

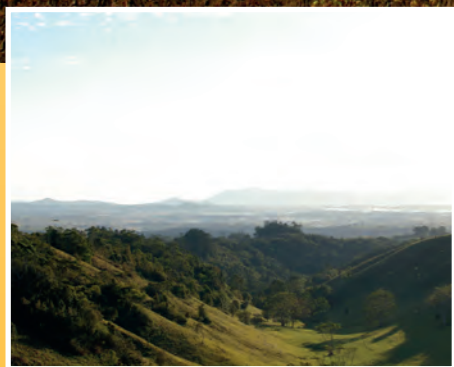


National Environmental
Research Program

TROPICAL ECOSYSTEMS *hub*

Technical Report

Environmental Research Plan for Natural Resource Management Organisations and Regional Development Australia Boards in Northern Australia



Crowley, G.M., Dale, A., Banks, R., Barclay, S., Birch, P., Buchan, A., Cocco, R., Crase, J., Crawford, S., Dielenberg, J., Donohoe, P., Edgar, B., Franklin, J., Frazer, B., Harper, P., Hinchley, D., Hoogwerf, T., Ikin, N., Johnson, S., Mackay, G., Maher, E., May, K., Miley, D., Mitchell, C., Moller, M., Morris, S., Musgrove, R., Peake, K., Pearson, D., Pentz, D., Schuntner, G., Sinclair, I., Standley, P.-M., Sweatman, C., Tambling, L., Wessels, A., and Wilson, B.



Australian Government
Department of the Environment



Environmental Research Plan for Natural Resource Management Organisations and Regional Development Australia Boards in Northern Australia

NERP TE Hub Project CF14 Final report

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Department of the Environment

Supported by the Australian Government's
National Environmental Research Program
Project CF14 Environmental Research Plan for Natural Resource Management Organisations and
Regional Development Australia Boards in Northern Australia

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National Library of Australia Cataloguing-in-Publication entry:

978-1-925088-36-6

This report should be cited as:

Crowley, G.M., Dale A., Banks, R., Barclay, S., Birch, P., Buchan, A., Cocco, R., Crase, J., Crawford, S., Dielenberg, J., Donohoe, P., Edgar, B., Franklin, Frazer, B., J., Harper, P., Hinchley, D., Hoogwerf, T., Ikin, N., Johnson, S., Mackay, G., Maher, E., May, K., Miley, D., Mitchell, C., Moller, M., Morris, S., Musgrove, R., Peake, K., Pearson, D., Pentz, D., Schuntner, G., Sinclair, I., Standley, P.-M., Sweatman, C., Tambling, L., Wessels, A., and Wilson, B. (2014). *Environmental research plan for natural resource management organisations and Regional Development Australia boards in northern Australia. NERP TE Project CF14 Final report*. Report to the National Environmental Research Program. Cairns: Reef and Rainforest Research Centre Limited. 35 pp).

Published by the Reef and Rainforest Research Centre on behalf of the Australian Government's National Environmental Research Program (NERP) Tropical Ecosystems (TE) Hub.

The Tropical Ecosystems Hub is part of the Australian Government's National Environmental Research Program. The NERP TE Hub is administered in North Queensland by the Reef and Rainforest Research Centre Limited (RRRC). The NERP Tropical Ecosystems Hub addresses issues of concern for the management, conservation and sustainable use of the World Heritage listed Great Barrier Reef (GBR) and its catchments, tropical rainforests including the Wet Tropics World Heritage Area (WTWHA), and the terrestrial and marine assets underpinning resilient communities in the Torres Strait, through the generation and transfer of world-class research and shared knowledge.

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Cover photographs: Gabriel Crowley: Daly River at Nancar, Wet tropics landscape, Savanna burning, Magpie geese.

This report is available for download from the NERP Tropical Ecosystems Hub website:

<http://www.nerptropical.edu.au/research>

July 2014

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Abbreviations Used In This Report

AIMS	Australian Institute of Marine Science
AWC	Australian Wildlife Conservancy
BDT	Burdekin Dry Tropics region
BM	Burnett Mary region
BoM	Bureau of Meteorology
CDU	Charles Darwin University
CERF	Commonwealth Environment Research Facilities
CFI	Carbon Farming Initiative
CQU	Central Queensland University
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CYP	Cape York Peninsula region
DAFF	Australian Department of Agriculture, Fisheries and Forestry
DAFWA	Department of Agriculture and Food, Western Australia
DEC WA	Western Australia Department of Environment & Conservation
DOE	Australian Department of Environment
DPMC	Australian Department of Prime Minister & Cabinet
EK	Environs Kimberley
FB	Fitzroy Basin region
GA	Geoscience Australia
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GRDC	Grains Research and Development Corporation
GU	Griffith University
HAL	Horticulture Australia Limited
ILC	Indigenous Land Corporation
JCU	James Cook University
LGAs	Local Government Associations
MLA	Meat and Livestock Australia
NERP	National Environmental Research Program
NERP NA	National Environmental Research Program – Northern Australia Hub
NERP TE	National Environmental Research Program – Tropical Ecosystem Hub
NESP	National Environmental Science Program
NG	Northern Gulf
NRM	Natural Resource Management
NT	Northern Territory
NT DLRM	Northern Territory Department of Land and Resource Management
NT DPIF	Northern Territory Department of Primary Industries & Fisheries
PWCNT	Parks and Wildlife Commission Northern Territory
QDAFF	Queensland Department of Agriculture, Fisheries & Forestry
QDNPSRR	Queensland Department of National Parks, Sport, Recreation & Racing
QDNRM	Queensland Department of Natural Resources & Mines
QDSITIA	Queensland Department of Science, Information Technology, Innovation and the Arts
QEHP	Queensland Department of Environment & Heritage Protection
QUT	Queensland University of Technology

