

Submission

## 2016 National Research Infrastructure Roadmap Capability Issues Paper

Name	Dr Leanna Read
Title/role	Chief Scientist for South Australia
Organisation	SA Government

**Question 1: Are there other capability areas that should be considered?**

The capability areas defined have clear alignment to state and national priorities, and in the case of South Australia, the South Australian Economic Priorities as well as significant strategic projects being investigated in the areas of cyber security testing, nuclear fuel, future submarines project and proton therapy.

I note that the important area of Space Technologies is covered in part under Environment and Natural Resource Management, as well as Advanced Physics, chemistry, mathematics and materials. However, Space Technologies could warrant inclusion as a headline area.

Other areas for consideration:

- Autonomous Systems (including vehicles) as a key capability area for the future.
- Energy generation: it is not clear where this is covered – this is an important consideration and should include nuclear fuel cycle, given South Australia’s Nuclear Royal Commission. If nuclear waste storage, or other parts of the nuclear fuel cycle are introduced, there will be considerable demand for research and development infrastructure.
- Defence manufacturing: submarines, frigates etc are a major focus nationally and for South Australia particularly. The infrastructure needs of defence manufacturing do not appear in the outline of the National Security section.
- Agriculture should be given headline status – there are relevant technologies sprinkled through the document, but high-value add agriculture is an obvious national priority

**Question 2: Are these governance characteristics appropriate and are there other factors that should be considered for optimal governance for national research infrastructure.**

The governance characteristics are generally appropriate, with the following comments:

- Defining clear roles and responsibilities is highly important to ensure there are the mechanisms in place to support the facility and its end users.
- A key focus of governance should be building a culture that is customer-focused and quality systems focused. This is not a ‘normal’ part of research culture but is essential for facilities that provide services, such as NCRIS.
- Effective governance will require attention to the allocation of resources between major equipment, facilities and the staff to run those facilities effectively as a service - ensuring the appropriate staff who can maximise the potential current and future use of these facilities with end users is essential to ensuring the best solutions are available.
- See response also to Q 6.

**Question 3: Should national research infrastructure investment assist with access to international facilities?**

Providing access to world-class facilities for Australian researchers, including access to the data generated (where appropriate) is essential to ensuring access to the most recent knowledge and techniques, increased capability and capacity and provides economic, social, health and environmental benefits to the community. As Chief Scientist, I would be supportive of facilitating researchers access to international facilities. However there would need to be clear guidelines and outcomes associated with the intended use of the facility and how access to such a facility would be critical to the researcher/end user. Also, provision of access to international facilities should not be on the basis that they are not available in Australia.

Consideration should be given to the provision of a specific fund to allow researchers to access international facilities that meet the criteria, but can make a sound case that the access to such facilities, will drive national research capability.

**Question 4: What are the conditions or scenarios where access to international facilities should be prioritised over developing national facilities?**

This could include facilities where the cost-benefit is not justifiable to invest in Australian facilities – such as in niche research areas or where Australia does not have the capability to manage the facilities

**Question 5: Should research workforce skills be considered a research infrastructure issue?**

Yes – but specifically as they relate to building/operating a research infrastructure facility (eg GLP practice) – i.e. not general workforce skills. Without the highly skilled technicians to train and run the equipment, end users would not get the results they require to deliver their services. Therefore, support for the skilled technicians who are trained to use these important pieces of infrastructure is essential and should be considered as a research infrastructure issue

**Question 6: How can national research infrastructure assist in training and skills development?**

Allocate a percentage of National Infrastructure Program funding to the training of scientific staff to operate facilities that meet customer requirements – particularly around quality control and quality assurance– ie. Not just technical skills.

The roadmap should identify the types of expertise that are needed to effectively manage such facilities and inform the relevant training organisations – universities, TAFE etc

**Question 7: What responsibility should research institutions have in supporting the development of infrastructure ready researchers and technical specialists?**

Prioritise training programs on the basis of the roadmap needs and awards of NCRIS grant should be conditional on commitments by the host research institutions to training of staff to run the facilities appropriately.

**Question 8: What principles should be applied for access to national research infrastructure, and are there situations when these should not apply?**

Access should be open to all – including industry, but principles should be established to determine priority of access and the charge rate applied. Fraunhofer and UK Catapults offer some models.

With regards to fees to access the equipment, there needs to be tiered structure that ensures affordability for public sector researchers, with industry contributing higher amounts to provide opportunities for greater self-sufficiency of the facilities.

The statement in the issues paper – *“The principles that underpin access to national research infrastructure need to ... maintain priority for the very best research, in the national interest”* – requires clarity around what is meant by ‘best’. This should not simply be on the basis of best basic research, but also include quality of applied outcomes/industry development.

**Question 9: What should the criteria and funding arrangements for defunding or decommissioning look like?**

Firstly, clear and measurable performance KPIs must be in place as the basis on which to evaluate whether a facility should be defunded or decommissioned.

