



Country: multiple values, multiple benefits into the future

Research priorities for Indigenous Protected Areas
across northern Australia

Final report

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ACRONYMS

DOE	Department of the Environment
ILM	Indigenous land management
IPA	Indigenous Protected Area
KLC	Kimberley Land Council
NAER	Northern Australia Environmental Resources [Hub]
NESP	National Environmental Science Programme
NLC	Northern Land Council
TO	Traditional Owner
TRaCK	Tropical Rivers and Coastal Knowledge
TWQ	Tropical Water Quality

ABBREVIATIONS

Al.	alia (others)
Etc.	etcetera
E.g.	for example

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Co-author contributions: Melissa George of NAILSMA and CSIRO's Rosemary (Ro) Hill have provided overall project co-leadership and development of project governance through the Steering Committee and stakeholder liaison. Melissa, Ro and Pethie Lyons co-designed the research, conducted interviews, and facilitated workshops. Pethie led the documentary analysis and Ro led the analysis of interview and workshop data. Kelsea Biggs undertook the literature review of participatory prioritisation methods. Ro led writing of the final report, with contributions from Pethie, Melissa and Kelsea.

EXECUTIVE SUMMARY

Indigenous peoples are responsible for land management across 58% of northern Australia, and their roles in protecting threatened species, significant biodiversity and heritage are critical to the Australian national interest. This report presents outcomes from a National Environmental Science Program (NESP) project focused on identifying research priorities for Indigenous Protected Areas (IPAs) across northern Australia. The project was supported through the Northern Australia Environmental Resources Hub (NAER Hub), and co-led by the Northern Australia Indigenous Land and Sea Management Alliance (NAILSMA) and CSIRO Land and Water.

The research was guided by a Steering Group including Indigenous peoples, representatives of the Australian government and an environmental non-government organisation. We based our approach to prioritisation of research needs for IPAs on a literature review of effective methods, such as multi-criteria analysis and horizon scanning. The prioritisation activities included documentary analysis, individual and small group interviews and regional workshops. The research aimed to ensure that (1) research topics and needs were identified through a transparent, collaborative process; (2) a range of robust techniques and methods for prioritisation were appropriately applied; (3) relevant stakeholders were engaged and confident in the approach and results of the study; and (4) proposed project partnerships and agreements were scoped in order to facilitate movement to the next stage of research.

The project identified 5 priority research topics and questions and 6 key findings about IPAs that underpin and explain these priorities. The greatest single research priority identified was the development of new models of research in which Indigenous people are central to the planning, process and outcomes. The remaining 4 research topics and questions were relatively equally weighted and focussed on the need to acquire knowledge to manage country into the future for multiple values and multiple benefits.

Priority research topics and questions:

1. **New research models:** What innovations and adaptations to models for different types of environmental research can enable Indigenous people to be central and gain greater benefit from current and new research?
2. **Economic dimensions:** What does Indigenous land management contribute when valued through economic approaches?
3. **Knowledge brokering:** How can both science and Indigenous knowledge be made more accessible and useful to Indigenous decision makers?
4. **Sustainable enterprise:** How can Indigenous caring for country be made sustainable through models of planning, innovation, governance, and business that can be tailored to diverse contexts?
5. **Frameworks responsive to new impacts:** What participatory monitoring, participatory impact assessment methods, and institutional or tenure responses enable Indigenous managers to protect country in response to new impacts and new conservation and development proposals.

Key findings from this research that underpin the identified research priorities for IPAs:

1. Caring for country through IPAs across northern Australia forms part of the broader spectrum of Indigenous land management activities (ILM) that have similar features, such as using traditional knowledge for management, resulting in similar research needs.
2. All identified research needs fit within the theme of understanding how to manage country for multiple values and multiple benefits while supporting youth into the future.
3. The greatest priority for Indigenous land managers is the development of research models tailored to the diverse environmental, economic and social information needs.
4. Place-based, integrative research and practice through Indigenous-driven case studies provides the best model to address the diverse and area-specific research needs of land managers.
5. Systematic and participatory prioritisation of research needs can be supported through: looking at priorities listed in strategic plans; horizon-scanning (identifying current and future factors that affect people and country); Indigenous-led group discussions about criteria to guide decisions; ranking based on these criteria in workshops; interviews to discuss priorities; and review and feedback before finalisation.
6. Current factors that influence research priorities for land management are a mix of opportunities, challenges, and factors that could be considered as both. For example: deriving economic and other benefits is an opportunity; prevalent community socio-economic disadvantage is a challenge; and large numbers of youth in communities can be viewed as both an opportunity and a challenge.

Ten potential responses to the research priorities are identified (Table 1), including further scoping and cross-hub collaboration. The NAER Hub has already responded to three of these priorities with investments in projects from 2016-2019: Project 5.3 *Multiple benefits and knowledge systems of ILMPs – economic perspectives*; Project 5.4 *Knowledge brokering for Indigenous land management* and Project 1.6 *Multi-objective planning in northern Australia*. A serious effort by research providers and investors to implement the remainder of the research priorities, through all of some of the identified potential responses, would build and draw upon this initial scientific effort to meet the needs of Indigenous land managers and northern Australian environments.

Table 1 Potential responses by the research providers and investors to the 5 identified research priorities

Identified research priority/question	Potential responses by research providers and investors, including some specific to the NAER Hub
1. New research models with Indigenous people	Scope how to systematically test how research models can be more effective for meeting the needs of Indigenous land managers through the Hub's current delivery of a portfolio of activities.
	Implement a framework for the Integrated Fitzroy Catchment Project similar to that being developed Traditional Owner groups involved in the Kimberley

	Indigenous Salt Water Science project.
	Scope a project for science partnerships within the proposed National Indigenous Land and Sea Network to design and test effective science-Indigenous knowledge exchange and peer-to-peer learning activities.
	Scope a cross-Hub collaborative project to provide practical guidelines for innovations and adaptations to a range of different types of environmental research that would enable Indigenous people to be central and gain more benefit from research (emerging priorities funding).
2. Economic dimensions of Indigenous land management	Implement Project 5.3 and ensure results are made widely available.
	Engage Nyamba Buru Yawuru and Jabalbina Yalanji Aboriginal Corporation in scoping, if any occurs, of responses to the “sustainable land management enterprises” priority.
3. Knowledge brokering for Indigenous land management	Implement Project 5.4 and ensure results are made widely available.
	Consider how to effectively link the knowledge network activities in Project 5.4 with any scoping, if it occurs, of the opportunity for science partnerships within the proposed National Indigenous Land and Sea Network.
4. Sustainable enterprise: Indigenous land management	Scope a project through evidence-based action co-research to design and test tailored sustainable enterprise models, including integrated place-based case studies, drawing on a range of planning, innovation, governance and business tools.
5. Frameworks responsive to new impacts enabling Indigenous land managers	Build early and subsequent results from Project 1.6 <i>Multi-objective planning in northern Australia</i> and Project 5.4 <i>Knowledge brokering for ILM</i> into scoping a project that identifies what participatory monitoring, participatory impact assessment methods, and institutional or tenure responses enable Indigenous managers to protect country in response to new impacts and new conservation and development proposals.

The report concludes with recognition that research priorities are dynamic, and that a one-year research project is limited in the extent to which it can engage with Indigenous land managers. Several options are suggested to support ongoing engagement between the NESP NAER Hub and Indigenous land managers and stakeholders about these research priorities:

1. Include discussions on research priorities as part of activities of the proposed National Indigenous Land and Sea Alliance
2. Provide support for development and scaling-up of Indigenous driven research priorities and strategies by ILM practitioners in self-determined groups
3. Review effectiveness of the approach and methods adopted in this project to identifying research priorities through tailoring methods drawn from literature review and expert guidance
4. Include opportunities for project review and evaluation during the life of NAER Hub within the Indigenous Research Collaboration Strategy.

1. INDIGENOUS PROTECTED AREAS IN CONTEXT

More than 70 Indigenous Protected Areas (IPAs) now make up over 40% of Australia's National Reserve System: they protect over 64 million hectares of nationally significant biodiversity, ecosystem services, culture, and community values (Table 2).

Table 2 Indigenous Protected Areas extent in Australia, May 2016.

Source: <https://www.dpmc.gov.au/indigenous-affairs/environment/indigenous-protected-areas-ipas>)

Indigenous Protected Areas (IPAs)	2016
Dedicated IPAs	72
Total area	65,045,341 hectares
Percentage of National Reserve System	44.4%

Caring for country through IPAs is part of a spectrum of Indigenous land management activities that include a wide array of environmental, natural resource, and cultural heritage management activities undertaken by individuals, groups and organisation across Australia for customary, community, conservation and commercial reasons (Hill et al. 2013). These activities originate in the connections between Indigenous societies and their customary land and sea estates – their country – that have evolved over at least 50,000 years.

Indigenous Protected Areas (IPAs) are formed by voluntary agreements between the Indigenous Traditional Owners or custodians and the Australian Government for the purposes of promoting biodiversity, and cultural resource conservation on their lands and/or seas (Davies et al. 2013). As part of Australia's National Reserve System they protect biodiversity for the benefit of all Australians, and contribute to the fulfilment of our national and international environmental conservation obligations.

While IPAs therefore sit alongside other parks and protected areas in contributing to biodiversity conservation in the national interest, they also display unique features that make them *different from* other parks, and *similar to* other Indigenous land management activities. These features include governance arrangements based on customary institutions; the importance of Indigenous knowledge systems for management; and a priority to deliver multiple economic, cultural and social benefits together with nature conservation (Davies et al. 2013; Robinson et al. 2016). Indigenous land management (ILM) activities (both within and beyond IPAs) include, for example: rangers working on weed and feral animal control; biosecurity risk detection; cultural mapping; cultural heritage protection; fire

'Caring for country' is when Indigenous people use their rights and carry out their responsibilities to manage their country and the environment through their Traditional Knowledge systems, cultural values, working together with western science, integrating expertise and technological knowledge. National Caring for Country Discussion Paper (Grant 2008) Coordinator, April 2016

management; tourist interpretation; threatened species mapping and protection; soil erosion control; track maintenance; monitoring threats to biodiversity; and many others. Across northern Australia, the Australian Government funds 20 IPA and Ranger groups together, a further 34 Ranger groups, and 3 IPAs (Table 3, Figure 1). In addition, there are 12 IPA consultation projects that are likely to result in declared IPAs.

Table 3 Australian Government-funded Indigenous land management in northern Australia, 2016.

Source: <https://www.dpmc.gov.au/indigenous-affairs/ia-projects> (see also Appendix 1)

Sub-region	IPAs only	IPAs & Rangers	Rangers only	IPA consultation
North Queensland	1	5	11	5
Arnhem Land		7	10	3
NW Northern Territory	1	1	8	1
Kimberley	1	7	5	3
Total	3	20	34	12

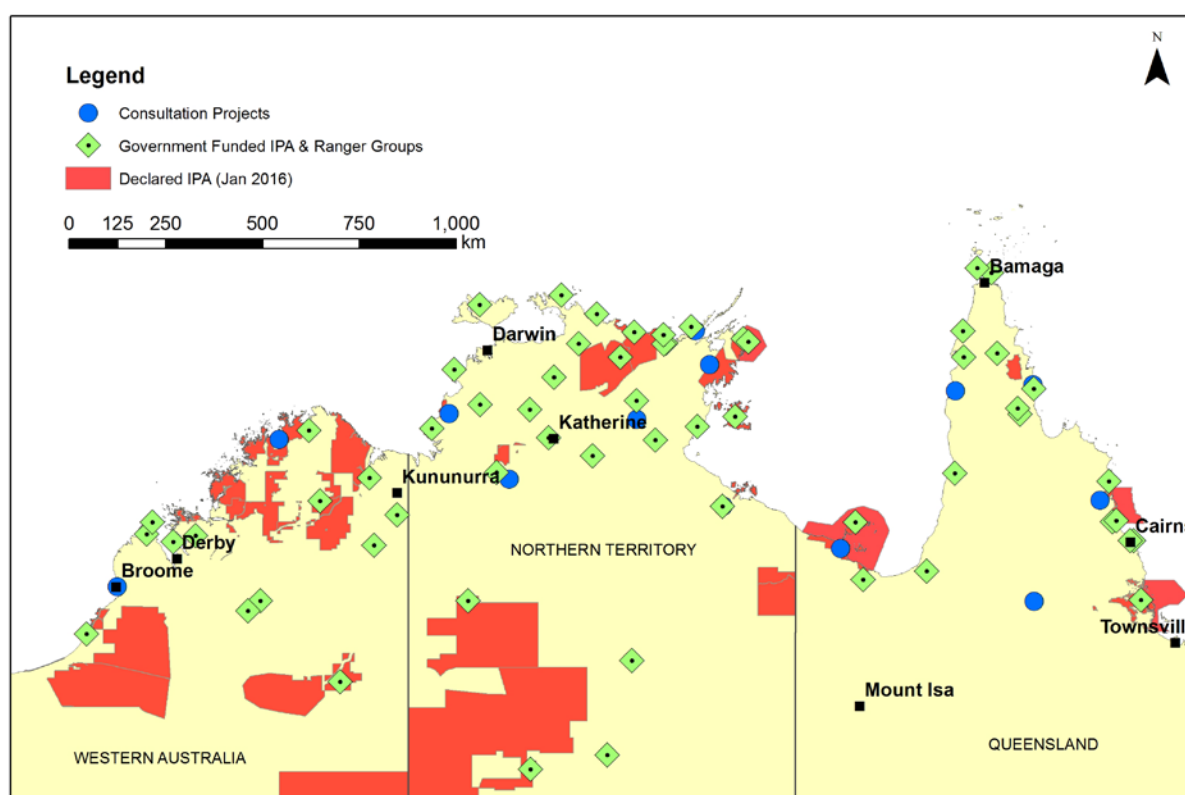


Figure 1 Location of declared IPAs, ongoing IPA consultation projects and Australian Government-funded IPAs and Ranger groups across northern Australia (excluding the Torres Strait).