RDA	Regional Development Australia
RGC	Queensland Regional Group's Collective
RIRDC	Rural Industries Research and Development Corporation
RRRC	Reef and Rainforest Research Centre
SG	Southern Gulf region
SSD	Supervising Scientist Division, Department of Environment
Syd	Sydney University
TCI	The Cairns Institute, James Cook University
TNC	The Nature Conservancy
TOs	Traditional Owners
TRaCK	Tropical Rivers and Coastal Knowledge
TropWATER	Tropical Water & Aquatic Ecosystem Research, James Cook University
TS	Torres Strait
UniSA	University of South Australia
UNSW	University of New South Wales
UQ	University of Queensland
USQ	University of Southern Queensland
UWA	University of Western Australia
WA	Western Australia
WA DPaW	Western Australian Department of Parks and Wildlife
WAM	Western Australian Museum
WT	Wet Tropics
WWF	World Wide Fund for Nature



Acknowledgements

This plan would not have been possible without the direct involvement of the Natural Resource Management (NRM) organisations and Regional Development Australia (RDA) boards. We thank them for their support.

Preparation of the plan was funded as part of the National Environment Research Program Tropical Ecosystems Hub (NERP TE) Contestable Funds Project CF14 *Ongoing integration of NERP TE science into regional planning*, with institutional support from the Reef and Rainforest Research Centre (RRRC). We thank Julie Carmody and Ryan Donnelly (RRRC) for their help and guidance. Collaboration with NERP Northern Australia led by Michael Douglas at Charles Darwin University extended the scope and impact of this project. We thank Michael for his cooperation and support.

Jennifer McHugh and Katrina Keith, The Cairns Institute (TCI), James Cook University, and are thanked for proof-reading this document and, along with Maxine Goulston, TCI and for assisting with the necessary processes and procedures that enabled us to undertake this project.

All photographs are the property of Gabriel Crowley.



Executive summary

This report presents an environmental research plan for Natural Resource Management (NRM) organisations and Regional Development Australia (RDA) boards across northern Australia. It includes priority knowledge needs and governance arrangements necessary to address them. The plan aims to assist the Australian Department of Environment to formulate its national environmental research priorities and design its National Environmental Science Program (NESP). The plan also, however, provides a platform from which all groups can progress a long term research agenda beyond NESP investment.

The plan was compiled in collaboration with 11 NRM groups and seven RDA boards from northern Western Australia, the Northern Territory and northern Queensland. It identifies 48 potential projects to address 39 priority research needs organised under five research themes

- 1 Governance, policy and influence
- 2 Sustainable livelihood and agricultural options
- 3 Water resource planning and water quality improvement
- 4 Landscape planning for land use and management
- 5 Biodiversity and wetlands management

Priority knowledge needs are presented as NRM-related problems that needs solving or opportunities to be grasped. Potential research approaches are then identified to deliver practical and applicable solutions that will assist NRM groups, RDAs and their respective stakeholders to improve sustainable management of nature resources and build community resilience.

The plan also describes the governance arrangements required to ensure research programs meet these knowledge needs. To an extent only limited by their institutional capacity, NRM groups and RDAs see themselves as partners in the broader business of environmental research programs. They also consider such partnerships need to span from the initiation of research bids through to project delivery. Research partnerships with NRM groups and RDAs should be formalised through strategically-managed processes and partnership arrangements that provide recognition of their roles, responsibilities and expectations. This will not only ensure they are embedded as key stakeholders in the research program, but will also assist these organisations to incorporate their roles and responsibilities into their own work programs and internal reporting arrangements.

NRM groups and RDAs can invest directly in research programs and projects to fulfil this plan to only a limited extent, but they can make many other valuable contributions. In addition to providing insight about knowledge needs and program operation, they can draw on their extensive networks to provide two-way communication between researchers and stakeholders; facilitate access to research locations, partners and case studies; and ensure the uptake of research findings. NRM groups and RDAs see action research approaches representing as the most productive research models to inform adaptive management and decision making. To facilitate this, they can also coordinate citizen science projects within their regions and be active participants in research programs. They can also broker partnerships with potential investors. All these activities demand time and resources. So enough time should be allowed for these groups to undertake proper engagement with their own stakeholders as well as to engage with the research providers. Where possible, the cost of these activities will also need to be recompensed, either through the research program budget or through the certainty of receiving fit-for-purpose research outputs.

It is hoped that this plan will encourage those designing research programs to address the knowledge needs of NRM groups and RDAs through positive engagement to the enduring benefit of the people and environments of northern Australia.

The Research Plan

Purpose of plan

Current focus on the development of northern Australia provides an imperative to improve our understanding of the north's natural resources; the best options for their management and use; and how to harness this knowledge to the benefit of the people who live in the region. National policy attention is being focused on identifying the best ways to protect and manage of the north's environmental and cultural values. This environmental research plan has been therefore been developed by Natural Resource Management (NRM) organisations and Regional Development Australia (RDA) of northern Australia to inform this policy development.

