Name of Submitter: **Ecosystem Science Council**

Draft 2016 National Research Infrastructure Roadmap Submission Template

A. Endorsement and support from Ecosystem Science Council

A.1. The ecosystem science community strongly supports the need for a landmark national ecosystem observatory and forecasting capability that is world-leading.

We agree that supporting current programs such as TERN that measure carbon, water and biodiversity – needs to be the highest priority. However, Australia also needs an ***enhanced capability*** that includes all ecosystems (terrestrial, freshwater, marine, coasts, urban as well as agricultural and other production systems), with a capacity to integrate, model and understand the trends over space and time in ALL our natural capital.

Five reasons that justify prioritising resources for this action:

(1) Return on investment
Firstly, the large monetary value of our natural capital. The total value of Australia's environmental assets was $5.8 trillion at 30 June 2015, but this is an underestimate due to data deficiencies (Australian Bureau of Statistics report 2016). Globally, the estimate of ecosystem services in 2011 of $124.8 trillion/yr was far greater than for global GDP (approximately $75.2 trillion/yr) in 2011.

(2) Filling substantive data deficiencies
Secondly, the poor state of current information on which to base planning decisions. Data streams to quantify and understand change in our ecosystems are highly deficient in Australia. At least four major reports call for increased monitoring and data collection: ('*State of the Enviroment report 2011*'; '*Stressed ecosystems: better decisions for Australias's Future* (2011); '*Sustainable Australia Report 2013: conversations with the future*' (Australian Government); '*Measures of Australia's Progress*' (Australian Bureau of Statistics 2016).

(**3) Innovation and cutting-edge discoveries**
Third, a ***holisitic and integrated systems approach*** to ecosystem monitoring and forecasting will stimulate innovation and efficiencies. To build a predictive understanding of how our ecosystems work, the biological and physical states of these systems need to be rigorously measured (e.g. essential environmental variables), along with the interactions and feedbacks that drive change within and across ecosystems. In parallel with forecasting, the projected changes need to be placed within a well-structured ecological-social-economic framework to complete the risk analyses.

(4) Meeting Australia's National Science and Research Priority – Environmental Change
Fourth, an enhanced ecosystem monitoring capacity is required to address the NSRP on environmental change: *"Build Australia's capacity to respond to environmental change and integrate research outcomes from biological, physical, social and economic systems."*

(5) Meeting global demand
Finally, as the Commonwealth and State governments have recently pledged to introduce integrated Environmental Accounting, and the ACT government from 2017 is adopting the United Nations System of Environmental-Economic Accounting (SEEA) framework (http://unstats.un.org/unsd/envaccounting/seea.asp)we need increased data collection and delivery capability to quantify national assessments of ecosystem services which benefit economic and other human activity.

A.2. We strongly support the leadership role of the Australian Government in providing national research infrastrucuture, and stress that for planning security and co-investment, the funding needs to be long-term, with streamlined reporting requirements.

B. Suggestions for improvements

B.1. *Broaden scope* – Biodiversity (P44) – this section seems to imply that sufficient information on spatial and temporal patterns of biodiversity is already available for modelling and predicting future changes. In most of Australia, baseline data on biodiversity is lacking, and trends in biodiversity are simply not known.

B.2. *Prioritise long-term data* – Continuation of long-term data streams is a prerequisite for the environmental prediction system and therefore should be prioritised for investment.

B.3. *Broaden scope* – The data Australia needs cannot be solely provided through remote sensing, sensors or other technology. It will require a continuation of direct onground field monitoring programs as part of the national infrastructure.

B.4. *Prioritise collaboration, integration and synthesis* – Adoption of a smaller number of high-level focus areas is reasonable but the nine selected areas tend to entrench silos, reinforce past inequalities in resourcing, and are somewhat biased towards technological industries that consume natural resources and generate waste. An alternative is to increase resources in areas that demonstrate collaboration, equity of access, maintain a skilled workforce, and facilitate wellbeing for all Australians.

B.5. *Change focus* – We do not agree that future investment in national research infrastructure should *require* strong links with industry and business (p13). Such links are important for *commercial* infrastructure, but should not be a requirement for Australian Government research infrastructure investment. The Australian Government must assume the responsibility for public good research infrastructure investment important in biodiversity research.

B.6. *Correct bias* – Access principles commercial (P21) – there is a risk of commercial interests locking up access to facilities, to the detriment of stakeholders (such as researchers) with less ability to pay. All data collected through publically funded, public good infrastructure should be required to be made available under responsible terms and conditions.

B.7. Expand P46 – All four points about what is needed are primarily about remote sensing and using large data sets and modelling to predict the future of environmental systems. **When currently there is a lack of baseline data, meaning current models and predictions are of limited value.** The first point should be to establish a large network of baseline and monitoring sites and networks. Data obtained from these sites can then be used to model and predict.

C. Minor corrections

P5 – The definition of 'research infrastructure' is crucial to this roadmap but the term is used inconsistently (e.g. compare P5, P13, P15). In particular, "assets" explicitly needs to reflect ALL disciplines, and include for example, data and specimens, rather than overly focus on built machinery and include the skilled workforce integral to the operation.

P23 Table 2 – Environmental Systems should be aligned with Transport as transport infrastructure can seriously affect biota (populations, communities, etc) and conversely be impacted by extreme environmental events (heat waves, sea incursions, etc).

Environmental Systems should also be aligned also with Health NSRP as ecosystems and their species are linked directly to emerging infectious diseases globally, and these affect livestock, agriculture, humans and wildlife (https://ecohealth.net/en/).

P44 – para 2 – last sentence is out of place and does not seem to make sense.

P44 – 3rd para starting "National research infrastructure…." includes non-marine matters, and these should be separated for clarity and to give due prominence to terrestrial issues.