Source: Locations of Government Funded IPA & Ranger Groups from <http://www.dpmc.gov.au/indigenous-affairs/environment/indigenous-land-and-sea-management-projects>. IPA data <http://www.olr.npi.gov.au/indigenous/ipa/map.html>

2. METHODOLOGY

2.1 Collaborative research framework

Researchers from CSIRO and the North Australian Indigenous Land and Sea Management Alliance co-led the assessment of research priorities through an equitable collaborative partnership. The work was guided by: a Steering Group of four people from Indigenous organisations in the Kimberley, northern Queensland and the Northern Territory; two Australian Government representatives; and a person from a philanthropic organisation (Table 4). The Steering Group (SG) adopted a Terms of Reference for their role in assisting the research to be: collaborative; protective of intellectual and cultural rights; ethical and culturally appropriate in accordance with particular Traditional Owner protocols; and useful to IPA managers and partners with influence beyond the life of the project. The SG met together twice in person, several times through phone link-ups, and made many contributions to reviewing and advising on project documents, plans, methods and opportunities for engagement with Indigenous land managers and partners.

The research aimed to ensure that:

1. Research themes and needs were identified through a transparent, collaborative process
2. A range of robust techniques and methods for prioritisation were appropriately applied
3. Relevant stakeholders were engaged and confident in the approach and results of the study
4. Proposed project partnerships and agreements were scoped in order to facilitate movement to the next stage of research.

Table 4 Project Steering Group members and their organisations

Name	Organisations
Dean Yibarbuk	Wardekken IPA
Tom Holyoake	Kimberley Land Council
Julie Melbourne	Nyamba Buru Yawuru
Fiona Peek	Northern Land Council
Sharon Prior	Ewamian Aboriginal Corporation
Lynne McCarthy	Department of Prime Minister & Cabinet
David Hinchley	The Nature Conservancy
Emma Campbell	Department of Environment

2.2 Review of prioritisation techniques

In developing the research methodology, relevant and potentially appropriate prioritisation techniques were identified including deliberative dialogues, Indigenous-led discussions, multi-criteria analysis, horizon-scanning and strategic planning. All approaches were

considered to have strengths and weaknesses in relation to the process of identifying the research priorities and for IPAs and ILM across northern Australia, as considered below.

A 'deliberative dialogue' is a group process that emphasises learning and discussion while making decisions that are reasoned, evidence-based and public-spirited. Dialogue is "the medium through which people seek shared meaning and understanding" and allows the expansion of knowledge and understanding to those participating (Raelin 2012). For successful dialogues to occur, the participants must be interested and skilled in listening to one another and in learning throughout the process. Dialogues however, cannot handle issues of power and politics, and prevailing cultural core values may dominate a dialogue and marginalise certain voices. Deliberative dialogues must be well designed, guided and documented to produce shared understanding and clear outcomes (Tan et al. 2012).

'Indigenous-led discussions' support people to give voice to their understandings using their own styles and formats. "Yarning", the Indigenous method of storytelling, knowledge creation and conversation, is a technique that allows Indigenous people to engage in two-way learning in a transparent and participatory manner. Similar in some respects to a deliberative dialogue, yarning as a research technique aims at empowering people from their own standpoint, in a culturally safe environment (Fredericks et al. 2011; Geia et al. 2013; Nursey-Bray et al. 2009). Indigenous-led discussions enable the connections of people to each other, to country, culture and customary institutions, to shape the decision-making context (Barbour and Schlesinger 2012). Indigenous-led discussions help mobilise Indigenous institutions, languages, and styles of communication, and they equalise the power relationships that have arisen from past discrimination and exclusion of Indigenous voices in research, and the negative effects from colonisation (Hankins and Ross 2008; Langton 1981; Smith 2012). The key barriers to implementation of Indigenous-led discussion techniques arise from the allowance of communities to use procedures and rhythms of their choosing, which are often much slower than the pace required for research and decision-making (Carino and Colchester 2010).

Multi-criteria decision analysis (MCDA) is used by decision makers when information is complex, conflicting, and multiple stakeholders have a role (Belton and Stewart 2002; Yatsalo et al. 2015). Malczewski (1999) describes general steps that are common to all MCDAs: (1) define the problem, (2) specify the set of evaluation criteria, (3) generate alternative actions or strategies, (4) evaluate the decision alternatives against the criteria through quantitative ranking, (5) apply the criteria weights, (6) organise in the form of a decision matrix or evaluation table, and (7) perform sensitivity analysis to determine robustness. MCDA seeks to make the participants' subjective values visible, through supporting stakeholders to consider and weight criteria, with objective judgments through quantitative ranking (Yatsalo et al. 2015). MCDA offers a structured and replicable method for decision making. However, the later stages of the process use computer programming and algorithms to produce results that cannot be readily made transparent to some Indigenous stakeholders, such as senior cultural leaders. In addition, the need to weight criteria to overcome the inherent problems in combining ranked data ultimately results in value contests that may be resolved in favour of one group of stakeholders. Deliberative dialogue can assist in arriving at greater levels of consensus around such weightings (Proctor and Drechsler 2006).

Participatory MCDA, where deliberative approaches are included throughout all stages of the MCDA process, has not been strongly developed with Indigenous people in Australia or in other parts of the world (Straton et al. 2010). Concerns have been expressed that the structured and technical nature of some MCDA processes are not suitable for inclusion of Indigenous peoples (Proctor and Qureshi 2005). However, a deliberative MCDA study in New Zealand resulted in Māori concepts of kaitiakitanga (guardianship) and rangatiratanga (variously translated as sovereignty, chieftainship, right to exercise authority, chiefly autonomy, self-determination, self-management, ownership) being incorporated into the criteria. This incorporation led to the conclusion that use of MCDA is not intrinsically inconsistent with Māori ways of doing business, although weighting may be more problematic (Lennox et al. 2011).

‘Horizon scanning’ is a foresight tool used to identify emerging issues (exploratory-centred) and to better understand known issues (issues-centred) through the collection and identification of information from diverse sources. Exploratory and issue-centred scanning can be used sequentially, allowing continued monitoring of issues. Scanning can help prioritise resource-allocation through a risks-based approach that identifies issues that warrant immediate attention, and those that require surveillance, before determining where to invest in action. Scanning can be limited by the participant groups’ ability to identify only those issues about which sufficient information is available to identify their significance. Hence it is important that participant groups and analysts have significant diversity and a broad information base (Cook et al. 2014). Horizon scanning has been used annually on a global level for the prioritisation of conservation issues, using expert opinion (Sutherland et al. 2014).

‘Strategic planning’ uses foresight, vision-setting and other tools to ensure options are considered, evaluated, and result in action-producing outcomes. Participatory forms of strategic planning are widely used by Indigenous Protected Area and Indigenous land and sea managers in Australia to prioritise management actions on multi-year and annual cycles (Davies et al. 2013; Hill et al. 2013; Moorcroft et al. 2012). However, these planning exercises often have a limited foresight consideration, as they are aimed at developing practical plans for particular areas (Hill et al. 2011). IPA strategic planning activities are recognised as most useful when they focus on the traditional territories as a whole, rather than just an IPA – this approach has become known as ‘country-based planning’ (Davies et al. 2013). More generally, strategic planning uses foresight to explore possible futures, their consequences for decisions, and the actions that promote more desirable futures (Cook et al. 2014). There are 6 stages of strategic planning: (1) setting the scope, (2) collecting the inputs, (3) analysing the signals, (4) interpreting the information, (5) determining how to act, and (6) taking action. A range of tools can be employed in each stage; for example if participation is important, techniques such as citizen juries, scenario generation and visioning can be utilised. Strategic planning can facilitate creative thinking, important in the development of new ideas.

Each of these techniques has strengths and weaknesses and a combination of approaches is required to enable robust, transparent and participatory prioritisation in the context of IPA and ILM research.

2.3 Research methods

The prioritisation methods were tailored to the context of the research by:

- (1) the use of Indigenous-led discussion to facilitate participation of Indigenous views in workshop settings;
- (2) horizon scanning through identifying issues in workshop discussions and through guided questions about issues in interviews;
- (3) development of criteria (to make subjective values visible) through discussions in workshops;
- (4) application of these criteria to rank research topics in workshop settings - by voting following participatory clustering of topics;
- (5) prioritisation by guided questions about the most important research topics and issues in interviews;
- (6) documentary analysis to capture previous strategic planning activities in IPA plans and associated documents; and
- (7) processes of feedback of information for review to assist transparency and validity.

Qualitative data were collected using mixed methods approaches - documentary analysis, workshops, interviews, feedback, and synthesis (Liamputtong 2008). The project, its collaborative research framework and mixed methods approach was approved by the CSIRO Social Science Human Research Ethics Committee (Ref: 053/15).

Key stages in the application of these techniques were:

- i. Analysing IPA plans derived from strategic planning and related documents (e.g. reports from research projects about IPAs and ILM projects and activities) (Appendix 2).
- ii. Workshops, interviews and discussions to:
 - a. Identify issues, challenges and opportunities for IPAs (context factors)
 - b. Establish criteria for deciding which research topics are priorities
 - c. Review the list of priorities from the IPA plans
 - d. List important research questions and topics
 - e. Rank the topics according to the criteria or in response to questions in interviews.
- iii. Matching research topics to existing and proposed projects.
- iv. Synthesising the information to establish research priorities and scope project plans and next steps.
- v. Feedback to stakeholders for review of the synthesis and subsequent revision and finalisation.

Collaboratively-derived criteria were used to rank research priorities at four workshops:

- Steering Group workshop in October 2015, including Ewamian Aboriginal Corporation and Nyamba Buru Yawuru members.

- Broome workshop with Kimberley coastal Traditional Owners (TOs) in October 2015, including Dambimangari, Wunambal Gaambera, Nyul Nyul, Yawuru and Bardi Jawi groups.
- Fitzroy Crossing workshop with Fitzroy basin TOs in November 2015, including Nyinkina Mangala, Gooniyandi, Bunuba and Walmajarri groups.
- Kununurra workshop in November 2015, including Kija TOs and staff and Ngarinyin staff (Wilinggin IPA and Rangers).

The criteria identified highlighted the need for the research to benefit multiple groups, address important issues for all, and match with departmental priorities for environmental outcomes. Horizon scanning occurred along with discussion of issues and challenges to identify the current important context factors, and the linkages between these and priority research topics and approaches. Interviews were conducted using an interview-guide which facilitated the identification of context factors, criteria for prioritisation and top priorities (ranking occurred in the interviews simply through enquiring which were considered to be the most important priorities).

The team worked collaboratively with the Steering Group members to host workshops, identify key people for interviews, and make use of opportunistic occasions to engage with stakeholders. Research team members conducted four participatory prioritisation workshops as noted above, engaging twenty-one Traditional Owner and seven staff across the Kimberley. The workshop data were analysed using participatory clustering techniques, visual representation of the rankings in charts, and Excel analysis (Appendix 3, Figures 3, 4 and 5).

Nine formal interviews with Indigenous land managers and/or their staff (including two group interviews, one with six and another with three participants) were conducted, three in the Northern Territory and six in Queensland. The interview data were imported into N-Vivo software and coded according to themes in two major groups: context factors and research priorities (Appendix 3, Figure 6).

Draft research priorities were presented to members of the Northern Land Council (NLC) Full Council meeting at Ngukurr in May 2016 and responses collated, including further identification of context factors and research priorities. NLC Full Council includes seventy-eight members and five co-opted Women's positions, elected from Traditional Owners across the NLC's seven regions. Meetings were held that involved twelve Australian government staff and two Western Australian government staff involved in supporting Indigenous land management programs. Meetings to gauge interest and seek input were also held with three Queensland IPA managers that resulted in their decision not to engage in the project for a variety of reasons, including its pan-northern rather than specific community focus. One community advised that they were currently developing their own research strategy and were not engaging in any research until that was completed.

Validity of themes identified in the analysis of data from diverse sources (workshops, interviews, documentary analysis) was assessed through testing for convergent triangulation. The quantity of evidence behind a particular theme is greater where it is identified in multiple sources. The quality of evidence is also an important consideration in qualitative enquiry –

where one or more data source supplies greater levels of attention and detail to certain themes and topics (Creswell and Miller 2000). Validity was also tested through review of first a preliminary report, and subsequently a draft of the final report by the participants in the study and other stakeholders, supporting processes of testing for missing and “disconfirming evidence” (Cresswell and Miller 2000, p. 127). Lincoln and Guba (1985) argue that checking and reviewing by participants in the study is regarded the most crucial technique for establishing credibility in qualitative enquiry.