This plan identifies the knowledge gaps that need addressing in the next three to five years if we are to ensure the integrity of the north's natural resources are maintained in the face of increasing economic development and environmental stress. It aims to assist the Australian Department of Environment (DOE) to formulate its national environmental research priorities and design its National Environmental Science Program (NESP). The plan also, however, provides a platform from which all groups can progress a long term research agenda along strategic lines.



Research priorities

This plan identifies research priorities identified by Natural Resource Management (NRM) organisations and Regional Development Australia (RDA) boards across northern Australia to provide a knowledge base for improving sustainable management of natural resources and build community resilience. These priorities are organised into five inter-related themes

1. Governance, policy and influence
2. Sustainable livelihood and agricultural options
3. Water resource planning and water quality improvement
4. Landscape-scale planning for land use and management
5. Biodiversity and wetlands management

Within each theme, priority knowledge needs are presented as NRM-related problems that needs solving or opportunities to be grasped. Potential research approaches are then proposed to deliver practical and applicable solutions. A total of 48 potential research projects were identified to meet 39 knowledge needs. Research providers and other stakeholders were identified for each project, wherever possible. Alignment with Australian government programs and priorities were also identified.





Governance, Policy & Influence

Efforts to improve environmental, social, cultural and economic outcomes will only be effective if they are supported by good environmental governance at all levels – from those who develop and implement policy to on-ground practitioners. At the highest level, this theme addresses the difficult task of ensuring national policies and programs aimed at improving environmental outcomes reflect northern conditions and needs, and that evidence-based planning processes provide quadruple-bottom line outcomes. This theme will also rely on the development of governance benchmarks and social and environmental indicators that can be used to influence decision making and track program progress.

At the NRM coal-face, the theme will need to identify which governance models are the most effective at developing community ownership of NRM programs, and which extension activities have the most influence on implementation and how this insight can be used to effect greater improvements in social, cultural, environmental and economic outcomes.

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners ¹	DOE/DPMC priorities & programs	Northern Australia Green Paper
Governance Reform						
Improved integration of the nature of northern Australia's environmental issues & management capacity is needed in national & state NRM programs	Identify reform required in national & state policies, program & priorities to address northern Australian environmental issues & management capacity	Uptake & implementation of policy and regulatory reforms through northern NRM plans, with more enduring improvement of natural resource conditions	Northern Australia	CDU, GU, JCU, QUT Industry, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment (land, water & air) Biodiversity Indigenous Advancement Strategy (Remote Australia Strategies)	Effective engagement with, & presence in, northern Australia Collaboration across governments Innovative business-friendly policies Capable & sustainable institutions Efficient service delivery

¹Research providers & partners (preliminary list only): BoM=Bureau of Meteorology; CDU=Charles Darwin University; CQU=Central Queensland University; GU=Griffith University; JCU=James Cook University; NRM=Natural Resource Management groups; QUT=Queensland University of Technology; RDA=Regional Development Australia; RGC=Queensland Regional Groups collective; Syd=Sydney University; TOs=Traditional Owners; UniSA=University of South Australia; UQ=University of Queensland; UWA=University of Western Australia

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners ¹	DOE/DPMC priorities & programs	Northern Australia Green Paper
Sustained improvement in natural resource condition is impeded by discontinuous & uncertain program funding & shifting priorities in national & state NRM programs	Identify reform required in national & state policies, programs & partnership arrangements required to support sustained improvement in environmental management	Uptake & implementation of policy and regulatory reforms through northern NRM plans, with more enduring improvement of natural resource conditions	National	JCU, GU, CDU Industry, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment Biodiversity Indigenous Advancement Strategy	Collaboration across governments Capable & sustainable institutions Efficient service delivery
NRM Links to Land Use Planning						
Natural resource management plans draw on the best available information & expertise, but are not always taken into account in statutory regional planning processes	Action research trialling integrated planning processes and identifying effective pathways for their incorporation into policy development at national to regional scales	Institutional support for long-term strategic implementation of northern NRM plans & programs with more enduring improvement of natural resource conditions	Regional	CSIRO, JCU, QUT NRM, RGC	Sustainable communities A cleaner environment (land, water, air & heritage) Climate change (Emission reduction fund) Biodiversity Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia Collaboration across governments Best practice planning & management

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners ¹	DOE/DPMC priorities & programs	Northern Australia Green Paper
Some land & water use decisions may prevent the realisation of future options, so a flexible adaptive model of land use planning is necessary *see also • <i>Water resource planning & management</i> • <i>Landscape-scale planning for land use & management</i>	Identify reform required in national, state & regional planning schemes & tenure systems to incorporate adaptive decision making	More rapid uptake of innovative industries & land uses Improved sustainable and economic land uses	Northern Australia	JCU, Syd, UniSA Industry, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment (land, water, air & heritage) Biodiversity Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia Diverse & longer pastoral leases Innovative business-friendly policies Flexible leases for Indigenous landholders Efficient native title processes Best practice planning & management
Regional NRM groups are adopting new governance methods for designing & delivering NRM plans to improve engagement & uptake, but are unsure of which approaches will be most effective	Case studies documenting the effectiveness of different governance approaches in NRM organisations	NRM groups will deliver better programs to engage a wider range of land & sea managers More land & sea managers will be using sustainable practices, with environmental & economic benefits	Regional	CQU, CSIRO, GU, JCU NRM, RGC, TOs	A cleaner environment (land, water, air & heritage) Biodiversity Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia Building capabilities & skills
Local & delivery groups involved in NRM often struggle with effective governance, and need information on which models of regional support of governance building might deliver the best outcomes	Further exploration of the role of regional NRM bodies in supporting effective governance strengthening in delivery groups (e.g. Landcare, councils, industry bodies, Indigenous groups, etc.).	More cohesive delivery systems and greater subsidiarity	Regional to local	CDU, CQU, JCU, QUT, UWA NRM, RGC, TOs	Sustainable communities A cleaner environment (land, water & air) Biodiversity Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia Capable & sustainable institutions More accessible information

