

Submission Template

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 overall emerging directions and infrastructure capabilities described in the plan are very good, but somewhat general. Existing regional environmental observation networks like TERN OzFlux provide a critical service not only to Australia, but the larger global science community as well. These sites are particularly important given the current sparse distribution of in situ environmental station observations in the Southern Hemisphere relative to the northern temperate latitudes. It seems that the science value of these networks could be strengthened by: 1) stabilizing the support infrastructure to enable uninterrupted long-term observations, regular operational reporting and widespread public distribution of the data; 2) Increasing the number of sampling sites to more fully capture national diversity of land cover and land use, vegetation, climate, biodiversity and disturbance conditions; 3) Enhancing the site level sampling design to facilitate spatial and temporal upscaling of in situ observations commensurate with satellite remote sensing and regional ecosystem model based assessments (e.g. in collaboration with eMAST and other stakeholders); 4) Enhancing synergistic sensor measurements of critical variables (e.g. soil moisture, CH₄ exchange, overstory/understory sampling) and standardization of sensors and sampling protocols (where needed) across sites.

The trend toward better integration across capability elements and development of a national integrated automated database system is good to see, especially if it includes expanding coordination and single point access to environmental monitoring station networks and associated data collections. Much of this effort should also include recovery and curation of historical data records, which provide much needed baseline information for evaluating environmental trends.

A national approach to sensor networks and the potential reorganization of facilities within a national ecological observatory framework is good. However, particular care will be needed in designing such a system to fully capture climate and ecosystem diversity, and cross-disciplinary linkages. From the TERN perspective this could involve designing new tower or sensor arrays and spatially nested sampling

footprints including both permanent and mobile tower systems with supporting measurements and geospatial data.

Continuing access to satellite remote sensing data through international partnerships is critical for national monitoring and assessment programs. Likewise, detailed regional environmental data collections and modelling activities generated by TERN, ACCESS and other national programs provides valuable information to international partners that strengthens regional Cal/Val refinements and improvements to global satellite retrievals and global carbon and climate models. National efforts to enhance these collaborations and informational exchanges should be encouraged. Increasing development of Australian space science capabilities and potential partnerships with other international space agencies (e.g. NASA, ESA, CNSA, JAXA) in the arena of Environment and Natural Resource Management should be strengthened. Potential benefits of these partnerships may include more formal representation, input and benefits from Australian scientists on the design and operations of new satellite missions; more formalized data sharing agreements with international partners; increased opportunities for new sensors developed specifically to meet national needs to participate on shared international launches and/or missions.

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

There is strong potential for Australian collaborations on several upcoming satellite missions that would benefit both regional environmental assessment and monitoring efforts, and global science value-added. Ongoing participation from Australian researchers and TERN OzFlux network observations continue to benefit the NASA SMAP mission, resulting in regional Cal/Val refinements to global soil moisture and carbon data products. These collaborations will continue to be valuable as the SMAP mission enters extended mission phase after 2017, including assistance in developing new science data products (e.g. open water inundation and flood dynamics; improved accuracy of soil moisture retrievals in forested areas; improved regional weather and hydrologic forecasts). Other upcoming international satellite Earth observation missions within the next decade and with potentially strong value to Australia environment and natural resource assessments include NASA led GRACE-FO, NISAR, OCO-3, and SWOT missions; ESA CarbonSat, FLEX and Biomass missions. Formal collaborations and information exchanges between Australian researchers and the international missions should be strengthened and potentially coordinated through the Australian space science arena; potential outcomes from these activities could include Australian mission teams and regional science algorithm and data product enhancements targeted to address national needs.

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?

The Roadmap does good job in capturing the general elements, but is somewhat lacking in details. The above comments identify a few details and issues that could be strengthened. There are also other capability focus areas with infrastructure and information needs overlapping with Environment and Natural Resource Management (e.g. National Security, Advanced Physics, etc.). These connections could be better articulated in the Plan.