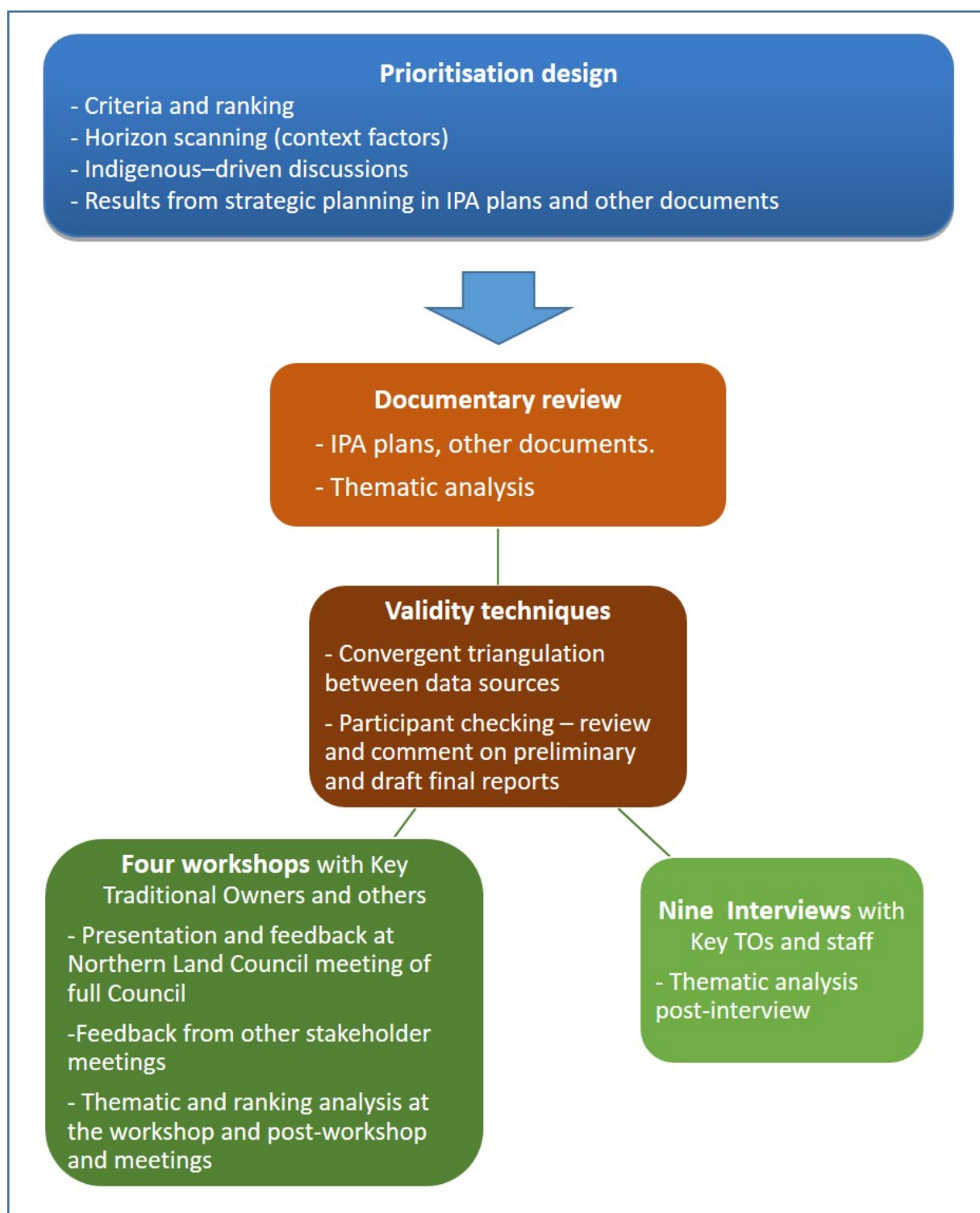


Figure 2 Qualitative research design and validity techniques

Drafts of this report and accompanying fact sheets were distributed to all contributors with follow-up emails and phone calls seeking responses. The drafts were made available on the NAER Hub web-site, and email notification about opportunities for comment distributed widely among the Steering Group's networks of contact. A face-to-face meeting occurred with relevant staff from the Department of Prime Minister and Cabinet, and the Department of Environment, where the findings were presented and feedback obtained on the drafts.

The project aim of scoping proposed project partnerships and agreements in order to facilitate movement to the next stage of research occurred in detail for two of the five identified research priorities, resulting in two projects being included in the NAER Hub Research Plan V2 for delivery from July 2016 to June 2019¹. Time constraints did not allow for scoping of proposed project partnerships and agreements for the other three identified research priorities. However, suggested next steps for each identified priority are included in the next section.

¹ The full text of NAER Hub Research Plan V2 will be released to stakeholders once approved by the Australian Government. Contact Professor Michael Douglas michael.douglas@uwa.edu.au for details.

3. RESEARCH PRIORITIES FOR IPAS AND ILM ACROSS NORTHERN AUSTRALIA

3.1 Overview of research priorities

The study identified 5 critical research topics and questions. The greatest single research priority emerging from the data analysis was the development of new models of research in which Indigenous people are central to the planning, process and outcomes. This priority attracted significant discussion and highlighting in most interviews and workshops, and also consistently appeared in the list of topics in IPA plans. The remaining 4 research topics and questions were relatively equally weighted and focussed on the need to acquire knowledge to manage country into the future for multiple values and multiple benefits.

The 5 priority research topics and questions are:

1. **New research models:** What innovations and adaptations to models for different types of environmental research can enable Indigenous people to be central and gain greater benefit from current and new research?
2. **Economic dimensions:** What does Indigenous land management contribute when valued through economic approaches?
3. **Knowledge brokering:** How can both science and Indigenous knowledge be made more accessible and useful to Indigenous decision makers?
4. **Sustainable enterprise:** How can Indigenous caring for country be made sustainable through models of planning, innovation, governance, and business that can be tailored to diverse contexts?
5. **Frameworks responsive to new impacts:** What participatory monitoring, participatory impact assessment methods, and institutional or tenure responses enable protection of country in response to new impacts and new conservation and development proposals.

Six key findings underpin the research priorities for IPAs and ILMs identified through this research:

1. Caring for country through IPAs across northern Australia forms part of the broader spectrum of Indigenous land management activities (ILM) that have similar features, such as using traditional knowledge for management, resulting in similar research needs.
2. All identified research needs fit within the theme of understanding how to manage country for multiple values and multiple benefits while supporting youth into the future.
3. The greatest priority for Indigenous land managers is the development of research models tailored to the diverse environmental, economic and social information needs.
4. Place-based, integrative research and practice through Indigenous-driven case studies provides the best model to address the diverse and area-specific research needs of land managers.

5. Systematic and participatory prioritisation of research needs can be supported through: looking at priorities listed in strategic plans; horizon-scanning (identifying current and future factors that affect people and country); Indigenous-led group discussions about criteria to guide decisions; ranking based on these criteria in workshops; interviews to discuss priorities; and review and feedback before finalisation.
6. Current factors that influence research priorities for land management are a mix of opportunities, challenges, and factors that could be considered as both. For example: deriving economic and other benefits is an opportunity; prevalent community socio-economic disadvantage is a challenge; and large numbers of youth in communities can be viewed as both an opportunity and a challenge.

As noted, the overarching common research priority theme for Indigenous land managers across their diverse contexts is about understanding how to manage country to protect its multiple values, generate multiple benefits and ensure that these support today's youth into the future. IPAs across northern Australia are very different to one another, ranging from large, relatively remote areas on Indigenous-owned desert and savanna landscapes, to small, rainforest multi-tenured sites where the IPA co-exists with national parks, lease-hold and privately owned lands. As well some are relatively newly listed, others well established. Indigenous land management activities are therefore also diverse. While environmental research focused on specific weeds such as grader grass, or specific domains such as fire management are recognised as useful, the greater priority is for research that unpacks how to continue to deliver effective caring for country in diverse contexts.

Integrated place-based research, through Indigenous-driven case studies focused on the above priority topics, provides an opportunity and the preferred model to address ILM practitioners' highly diverse, area-specific environmental and cultural resource management research priorities.

3.2 New, more effective research models with Indigenous peoples

Indigenous peoples have been arguing the case for participatory research models that generate genuine community benefit for many years (Martin 2003). Progress has been made, for example in terms of acknowledgement, co-authorship, and returning materials to communities. In the Tropical Rivers and Coastal Knowledge (TRaCK) program of work, Indigenous participation in research delivered multiple benefits to Indigenous participants, including opportunities to return to country, exchange traditional and scientific knowledge, learn new skills, and strengthen pride in culture and identity (Jackson and Douglas 2015). "Respectful and trusting relationships were the hallmark of most interactions" among the Indigenous people and scientists although TRaCK, for a variety of reasons, was "less successful in achieving a high degree of Indigenous control of the projects" (Jackson and Douglas 2015, p. 16). Despite these and other advances, moving research to new, more Indigenous-driven research models that generate greater and more consistent community benefit is a major and still unmet goal for many Indigenous land managers.

The key question has been identified as: “what innovations and adaptations to models for different types of environmental research can enable Indigenous people to be central and gain greater benefit from current and new research?” Some types of environmental research will require a greater level of engagement with Indigenous people than others. NESP NAER and Tropical Water Quality Hubs have now recognised this within their Indigenous Engagement Strategies, differentiating three levels of engagement. However, a wide array of research methods exist that potentially can bridge the gap between science and Indigenous land managers, including problem-solution co-framing, Indigenist research, Indigenous-driven research, action research, and cooperative and collaborative approaches. The NESP NAER Hub has an opportunity to systematically test research models through its current delivery of a range of approaches in their portfolio of activities.

The ILM practitioner participants in the research consider that effective research models:

- i. Are driven by the Indigenous group themselves from the context of their own ILM issues, contexts, aspirations and capacities;
- ii. Drive benefit for other groups and other contexts, and scale-up findings through peer-to-peer networks, knowledge exchange and synthesis;
- iii. Are adaptive, collaborative, have meaningful engagement from communities, and integrate skill development and training; and
- iv. Involve both immediate and long term community benefit.

‘A lot of research has been done, but it’s still a top-down situation, this has got to change ... We’d like to work from the bottom up and involve people here ... it’s a difficult nut to crack. It’s a chestnut that’s been in the bottom of the fire for a long time and no one’s done anything about it’.
Kowanyama Land and Sea Manager. April 2016

Participants at the Broome Workshop developed the following set of guidelines for approaches that they believe should apply to all research in the Hub.

✓Training and tools - legacy:

- Training comes with research;
- Skills and methods are left behind after research; and
- On-going, self-sustaining tools, knowledge and benefits are left at end of project.

✓Inclusive and participatory set-up of project:

- Free, prior and informed consent of appropriate TOs;
- Come with a “blank sheet”;
- Involvement and ownership of research design by TOs;
- Research implementation is adaptive and responsive; and
- The research process is evaluated by IPA groups.

✓Community benefits – social/emotional:

- High community benefit, immediate, long-term and on-going;
- Social and emotional well-being;

- Protect and strengthen cultural values;
- Country looks healthy/better after it was sick; and
- Promotes IPA/ILM.

✓Ownership and communication effectiveness:

- Clear and effective communication – daily with individuals, research goals and findings, products and next steps;
- Integration into existing documents, plans and efforts;
- Useful to management of country;
- Joint ownership of process, IP, outcomes, benefits, presentations; and
- Community involvement and communication.

The collaboratively-derived criteria from the Steering Group similarly emphasised the importance of *how* the research is conducted and not only *what* it is about:

✓Ethical Standards:

- Ethical standards include mutual benefits, free prior informed consent, mutual goal setting, negotiated agreements, reporting back and sharing outcomes;
- Following protocols, including local cultural protocols; and
- Ensuring evaluation, monitoring and reflection.

‘There is a lot of gaps in any research, but the key thing is getting the TOs involvement in any research, if you’re not engaging with the relevant TOs well the research sort of fails.’
 Waanyi Garawa IPA
 Senior Cultural
 Advisor, May 2016

✓Adaptive collaborative:

- Can develop in a collaborative and mutually beneficial way;
- Is able to be flexible and adaptable to changing conditions; and
- Contributes to a knowledge system to enable learning from what is done and from what others have done.

✓Meaningful engagement:

- Builds local capacity to make informed land management decisions;
- Practically feasible – commitment, skill and energy for it, community champion with sustained commitment;
- Value lies in fostering relationships, engagement imperative, regular contact, and ensuring Indigenous people will utilise it in practice; and
- Follows best practice international guidelines/standards.

While many researchers would agree that these are good ways to carry out research that is mutually beneficial, the key gap identified is in practical examples that implement these ideas in ways that recognise the diverse context of research. ILM managers want the research above all to be useful to them, to be:

‘...focussed on the actual needs of the IPA ... well-coordinated and well planned ... effectively engaged with IPA staff and IPA landowners. They, [and] we have to be clear about what the products are going to be and how those products are going to be delivered

and what we intend to do with those products... they have to contribute to what we are actually doing on the ground and in our day-to-day management. So it should be seamless.' Dhimurru Interview May 2016.

Senior Traditional Owners (TOs) attending the Northern Land Council Full Council meeting emphasised the need for research priorities to recognise and be driven by their obligations to country, and for TOs to be part of the research.

Peer-to-peer Indigenous knowledge exchange through networks is seen as the best way to drive benefit from place-based research into other places and contexts. Indigenous land managers recognise that governments and research providers often require research to generate benefit beyond one single community. In this regard, preferred models are those that scale-up through the linking of multiple case studies and experiments embedded in integrative place-based research and practice, to identify effective methods. An example of this scaling-up approach is the National IPA planning guidelines. This synthesis was achieved by Indigenous people and their staff meeting at a workshop to share common experiences over many years of place-based IPA planning and management. The workshop supported participants to identify planning elements that do work and elements that do not, and these findings were synthesised to produce a practical set of guidelines for planning (Hill et al. 2011).

Synthesis by more generic question-driven approaches on aspects such as weed and feral animal control, fire management, or threatened species, is seen as less successful. The difference lies in what is driving the research – whether driven by TO interests from their place-based experiences, or driven by scientific disciplinary-based interest in particular topics.

Different models of peer-to-peer knowledge exchange have been identified as potentially required, including for example a sub-regional hub sharing experiences and research findings across western Cape York Peninsula communities who are tackling many similar challenges in relation to weeds, pests and development impacts. The current “Kimberley Indigenous Salt Water Science” project that has been developed through negotiation between Traditional Owners and the Western Australian Marine Science Initiative is viewed by participants in the research as a good way to build a sub-regional approach to effective research. This project is designed to develop frameworks and protocols that will assist in bringing Indigenous knowledge and western science together to help better understand and manage the marine environment, focusing on three sets of activities:

1. The development of an overarching marine research agreement and research process for TOs and scientists.

'Engaging with the TOs, share ideas of what has worked and what hasn't worked ... [where] room for improvement, meeting other IPA groups where some things might have worked, and exchange ideas.'
Djelk Ranger, May 2016

2. The development of protocols for the capture, interpretation and management of traditional knowledge to enable its integration into joint management of the marine environment.
3. The development of a framework for standardised methods and a training resource to improve the consistency and validity of marine research conducted by and with TOs.