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners ¹	DOE/DPMC priorities & programs	Northern Australia Green Paper
Outcomes Reporting						
Current methods of monitoring & reporting social & environmental conditions & trends are costly to undertake & poorly reflect northern conditions	Develop a set key indicators suited to northern conditions & trial with regional NRM groups & RDAs, particularly as part of integrated biodiversity management (see <i>Biodiversity, wetlands & water quality improvement</i>), and identify effective pathways for their incorporation into policy development at national to regional scales	Better information on which to prioritise environmental management & social resilience work, and institutional support for doing so	Northern Australia	CDU, GU Industry, JCU, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment (land, water & air) Biodiversity Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia Capable & sustainable institutions More accessible information
Climate and Carbon Policies and Natural Resource Outcomes						
Changes in international policies & markets will affect the economics of managing carbon resources as part of NRM	Assessment of current & projected changed in global carbon policies & markets & how this will influence economics of northern CFI projects	More strategic investment in CFI projects, helping underwrite NRM livelihoods	Global/ Northern Australia	CDU, GU, JCU Industry, NRM, RDA, RGC, TOs	A clean environment (air, land, water, heritage) Biodiversity Climate change adaptation Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia Building capabilities & skills New markets & greater trade links

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners ¹	DOE/DPMC priorities & programs	Northern Australia Green Paper
Carbon Credits (Carbon Farming Initiative) show promise, but benefits to northern land & sea managers & environments are currently restricted *see also <i>Sustainable livelihood & agricultural options</i>	Identify further reform required in Emission Reduction Fund to benefit northern environments & managers	Improved contribution of northern Australia to emission reduction, with environmental & economic benefits	Northern Australia	CDU, GU, JCU Industry, NRM, RDA, RGC, TOs	Climate change (Emission reduction fund) A cleaner environment (land, water, air & heritage) Biodiversity Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia Building capabilities & skills New markets & greater trade links
Escalating insurance premiums are imposing an unsustainable burden on NRM & agriculture & can be a barrier to development	Assessment of the financial burden of rising insurance premiums on NRM & agriculture, & identification of potential policy responses	Reduction of the impediment insurance poses to NRM & agriculturally-based livelihoods & new developments	Northern Australia	BoM, CSIRO, Syd, UQ Industry, NRM, RDA, RGC	Sustainable communities	Effective engagement with, & presence in, northern Australia Capable & sustainable institutions
Uptake and Practice Adoption						
Not all land & sea managers are adopting proven sustainable practices	Action research to test ways to achieve industry-wide uptake of proven sustainable practices	NRM groups will deliver better programs to engage a wider range of land & sea managers	Regional	CQU, JCU, CDU NRM, Industry	A cleaner environment (land, water & air) Biodiversity	Effective engagement with, & presence in, northern Australia Best practice planning & management Building capabilities & skills Capable & sustainable institutions
	Analysis of the economic & social implications of practice improvement to individual enterprises	More land & sea managers will be using sustainable practices, with environmental & economic benefits	Property/ Regional	CQU, JCU, CSIRO Industry, NRM		



Sustainable Livelihood & Agriculture Options

Development of the north should be both sustainable and benefit the whole community. This means identifying new economic opportunities that are compatible with the region's high ecological values and provide sustainable employment. Potential areas for investigation should include agricultural (e.g. food and tree crops; biofuels) and alternative livelihoods (e.g. eco- and cultural-tourism; sustainable wildlife, plant and seed harvesting; environmental mapping and monitoring; cultural mapping and heritage management; carbon farming; alternative fuel generation); as well as using offset schemes to transfer economic gains realised from development to support NRM. Feasibility assessments, including pilot programs, are required to determine whether new opportunities can provide long-term employment and economic solutions. Once options are identified as assessed then it is important to know how these are best combined across the landscape and can be supported by low-footprint, cost-effective infrastructure. Synthesis and improved access to information on sustainable livelihood options is also a priority.

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners ²	DOE/DPMC priorities & programs	Northern Australia Green Paper
Information Access						
Information required to improve sustainable land & sea management specific to northern Australia is difficult to access & understand	Synthesis & delivery of research results & local knowledge through NRM & RDA networks	Land & sea managers & planners will be better informed about environmental & cultural values & sustainable management options	Regional	JCU, CDU, CSIRO, private researchers Industry, NRM, RDA, TOs	A cleaner environment (land, water & air) Biodiversity Indigenous Advancement Strategy (Jobs, Land & Economy; Culture & Capability)	Effective engagement with, & presence in, northern Australia More accessible information Best practice planning & management Building capabilities & skills Capable & sustainable institutions

