

# Submission

## 2016 National Research Infrastructure Roadmap

### Capability Issues Paper

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#### Questions

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

**Yes, Agriculture and Food is a natural Capability Area that should not have been overlooked.**

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

The most important thing is to have community participation so that investments are not wasted or commandeered by narrow (self-) interests.

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

Absolutely; this simply recognises the international nature of science and the importance of building scientific communities across borders.

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

Where it makes sense to do so based on the individual case. Clearly some issues have a national focus whereas others are global, eg conserving Aboriginal languages vs climate change.

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

Yes, on a case by case basis.

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

I would argue that training and skills are often an essential aspect of such investments. In my own experience through BPA, rapid change in DNA sequencing technology necessitated national investment in genomics infrastructure. However, without trained technicians and scientists to manipulate and analyse the data, the investment would have been worthless. By providing physical and dataset infrastructure and access to training, the genomics revolution could be very quickly integrated into my field (wheat pathogenomics). However, more could have been done.

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

Institutions should be ready to support infrastructure investments on a co-investment basis, as a requirement for hosting. They must be able to support access to the infrastructure by Australian researchers and the public. Many institutions have an education and/or training mandate, and this should be integrated into running the investment.

For some investments, there will be substantial leverage obtained by co-funding models with Research Councils, for example in providing scientists, technicians or research studentships to capitalise on the infrastructure investment. These opportunities should always be investigated and should form part of the case for funding.

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

Primarily merit-based; perhaps with an element of cost-recovery for public institutions, and a greater proportional contribution from private institutions. Public access should be prioritised over private access. Special arrangements for access by citizens should be investigated.

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

Probably on the basis of independent expert review, perhaps on a 5-yearly basis. Perhaps it is possible to provide funds for eventual wind-down at the moment of initial investment. The hosting institutions should also contribute. Aspects such as redundancy need to be thought through.

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

Institutions, State Governments, Research Councils, and potentially even private enterprise, should be consulted for interest prior to tender.

With respect to finance models, where the proposed infrastructure is expected to generate a positive financial return over its lifetime, financing by credit may be appropriate.

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

Wherever possible and appropriate.

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

A review of the major science countries strategies for such investments should be conducted.

*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?*

A review of the major science countries strategies for such disinvestments should be conducted.

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

N/A.

### **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?*

**Plant Science is not dealt with explicitly which is an omission because plant productivity underpins all life and a great deal of our economy and natural resources. There are many overlaps with health and medical resources and these should be acknowledged and exploited. The Plant Science community should be consulted and included in planning decisions.**

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

N/A

*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?*

N/A

### **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?*

N/A

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

N/A.

*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?*

**Australia should have a national facility for Wheat Genome Modification that allows researchers countrywide the access to wheat transformation and genome manipulation tools, together with contained facilities for growth of GMOs including pathogens. This is currently a severe barrier to participation of wheat researchers in the most modern techniques and tools.**

#### **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?*

N/A

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

N/A

*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?*

N/A

#### **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?*

N/A

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

N/A

*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?*

N/A

#### **National Security**

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

Emerging directions are well mapped.

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

The Biosecurity objectives are written very much on a national basis, but in fact most threats will be imported as foreign incursions. Therefore, there needs to be an ability to engage with the global community on these threats, particularly through monitoring both threats and pathogen movement. Engagement with foreign countries at moments of need will provide invaluable experience and knowledge to Australian researchers, although this may not be an aspect of infrastructure per se.

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

No.

### **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?*

Looks good.

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

N/A

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

N/A

### **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?*

See comments for Q35.

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

N/A

*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?*

**There needs to be more of a focus and discussion around participation and access for Citizen Scientists/Artists/Collectors etc in National Research Infrastructure. It is absent from the document and is a bad omission.**

**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.

## **Statement on involvement in NRI**

I am an academic and lab leader at The Australian National University working on the fungal disease stripe rust of wheat. My experience with NRI was via Bioplatforms Australia (BPA), who wished to invest in genomics infrastructure for wheat, as an addition to their other technical platforms. I was a member of the steering group that helped to organise the participation of Australian researchers working on wheat fungal diseases and decide on the priorities for support (wheat pathogenomics group). The research support was provided in the form of vouchers redeemable at BPA technical facilities. The infrastructure datasets included fungal genomes (DNA), transcriptomes (RNA), proteomes (proteins), and metabolomes (small organic molecules). In addition to dataset generation, storage of the datasets under standard metadata descriptors on BPA servers was mandated and all data were made accessible from within Australia. This was a profoundly positive exercise that revolutionised the study of these important organisms and comprises resources for ongoing investigations. This will be invaluable in the ongoing battle to save Australia's wheat crop from diseases, as the fungal pathogens cause the greatest losses. The major benefits of this investment were the datasets that were generated; the stimulation of activity on neglected and difficult to study diseases; and the establishment of a scientific community that heretofore had been somewhat dispersed. The latter aspect has led to ongoing collaborations and scientific exchanges, and establishment of an annual science meeting. Further, it has promoted the expertise in bioinformatics within the participating groups.

In my view, although this investment was highly successful, it would have been more so if funds had also been provided for scientists, technicians and research students to analyse the data, particularly in the area of bioinformatics. Possibly the best way to implement this would have been to invite Research Councils to co-invest at the time. This is a useful recommendation to take forwards to future NRI investments.

Finally, I note that BPA are an excellent organisation to interact with and have been helpful and flexible at all times.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'John P. Rathjen', with a stylized, flowing script.

**John P. Rathjen**

**Associate Professor, ANU**

**Wednesday, 31 August, 2016**