A National Indigenous Land and Sea Managers Network has been proposed that aims to provide a vehicle for government to exchange with Indigenous managers on matters of national and international environmental significance and provide opportunities for Indigenous managers to come together to develop an Indigenous position on existing policy mechanisms to support land and sea management. The Network also aims to provide to provide a coordinated learning environment, promote information exchanges and shared understandings of issues and opportunities (George 2016). These activities of the proposed network would be highly relevant to the knowledge-networking research priorities identified in this project.

Next steps: Four activities have been identified as potential responses to this identified research priority.

1. Scope how the NESP NAER Hub could use its opportunity to systematically test how research models can be more effective for meeting the needs of Indigenous land managers through its current delivery of a range of approaches (adapted to meet Indigenous engagement requirements) in their portfolio of activities. Scoping of what is required for such systematic testing can determine whether a new research project is needed (to establish and implement a framework for such testing), or whether the testing could be embedded in Hub's current knowledge brokering and Indigenous engagement activities. Given the interest from Indigenous land managers in new research models, scoping could also address how relevant innovations can be brought into future research projects.

2. Implement a framework for the suite of NAER Hub-projects in the Fitzroy Catchment similar to that being developed by Traditional Owner groups involved in the Kimberley Indigenous Salt Water Science project.

3. Scope the opportunity for science partnerships with the proposed National Indigenous Land and Sea Network to design and test effective science-Indigenous knowledge exchange and peer-to-peer learning activities. Peer-to-peer knowledge networking and exchange activities have been included in Project 5.4 *Knowledge brokering for Indigenous land management* of NAER Hub Research Plan V2. However, the networking is a small component of the project and is not likely to fully meet the identified need.

4. Scope a Cross-Hub collaborative project to provide practical guidelines for innovations and adaptations to a range of different types of environmental research that would enable Indigenous people to be central and gain more benefit from research. Feedback from the Department of Environment during review of an earlier draft of this report identified that an emerging priority for many NESP Hubs is to obtain guidance on how to tailor diverse

research methods to meet Indigenous engagement requirements. Cross-Hub collaboration may be appropriate to scope a relevant project for funding as an emerging priority.

3.3 Economic dimensions of Indigenous land management benefits

Indigenous land managers across northern Australia are highly concerned that failure to recognise the *co-benefits* of ILM (both IPAs, Rangers and other land management activities) will likely lead to under-investment. The need for quantitative, comparable data about the range of cultural, social, economic and environmental benefits from different approaches to supporting ILM drove early recognition that this is an immediate priority for investment by the NESP Northern Australia Hub and a relevant project is included in Research Plan Version 2.

Project 5.3 *Multiple benefits and knowledge systems of ILMPs – economic perspectives* was developed through community engagement under the guidance of this project's Steering Group. The project commenced in January 2016 for a three year period, ending December 2018. The key gap the project addresses is the need for quantification of the numerous social, cultural and economic benefits (co-benefits) that have been recognised through several qualitative studies (Esparon et al. 2015). Where co-benefits have been quantified, these most frequently included the number of people employed, or the value of food harvested from country. Research that focuses on intangible benefits – such as the Indigenous cultural values associated with ILMPs, or the benefits of ILMPs to the wider community - is less numerous and is dominated by qualitative methods. This reflects the difficulty of monetising numerous inter-related and often intangible values, particularly in Indigenous contexts, where benefits are often inseparable and where traditional non-market valuation techniques are not always appropriate.

Social Return on Investment (SROI) projects in four Australian IPAs across Australia are filling some of these knowledge gaps (Social Ventures Australia 2016). However, the SROI approach relies on market/price-based valuation methods which cannot account for all benefits; and does not provide information about the way in which the wider 'flow-on' benefits of ILMPs are distributed within Indigenous and non-Indigenous communities, locally, regionally, nationally and internationally. Project 5.3 addresses these key remaining gaps in four ways.

First the project will provide information about the direct and indirect financial benefits that flow from the current expenditures in ILM. Second the project will collate, classify and analyse information about existing enterprises across northern Australia that maintain and protect people, culture and land, and generate revenue. The analysis will enable the identification of constraints and opportunities. Third, the project will conduct five community case studies in different settings for ILM to enable comparative analysis of the strengths and weaknesses of diverse approaches (e.g. Rangers, IPAs). Finally the project will identify how connections from these communities spread the benefits of ILM more broadly, particularly through knowledge-sharing.

Some gaps around economic dimensions that are priorities for Indigenous land managers across the north are however not addressed Project 5.3, or addressed only in part. The first pertains to the building of models on how to develop sustainable enterprises. This has been

identified as a separate research priority “sustainable land management enterprises”, but it can draw on the collation and comparative analysis of strengths and weaknesses in enterprises that will occur in Project 5.3. The second relates to communities who expressed a high level of interest in being part of an economic multi-benefit case study, but have not been able to be included, primarily due to the time-frames needed for their own decision-making and resource constraints. Jabalbina Yalanji Aboriginal Corporation and Yawuru remain very interested in engaging in community-driven economic research.

Next steps

Two activities are identified as potential responses to this research priority.

1. Implement Project 5.3 and ensure results are made widely available.
2. Engage Nyamba Buru Yawuru and Jabalbina Yalanji Aboriginal Corporation in scoping, if any occurs, of responses to the “sustainable land management enterprises” priority.

3.4 Knowledge brokering for Indigenous land management

Substantial knowledge resources, both from science and Indigenous sources, are available to underpin effective ILM across northern Australia. However, Indigenous land managers have identified that these knowledge resources have not yet fully empowered their land management and development capability. Recognition of the need to overcome technological, social and organisational barriers to knowledge uptake drove early recognition that this is an immediate priority for investment by the NESP Northern Australia Hub and a relevant project is included in Research Plan Version 2.

Project 5.4 *Knowledge brokering for Indigenous land management* was also developed through community engagement, and under the guidance of this Project’s Steering Group. Project 5.4 will undertake action co-research, partnering with Indigenous people in the Fitzroy catchment (WA) and in the Northern Territory to design and test culturally tailored knowledge brokering methods and tools, and share these through a pan-northern Indigenous knowledge network.

Indigenous-specific requirements for Plain English, visual or audio information sources, or information in Aboriginal languages, are often not able to be met by current research portals. Many bodies of Indigenous Knowledge are held by a few senior custodians whose health and other commitments preclude their ability to contribute sufficiently to all the requests for knowledge contributions. Staff of Indigenous organisations often act as brokers between diverse knowledge-holders, but brokering requires extensive time and energy. Many such staff suffer burn-out and are unable to establish effective systems to support brokering as an activity rather than something relying on an individual.

Project 5.4 addresses these gaps through action co-research to co-develop and test knowledge brokering methods, tailored for Indigenous requirements, to improve knowledge uptake into ILM, including land use decisions. Peer-to-peer knowledge exchange networks², and two knowledge brokering tools will be evaluated: *collaborative spatial influence mapping (Fitzroy River Indigenous groups)* and *Indigenous-driven evaluation and re-planning (Waanji Garawa IPA and Rangers)*. Participatory tools are central to effective knowledge brokering, but these must be tailored to the needs of the knowledge-users. The Fitzroy River case study involves construction of a 3D participatory spatial model as the foundation of knowledge brokering activities. The project will deliver three broad outputs: the tailored knowledge brokering tools, the knowledge network, and the diagnosis of the conditions under which knowledge brokering can improve Indigenous adaptive management of environmental assets.

Some gaps around knowledge brokering that are priorities for Indigenous land managers across the north remain that Project 5.4 does not address, or addresses only in part. The development and testing of regional and sub-regional knowledge networks is a preferred approach for many ILM practitioners, in addition to the pan-northern approach. A range of tools are likely to be useful for knowledge brokering, and Project 5.4 is obviously limited in its scope. Some communities outside the Fitzroy River have already identified an interest in participatory mapping techniques, and so it will be important to ensure that the knowledge network is effective in diffusing innovations to other places.

Next steps

Two activities are identified as potential responses to this research priority.

1. Implement Project 5.4 and ensure results are made widely available.
2. Consider how to effectively link the knowledge network activities in Project 5.4 with any scoping, if it occurs, of the opportunity for science partnerships within the proposed National Indigenous Land and Sea Network.

'A lot of research has been going on but we mightn't have access to it ... Some white fellow get up there and he say a couple of sentences and they're lost straightaway then. Then he just keep going on and on, but to them it's like what the hell this white guy talking about?'
Gunggandji Interview
April 2016

3.5 Sustainable Indigenous land management enterprises

A key priority for all ILM practitioners engaged through this project was the generation of knowledge on how Indigenous caring for country can be made into a sustainable enterprise that can enable themselves and their young people to stay on country and carry out their

² See output from NERP Project 12.1 that identified the potential for knowledge-networks to improve ILM. [How knowledge networks can improve collaborative governance across wet tropics country](#)

responsibilities for country into the future. While ensuring environmental outcomes is a critical driver of ILM, the priority information needs are for models of planning, innovation, governance and business that can be tailored to diverse contexts and support ILM enterprises into the future.

Further scoping is needed to generate a specific research project related to this information gap. However, a number of aspects have been identified. The preferred approach is to first work with communities to tailor enquiry about sustainable enterprises to the context, and then undertake a process of learning from one another's experience:

'Opportunities to run an IPA sustainably are going to often be quite specific to that area, because the tourism opportunities might be different ... the opportunities to have carbon or ecosystem services are probably different...research tailored to specific areas is going to be more useful ...start at a particular place and then look at the characteristics of that place ... the research would need to be tailored to there. Then if there's things, lessons learnt out of that that can apply more broadly, then good.'
Balkanu Interview, April 2016.

Workshops to share information between people are welcomed, but there is also recognition that videos of people talking about what they have done, or what they have learned from attending a workshop, are an important method of making information more available.

Second, Indigenous land management activities are recognised as a good incubator for innovations, and for motivating Indigenous community action on the broader array of activities required to advance toward their aspirations. However, access to information about business innovation models, fostering supply chains, and other activities critical to ensuring revenue, is currently lacking. A number of Indigenous groups have expressed interest in engaging in the CSIRO's ON program³ of innovation and mentorship to develop an economic enterprise to turn feral pigs into fertiliser products. (The ON program supports innovators in science and technology to translate ideas into breakthrough innovations that generate positive impact in the face of big global challenges by bringing together industry, government and the broader research sector to solve challenges together.) One group is currently accessing a current entrepreneurial innovation learning program, the Lean Launch Pad.

Third, information gaps have been identified about governance and administrative arrangements that support best practice for ILM as the centrepiece of sustainable enterprises. Concerns exist that the rapid increase of Rangers have led to a context where IPA and Ranger processes have not met the need for ensuring Traditional Owners' authority and engagement in decision making and activity on country:

'The corporate and administrative arrangement framework ... we also would benefit from more research into effective governance. I know that it is a substantial issue. When we look at what's happening to some IPAs ... we have quite a range of different governance arrangements that we're operating within and I think we would benefit from

³ <http://www.csiro.au/en/ON-Program>

research into that, how those operate and what might form a best model or a range of models that we could choose from as they go forward.' Dhimurru Interview May 2016

Scoping research project/s based on community case studies of sustainable ILM enterprise development, drawing on a range of planning, innovation, governance and business tools, is recommended to further develop this priority. Well-designed action research can ensure that these integrated projects are research activities, not just community projects. Attention to scaling-up using comparative cross-case analysis techniques, as well as Indigenous knowledge networks, can ensure the lessons that are produced provide outcomes for Indigenous communities, the Australian Government and other research investors, and the international scientific literature.

Next steps

A scoping activity is identified as a potential response to this research priority.

1. Scope a project through evidence-based action co-research to design and test tailored sustainable enterprise models, including integrated place-based case studies, drawing on a range of planning, innovation, governance and business tools. Share lessons, tools and models from the project and case studies through peer-to-peer knowledge networks.

3.6 Frameworks for Indigenous land managers to assess and respond to new impacts on country

While all ILM practitioners across northern Australia are engaged in responding to new impacts on country, the diversity of these impacts is very high. IPA managers and Ranger groups in the Wet Tropics, for example, have numerous endangered ecosystems, and species facing threats from new invasive species such as yellow crazy ants. In the savanna landscapes, many ILM practitioners are concerned about changes to fire regimes, in some cases driven by new fire-prone invasive species, including both too much fire and lack of fire in the right time and right places.

Despite this diversity, the ability to respond to both sorts of impacts is affected by common factors. For example, both groups noted tenure arrangements as the greatest determinant of their capability to respond to impacts. The *common* information needs in relation to impact are about how Indigenous land managers can drive approaches to: (1) assess and prioritise emerging new impacts through participatory monitoring methods that link science with Indigenous knowledge; (2) evaluate the potential impacts of proposed new developments in ways that are simple and effective for the ILM groups, and support informed consent; and (3) respond to proposals through appropriate agreement-making, tenure arrangements and other institutions that support multiple benefit outcomes.

