

Submission

2016 National Research Infrastructure Roadmap

Capability Issues Paper

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Title/role	On behalf of the Chair
Organisation	National Committee for Cell and Developmental Biology, Australian Academy of Science

Questions

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

Our committee did not raise any additional capability areas to be addressed over and above those listed in the Issues Paper.

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 proposed appear broadly appropriate. A strong emphasis on nationally open access should be applied.

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

Yes, national research infrastructure investment should assist with access to international facilities where appropriate, particularly with respect to the dimensions outlined in the Issues Paper and where the research infrastructure available internationally is not accessible within Australia.

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

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

Our committee is in strong agreement that enhancing and retaining research workforce skills be considered a key research infrastructure issue. There is little point in building cutting edge national infrastructure capacity without the highly skilled managers/operators required to derive the greatest benefit from the investment in infrastructure. In particular, as there are likely to be infrastructure nodes present in multiple locations, procedures should be put in place to assure the sharing of know how and the storage of data in compatible formats.

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

Well managed national research infrastructure can provide valuable opportunities for training, for researchers at all levels. In particular, the provision of training scholarships and/or subsidised workshops would prove valuable investments in students and postdoctoral researchers.

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

Research institutions have a responsibility to educate infrastructure-ready researchers broadly in terms of technological advances and their application to research/industry outcomes. An example of this would be the training of undergraduates in the basics of bioinformatics. In doing so they are more likely to embrace a future in technology and innovation. Additional, more specialist training opportunities, as provided by NCRIS nodes, should be available to PhD and postdoctoral trainees, as well as early career independent researchers.

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

In general, national research infrastructure should be accessible to all researchers on a first-come first-served basis, though factors such as institutional co-contribution need to be recognised. One potential model could be that priority access (time on a machine for example) could be allocated to individuals from the host institution based on the proportion of funds the host has contributed to the facility up to a maximum of 50% of the total time available.

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

The committee recognized that decommissioning of facilities is part of the normal technology cycle. This should occur following discussion with the funding agency and the host institution and recognising that in some instances, additional funds may be necessary to move core reagents to a new facility or to maintain legal/IP compliance. An example of such a situation would be NCRIS-funded facilities to store genetically modified germ cells, somatic cell lines or human tissues where the destruction/disposition of such materials amounts to a significant loss of material value and investment.

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

A capital investment fund would seem an appropriate mechanism to support continued investment in national research infrastructure.

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

This would seem logical where necessary to meet industry/end user requirements. Clearly, there is a consistent need for infrastructure capabilities to enable scientific rigour to be achieved. The timing of such accreditation will however, vary depending on nature of the activity and its relative involvement in discovery versus commercial/translational research. For example, there may never be a need for an animal facility to reach ISO9000 accreditation (notwithstanding the need to meet animal ethics and health standards), however, the need for a DNA sequencing service to obtain accreditation and thus allow them to move into diagnostics might be highly desirable. The urgency of such a decision should be guided in part by the market demand that accreditation will open access to.

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

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?

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?

Our committee agrees with the emerging directions that have been identified in the Issues paper as important targets for funding through a national research infrastructure scheme. There are several additional emerging directions we would like to emphasise as key areas where investment in national infrastructure would tremendously boost the capacity of Australian scientists to perform world leading health and medical research. These include:

CRISPR/Cas9 genome editing technology: The use of this technology to edit the genomes of cells and model organisms (largely mice) has been revolutionary. As a committee, we would like to see expansion of capacity in CRISPR/Cas9 genome editing, including the acquisition of CRISPR/Cas9 guide RNA libraries so as to allow large scale genetic screens in a variety of species. Ideally guides would be distributed using a cost-recovery model. Such facilities could be implemented through current Australian Phenomics Network nodes for example.

Equally, such libraries would be of enormous value to the ES cell/iPS cell community. There remains a critical need for a centralized facility to produce animal models of human disease, and while the favoured model remains the mouse, consideration should be given to other lower-order species. Such models are, for example, of critical importance to validate the huge number of potentially disease causing variants emerging from whole genome sequencing studies, and for discovery science.

High throughput, large scale cell screening technology: requiring robotics technology for rapid and reliable cell manipulation and phenotyping. Additional investment in infrastructure required for high throughput cell screening employing RNA interference, CRISPR/Cas9 or chemical/small molecule libraries is required to facilitate both fundamental gene/pathway discovery and the generation of new therapeutics for clinical translation.

Confocal, super-resolution and high-end electron microscopic imaging: High resolution imaging technology is fast developing and provides insight to cell and developmental biological events not previously accessible. Designated funding for imaging equipment including high resolution confocal, Light Sheet, STED, STORM, FIBSEM and cryo-electron microscopes to be available in centralised nodes in each state of Australia would tremendously increase our capacity to be leaders in this space.

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

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?

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?

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

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?

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?

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

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?

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?

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?

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.

The Australian Academy of Science National Committee for Cell and Developmental Biology strongly supports strategic investment in research infrastructure, both in terms of facilities and skills.