to date we have lacked an overarching activity to unite our short-term, campaign-based research efforts.

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

There are many health air quality benefits expected with the decombustionizing of our energy system. But the reduction in aerosols and their indirect cloud effects will result in a full exposure to the greenhouse gas warming as we have already seen in the maritime sector desulfurization. The hydrogen economy's impact on atmospheric composition is poorly characterised, but through tropospheric oxidant and stratospheric water the global warming potential of hydrogen in our region needs to be understood. Production of hydrogen and links to ammonia (relevant also for fertilizer production) need to be closely examined as this is a potent atmospheric pollutant and health concern. Legacy LNG infrastructure in our urban areas (i.e. 80% of Victorian homes) and that we don't openly track methane fluxes (leaks) for efficiency as well as human health reasons means decarbonization efforts are scattered and blind to transition legacy infrastructure and stranded asset risks.

Q31.

Supporting healthy and thriving communities

The impact of poor air on communities (particularly poor communities) is well documented. A societal uplift is expected with improvements to air quality. From trucking routes, schools, indoor air quality, asthma / hayfever sufferers, coal, gas terminal, mineral processing, waste incineration, wildfires and carbon emissions - the implications of atmospheric composition on society is the single greatest perturbation we have made to our environment. Everyone and everything breathes. That we don't have accessible air information to improve our air is a systemic problem that needs to be addressed.

Q32.

Elevating Aboriginal and Torres Strait Islanders knowledge systems

Murujuga Aboriginal Corporation, Circular Head Aboriginal Corporation and several other traditional knowledge holders work closely with our community to protect the sky countries.

Q33.

Protecting and restoring Australia’s environment

Air and it composition is the single most important environmental risk factor for human health, with in excess of 8 million premature deaths globally every year.

Q34.

Building a secure and resilient nation

Airborne threats: from pandemics to wildfires and weapons as well as sovereign knowledge.

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.

Our community interacts with the state of the environment reporting: https://soe.dcceew.gov.au/ "Government policy around air pollution regulation could be improved with an exposure minimisation approach (Zosky et al. 2021). However, such an approach relies on increasing air quality monitoring infrastructure, and active participation by industry and residents to drive down emissions. It is not enough to set new National Environmental Protection Measures targets for air pollution levels if behavioural change is not encouraged in legislation." White papers / peer reviewed community papers on observations: Clean air plan for Sydney https://www.mdpi.com/2073-4433/10/12/774. A Decadal Plan for Earth System Science 2024-2033: https://www.science.org.au/files/userfiles/support/reports-and-plans/2024/decadal-plan-earth-system-science-2024-33.pdf has one of the priorities listed as: R3: Coordinate and prioritise observational programs for research across Australia. Oversight of these observational programs, strategic review of investment in research observations and a strategy to identify emerging needs should be established above the level of individual capabilities. As a community we have been working towards an integrated community network to achieve streamlined atmospheric compositional observations for some time - i.e. Schofield, Robyn (2025). AUSTRAL - Australia's Urban Supersite neTwork for Research on Air quaLity. The University of Melbourne. Poster. https://doi.org/10.26188/28605209 With AUSCOPE in 2019 CSIRO, BoM and Universities worked together to create an AUSCOPE-Atmosphere vision - this report exists as a word document. I can share that upon request.

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.

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.

AuScope_Atmosphere_final.docx
625.4KB
application/vnd.openxmlformats-officedocument.wordprocessingml.document