Again, while further scoping is needed to generate a specific research project related to this information gap, a number of aspects of the frameworks (and tools/methods) required have been identified. First, seek more effective ways of assessing impacts on key values, and prioritising these. While people welcome the progress made through the I-tracker and Tablet methods of monitoring on country, these methods currently lack the capability to capture the intersection between impacts and critical issues for Traditional Owners such as cultural

boundaries. More effective techniques for mapping assets and threats that fit with Aboriginal understanding of country are required:

'[We need] proper mapping and mapping of bushland so people can understand, a bit complicated how this map is, I mean people can understand it, but they don't understand Aboriginal thing across it, this will help a lot.' Waanyi Garawa IPA Senior Cultural Advisor

Several threat prioritisation methods that link standard biodiversity approaches with Indigenous approaches are being piloted, for example:

Threat, the standard biodiversity priority and how they link with traditional knowledge and the utilisation of traditional knowledge. We also have been developing a threat assessment matrix for sacred sites. Dhimurru Interview April 2016

Second, many groups identify a mis-match between current responses to impacts and ILM priorities and cultural obligations:

'Feral animals, they want to bring 1080 bait in now and start dropping that around. We still hunt and gather fish. We're frightened we're gonna attract the poison in the second-third stage from anything that got contact with 1080 bait. We want to walk in and burn, teach our kids, we know the boundaries of a certain creek. National Park want to fly in with a plane and drop golf balls all around the block because it's more efficient for them. It's really taken away the Indigenous side of who we are, what we doing for 40,000 years.' Angkum IPA Interview, March 2016

Third, people are very frustrated about the lack of appropriate institutions to support their management of impacts on country:

'Here's our country ... [we wish] that means you can't do sand extraction or soil extraction or water extraction without a permit, without it having an environmental assessment etcetera. I mean there are lots of things that impact on [country] and they're the same all up and down the coast with Indigenous people.' Kowanyama Land and Sea Manager April 2016.

In Queensland, ILM practitioners and TOs who want to control impacts of mining are only able to do so through national park declarations, which are not regarded as the most effective models for fostering their aspirations and fulfilling their land management obligations. In other jurisdictions, understanding impacts of new mining methods, such as sea floor mining and unconventional gas, is a key priority.

This research priority therefore involves a complex set of inter-related needs around Traditional Owner-driven monitoring, assessment, evaluation and response. Collaboration activities with Indigenous people planned in NAER Hub Project 1.6 *Multi-objective planning in northern Australia*, and the two case studies in Project 5.4 *Knowledge brokering for ILM*, will begin to meet some of these research needs. Early results from these projects could support efforts to scope a project to address the need for (Indigenous-driven) frameworks for assessing and responding to impact.

Next steps

A scoping activity is identified as a potential response to this research priority.

1. Build early and subsequent results from Project 1.6 *Multi-objective planning in northern Australia* and Project 5.4 *Knowledge brokering for ILM* into scoping a project that identifies what participatory monitoring, participatory impact assessment methods, and institutional or tenure responses enable Indigenous managers to protect country in response to new impacts and new conservation and development proposals.

3.7 Integrated place-based research to meet area-specific needs

All ILM practitioners have area-specific environmental and cultural resource management research-related needs for better information about species, habitats, cultural sites, resources and the drivers of change including weeds, fire regimes and the feral animals particular to their regions. Analysis of the IPA plans and documents produced an initial list of topics related to these area-specific needs: broad-scale issues of pervasive threats; ways of working together and learning from each other; linking conservation and health outcomes; recognising multi-objective goals for country and of people; surveys and mapping; species specific studies; managing resource industry partnerships for sustainable development; and two-way research rehabilitation and emerging issues. These lists were presented and discussed in all the workshops and interviews (Appendix 2).

However, no one of these areas is a priority interest to all ILM practitioners across the north. For example, fire management for multiple values was among the bottom four of fourteen priorities in the ranking that emerged from the workshops, and weeds and ferals was ranked eighth (Appendix 3, Figure 3). However, neither of these were identified as key priorities in the subsequent interviews:

'Research into weeds and the spread of weeds and all that is very important. But unless you've got some kind of model of sustainability for ranger groups, a lot of that work is just not going to happen ... [We need] the research into how these things become sustainable.' Balkanu Interview April 2016

Domain-driven research will continue to be important to the Australian Government with specific responsibilities under various legislations for threatened species recovery, and for managing potentially threatening processes such as weeds and inappropriate fire regimes. Finding good ways of connecting between these different drivers – Indigenous leadership of country, and government environmental responsibilities and risk management – is important, and some successful examples were identified. The research into pigs that occurred as part of an integrated place-based suite of research in Cape York Peninsula is an example.

'One of the areas we've focused quite a lot of attention is the Aurukun areas, APN and that group, and, yeah, building a fire project there, pigs research, Nest to Ocean, and all that. Then you start to build a model that may be sustainable. Yeah, and that's heavily involved - it's involved [a specific research organisation], it's involved other researchers in it.' Balkanu Interview May 2016

In addition, this research was identified by neighbouring ILM groups as a case where the preferred scaling-up methods of peer-to-peer knowledge exchange had not yet occurred, but

would be very welcome. The National Indigenous Fire Knowledge Forum noted that further research on Indigenous fire knowledge and management should focus on multiple benefits delivered and supporting sustainable enterprises (Robinson et al. 2016c). Place-based partnership approaches were recognised as needed for delivery of Indigenous fire management, and Indigenous fire knowledge research needs to be collaborative co-research that involves Indigenous people in research design, implementation, and analysis (Robinson et al. 2016a). Peer-to-peer knowledge exchanges were identified as key area for future research.

Area-specific priorities, and key opportunities for delivering benefit such as fire management and feral pig control, are amenable to investigation through integrated, place-based research case studies. Focusing on specific domains (e.g. fire, ferals) through the identified priority research topics, including sustainable ILM enterprises, and the frameworks for impact assessment and response, offer opportunities to meet both area-specific needs, larger Indigenous goals and national environmental responsibilities. In addition, developing new research models can make ongoing scientific research (e.g. fire, weeds, ferals, surveys and mapping of environmental assets) and more useful for ILM practitioners, will further enhance opportunities to meet ILM practitioners' information needs.

4. CONTEXT FACTORS

4.1 Overview of context factors

The horizon scanning activities at the workshops and those that occurred in the interviews identified 14 contemporary context factors that affect current research priorities for ILM, including a mix of opportunities, challenges, and factors that were potentially both a challenge and an opportunity.

Opportunities include: being able to meet caring for country obligations; deriving economic and multiple benefit outcomes from ILM; national heritage recognition of the Indigenous values of the Wet Tropics and the Kimberley regions; and communities that are strong in language, lore and culture.

Challenges include: Indigenous disadvantage and capacity limitations; centralisation of services and proposed community closures; uncertainty in government policy and funding for ILM; demand for IPAs and ILM not matched to National Reserve System and other targets; and loss of knowledge and culture.

Factors that are both an opportunity and a challenge include: the large proportion of youth in Indigenous communities; water and land intensification; native title recognition and devolution to PBCs (Prescribed Bodies Corporate); different tenures with different impacts on rights; and different conservation and protected area models on offer.

4.2 Opportunities

Opportunities for caring for country, for fulfilling cultural and customary obligations to look after the environmental and social conditions of traditional estates, are critical contextual factors in all consideration of research priorities. Participants in the research emphasised that land and sea management by Traditional Owners is a continuum, IPAs exist in some places, but the responsibility to keep country healthy exists outside IPAs as well. However, IPA networks are viewed as making a vital contribution to landscape scale protection.

Sitting alongside the opportunities of caring for country, IPAs and ILM are contextualised within the over-arching priority to generate multiple benefits through those activities. These multiple benefits opportunities are related to:

- Cultural benefits – Indigenous land managers representing their communities in the protection of sites and other cultural values
- National mainstream Australia benefits - linking Indigenous aspirations to look after country with mainstream aspirations for biodiversity protection
- Social benefits – generating and realising aspirations of putting country and people back together
- Knowledge benefits - building knowledge and baseline data to understand and engage with landscape intensification processes and cultural and biodiversity protection
- Economic benefits – IPAs' role in broad estate economic frameworks, carbon economies
- Local level enterprises and partnerships with government, philanthropy and industry, cattle, mining, agriculture.

Through opportunities for caring for country, Indigenous land managers are able to address key issues identified in their IPA plans – for example, in relation to fire:

- Co-ordination of fire, feral animal and weed control across programs, tenures and groups.
- Fire for protecting cultural and natural values.
- Partnerships across government, private companies, and Indigenous groups that agree on prescribed burning programs and maintain cultural and environmental values.

Participants also highlighted that many opportunities arise because communities are strong in law, language and culture. Linkages with Indigenous knowledge of country, seasonal indicators and bush medicines are important when considering research priorities. Key points include:

- Language and stories connect people and country.
- Law sets out ways of working that protects country and culture.

The West Kimberley and the Indigenous Cultural Values of the Wet Tropics World Heritage area were recently listed as Nationally Significant Heritage under the *Environment Protection*

and *Biodiversity Conservation Act 1999 (Commonwealth)*. Indigenous peoples in both regions viewed these listings as clear evidence that their role in caring for country benefits all Australians, and is therefore worthy of, and indeed requires, long-term government support for ILM. Both these listings reflect many years of advocacy, research and knowledge mobilisation activities by Indigenous peoples.

4.3 Challenges

The ongoing socio-economic disadvantage and capacity limitations of Indigenous people when compared to the broader Australian community is a key challenge that influences research priorities. The life expectancy of Indigenous Australians is still around ten years less than that of non-Indigenous Australians; child mortality rates are slowly declining but remain well above those of non-Indigenous people; in very remote areas less than 40% of year 5 students meet minimum literacy standards; and the total employment rate of Indigenous people has declined only slightly from 48.2% in 2002 to 47.5% in 2012-13 (Commonwealth of Australia 2016).

Participants in this research note many of these factors as influences on ILM:

- Poor health, unemployment, issues of alcohol and drugs
- Poverty, lack of community infrastructure and resources
- Educational disadvantage, literacy and numeracy issues
- Family dysfunctionality and domestic violence.

This context is a key driver of the priority for new research models that build capacity of the ILM practitioners:

'Can't really expect the ranger crew to just start up, and suddenly be quickly hitting a whole lot of environment targets ... there's all that workplace development, and skilling everybody up, and getting the green ways of working, and the green ways of elders being involved ... even just people being used to the eight hour day, and turning up at the same time ... need to get into a social level, and before you can really start to eradicate those pineapple infestations up and down the coast. Or start to improve country's health through burning.' Jabalbina Yalanji Aboriginal Corporation interview, November 2015.

All groups identified government policy and funding uncertainty as a key context, which focused attention on the need to be able to measure and demonstrate the multiple benefits that ILM produces for both Indigenous communities, the land, and wider Australian government and community environmental responsibilities. Participants point to the:

- Uncertainty and instability in funding of IPAs with funding not secure beyond 2018
- Uncertainty of program and policy priorities, for example in relation to the perceived certainty of the National Reserve System to conserve values when public conversations occur suggesting the “unlocking of land” from reserves.

ILM practitioners, particularly in the Kimberley, expressed great concern about how the governments' centralisation of services policies will affect their ability to continue ILM across

large parts of the Australian continental land mass for which they are responsible. The ability of IPAs, and Rangers to carry out their roles will be greatly diminished should governments remove support for communities, infrastructure and services. Indigenous knowledge responsibilities need people to be on country.

Another key challenge for IPAs and Ranger programs is the pressure for them to function as repositories and sources of Indigenous knowledge as communities struggle to respond to the numerous proposals for new conservation and development projects. The development nexus is pressuring an already fragile situation.

Several Indigenous groups who participated in the research expressed strong aspirations to consider IPAs and associated Rangers for their country. A key challenge here is matching national and international protected area targets to the demand for IPAs and ILM to support Indigenous peoples' obligations for the management of their traditional estates. National Reserve System objectives and targets under the Convention on Biological Diversity emphasise factors such as representativeness of ecosystems that are not relevant to ILM practitioners.

While the strengths that people have in knowledge and culture is recognised as an important opportunity, Indigenous communities face great challenges in stemming the loss of knowledge and culture associated with prevalent socio-economic disadvantage and other impacts of colonisation that have disconnected people from country.

4.4 Potentially both challenges and opportunities

In northern Australian communities involved in ILM programs, the skewing of the demographic profile towards a very large youth population is a major driver of identified information needs. Participants in this research estimated that in some communities, 60% of the population are under 14. In 2011, Australia wide, 36% of Indigenous people were aged 0-14, compared to 18% for non-Indigenous Australians (Commonwealth of Australia 2016). People see that providing an economically viable future that keeps their youth connected to country is a major challenge. However, this youthful population also has many opportunities for education and new capacities, for example to use digital technologies that may bring innovative solutions to the communities.

Many of the processes of native title recognition have now been completed in northern Australia, providing opportunities to leverage benefit from newly-secured land resources. However, the Prescribed Bodies Corporate organisations (PBCs) established to hold land are challenged by being small, poorly resourced, and faced with rapidly building their capacity to enable them to make some significant decisions with long-term consequences. The current water and land intensification agenda for northern Australia presents both challenges and opportunities that Traditional Owners will need to balance in making decisions, and the PBCs will largely be responsible for ensuring that sufficient information is available to make decisions.

Key challenges identified include:

- Intensification will take water and bring new social and environmental threats that will require management;

- Water extraction impacts on cultural values and resources; and
- Decisions about tenure arrangements for agricultural development could diminish native title rights permanently.

On the other hand there are range of opportunities:

- Water and land intensification can help lift employment and provide economic opportunities; and
- Different partnership arrangements and tenure models may preserve native title rights.

Finding appropriate tenure models is also a key opportunity and challenge for caring for country and conservation opportunities. Some conservation models that are being proposed (e.g. joint managed parks) impede the exercise of Native Title rights, including to implement Indigenous traditional fire practices. The opportunity is to find tenure models that empower rather than impede Indigenous rights and ILM practices. State and Land Council lawyers have different views on the effects of tenure, which is very confusing for ILM practitioners.

