Submission
2016 National Research Infrastructure Roadmap
Capability Issues Paper

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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 NCRIS Roadmap July 2016 has some severe deficiencies. The writers of the roadmap seem to be unaware that the maintenance of biodiversity is a critical to optimal natural resource management. **We therefore need an evidence-based and manage biodiversity (as well as manage water, carbon, soil and air resources).**

A. The emphasis in the documentation is on "observatories". This is a "passive" approach to gathering data and is usually not cost effective and only usually returns key information or makes major discoveries through sheer serendipity and good luck. Question-driven science for long-term research and monitoring is critical and is far more cost-effective and far more likely to make the critical detections of key trends or the key major new discoveries in the ecological sciences. The fundamental principles for good science are to first set good questions – big data does not do this – it is science done backwards (see Lindenmayer, D.B. and Likens, G.E. (2013). Don't do big-data science backwards. Nature, 499, 284.).

B. The Roadmap document fails to recognize that people can be critical infrastructure on the ground – and in fact key environmental monitoring of many aspects of the environment will not be effective without people. Many key kinds of measurements cannot be automated – or will produce poor quality data if measurements are automated.

C. The current Long-term Ecological Research plot networks within TERN have many key components of research infrastructure such as long-term permanent plots, curated plot data, field stations etc. All of these are important assets and a key part of the nation's environmental infrastructure.

D. The Roadmap document fails to make explicit acknowledgment of biodiversity as a key part of ecosystem function. This might be excusable in the 1970s but not in this decade.

E. The Roadmap document fails to recognize that Australia is a world leader in environmental and ecological sciences and is potentially well positioned to capitalize on this in an economic (and training) context – but has largely failed to do this to date. This is where there are true innovation opportunities but largely missed to date.

F. The Roadmap document fails to recognize that ecosystems have intrinsic value – for example value for tourism etc. Indeed, the innovation in eco-tourism around the natural environment is a major area of economic and environmental advantage for Australia and a huge multiplier in terms of employment relative to extractive industries. Nations like New Zealand do the eco-tourism industry extremely well and far better recognize the values of the natural environment as an economic asset than Australia.

G. The Roadmap document fails to recognize that biodiversity is a major natural asset that has significant economic value. The Koala alone is worth over $4 bn annually for international tourism.

H. The Roadmap document fails to understand that there are very substantial opportunities for tourism and other allied service industries from natural ecosystems (and these are often worth significantly more to the economy than extractive industries such as logging and fishing).

I. The Roadmap document states that "Data collected on long-term environmental variables to sustainably manage resources and ecosystems are essential". I agree, but is important to recognize that these variables will often vary between ecosystems (that is, the key variables will be ecosystem-specific). This is because what is sensible to measure in a tropical rainforest will be entirely unsuited to a desert environment. As an example, fire is a key ecosystem driver in the tropical savannas of northern Australia and its effects as well as frequency and severity will need to be measured annually. By contrast, fire is extremely rare in the wet forests of western Tasmania and its effects may need to be measured once every 100-500 years. This means that metrics of ecosystem condition will be ecosystem-specific – and hence reporting of ecosystem condition (e.g. under IUCN criteria or SOE reporting) would need to reflect temporal changes in different metrics in those different 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?

A. Various nations around the world already have well established LTER networks or are quickly establishing their networks. Australia must ensure that it maintains its existing LTER network (LTERN with TERN) so that it can be part of major initiatives associated with global integration across plot networks in different countries. Notably, the Australia LTERN facility runs at 1/25th of the cost of the US-LTER network but the Australian LTERN is more productive and has successfully integrated information across its network whereas as the US-LTER Network has failed to do this.

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?

A. Yes. The links to practical uses of LTER data needs to be made more apparent. Two key examples are the use of long-term ecological data in the construction of economic and environmental accounting such as under the United Nations System of Economic and Environmental Accounting (SEEA) framework. This is a valuable approach to

highlight how environmental assets can be properly valued in terms of their contribution to the economy. SEEA accounting can be critical for informing decisions about how best to manage environmental assets. A set of SEEA accounts should be produced for every ecosystem in Australia (often accounts will be best done at an ecosystem level)

B. Yes. Long-term data from LTER plot networks can be used in very powerful ways such as the IUCN Ecosystem Assessment process – akin to the IUCN approach for assessing the status of individual species.

C. Yes. Long-term data from LTER plot networks must be better and more often used to inform key documents such as State of Environment (SOE) reporting.

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 Roadmap document fails to recognize the importance of collections (e.g. the National Insect Collection) – these are critical infrastructure and must be funded appropriately.

The Roadmap document makes a lot of "big data". I am sceptical about the contributions of big data in many aspects of ecological science. This is because it stimulates science to be done backwards – collect the data and then ask what the hell will we do with it later? (Lindenmayer and Liken, 2013, Nature). A better, more cost-effective way to do science is to ask good questions that are management and policy relevant and then gather the data appropriate for answering those questions. This is why the observatory concept in terrestrial ecology is silly and cost-ineffective and will fail to diagnose key problems. Such an approach also will not create the kinds of data required to properly assess ecosystems nor construct useful sets of environmental accounts.