² Research providers & partners (preliminary list only): CDU=Charles Darwin University; CQU=Central Queensland University; DAFF=Australian Department of Agriculture, Fisheries & Forestry; DAFWA=Department of Agriculture and Food, Western Australia; GU=Griffith University; ILC=Indigenous Land Corporation; JCU=James Cook University; NRM=Natural Resource Management groups; NT DPIF=Northern Territory Department of Primary Industries & Fisheries; QDAFF=Queensland Department of Agriculture, Fisheries & Forestry; QDSITIA=Queensland Department of Science, Information Technology, Innovation and the Arts; RDA=Regional Development Australia; RGC=Queensland Regional Groups collective; RIRDC=Rural Industries Research and Development Corporation; Syd=Sydney University; TOs=Traditional Owners; TRaCK=Tropical Rivers and Coastal Knowledge; UQ=University of Queensland; UWA=University of Western Australia

Industry Planning						
Development & improvement of livelihoods in northern Australia will require adoption of new industries & practices, but we don't know which mixes will provide the best outcomes	Identify which industries have the potential to provide long-term sustainable livelihoods in each region of northern Australia taking into account impacts on water, land, biodiversity & cultural values & trade-offs	Development & uptake of, and institutional support for sustainable options and practices leading to more enduring improvement in natural resource conditions	Regional	CDU, CQU, JCU, RIRDC Industry, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment (land, water, air & heritage) Climate change (Emission reduction fund) Biodiversity Indigenous Advancement Strategy	Effective engagement with, & presence in, northern Australia New markets & greater trade links Best practice planning & management Building capabilities & skills More accessible information

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners	DOE/DPMC priorities & programs	Northern Australia Green Paper
	Economic case studies of enterprises obtaining income from different mixes of agricultural crops & other natural resource livelihoods, taking into account external income & expenditure	Improved livelihoods & more resilient businesses & communities in northern Australia	Property/ Regional	CSIRO, CQU DAFF, DAFWA, Industry, NRM, NT DPIF, QDAFF, RDA, RGC, TOs		
Indigenous people wish to improve their livelihood options through the management of their own land & sea estates, but we don't know which options will provide the best outcomes	Identify which industries have the potential to provide long-term sustainable livelihoods on Indigenous estates in each region of northern Australia taking into account impacts on water, land, biodiversity & cultural values & trade-offs	Improved economic options for Indigenous livelihoods with more enduring improvement in natural resource conditions	Northern Australia	CDU, CSIRO, TRaCK ILC, Industry, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment (land, water, air & heritage) Climate change (Emission reduction fund) Biodiversity	Effective engagement with, & presence in, northern Australia New markets & greater trade links Best practice planning & management Building capabilities & skills More accessible information
	Action research with Indigenous communities to trial different economic livelihood options & identify appropriate models for government and private sector support for the development of these appropriate livelihoods	Improved livelihoods & more resilient Indigenous businesses & communities in northern Australia	Property/ Regional	CDU, JCU, TRaCK ILC, Industry, NRM, RDA, RGC, TOs	Indigenous Advancement Strategy (Jobs, Land & Economy; Culture & Capability)	

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners	DOE/DPMC priorities & programs	Northern Australia Green Paper
Emission Reduction						
Carbon Credits (Carbon Farming Initiative - CFI) show promise, but benefits to northern land & sea managers & environments are currently restricted *see also <i>Governance, policy & infrastructure</i>	Research to develop & refine CFI methodologies suited to northern Australia conditions while protecting environmental & cultural values	Improved contribution of northern Australia to emission reduction, with environmental & economic benefits	Regional	CDU, GU, JCU, QDISITIA, UQ ... ILC, Industry, NRM, RDA, RGC, TOs	Sustainable communities Climate change (Emission reduction fund) A cleaner environment (land, water, air & heritage) Biodiversity Indigenous Advancement Strategy (Jobs, Land & Economy; Culture & Capability)	Effective engagement with, & presence in, northern Australia Building capabilities & skills New markets & greater trade links
	Case studies of integrating CFI into enterprises based on multiple use	Improved livelihoods & more resilient businesses & communities in northern Australia contributing to emission reduction targets	Property	CSIRO, CQU, QDAFF DAFF, DAFWA, ILC, Industry, NRM, NT DPIF, RDA, RGC, TOs		
	Action research developing demonstration sites for avoided deforestation	Improved livelihoods & more resilient businesses & communities in northern Australia contributing to emission reduction targets	Regional	JCU, UQ Industry, NRM, RDA, RGC, TOs		

Problem/Opportunity	Research solutions	Benefits	Scale	Potential research providers & partners	DOE/DPMC priorities & programs	Northern Australia Green Paper
Infrastructure						
Livelihoods & businesses in northern Australia are restricted by expense of & poor access to communications, energy & transport	Identify cost-effective options to provide communications, energy & transport to rural & remote communities while minimising environmental footprints, with some practical first-step options	Improved livelihoods & more resilient businesses & communities in northern Australia leading to more enduring improvement in natural resource conditions	Northern Australia	CDU, CSIRO, JCU, UQ Industry, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment (land, water & air) Biodiversity Indigenous Advancement Strategy (Remote Australia Strategies)	Effective engagement with, & presence in, northern Australia Best practice planning & management Productive new infrastructure
Workforce						
While workforce & wages growth in northern Australia is faster than the national average, employment in northern NRM is challenged by limited & uncertain employment, low wages & difficult working conditions	Identify policy & program reform & partnership arrangements required to improve employment opportunities & working conditions, career progression, training and education opportunities etc.	Improved livelihoods & more resilient businesses & communities in northern Australia leading to more enduring improvement in natural resource conditions	Northern Australia	CDU, CSIRO, JCU, UQ ILC, Industry, NRM, RDA, RGC, TOs	Sustainable communities A cleaner environment (land, water, air & heritage) Biodiversity Indigenous Advancement Strategy (Jobs, Land & Economy; Culture & Capability)	Effective engagement with, & presence in, northern Australia Workforce availability & skills that meet business needs Building capabilities & skills