'Dealing with this incredible complex tenure environment ... the concepts are often so foreign to people ... there's always going to be work for someone ... who's got their head around all of the different tenures.' Jabalbina Yalanji Aboriginal Corporation interview, November 2015.

5. DISCUSSION AND CONCLUSION

5.1 Potential responses to the identified research priorities

Indigenous land managers now hold interests and responsibility for management of 58% of land across northern Australia, including significant areas of high-value environmental assets, with many rare and threatened species and ecosystems⁴ (Australian Government 2016 (in press)). This project has identified that ILM practitioners recognise many information gaps where research could help improve management and deliver benefits toward meeting Australian Government responsibilities for these assets. However, to achieve this potential benefit, a change is required towards new models of research, that are better able to meet Indigenous land managers' aspiration to be central in research.

Indigenous peoples are seeking empowering, integrated place-based research that fits in with their community-driven activities on country, builds capacity and shares outcomes through peer-to-peer networks. Aligning Australian Government's responsibilities for environmental management and risk control with these preference is challenging.

However, if the NESP NAER Hub is able to deliver effective new research models, a significant prospect exists for rapid improvements in the management of Indigenous lands. Transdisciplinary research models that can craft knowledge in ways that support sustainable development are attracting significant scientific attention globally (Clark et al. 2016). A serious effort, by research providers and investors, to implement the research priorities through all or some of the ten potential responses identified in this report (Table 5) can both draw on and build this scientific effort, while meeting the needs of Indigenous land managers and northern Australian environments.

Table 5 Potential responses by research providers and investors to the identified research priorities

Identified research priority/question	Potential responses by research providers and investors, including some specific to the NAER Hub.
1. New research models with Indigenous	Scope how to systematically test how research models can be more effective for meeting the needs of Indigenous land managers through the Hub's current delivery of a portfolio of activities.

⁴ Here we define land where Indigenous people hold interests and responsibility for management as comprising:

- Indigenous tenure for Australia (Aboriginal Reserve, Aboriginal Deed of Grant, Aboriginal Freehold Land (inalienable and alienable), Aboriginal Local Government Lease, Aboriginal held lease (other than pastoral), Aboriginal held pastoral lease, Multi feature Aboriginal freehold – National Parks);
- Indigenous Protected Areas;
- Determine Native Title including exclusive possession and non-exclusive possession;
- Collaborative Australian Protected Areas Database 2014 – (Aboriginal Areas, and National Park Aboriginal)

Note: overlaps have been removed between tenure types (a-d).

people	Implement a framework for the NAER Hub Integrated Fitzroy Catchment Project similar to that being developed Traditional Owner groups involved in the Kimberley Indigenous Salt Water Science project.
	Scope a project for science partnerships within the proposed National Indigenous Land and Sea Network to design and test effective science-Indigenous knowledge exchange and peer-to-peer learning activities.
	Scope a cross-Hub collaborative project to provide practical guidelines for innovations and adaptations to a range of different types of environmental research that would enable Indigenous people to be central and gain more benefit from research (emerging priorities funding).
2. Economic dimensions of Indigenous land management	Implement Project 5.3 and ensure results are made widely available.
	Engage Nyamba Buru Yawuru and Jabalbina Yalanji Aboriginal Corporation in scoping, if any occurs, of responses to the “sustainable land management enterprises” priority.
3. Knowledge brokering for Indigenous land management	Implement Project 5.4 and ensure results are made widely available.
	Consider how to effectively link the knowledge network activities in Project 5.4 with any scoping, if it occurs, of the opportunity for science partnerships within the proposed National Indigenous Land and Sea Network.
4. Sustainable enterprise: Indigenous land management	Scope a project through evidence-based action co-research to design and test tailored sustainable enterprise models, including integrated place-based case studies, drawing on a range of planning, innovation, governance and business tools.
5. Frameworks responsive to new impacts enabling Indigenous land managers	Build early and subsequent results from Project 1.6 <i>Multi-objective planning in northern Australia</i> and Project 5.4 <i>Knowledge brokering for ILM</i> into scoping a project that identifies what participatory monitoring, participatory impact assessment methods, and institutional or tenure responses enable Indigenous managers to protect country in response to new impacts and new conservation and development proposals.

5.2 Review and updating of research priorities for IPAs and ILMs across northern Australia

This project has identified five research priorities for Indigenous land managers (including of IPAs) across northern Australia. The process involved substantial levels of engagement with Indigenous land managers, partners and investors. However, a one year research project inevitably has limitations in the extent to which Traditional Owners, rangers, IPA staff and others are able to be involved.

In addition, priorities that are placed on research topics are influenced in part by a range of context factors. Priorities will change as new opportunities open up – such as the proposed National Indigenous Land and Sea Network – and new decisions are made – for example in relation to land and water intensification. Research itself usually opens up new questions, as well as providing some answers to the ones that were posed at the beginning of the project.

The five priorities identified here are therefore likely to change over time, in response to changes in the context, outcomes of the research itself, and input from other ILM practitioners and stakeholders. Ongoing updating and reviewing through available opportunities is important (Table 6).

This project has also identified that new research models are required that more effectively place Traditional Owners in the driving seat and engage them centrally in research on their country. This project tailored some existing methods to the particular context of prioritisation with Indigenous land managers, and review of the effectiveness of this project would be valuable, and contribute to the search for new more effective research models. However, other more Indigenous-driven approaches to identifying research priorities are emerging and could be supported by NAER Hub in the future.

Ongoing discussions of research priorities for IPAs and ILM across northern Australia during the lifetime of the NAER Hub would therefore be beneficial. Opportunities for such discussions would be possible through the knowledge network activities in Project 5.4, and the proposed National Indigenous Land and Sea Network if established (Table 6).

NESP Northern Australia Environmental Resources Hub draft Indigenous Research Collaboration Strategy establishes the intent to view Indigenous communities and Traditional Owner groups as potential research collaborators with their own research priorities, knowledge systems and expertise, rather than as participants who “engage” in the research projects developed and led by others. The draft Strategy also recognises that groups are at diverse stages in developing their own research priorities and strategies. For example, in this project Giringun Aboriginal Corporation identified that they were currently engaged in formulating their own strategy and would not be engaging in research until that was completed. The Kowanyama Land and Sea Manager identified that a sub-regional approach to research implementation and sharing would be beneficial for them. In future, research priorities for Indigenous land managers across northern Australia may best occur through support for and scaling up of these Indigenous-led prioritisation activities (Table 6).

Table 6 Potential responses by the NAER Hub to the need for review and updating of research priorities for IPAs and ILMs across northern Australia

Identified need	Potential responses by the NAER Hub
Ongoing discussions of research priorities	Include discussions on research priorities in the knowledge network activities of Project 5.4 Knowledge brokering for Indigenous land managers
	Include discussions on research priorities as part of activities of the proposed National Indigenous Land and Sea Alliance
Indigenous-driven research priorities and strategies	Provide support for development and scaling-up of Indigenous driven research priorities and strategies by ILM practitioners in self-determined groups
Project review	Review effectiveness of the approach and methods adopted in this project to identifying research priorities through tailoring methods drawn from literature review and expert guidance.
Ongoing NAER	Include opportunities for project review and evaluation during the life

review	of NAER Hub within the Indigenous Research Collaboration Strategy.
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6. REFERENCES

- Australian Government. 2016 (in press). *State of the Environment 2016*. Canberra, Australia: Australian Government Department of the Environment.
- Barbour, W., and C. Schlesinger. 2012. Who's the boss? Post-colonialism, ecological research and conservation management on Australian Indigenous lands. *Ecological Management & Restoration* 13 (1):36-41.
- Belton, V., and T. Stewart. 2002. *Multiple criteria decision analysis: an integrated approach*. Springer Science & Business Media.
- Carino, J., and M. Colchester. 2010. From dams to development justice: progress with 'free, prior and informed consent' since the World Commission on Dams. *Water Alternatives* 3 (2):423-437.
- Clark, W.C., L. van Kerkhoff, L. Lebel, and G.C. Gallopin. 2016. Crafting usable knowledge for sustainable development. *Proceedings of the National Academy of Sciences* 113 (17):4570-4578.
- Commonwealth of Australia. 2016. *Closing the Gap Prime Minister's Report*. Canberra, Australia. Online: http://closingthegap.dpmc.gov.au/assets/pdfs/closing_the_gap_report_2016.pdf. Department of the Prime Minister and Cabinet.
- Cook, C.N., S. Inayatullah, M.A. Burgman, W.J. Sutherland, and B.A. Wintle. 2014. Strategic foresight: how planning for the unpredictable can improve environmental decision-making. *Trends in Ecology & Evolution* 29 (9):531-541.
- Creswell, J.W., and D.L. Miller. 2000. Determining validity in qualitative inquiry. *Theory into Practice* 39 (3):124-130.
- Davies, J., R. Hill, F.J. Walsh, M. Sandford, D. Smyth, and M.C. Holmes. 2013. Innovation in Management Plans for Community Conserved Areas: Experiences from Australian Indigenous Protected Areas. *Ecology and Society* 18 (2):14. Online: <http://www.ecologyandsociety.org/vol18/iss2/art14/>.
- Esparon, M., M. Farr, D. Grainger, S. Larson, and N. Stoeckl. 2015. *Economic values and Indigenous Protected Areas across Northern Australia. Preliminary Report*. Townsville, Australia: Northern Australia Environmental Resources Hub, National Environmental Science Program.
- Fredericks, B.L., K. Adams, S.M. Finlay, G. Fletcher, S. Andy, L. Briggs, L. Briggs, and R. Hall. 2011. Engaging the practice of yarning in Action Research. *Action Learning and Action Research Journal* 17 (2):7-19.
- Geia, L.K., B. Hayes, and K. Usher. 2013. Yarning/Aboriginal storytelling: towards an understanding of an Indigenous perspective and its implications for research practice. *Contemporary nurse* 46 (1):13-17.
- George, M. 2016. Developing a National Indigenous Land & Sea Managers Network. In *National Native Title Conference 2016*. Darwin, 1-3 June: Australian Institute of Aboriginal and Torres Strait Islander Studies.
- Grant, C. 2008. National Caring for Country Discussion Paper. Canberra: Prepared by the Indigenous Advisory Council Deputy Chair.
- Hankins, D.L., and J. Ross. 2008. Research on Native Terms: Navigation and Participation Issues for Native Scholars in Community Research. In *Partnerships for Empowerment Participatory Research for Community-based Natural Resource Management*, edited by C. Wilmsen, W. Elmendorf, L. Fisher, J. Ross, B. Sarathy and G. Wells. London UK and USA: Earthscan, 239-258.
- Hill, R., F. Walsh, J. Davies, and M. Sandford. 2011. Our Country Our Way: Guidelines for Australian Indigenous Protected Area Management Plans. Cairns: Australian Government, CSIRO Ecosystem Sciences and Department of Sustainability, Water, Environment, Population and Communities. <http://www.environment.gov.au/indigenous/ipa/toolkit/management.html>.

- Hill, R., P.L. Pert, J. Davies, C.J. Robinson, F. Walsh, and F. Falco-Mammone. 2013. Indigenous Land Management in Australia. Diversity, scope, extent, success factors and barriers. Cairns, Canberra: CSIRO Ecosystem Sciences. <https://publications.csiro.au/rpr/download?pid=csiro:EP124759&dsid=DS5>.
- Jackson, S.E., and M. Douglas. 2015. Indigenous engagement in tropical river research in Australia: the TRaCK program. *International Indigenous Policy Journal* 6 (2):Retrieved from: <http://ir.lib.uwo.ca/iipj/vol6/iss2/3> DOI: 10.18584/iipj.2015.6.2.3.
- Langton, M. 1981. Urbanizing Aborigines The Social Scientists' Great Deception. *Social Alternatives* 2 (2):16-22.
- Lennox, J., W. Proctor, and S. Russell. 2011. Structuring stakeholder participation in New Zealand's water resource governance. *Ecological Economics* 70 (7):1381-1394.
- Liamputtong, P., ed. 2008. *Doing Cross-Cultural Research Ethical and Methodological Perspectives*. Heidelberg, Germany: Springer.
- Lincoln, Y.S., and E.G. Guba. 1985. *Naturalistic Inquiry*. Newbury Park: Sage Publications.
- Malczewski, J. 1999. *GIS and Multi-Criteria Decision Analysis*. New York, USA: John Wiley & Sons, Inc.
- Martin, K.B.M. 2003. Ways of knowing, being and doing: A theoretical framework and methods for indigenous and indigenist re-search. *Journal of Australian Studies* 27 (76):203-214.
- Moorcroft, H., E. Ignjic, S. Cowell, J. Goonack, S. Mangolomara, J. Oobagooma, R. Karadada, D. Williams, and N. Waina. 2012. Conservation planning in a cross-cultural context: The Wunambal Gaambera Healthy Country Project in the Kimberley, Western Australia. *Ecological Management and Restoration* 13 (1):16-25.
- Nurse-Bray, M., A. Wallis, and P. Rist. 2009. Having a yarn: The importance of appropriate engagement and participation in the development of Indigenous driven environmental policy, Queensland, Australia. *Indigenous Policy Journal* 20 (3).
- Proctor, W., and E. Qureshi. 2005. Multi-criteria evaluation revisited. Paper read at Proceedings of the Australia New Zealand Society for Ecological Economics Conference, Massey University, Palmerston North, New Zealand.
- Proctor, W., and M. Drechsler. 2006. Deliberative multicriteria evaluation. *Environment and Planning C-Government and Policy* 24 (2):169-190.
- Robinson, C.J., G. James, and P.J. Whitehead. 2016. Negotiating Indigenous benefits from payment for ecosystem service (PES) schemes. *Global Environmental Change* 38:21-29.
- Smith, L.T. 2012. *Decolonizing Methodologies Second Edition*. London & New York: Zed Books Ltd.
- Social Ventures Australia. 2016. *Consolidated report on Indigenous Protected Areas following Social Return on Investment analyses*. Canberra, Australia. Online: https://www.dpmc.gov.au/sites/default/files/publications/SROI-Consolidated-Report-IPA_0.pdf; Department of Prime Minister and Cabinet, Australian Government.
- Straton, A.T., S. Jackson, O. Marinoni, W. Proctor, and E. Woodward. 2010. Exploring and Evaluating Scenarios for a River Catchment in Northern Australia Using Scenario Development, Multi-criteria Analysis and a Deliberative Process as a Tool for Water Planning. *Water Resources Management* 25 (1):141-164.
- Sutherland, W.J., R. Aveling, T.M. Brooks, M. Clout, L.V. Dicks, L. Fellman, E. Fleishman, D.W. Gibbons, B. Keim, and F. Lickorish. 2014. A horizon scan of global conservation issues for 2014. *Trends in ecology & evolution* 29 (1):15-22.
- Tan, P.L., K.H. Bowmer, and J. Mackenzie. 2012. Deliberative tools for meeting the challenges of water planning in Australia. *Journal of Hydrology* 474:2-10.
- Yatsalo, B., V. Didenko, S. Gritsyuk, and T. Sullivan. 2015. Decerns: A framework for multi-criteria decision analysis. *International Journal of Computational Intelligence Systems* 8 (3):467-489.

