Australian Academy of Science submission to the Department of Education, Skills and Employment - 2021 National Research Infrastructure Roadmap Exposure Draft

22 December 2021

Are the recommendations appropriate to the current NRI environment?

The recommendations are largely appropriate to the current NRI environment, particularly Recommendation 2 as continuity of funding for NRI is critical to support our nation's research. While the challenge framework outlined in Recommendation 3 will help align NRI with other government funding priorities, it should be noted that much of the work that NRI supports is fundamental research, with applications to challenges that may not yet be realised, such as pandemics and catastrophic bushfires. This work is critical to the research pipeline, as well as training and support for the workforce, and should not be forfeited in favour of additional applied research that maps more closely to these challenges.

The issue of workforce development and skills should be listed as a separate recommendation, due to the critical role the workforce will play in ensuring the success of NRI into the future and implementing the roadmap. Particular attention should be paid to the current perceptions of a career in NRI and whether there may be some similarities with the challenges faced by researchers having their time spent in industry recognised.

The Academy is supportive of the establishment of an Expert NRI Advisory Group. This group should prioritise forward thinking leadership and should be required to maintain representative expertise with diverse skills within the membership. It should also be adequately resourced, to be able to effectively monitor research trends, calibrate Australia's infrastructure support internationally and to measure the efficacy of the NRI in maintaining Australia's national and international research capabilities.

If the Expert Advisory group is established and develops an NRI Workforce Strategy as recommended, the group should have a key focus on equity and diversity, which will be of great importance in addressing the workforce issues identified.

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

The principles articulate the key elements required of NRI, however, they do not articulate the vision. The principles should be visionary rather than based in the present, be ambitious and future-proof to meet the challenges of the next 15 years.

The Academy suggests NRI Principle 2 should be revised. While NRI should be collaborative, it should invest in areas that can demonstrably support Australia's research and innovation system. These areas may and should overlap with areas of national significance, however, they may not necessarily be aligned to government priorities in the first instance, such as NRI's role in supporting new discoveries and fundamental research and international collaborations that Australia depends on to meet our own needs while contributing to solutions that require global efforts.

Principle 5 under-emphasises the role of collaboration in driving impact. This is especially the case for collaborations that allow multidisciplinary teams to leapfrog discipline specific challenges to drive progress and innovation.

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

One element that appears to be lacking from the digital research strategy is adequate acknowledgement of the impact this has on the environment. It should also consider the cost of energy, energy efficiency of facilities and social license to operate.

Also lacking is a focus on preparations for the scale of the next generation of computational infrastructure. A strong direction will be needed to determine what facilities we will need locally and what facilities Australia should be investing and participating in internationally. Opportunities to host international facilities in Australia should also be considered as part of this direction.

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?

A translation fund mirroring the Medical Research Future Fund (MRFF) for sciences that are not currently eligible for the MRFF, such as the physical sciences should be considered. Many of the challenges areas outside medicine and health are based in the physical sciences. This is particularly relevant in the frontier technologies and modern manufacturing list, where much of the infrastructure described relates to the physical sciences. Support for translation of all research will be critical to maintain the knowledge pipeline for such future manufacturing opportunities.

Research translation may also be encouraged by fostering a strong network for NRI Fellows. Giving NRI Fellows more opportunities to work collectively will promote collaborations and help raise their visibility in the sector. For example, this network could be established by hosting an annual conference focused on collectively addressing the challenges across facilities.

The Academy is supportive of additional measures to strengthen the career pathways into research infrastructure for academics who want to specialise in these areas. The contribution the NRI Fellows make to science, and the nation, needs to be appropriately recognised.

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

Basic enabling sciences can't always be mapped to grand challenges – they underpin them and often contribute to more than one. When providing landmark investments to drive step change, investments must also be made in fundamental research to build a knowledge repository that can be drawn on to solve challenges of the future. Many NRI facilities support fundamental research, and this research must retain priority to secure the future of Australian research, translation, workforce, and manufacturing.

The draft roadmap does not adequately address support for open scholarly communications infrastructure. This is urgently needed to support the needs of researchers, funders, policy makers and the Australian public that need to publish, synthesise, and access research.

When considering challenges in the next 10-15 years, 'Industry 5.0' should be considered. This is a term associated with the future state of manufacturing, where the work of computers and humans will be further integrated. This will raise challenges of ethics, security, and regulation, and our NRI system should be sufficiently prepared to respond to these challenges.

It is important that priority areas within the challenge of 'Defence' are considered within the national context. For example, cybersecurity is a problem in many other domains beyond Defence, including in health.

Please add any other comments you would like to provide to the expert working group.

The Academy recommends that the role technicians play in supporting research is more strongly reflected in this document. NRI technicians commonly have many roles in contributing to research projects and should be adequately recognised as such. One specific area to address will be adding a link to connect technicians and researchers in Figure 4.

The Academy would support the utilisation of an independent organisation to be a knowledge broker between NRI facilities, academia and industry. Having industry engagement staff in-built in facilities is unlikely to be able to sufficiently address the existing gap in communication and collaboration. The Academy would be happy to support the development of a proposal for an independent knowledge brokering organisation for NRI.

This submission from the Academy has been drafted to reflect a whole of science perspective and address systems-level issues. Discipline specific issues and perspectives can be found in submissions from the Academy's National Committees.