Water Resource Planning & Water Quality Improvement

Agricultural and mining expansion across northern Australia is placing increasing pressure on water resources and associated ecosystems. Current and projected demand requires construction of surface water storage or extraction of groundwater. Before water is committed to new developments, information is required on the availability of supply, rates of groundwater recharge, and impact of storage and extraction on cultural and environmental values and other dependent industries and communities. Best practice storage, delivery and allocation needs to be designed to suit tropical conditions. Coastal development, in particular, needs to be informed by knowledge of current and future saltwater intrusion.

Efforts to improve water quality in terrestrial and marine environments also need to be evidence-based. This means improving our understanding of how and where the most damaging pollutants are generated, as well as the best options for reducing pollutants entering waterways.

Problem/Opportunity	Research solutions	Benefits	Scale ³	Potential research providers & partners ⁴	DOE/DPMC priorities & programs	Northern Australia Green Paper
Water Resource Assessment						
Knowledge of water resources in some regions is inadequate for planning & needs to be informed by an understanding of climate change	Inventory & baseline monitoring of surface & ground water resources (quantity, flow, seasonality, quality, aquifer recharge rates), along with climate change projections, with identification of pathways for incorporating results into regulatory framework	Water resource allocation will be based on better understanding of resource Better information for next generation Water Quality Improvement Plans	Regional (especially Callide, Mitchell, Daly, Ord, Gilbert, Flinders, Normanby, Kennedy & Wenlock catchments)	CSIRO, TRaCK, Private researchers Industry, NRM, RDA, RGC, TOs	Clean water	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments Best practice planning & management More accessible information
Water resource planning is impeded by poor knowledge of aquifer recharge rates after extraction &/or dry periods & influence on water quality	Identify processes that influence aquifer recharge & water quality	Water resource allocation & land use planning will be based on better understanding of water resources	Regional (FB)	CDU, CSIRO, GA, JCU, QDISITIA, TRaCK, USQ NRM, RGC	Clean water Clean land Biodiversity Climate change adaptation	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments

³ Regions (if not specified then across all regions): BDT=Burdekin Dry Tropics; BM=Burnett Mary; CYP=Cape York Peninsula; FB=Fitzroy Basin; GBR=Great Barrier Reef catchments; NG=Northern Gulf; SG=Southern Gulf; TS=Torres Strait; WT=Wet Tropics

⁴Research providers & partners (preliminary list only): AIMS=Australian Institute of Marine Science; CDU=Charles Darwin University; DAFF=Australian Department of Agriculture, Fisheries & Forestry; DAF WA= Department of Agriculture and Food, Western Australia; GA=Geoscience Australia; GBRMPA=Great Barrier Reef Marine Park Authority; GRDC=Grains Research & Development Corporation; GU=Griffith University; HAL=Horticulture Australia Limited; JCU=James Cook University; LGAs=Local Government Associations; MLA=Meat and Livestock Australia; NRM=Natural Resource Management groups; NT DPIF=Northern Territory Department of Primary Industries & Fisheries; QDAFF=Queensland Department of Agriculture, Fisheries & Forestry; QDSITIA=Queensland Department of Science, Information Technology, Innovation and the Arts; QDNRM=Queensland Department of Natural Resources & Mines; RDA=Regional Development Australia; RGC=Queensland Regional Groups collective; RIRDC=Rural Industries Research and Development Corporation; SRA=Sugar Research Australia; SSD=Supervising Scientist Division, Department of Environment; TOs=Traditional Owners; TRaCK=Tropical Rivers and Coastal Knowledge; TropWATER= Tropical Water & Aquatic Ecosystem Research, James Cook University; UNSW=University of New South Wales; UQ=University of Queensland; USQ=University of Southern Queensland; UWA=University of Western Australia; WAM=Western Australian Museum