APPENDIX 1: AUSTRALIAN GOVERNMENT SUPPORTED IPAS AND ILM PROJECTS, NORTHERN AUSTRALIA

Queensland

1. Angkum IPA and Rangers	Angkum Aboriginal Corporation
2. Apudthama Northern Peninsula Area Rangers	Northern Peninsula Area Regional Council
3. Dauan Rangers	Torres Strait Regional Authority
4. Eastern Kuku Yalanji IPA and Eastern Yalanji Rangers	Jabalbina Yalanji Aboriginal Corporation RNTBC
5. Erubam Rangers	Torres Strait Regional Authority
6. Gidarjil Rangers	Gidarjil Development Corporation
7. Giringun IPA and Giringun Land and Sea Rangers	Giringun Aboriginal Corporation
8. Gunggandji Land and Sea Rangers	Gunggandji Prescribed Body Corporate Aboriginal Corporation
9. Kaanju Ngaachi Wenlock and Pascoe Rivers IPA and Chuulangun Rangers	Chuulangun Aboriginal Corporation
10. Kaiwalagal Rangers	Torres Strait Regional Authority
11. Kalan Rangers	Kalan Enterprises Aboriginal Corporation
12. Kalan Rangers	Kalan Aboriginal Corporation and Toolka Land Trust
13. Kowanyama Land Office Rangers	Kowanyama Aboriginal Land and Natural Resources Management Office
14. Lama Lama Rangers	Yintjinga Aboriginal Corporation
15. Lamalgal Rangers	Torres Strait Regional Authority
16. Lockhart River Land and Sea Rangers	Lockhart Aboriginal Shire Council
17. Mabuygiw Rangers	Torres Strait Regional Authority
18. Malu Kiai Rangers	Torres Strait Regional Authority
19. Mandingalbay Yidinji IPA and Djunbunji Land and Sea Rangers	Djunbunji Limited
20. Mapoon Land and Sea Rangers	Mapoon Aboriginal Shire Council
21. Masig Rangers	Torres Strait Regional Authority
22. Meriam Rangers	Torres Strait Regional Authority
23. Mua Lagalgau Rangers	Torres Strait Regional Authority
24. Mura Badagal Rangers	Torres Strait Regional Authority
25. Nanum Wunghim Land and Sea Rangers	Napranum Aboriginal Shire Council
26. Nijinda Durlga IPA and Gangalidda-Garawa Rangers	Carpentaria Land Council Aboriginal Corporation
27. Normanton Rangers	Carpentaria Land Council Aboriginal Corporation
28. Nyungkal Rangers	Bana Yarralji Aboriginal Corporation
29. Porumalgal Rangers	Torres Strait Regional Authority
30. Pulu Islet IPA	Torres Strait Regional Authority
31. Thuwathu/Bujimulla	Carpentaria Land Council and Aboriginal Corporation
32. Ugaram Rangers	Torres Strait Regional Authority
33. Warraberalgal and Porumalgal IPA and Rangers	Torres Strait Regional Authority
34. Warul Kawa Island IPA	Torres Strait Regional Authority
35. Wugagal Rangers - Saibai	Torres Strait Regional Authority
36. Yuku-Baja-Muliku Rangers	Yuku Baja Maluku Land Trust

Northern Territory

37. Anindilyakwa IPA and Rangers	Anindilyakwa Land Council
38. Arafura Swamp Ranger Groups	Northern Land Council
39. Bulgul Land and Sea Rangers	Northern Land Council
40. Crocodile Islands Rangers	Milingimbi and Outstations Progress Resource Association
41. Dhimurru IPA and Rangers	Dhimurru Aboriginal Corporation
42. Djelk IPA and Rangers	Bawinanga Aboriginal Corporation
43. Ganalanga-Mindiberrina IPA and Waanyi Garawa and Garawa Rangers	Northern Land Council
44. Garngi Rangers	Northern Land Council
45. Gumurr Marthakal Rangers	Northern Land Council
46. Jawoyn Rangers	Jawoyn Association Aboriginal Corporation
47. Katukatjara Rangers	Central Land Council
48. Laynhapuy IPA and Yirralka Rangers	Laynhapuy Homelands Aboriginal Corporation
49. Li-Anthawirryarra Sea Rangers	Northern Land Council
50. Malak Malak Rangers	Northern Land Council
51. Mangarrayi Rangers	Roper River Landcare Group
52. Mardbalk Marine Rangers	Northern Land Council
53. Marri-Jabin IPA and Thamarrurr Rangers	Thamarrurr Development Corporation
54. Maru-Warinyi Ankkul Rangers	Central Land Council
55. Mimal Rangers	Northern Land Council
56. Njanjma Rangers	Djabulukgu Association
57. Northern Tanami IPA and Rangers	Central Land Council
58. Numbulwar Numburindi Amalahgayag Injung Rangers	Northern Land Council
59. South East Arafura and Gurruwiling Rangers	Northern Land Council
60. Thamarrurr Rangers	Northern Land Council
61. Tiwi Islands Marine Rangers	Tiwi Land Council
62. Wagiman Guwardagun Rangers	Northern Land Council
63. Wanga Djakamirr Rangers	Northern Land Council
64. Wardaman IPA and Rangers	Northern Land Council
65. Warddeken IPA and Rangers	Warddeken Land Management Limited
66. Warnbi Rangers	Warnbi Aboriginal Corporation
67. Werenbun Rangers	Werenbun Aboriginal Corporation
68. Yanyuwa IPA and li-Anthawirriarra Sea Rangers	Mabunji Aboriginal Resource Association
69. Yugul Mangi Rangers	Northern Land Council

Western Australia

70. Balangarra IPA and Rangers	Kimberley Land Council
71. Bardi Jawi Oorany IPA and Rangers	Kimberley Land Council
72. Dambimangari IPA and Rangers	Kimberley Land Council
73. Gooniyandi Rangers	Kimberley Land Council
74. Karajarri IPA and Rangers	Kimberley Land Council
75. Kija Rangers	Kimberley Land Council
76. Miriuwung Gajerrong Rangers	Yawoorroong Miriuwung Gajerrong Yirrgeb Noong Dawang Aboriginal Corporation
77. Nyangumarta Warrarn IPA and Rangers	Nyangumarta Warrarn Aboriginal Corporation
78. Nyikina Mangala Rangers	Kimberley Land Council
79. Nyul Nyul Rangers	Kimberley Land Council

80. Paruku IPA and Rangers	Kimberley Land Council
81. Thuwathu-Bujimulla (Wellesley Islands) IPA	Wellesley Island Land and Sea Social Economic Development Pty. Ltd.
82. Unguu IPA and Rangers	Kimberley Land Council
83. Warlu Jilajaa Jumu Indigenous Protected Area and Ngurrara Rangers	Kimberley Land Council
84. Warlu Jilajaa Jumu IPA and Ngurrara Rangers	Kimberley Land Council
85. Wilinggin IPA and Wunggurr Rangers	Kimberley Land Council
86. Yirrganydji Indigenous Land and Sea Rangers	Dawul Wuru Aboriginal Corporation
87. Yuku-Baja-Muliku Rangers	Yuku-Baja-Muliku Land Owner and Reserves Limited

Sources:

Department of Prime Minister and Cabinet (2015) Commonwealth Funded Indigenous Ranger Groups (Map).

http://www.dpmc.gov.au/sites/default/files/files/ia/IEB/Indigenous%20Ranger%20projects%20Oct%202015_1.pdf

Accessed June 17 2016

Department Environment. (2015) Indigenous Protected Areas (Map).

https://www.dpmc.gov.au/sites/default/files/files/ia/IEB/ipa_national_map_Oct2015_1.pdf

Accessed June 17 2016

Department of Environment (2016) Indigenous Protected Areas (IPA) – Declared (GIS dataset).

<http://www.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7BB5B41F5B-25E2-4467-90E0-994C7A009889%7D>

Accessed June 17 2016

APPENDIX 2: PRIORITY RESEARCH THEMES IDENTIFIED FROM DOCUMENTARY ANALYSIS

A literature review and analysis of IPA plans produced an initial list of 8 priority research themes, each with a number of sub-themes and topics. These themes were (in no particular order):

1. **Broad-scale issues of pervasive threats:** weeds, ferals, fire for multiple values, traditional knowledge.
2. **Ways of working together and learning from each other:** Indigenous-driven, knowledge networks/tools, deep 2-way partnership.
3. **Linking conservation and health outcomes:** healthy country, healthy people.
4. **Recognising multi-objective goals for country and of people:** integrated culture-nature economies wildlife, fisheries, tourism, livestock, bush-food, cattle, carbon, environmental services, integrated 2-way monitoring.
5. **Surveys and mapping:** Indigenous-driven knowledge recording, Indigenous knowledge integration, cultural maps, joint, baseline surveys waterbirds, wetlands, sea-country, ferals.
6. **Species specific studies:** threatened, rare, vulnerable species e.g. quolls.
7. **Managing resource industry partnerships for sustainable development:** Culture-nature impacts of mining, water extraction.
8. **Two-way research rehabilitation and emerging issues:** 2-way understanding of impacts of development agenda, climate change, pollution.

The sub-themes and relevant specific detailed topics related to each of the 8 research themes are outlined below.

1. **Broad scale issues of pervasive threats**

(i) Partnerships to Manage Broad Scale Issues of Weeds, Fire, Feral Animals

- Co-ordination fire, feral animal, and weed control across programs, tenures and groups
- Fire – co-ordinated broad scale action and education
- Manage weeds and prevent new spread of weeds
- Manage invasive species
- Weed surveys
- Trial new techniques to control feral animals
- Trial weed control techniques

(ii) Fire and Managing for Multiple Values

- Fire and cultural and natural values
- Re-instatement of traditional fire regimes and restoration of ecosystem and native fauna population
- Fire and carbon
- Fire and impact on vertebrate population
- Experimental burning

2. **Ways of working together and learning from each other**

(i) Indigenous Driven Knowledge Networks to Support Social Learning and Co-Governance

- Baseline biome surveys and information sharing for contiguous IPAs
- Communication networks that sustain group membership
- Brokering hub that supports shared learning (for post-determination, economic development, IPA management strategies, developing genealogies, organisational structures for business and quality of governance) and provide for multi-scalar opportunities
- Social networks and multi-media communication systems consolidated and provide effective communication
- Organisational practice and management for better outcomes

(ii) Partnerships that Strengthen Cross-Cultural Management that include 'Supporting Culture' criteria in new research and management projects

- Partnerships across government, private companies, and Indigenous groups that agree on prescribed burning programs and maintain cultural and environmental values (weeds control too)

(iii) Two-Way Project Models that Build Capacity with Deep Participation across all Sectors of IPA

- Two-way research projects (includes design)
- Two-way research process to improve local knowledge
- Two-way research knowledge sharing on country
- Recording/collecting traditional knowledge and science and creating understanding
- Participation of traditional owners across all research activities
- Capacity building for management decisions across programs

3 Linking conservation and health outcomes

(i) Programs that Deliver and Monitor Healthy People and Healthy Country Outcomes

- Program partnerships for conservation and community health outcomes
- Nursery and planting of cultural plants

4 Recognise multi-objective goals for country and of people

(i) Management Tools that Support Multi-Objective Land and Sea Management

- Integration of industry, weed control and traditional land management practice
- Biodiversity and social benchmarking programs (conservation and income generation)
- Two-way research that supports multi-objective priorities and outcomes for culture, ecology, recreation and economic values of country
- Monitoring for cattle, culture and environmental outcomes
- Integrated monitoring – pest (pigs) and threatened and culturally important species (turtles, bird)

(ii) Two-Way Knowledge to Sustainably Manage Fisheries across Traditional, Commercial, and Recreational Activities

- Management of impacts of traditional fishery from commercial and recreational fishing and other activities
- Sustainable harvesting of cultural species
- Baseline fish stock surveys and monitoring (including catch monitoring)

(iii) Emerging Natural and Cultural Based Economies: Tourism, Environmental Services, Aquaculture, Livestock, Bush-Food and Wildlife Based Economies

- Provision of environmental services
- Research into provision of environmental services and product endorsement initiatives

- Opportunities in carbon farming
- Commercial wildlife utilisation
- Intellectual property and commercialisation of medicinal plant knowledge
- Bush food enterprise development
- Sea-resource harvests (beche-de-mer)
- Nature and culture based enterprise
- Beach resort enterprises
- Small scale eco-tourism camp
- Cattle and tourism
- Ecotourism opportunities