Secondly, objective evidence should be established that these KPIs are not being met and/or there is no longer a need for the facility – customer consultations should form part of this.

Thirdly, facilities should be given at least a 12 month runway to closure or renewal so that they do not lose key staff. The current situation where NCRIS facilities are due to reach the end of their funding period without guidance as to their likelihood of renewal is unacceptable. Note that funding for the existing NCRIS facilities finishes next June. Key staff will soon start to seek alternative employment if renewal is not clarified soon. This should be an urgent priority for the program.

Further, it is suggested that decommissioning of facilities should only be funded by the Commonwealth for very large and expensive equipment with institutions having responsibility to decommission smaller facilities.

**Question 10: What financing models should the Government consider to support investment in national research infrastructure?**

The operating costs need to be included, not just capital. The success of such facilities is heavily dependent on the skills of the operators.

The Commonwealth should not fund 100% of the costs of the infrastructure and its operations – institutions and state government should continue to contribute. The South Australian Government has previously provided contributions for capital costs only for national infrastructure. Future funding options for contributions to capital and operating costs will be investigated in the coming months to ensure continued support of the research community.

Institutions still need to contribute cash commitments for national infrastructure, but a cash contribution could include provision of key staff to run the equipment, provided the staff time was at least 50% commitment and audited.

The Government should also look at alternative sources of co-funding. Some possibilities include:

- Co-investment with international partners
- Seed funding to allow a commercially viable facility to develop. By way of example, the CRC for Cell Therapy Manufacturing is developing a prototyping facility that will be funded ultimately on a fee for service basis from industry clients. Seed funding to establish such facilities could provide an efficient means to generate leverage and long term viability.
- Commercial partners could donate some of the major equipment to the facility – equipment suppliers are likely to contribute some of the equipment at no cost on the basis that this will encourage industry users to commit to the use of their equipment in on-going commercial applications – a win-win situation.

**Question 11: When should capabilities be expected to address standard and accreditation requirements?**

Ensuring industry and end-users have access to appropriately certified research facilities is essential to ensure prototypes and concept devices are created to conform with global standards (such as NATA accreditation). In discussion with industry and end-users; they often state this as being a big barrier to engagement with the research sector. Investment in expertise in the areas of compliance and certification/accreditation would address this barrier.

Equivalent facilities found in the Fraunhofer Institute of Germany do possess such accreditation, thus bridging the gap between research and industry.

The standard and accreditation requirements need to be addressed very early in the operations of the facilities and incorporated as a fundamental component of all projects so that the outputs meet industry needs.

**Question 12: Are there international or global models that represent best practice for national research infrastructure that could be considered?**

- Fraunhofer Institutes (Germany),
- Catapult Centres (UK)
- The US Government model of funding and operating major centres – for example, there are a number of primate research facilities (eg UC Davis, Seattle etc) that service the key regions.

**Question 13: In considering whole of life investment including decommissioning or defunding for national research infrastructure are there examples domestic or international that should be examined?**

**Question 14: Are there alternative financing options, including international models that the Government could consider to support investment in national research infrastructure?**

Already covered in Question 10

**Health and Medical Sciences**

**Question 15: Are the identified emerging directions and research infrastructure capabilities for Health and Medical Sciences right? Are there any missing or additional needed?**

Personalised medicine, regenerative medicine and healthy ageing are important emerging areas.

**Question 16: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?**

The UK Catapult Centres and the Germany Fraunhofer Institutes are relevant (these apply across many fields, not just medical and health).

In the area of health record data sharing, the Scottish system should be considered – they have first class access to de-identified data for determining evidenced based medical practice.

**Question 17: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Health and Medical Sciences capability area?**

Personalised medicine and Regenerative medicine are important emerging areas.

## **Environment and Natural Resource Management**

### **Question 18: Are the identified emerging directions and research infrastructure capabilities for Environment and Natural Resource Management right? Are there any missing or additional needed?**

The Integrated Marine Observing System operates a wide range of observing equipment throughout Australia's coastal and open oceans, making data accessible to the marine and climate science community, other stakeholders and end users, and international collaborators. IMOS operates as a multi-institutional collaboration and is designed to be a fully-integrated, national system, observing at ocean-basin and regional scales, and covering physical, chemical and biological variables. Many of the data streams collected in IMOS are dependent on access to suitably equipped marine research vessels. Data provided by ocean moorings and biogeochemical sampling as part of IMOS are an essential input into decision-making tools (i.e. computer models) to support government, policy makers, industry and the community to make evidence-based decisions regarding the sustainable management of individual industries, and their interactions and cumulative impacts on the marine environment. The continuation of IMOS is critical to ensuring SA maintains relevant data streams for understanding our marine environment, and the implications to our marine industries.