Problem/Opportunity	Research solutions	Benefits	Scale ³	Potential research providers & partners ⁴	DOE/DPMC priorities & programs	Northern Australia Green Paper
Water resource planning is hampered by lack of knowledge of the impacts of water extraction in remote regions, particularly on biodiversity & cultural values * see also • <i>Biodiversity, wetlands & water quality improvement</i>	Assess impacts of water extraction on biodiversity (e.g. Freshwater sawfish, Speartooth Shark, stygofauna, troglofauna) & cultural values & agriculture, including thresholds of tolerance & trade-offs of different models of extraction	Water resource allocation will be based on better understanding of environmental, cultural & economic water needs	Regional (CYP, NG, SG, & parts of NT & WA)	QDISITIA, UQ, UWA, WAM Industry, NRM, RDA, RGC, TOs	Clean water Clean Land Biodiversity Indigenous Advancement Strategy (Culture and Capability)	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments More accessible information
Saltwater intrusion is affecting quality of groundwater in coastal regions, but the extent of the problem of how it will be influenced by climate change is unknown	Saltwater intrusion & ground water quality mapping, along with climate change projections	More strategic land & water use planning that takes into account sea level rise	Coastal regions (TS, WT, CYP, GBR, Darwin Harbour)	CDU, CSIRO, GU, QDISITIA, QDNRM, TRaCK, USQ Industry, LGAs, NRM, RDA, TOs	Clean water Biodiversity Climate change adaptation	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments More accessible information
Balancing Water Demands						
Inadequate knowledge of future & competing demands on water resources will hamper land & water use planning	Identify future pressures & drivers of water resource use, including a better understanding of the cultural values in water	Water resource allocation & land use planning will be based on better understanding of water resources and be more effective and efficient	Northern Australia	CDU, JCU, TRaCK Industry, NRM, RDA, RGC, TOs	Clean water Biodiversity Climate change adaptation Indigenous Advancement Strategy (Culture and Capability)	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments More accessible information
Culturally sensitive water planning is impeded by a lack of understanding of Indigenous values for water resources and ecosystems, and cultural water requirements	Extend TRaCK research on Indigenous values and water resources to develop a method for determining cultural water requirements for use in water planning	Water resource allocation will be based on better understanding of Indigenous values and cultural water needs	Northern Australia	CDU, CSIRO, JCU, TRaCK NRM, TOs	Heritage Clean water Clean land Biodiversity Indigenous Advancement	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments Best practice planning & management

Problem/Opportunity	Research solutions	Benefits	Scale ³	Potential research providers & partners ⁴	DOE/DPMC priorities & programs	Northern Australia Green Paper
	Determine cultural water requirements and incorporate into regional water planning and secure statutory protection in relevant water legislation		Regional (CYP, NG, SG)	CDU, CSIRO, JCU, TRaCK NRM, TOs	Strategy (Culture and Capability)	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments Best practice planning & management
Best Practice Water Delivery & Use						
Design of water infrastructure in northern Australia needs to be sensitive to high seasonality of flow & impacts on the north's unique environmental values	Best practice design of water storage and delivery practices and incorporation into policy framework	More efficient use of water resources minimising adverse environmental impacts with institutional support	Northern Australia	GU, JCU, SSD, TRaCK, TropWATER, UNSW Industry, NRM, RDA, RGC, TOs	Clean water Clean land Biodiversity Climate change adaptation	Effective engagement with, & presence in, northern Australia Best practice planning & management Productive new infrastructure
Future demand for water will exacerbate water shortage & quality issues that already exist in some irrigation areas	Identify economically viable options for optimising water use efficiency relevant to local/sub-regional level (e.g. crops that require water at different times of the year; more efficient irrigation techniques)	More efficient use of land & water resources	Regional (BDT)	CSIRO, GRDC, HAL, RIRDC, SRA DAFF, DAFWA, Industry, NRM, NT DPIF, QDAFF, RDA, RGC, TOs	Clean water Clean land	Effective engagement with, & presence in, northern Australia Best practice planning & management Better use of existing infrastructure More accessible information
	Identify mix of land & water uses that optimise water resource allocation	Long-term strategic land & water use leading to more enduring improvement in natural resource conditions	Regional (BDT)	CDU, CSIRO, JCU, RIRDC DAFF, DAFWA, Industry, NRM, NT DPIF, QDAFF, RDA, RGC, TOs	Clean water Clean land Biodiversity	

Problem/Opportunity	Research solutions	Benefits	Scale ³	Potential research providers & partners ⁴	DOE/DPMC priorities & programs	Northern Australia Green Paper
Water Quality Improvement						
Prioritisation of management to reduce sediment pollution of marine environments is hampered by uncertainty about the origin of the most damaging sediment fractions	On-ground assessment to identify key areas, landscape features (hillslopes, gullies, streambanks), land uses (mining, urban development, agriculture) & practices (e.g. road making, dredging) that are generating the greatest loads of the most damaging sediment fractions	More effective efforts to reduce sedimentation of marine environments More land managers using sustainable management practices	Regional (BM, FB, CYP)	AIMS, CSIRO, GU, JCU, MLA, QDISITIA, TropWATER DAFWA, GBRMPA, Industry, NRM, NT DPIF, QDAFF, RDA, RGC, TOs	Clean water Clean land Biodiversity	Effective engagement with, & presence in, northern Australia Best practice planning & management
Prioritisation of management to reduce nutrient & chemical pollution of marine environments is hampered by uncertainty about the origin of the most damaging fractions	On-ground assessment to identify key areas, land uses (urban development, agriculture) & practices (e.g. sewerage management, fertiliser regimes) that are generating the greatest loads of the most damaging nutrient & chemical pollutants	More effective efforts to reduce nutrient & chemical pollution of marine environments More land managers using sustainable management practices	Regional (FB, CYP)	CSIRO, GU, JCU, QDISITIA, QDNRM, SRA, TropWATER Industry, NRM, QDAFF, RDA, RGC, TOs	Clean water Clean land Biodiversity	Effective engagement with, & presence in, northern Australia Best practice planning & management
Coastal development and management, including port construction and maintenance should minimise adverse impact on marine and coastal values	Identify best practice options for minimising the impact of coastal development (including port dredging) on the marine and coastal ecosystems	Maintenance of high value marine and coastal ecosystems	Northern Australia	AIMS, JCU, TRaCK, TropWATER GBRMPA, Industry, NRM, RDA, RGC, TOs	Clean water Clean land Biodiversity Climate change adaptation	Effective engagement with, & presence in, northern Australia Best practice planning & management Productive new infrastructure