5 Surveys and mapping

(i) Indigenous Driven Knowledge Recording, Mapping and Management Prioritisation

- Indigenous driven knowledge recording and mapping
- Knowledge recording and strengthening Indigenous knowledge and language
- Record of sacred sites (including remote less accessible)
- Archaeology survey (include remote inaccessible sites)
- Cultural site survey to protect cultural heritage
- Collaborative cultural and natural baseline surveys for IPA expansion
- Cultural heritage monitoring
- Information management system for traditional knowledge, language and cultural maps
- Cultural knowledge revival
- Knowledge transmission in modern world/lifestyles
- Information management and prioritisation
- Survey botanical and indigenous use of plants
- Tools for prioritisation of natural and cultural values for protections

(ii) Joint Surveys to Understand, Prioritise and Manage Country for Natural and Cultural Health

- Joint survey to better understand health of country
- Extend wildlife surveys and use 'both ways' knowledge to protect vulnerable species and habitat
- Baseline biodiversity surveys for conservation status
- Baseline survey to monitor trend, critical-vulnerable species and for adapt management
- Surveys to protect cultural and natural values of places and species
- Biodiversity and threat surveys to protect threatened and culturally important species
- Baseline surveys to know what is on country
- Survey water birds
- Baseline surveys in new areas or important places on country
- Prioritisation over-time: species and eco-zone surveys
- Systematic surveys in important places and of important species
- Feral animal and weed mapping
- Survey and listing of all sacred sites for management prioritisation
- Record of sacred sites (including remote less accessible)
- Archaeology survey (include remote inaccessible sites)
- Cultural site survey to protect
- Collaborative, cultural and natural baseline surveys for IPA expansion
- Cultural heritage monitoring
- Sea country - cultural surveys to develop plan to protect places, objects and values

(iii) Island Surveys

- Health surveys of islands and to understand impacts of climate change
- Survey cultural values and conservation needs
- Survey, monitor and manage impact non-native animals on islands
- Biodiversity baselines

(iv) Aquatic Surveys

- Baseline aquatic surveys on critical habitats
- Improve our understanding of the distribution and status of our critical aquatic habitats.
- Water quality surveys to monitor impact of feral animals on wetlands
- Water quality surveys and run-off
- Waterway health for refuge and breeding sites
- Fish surveys to understand seasonality
- Water quality and culturally significant species

(v) Sea Country Habitat Survey and Monitoring of Important Species

- Surveys on species occurrence, movement and habitat health
- Surveys and monitoring of cultural sites, habitats and species for management
- Surveys and monitoring of by-catch of culturally important species
- Baseline survey regime for early pest and disease detection

(vi) Incorporation of Indigenous Expertise and Knowledge (IEK) and Research Results into IPA Management

- Communicate and use research results to manage IPA
- Incorporate IEK into IPA management and research
- Research and information management
- Weed survey and monitoring and adaptive management
- Weed survey and monitoring – access to country and threat to culture & international wetlands
- Mechanisms to protect cultural sites/places

6 Species specific studies

(i) Natural and Cultural Indicator Species Protection, Monitoring and Recovery (location specific)

- Species specific studies – indicator of biome/ecosystem health and cultural heritage
- For example the quoll - assess its population status on Cape York after declining greatly with the advance of the cane toad in the 1990s
- Threatened and rare species research
- Management strategies for threatened species and threatening processes
- Collaborative survey on threatened and vulnerable species

7 Managing resource industry partnership for sustainable development

(i) Resource Extraction Industry: Understanding and Managing Natural, Social, Economic and Cultural Impacts of Mining for Sustainable Development

- Sharing knowledge of changes on country (observed changes down-stream of mining site)
- Understanding impact of mining on ground water flow
- Understanding impact of mining on water quality and culture
- Mapping and registration of significant sea country sites in response to exploration permits
- Understanding impact of mining on cultural resources
- Managing mining partnerships for long-term outcome

8 Two-way research: rehabilitation and emerging issues

(i) Two Way Research: Rehabilitation

- Rehabilitation from heavy pest population (biomes, cultural places and species)
- Rehabilitation after grazing
- Rehabilitation of mining areas
- Rehabilitation – acid sulphate soils

(ii) Two Way Research: Emerging Issues and Prevention (Weeds, Feral Animals, Development and Climate Change)

- Studies of impact of disturbances on islands
- Prevention strategies for 'clean' areas
- How do people know climate change is happening and how can traditional owners prepare for it
- Monitor sea level rise – assess risk to infrastructure and shoreline
- Cultural mapping and registration of heritage sites in preparation for agricultural development
- Impact studies of broad-scale irrigated agriculture on water resources, species and ecological processes on country
- Baseline survey before infestation by foreign species
- Potential impact of increased traffic through country with infrastructure development
- Monitoring of and impact of pollution on keystone species and habitats

APPENDIX 3: EXAMPLES OF DATA ANALYSIS OUTPUTS

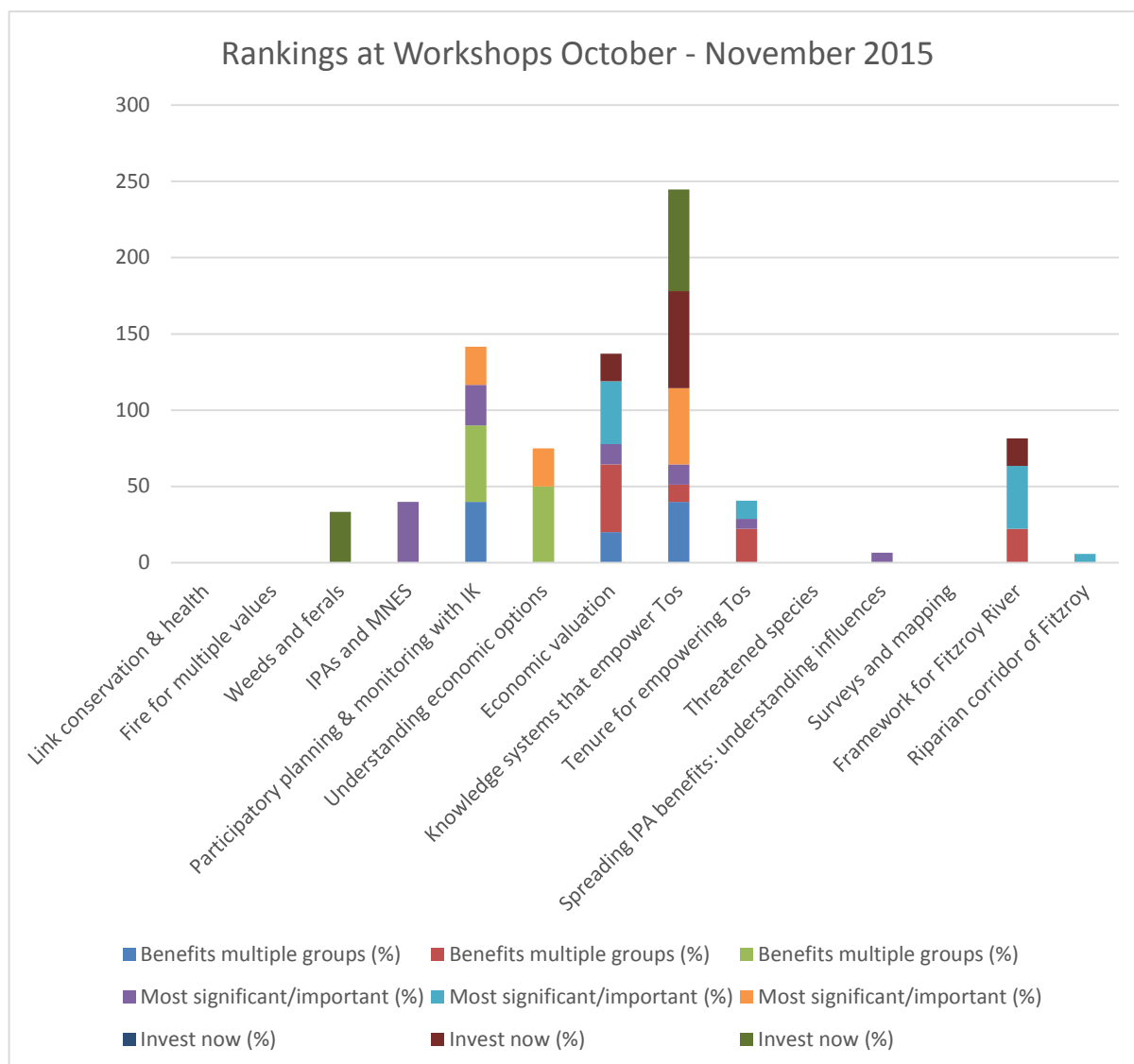


Figure 3 Workshop rankings of research topics (excluding new research models)

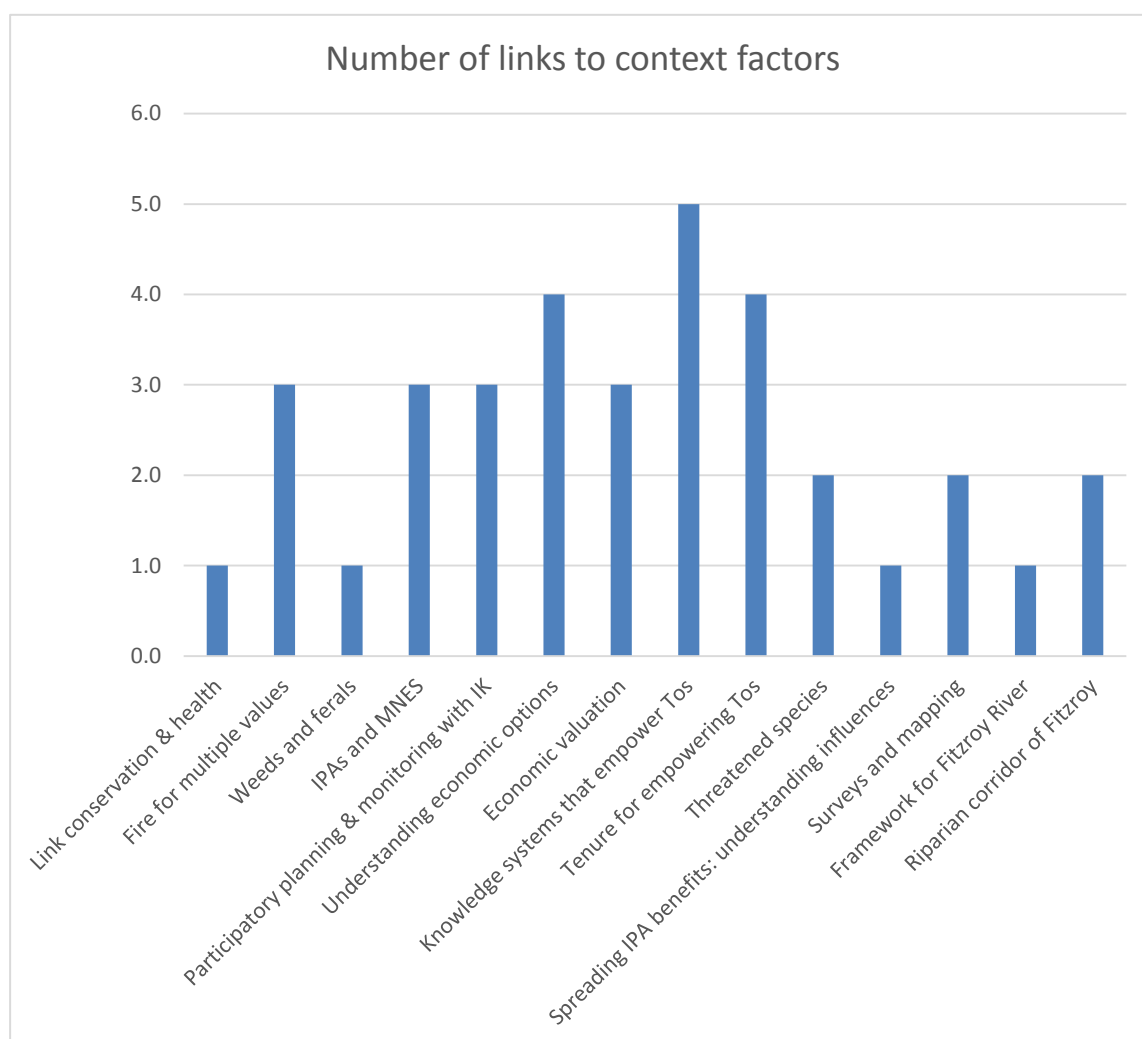


Figure 4 Number of links between context factors and research topics identified at the workshops

Unsorted topics



Clustered topics for ranking



Figure 5 Participatory cluster analysis at Fitzroy Crossing workshop, November 2015

NVivo

External Data Analyze Query Explore Layout View

Look for: Search In Nodes Find Now

Nodes

Name	Sources	References
Context factors	6	143
Caring for country opportunities	4	21
Centralisation agenda	0	0
Conservation models	3	19
Economic opportunities	3	9
Education	1	9
Indigenous disadvantage	4	9
National heritage list	1	2
Native title recognised, PBCs	3	10
Policy uncertainty	4	8
Research models	5	33
Strong language, culture	3	9
Tenure and rights	3	10
Un-met IPA demand	2	2
Water, land intensification	2	2
Research topics	0	0
Climate change	2	4
Economic valuation	0	0
Fire management	4	6
Governance	2	10
IPAs and MNES	3	5
Knowledge systems for TOs	6	47
Link conservation, health	1	1
Medicinal	1	1
Participatory monitoring	3	6
Spreading IPA benefits	1	2
Surveys and mapping	3	5
Sust dev models	5	78
Tenure for TOs	4	11
Threatened species	2	5
Understanding economic options	6	27
Understanding impacts	5	27
Weeds and ferals	3	13

Figure 6 Screen shot of N-Vivo codes of qualitative data



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