### **Question 19: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?**

With Australia having the third largest marine estate in the world, the National Marine Science Committee considers that for our nation to fully realise the significant benefits that our blue economy can generate (an anticipated increase from the current \$47 billion to \$100 billion by 2025), investment is needed for the foundational marine science capability provided by research vessels. Currently, Australia's cohort of research vessels is unable to service the research and knowledge needs of the entire Australian marine estate. A national alliance of a coordinated fleet of large-scale, offshore research vessels that cover Australia's marine estate, from the coast to the blue water, and the tropics to Antarctica, will increase the opportunities for scientific collaboration and discovery and enable the necessary data and information to be collected to derive the benefits from the nation's blue economy. The development of a coordinated national fleet of research vessels will be a strategic long-term investment for Australia and is critical to the future of marine science and the sustainable development of our seas and oceans.

### **Question 20: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Environment and Natural Resource Management capability area?**

Agricultural technologies receive insufficient consideration in the roadmap.

## **Advanced Physics, Chemistry, Mathematics and Materials**

### **Question 21: Are the identified emerging directions and research infrastructure capabilities for Advanced Physics, Chemistry, Mathematics and Materials right? Are there any missing or additional needed?**

Therapeutic ion accelerators capable of accelerating protons and heavier species are an emerging direction in the management of cancer. While there are several ion accelerators operating to produce radioisotopes for medical use in Australia, the accelerators required to generate energetic ions capable of therapy are significantly larger and require greater infrastructure. Proton therapy, the most widespread application of ion therapy, is rapidly expanding in developed countries within North America, Europe, East Asia and South-east Asia. Australia currently does not offer proton therapy. It is important that Australian patients are offered the most up-to-date and technologically advanced cancer treatment options made possible by advanced physics.

Autonomous systems (including vehicles) is another important emerging direction.

**Question 22: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?**

Development of imaging for proton therapy is an important area of research required to fully utilize the potential physical benefits of proton therapy over conventional X-ray therapy. Proton computed tomography (PCT) is a form of medical imaging in which the source of radiation is a high energy proton beam, as opposed to a conventional kilovoltage X-ray beam. Proton CT has the advantage of providing more relevant information about the properties of patient tissues for accurate planning of a proton radiotherapy treatment in comparison to conventional X-ray CT. Realization of a clinical PCT system requires a collaboration of high energy physics, high performance computing, applied mathematics and medical physics. Because of the multidisciplinary nature of the research, an international collaboration is required.

Carbon ion accelerator facilities are several times larger and more expensive than proton accelerators and are thus restricted to only several sites worldwide. It is important that Australia become actively involved in this new treatment direction, which may reduce side-effects of cancer treatment and reduced total treatment time. Proton therapy is commonly the stepping stone to carbon ion therapy and this should be the direction in which Australia moves in the next decade.

**Question 23: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Advanced Physics, Chemistry, Mathematics and Materials capability area?**

See response to question 21

## **Understanding Cultures and Communities**

Question 24: Are the identified emerging directions and research infrastructure capabilities for Understanding Cultures and Communities right? Are there any missing or additional needed?

Question 25: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 26: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Understanding Cultures and Communities capability area?

## **National Security**

**Question 27: Are the identified emerging directions and research infrastructure capabilities for National Security right? Are there any missing or additional needed?**

Authentication of product origin and composition is an important area – international fraud in this area is increasing at an alarming rate. Food and wine is a key sector. The Australian Wine Research Institute is developing innovative solutions to wine and food authentication.

Question 28: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

**Question 29: Is there anything else that needs to be included or considered in the 2016 Roadmap for the National Security capability area?**

Defence infrastructure capabilities is an important area. In South Australia particularly, the infrastructure requirements for submarine, frigate and other defence maritime builds are crucial.

## **Underpinning Research Infrastructure**

Question 30: Are the identified emerging directions and research infrastructure capabilities for Underpinning Research Infrastructure right? Are there any missing or additional needed?

Question 31: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

Question 32: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Underpinning Research Infrastructure capability area?

## Data for Research and Discoverability

**Question 33** Are the identified emerging directions and research infrastructure capabilities for Data for Research and Discoverability right? Are there any missing or additional needed?

**Question 34:** Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

**Question 35:** Is there anything else that needs to be included or considered in the 2016 Roadmap for the Data for Research and Discoverability capability area?

### Other comments

If you believe that there are issues not addressed in this Issues Paper or the associated questions, please provide your comments under this heading noting the overall 20 page limit of submissions.

I am concerned that the roadmap consultation process does not include clear timeframes to complete the roadmap and implement new funding arrangements. Most urgently, the uncertainty over the future of existing NCRIS facilities needs to be resolved with urgency.

Given that funding for the existing NCRIS facilities finishes next June, key staff will soon start to seek alternative employment if renewal is not clarified soon. To lose these highly skilled individuals would be wasteful and unproductive. The impact for South Australia alone would be very significant. The nine NCRIS facilities based in South Australia make an important contribution to the ability of the State to concentrate its expertise, engage with industry and increase collaboration locally, nationally and internationally.

Resolution of the future for such facilities needs to occur in a timeframe that is much shorter than the broader consultation on the roadmap. **I recommend that renewal of existing facilities is resolved by December 2016 at the latest.**