

Submission to Department of Education, Skills and Employment

National Research Infrastructure Roadmap

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Technology & Engineering

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The Australian Academy of Technology and Engineering (ATSE)¹ welcomes the opportunity to respond to the 2021 National Research Infrastructure Roadmap consultation, and commends the expert working group on the development of the draft roadmap.

ATSE is encouraged that the issue of inclusion of humanities and social sciences in the ethical development and implementation of new and emerging technologies is acknowledged in Finding 5, and that there is an acknowledgment of the challenges and opportunities presented by the increase in data, including the need for improved data and computational infrastructure.

Below are ATSE's specific responses to select questions from the consultation paper.

Question 1. Are the recommendations appropriate to the current NRI environment?

The proposed recommendations address a number of key issues for the sector. Some specific comments are provided below:

Recommendation 1: Adopt the NRI Principles

ATSE agrees with the adoption of the NRI Principles with one recommended change to the investment principle. Investment cases need to consider all these aspects of the functioning of the NRI capability but also ensure whole of lifetime funding. ATSE recommends new wording for this principle:

“Investment cases describe the intended impact and reflect the resources and governance needed to develop and manage world class research infrastructure capability. These include the equipment, processes, data, skills and knowledge needed to deliver maximum value across the whole of the life of the capability”

Recommendation 2: Provide continuity and long-term funding to the NRI

Continuity and long-term funding are essential features of Australia's NRI. This long-term vision allows for the development of a high skilled workforce and increased engagement with industry. As infrastructure depreciates over time, institutional-level infrastructure whole of lifetime planning needs to be considered. This will require current funding to be increased beyond 2028-29.

Recommendation 3: Adopt a challenge framework to support NRI planning and investment

ATSE supports a challenge framework. It is not clear however what role the humanities and social sciences will play in these challenges. Given the role technology will play in the Roadmap, future infrastructure, and Industry 5.0 (people working alongside machines), there will be a clear need for ethics, safety, governance and regulation.

Recommendation 4: Establish an Expert NRI Advisory Group to drive a more effective NRI ecosystem

ATSE supports Recommendation 4, particularly the first task of developing a plan for future NRI workforce and skills needs and suggests that a focus on data collection on workforce needs is also necessary. Researchers and academics in Australia need to be supported by having viable career

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¹ The Australian Academy of Technology and Engineering is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

pathways and a stronger collective national voice, and any effort towards improving cross-institutional collaboration would be positive.

ATSE also supports the role of providing advice to Government on immediate and long-term planning and funding strategies. It needs to be clear that the primary role of the NRI Roadmap, and therefore the role of the advisory group, is to maintain long-term certainty in the NRI and its funding which are key to the success of the NRI.

Recommendation 5: Drive a more integrated NRI ecosystem

Greater integration across the NRI ecosystem should be key but this needs to include a strong focus on integration of data across the ecosystem. ATSE believes an additional focus on data linkage and data re-use could allow more value to be derived from existing data resources.

Recommendation 6: Improve industry engagement with NRI

ATSE supports the aims of Recommendation 6 to improve industry engagement with NRI, however, more clarity around the change in business management indicated in the report would be helpful. Australia has a substantial number of SMEs which do not routinely engage with NRI and lack the resources for co-investment. The Government should consider driving industry engagement for research and impact rather than co-investment, to ensure SME's can benefit. Additionally, encouraging industry to contribute to and share datasets would be valuable.

Recommendation 7: Develop a National Digital Research Infrastructure Strategy

ATSE supports the development of a National Digital Research Infrastructure Strategy. This strategy needs to recognise the importance of data as a key aspect of research infrastructure. This data needs to be harmonised across facilities. These data sets will also attract greater industry engagement as they gain access to unique and big data sets to work with.

A recent report jointly published by the Australian Academy of Science and the Australian Academy of Technology and Engineering "[Australia's Digital Future – a nation of users or leaders?](#)" highlights the need to recognise digital technologies as an independent growth sector. Without this recognition and investment into research infrastructure that supports fundamental science and engineering behind emerging digital technologies, Australia risks becoming a laggard among the world's top technologically driven nations.

