Submission Template

2016 National Research Infrastructure Roadmap Capability Issues Paper

Submission No: *(to be completed by Departmental staff)*	
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Would you like your submission to remain confidential, i.e. not published on the website?	YES/**NO**

The Australian Marine Sciences Association is pleased to provide a submission on the 2016 National Research Infrastructure Roadmap Capability Issues Paper. AMSA is a professional society of over 800 members nationwide, committed to promoting marine sciences. Our members are from universities and government agencies and have expertise spanning all disciplines related to marine science. It should be noted that AMSA and our membership were quite active in the development of the *National Marine Science Plan 2015-2025: Driving the Development of Australia's Blue Economy* in collaboration with the National Marine Science Committee, of which AMSA is a member. As such, the submissions of the NMSC and AMSA share many common themes, derived from the Plan. The same can be said of the submission of the Sydney Institute of Marine Sciences (SIMS), which also has extensive membership overlap with AMSA.

Australia has a strong and diverse marine sciences community and its continued success into the future requires ongoing investment in the infrastructure to both support existing work and to fuel further innovations. The infrastructure requirements include observing systems, research vessels, experimental systems (research stations and aquaria) and the backbone of eResearch resources (computing, data handling, storing and serving) to support the various capabilities. Given this broad range of requirements, a coordinated approach to their acquisition as well as maintenance and support will be fundamental. As such AMSA strongly supports the development of the National Research Infrastructure Roadmap. Below we provide responses to specific questions as relevant to our membership.

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

The stated capability areas seem sufficiently inclusive. It should be clear that there may be considerable overlap amongst different themes as listed and that this overlap should be considered as especially beneficial grounds for multi-disciplinary advancements if properly supported.

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

These characteristics seem broadly appropriate. We would highlight whole-of-life approaches to infrastructure and attention to data support and access as key characteristics requiring attention within the roadmap. The sort of insurance attention to these issues provides will promote greater currency and dependence on data products, greatly enhancing their value.

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

Yes. Much of the work necessary for advancing our knowledge in the marine sciences is global in nature and as such it draws from many global datasets. Examples would be the integration of IMOS with the Global Ocean Observing System (GOOS) and the use of satellite derived data products from other countries within Australian climate modelling and forecasts. In addition, existing international programs with which Australian researchers are associated, such as International Indian Ocean Expedition (2015-2020), rely on major infrastructure such as the RV Investigator for these researchers to participate.

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

Where existing programs provide the type and resolution of data required by Australian Marine Science, the focus should be on collaboration rather than duplication. It will be essential to have broad international engagement in order for these situations to be identified.

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

Yes. Previous experience with major research infrastructure funding schemes demonstrates the importance of having skilled technicians and researchers to process, deliver and utilise the vast quantities of data produced. The workforce skills required, and the career opportunities offered by any infrastructure should be carefully considered. Where there are identified gaps, there must be some assessment of how the funding scheme can add in filling them.

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

Ready access to modern research infrastructure, including vessels of the Marine National Facility, is key to any training in its use. This sort of hands-on training is the model in the marine sciences. It

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is important that consideration is given for such training related access in the funding of any research infrastructure.

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

While research institutions would be key areas where relevant research and technical training could occur, it should not be their responsibility to do so necessarily. It is better to realise that the funding of infrastructure creates a demand for properly trained students to work in technical and research roles associated with it. Research institutions will be well placed, and indeed typically quite happy to provide the relevant training. Yet, education and research training are primarily the role of universities. Key here is that any potential training organisations are involved in the conversation about upcoming infrastructure as early as possible to allow for adaptation to their offerings where possible.

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

We should be striving for an open access model to all national infrastructure and data products. Where there is co-investment from other groups there may need to be modifications to this approach. Where there is high demand for specific infrastructure (vessels for instance), merit-based approaches (e.g., independent review of applications) may be needed.

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

A whole of life approach to all infrastructure should be the model. As such, it is imperative that the cost of periodic maintenance and/or replacement is properly budgeted. It would be advisable to establish some realistic success metrics against which a specific infrastructure component can be assessed with specific guidelines as to levels needed for continued operation. Wherever decommissioning is a possibility, it must be budgeted for in advance.

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

While there may be models of co-investment which would see specific industries partnering, this is unlikely to be a viable model to deliver a comprehensive infrastructure system. Rather it may lead to large investment in only those areas where industry has a vested financial interest. There are also typically issues with making the data products of such collaborations freely available. As such, the current model of co-investment of not only cash but also people and assets under which many NCRIS facilities currently operate, is likely to deliver a system most closely aligned with the ideals laid out in this roadplan.

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

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

Not directly applicable to our membership so we have not commented on these questions.

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

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?*

The issues papers does well to capture the direction and capabilities. Of specific interest is the sustainability of existing backbone programs such as IMOS and a more explicit recognition that the data products from such programs are part of the infrastructure. The processing and distribution of such data is an inherent component of the infrastructure. It is important to continue to develop these infrastructure programs to include more coastal regions (via land-based infrastructure, including research stations) and to further develop our capacity in the area of research vessels (blue water and coastal) beyond what's currently funded.

Understanding land-sea interactions is more comprehensive than outlined in the issues paper, as land degradation and rainfall patterns are not only affecting aquaculture, but entire coastal and marine ecosystems, which have some of the highest ecosystem service values of all habitats. Experimental infrastructure is needed to investigate cumulative effects of stressors on coastal and marine ecosystems.

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

Existing models for integration of oceanographic data would be the links between IMOS and the Global Ocean Observing System and the Ocean Tracking Network. Projects through "Future Earth" are addressing relevant marine science aspects in which Australia should engage. There are also ongoing international collaborative programmes such as the International Indian Ocean Expedition (2015-2020) from which Australia can derive great benefit and should therefore continue to engage in.

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?

Inter-disciplinary research, such as the integration of the social and natural sciences to inform governance and management effectiveness. Collaboration between researchers, managers and community stakeholders is essential for improved management outcomes for our marine estate, at both State and Commonwealth levels.

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?*

Many issues in the marine science space translate directly into national security issues, specifically those of food and biosecurity. Human impacts leading to things like climate change, disease transmission and species invasions all have the potential to (or indeed already have) threaten marine food industries, including wild caught, farming and mariculture. Only a solid understanding of the biophysical environment in which these processes are occurring can help us to predict and hopefully mitigate impacts. Infrastructure which allows for long term monitoring of physical and biological aspects of our blue water and especially coastal systems will enable this understanding.

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?*

The continued development of eResearch infrastructure is critical. This infrastructure needs to not only provide high performance computing but also the capacity to serve data products quickly and easily to non-expert users. This will enable rapid and wide uptake of data products, thus maximising their utility. Continued development of broadband networks to remote areas will allow timely access to data streams generated in more remote areas, a common occurrence in the marine sciences.

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?

The coordinated delivery of data derived especially from national infrastructure programs should be a priority. It would be ideal if these data delivery systems were also designed to allow for inclusion of data streams from other facilities or programs as well.

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.