Recommendation 8: Prepare Australia to tackle future challenges

Australia's NRI is successful because it takes a long-term view of future needs and challenges. This makes future challenges an important aspect of the NRI Roadmap. ATSE supports the Roadmap's role in tackling future challenges however this needs to include the future workforce of the NRI. The future NRI workforce is essential both in the functioning of the NRI but also an important consideration in enhancing Australia's sovereign capability. Australia's NRI cannot enhance the nation's sovereign capability without a sovereign and capable workforce to manage the capabilities.

Missing Recommendation: An NRI strategy that recognises the value of Indigenous knowledge and engagement

The Roadmap clearly outlines the importance of recognising Indigenous knowledge, engaging with Indigenous peoples and even the need to adopt the AIATSIS Code of Ethics. What the Roadmap fails to do is elevate the need for a NRI strategy that recognises the value of Indigenous knowledge and engagement to a formal recommendation. Indigenous knowledge and engagement should be elevated to being as important as the NRI engaging more with industry and ATSE recommends making this a clear recommendation.

Question 2. Do the principles articulate the vision and key elements required of NRI, including investment?

The principles broadly articulate the vision of the NRI, but it is important to note that at times these principles may be at odds with each other (for example, improving environmental conditions might come at an economic cost, or might lead to a short-term decline in social well-being). Similarly, a focus on national priorities and interests might conflict with the desire to be a good global citizen and work collaboratively on international datasets.

It will need to be clear (perhaps through the advisory group) how these conflicts between these principles can be dealt with.

Question 3. Are there any national research infrastructure needs missing in the draft roadmap?

The roadmap outlines the importance of emerging areas such as artificial intelligence and machine learning. For AI and ML methods to be developed and implemented, graphical processing units (GPUs) are essential. Outcomes from the ARC Linkage Infrastructure, Equipment and Facilities programs show that some research groups have access to GPU clusters, but it is not available at a national level. High performance computing is already included in the Roadmap, however GPU infrastructure needs to be explicitly included to support AI and ML across all institutes.

Question 4. A key priority for Australia is to enhance research translation. The 2021 Roadmap identifies some reforms and investments to achieve this. What other reforms would help deliver this priority?

The roadmap has raised the importance of future workforce planning within the NRI. Along with a workforce capable of utilising the NRI there needs to be consideration for the skills needed to engage industry as outlined in Recommendation 6. While the government's University Research Commercialisation plan will ideally address part of this, the NRI can also play a role. Providing staff within the NRI an opportunity to work across facilities and across challenges will allow these skills to transfer between facilities and create a more harmonious sector.

Given the importance of computing data, software and digital skills which will underpin much of the NRI, ATSE would also recommend the development of a framework for the information and communication sciences. This field cuts across almost all disciplines and provides an opportunity for better cross-sectoral benefits to the NRI. Such a framework could be developed as part of the work of the NRI advisory group but would need to include how engagement on/through the shared infrastructure.

Question 5. 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.

ATSE supports these areas for investment however it is not especially clear how these step change investments fit with the Roadmap themes and challenges. There are some intuitive connections, but the Roadmap needs to be clear how these landmark investments fit in. This is especially important given how these themes align with current Government strategy's (like the National Science and Research Priorities).

Another area that should be considered for landmark investment is the NRI workforce. The Roadmap clearly articulates the importance of the NRI workforce but not how it will benefit all research themes and landmark investments. All of the landmark investments being considered, and the research themes outlined will rely on a highly skilled workforce capable of engaging with each other across facilities and themes.

ATSE welcomes the opportunity to provide further input, clarification, or advice on this matter, drawing on our extensive network of leaders from industry, academia, the public sector, and research institutes.

For further information, please contact the ATSE Policy Team (AcademyPolicyTeam@atse.org.au).