Landscape-scale Planning for Land Use & Management

Northern Australia's future development needs to be well planned to maintain the region's unique ecological and cultural values, and enhance its long-term economic viability and community resilience. This theme will therefore develop and populate planning decision-support tools through improved understanding of:

- Environmental, cultural and economic assets
- Landscape function and processes, including ecosystem services and connectivity
- Pressures, drivers and long-term economic outlooks and how these are likely to interact
- Benefits, impacts and trade-offs of current and potential land uses and associated infrastructure

Decision support tools supporting trade-off analysis should facilitate assessment of the relative environmental, cultural, social and economic costs and benefits of specific alternatives as well as appropriateness of land uses in specific locations.

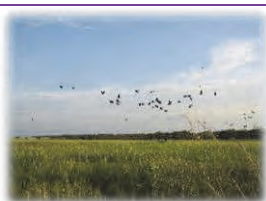
Problem/Opportunity	Research solutions	Benefits	Scale ⁵	Potential research providers & partners ⁶	DOE/DPMC priorities & programs	Northern Australia Green Paper
Flood Risk Assessment						
Planning for future land use & prioritisation of management activities is hampered by lack of knowledge of flood risks	Flood risk mapping & integration into relevant planning processes & development assessment processes	More strategic land & water use planning & management that takes into account sea level rise & changing flood risks	Coastal regions & floodplains (TS, NG, WT, CYP, FB, BM)	BoM, CSIRO, GA, JCU Industry, LGAs, NRM, RDA, TOs	Clean water Clean land Biodiversity Climate change adaptation	Effective engagement with, & presence in, northern Australia Best practice planning & management More accessible information

⁵ Regions (if not specified then across all regions): BM=Burnett Mary; CYP=Cape York Peninsula; FB=Fitzroy Basin; NG=Northern Gulf; TS=Torres Strait; WT=Wet Tropics

⁶ Research providers & partners (preliminary list only): BoM=Bureau of Meteorology; CDU=Charles Darwin University; GA=Geoscience Australia; JCU=James Cook University; LGAs=Local Government Associations; NRM=Natural Resource Management groups; RDA=Regional Development Australia; RGC=Queensland Regional Groups Collective; Syd=Sydney University; TOs=Traditional Owners

Problem/Opportunity	Research solutions	Benefits	Scale ⁵	Potential research providers & partners ⁶	DOE/DPMC priorities & programs	Northern Australia Green Paper
Land Use Scenarios						
Decisions about land use need to be informed by comprehensive assessment of resources, knowledge of all available options & an understanding of the trade-offs of favouring one use/industry over another	Comprehensive synthesis of suitable land management options (industrial, cultural & biodiversity), including an assessment of their interactions & trade-offs	More strategic land & water use planning & management that takes into account environmental constraints & the range of potential competing uses	Regional	CDU, CSIRO, JCU Industry, NRM, RDA, RGC, TOs	A cleaner environment (land, water & air) Biodiversity Indigenous Advancement Strategy (Jobs, Land and Economy; Culture and Capability; Remote Australia Strategies)	Effective engagement with, & presence in, northern Australia More accessible information Best practice planning & management Building capabilities & skills Capable & sustainable institutions
	Scenario modelling of different land uses incorporating multiple aspirations to mutual benefit, identifying integration pathways to inform statutory land use planning	More strategic land & water use planning & management that takes into account environmental constraints & the range of potential competing uses	Regional	CDU, CSIRO, JCU Industry, NRM, RDA, RGC, TOs		
Planning for land use & associated infrastructure is hampered by lack of knowledge of the impacts of different uses on biodiversity & cultural values & agriculture	Develop a decision support tool to assess impacts of proposed land uses & infrastructure corridors on biodiversity & cultural values & agriculture, including thresholds of tolerance & trade-offs	Land use planning will be based on better understanding of environmental, cultural & economic impacts	Regional	CSIRO, JCU Industry, NRM, RDA, RGC, TOs	Clean land Biodiversity Indigenous Advancement Strategy (Jobs, Land and Economy; Culture and Capability; Remote Australia Strategies)	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments More accessible information

Problem/Opportunity	Research solutions	Benefits	Scale ⁵	Potential research providers & partners ⁶	DOE/DPMC priorities & programs	Northern Australia Green Paper
Some land use decisions may prevent the realisation of future options, so a flexible adaptive model of land use planning is necessary, and needs to be integrated with regional NRM planning approaches *see also • <i>Landscape-scale planning for land use & management</i>	Scope future land use options, requirements for their realisation & trade-offs required to leave Land use scenario modelling	More rapid uptake of innovative industries and incorporation supported by an appropriate policy and regulatory framework	Northern Australia	JCU, Syd Industry, NRM, RDA, RGC, TOs	Sustainable communities Clean land Climate change (Emission reduction fund) Biodiversity Indigenous Advancement Strategy (Jobs, Land and Economy; Culture and Capability; Remote Australia Strategies)	Effective engagement with, & presence in, northern Australia Diverse & longer pastoral leases Flexible leases for Indigenous landholders Efficient native title processes Best practice planning & management



Biodiversity & Wetlands Management

Biodiversity underpins the unique character of the north and its natural resource values. Direct management may be required of high-value species and habitats, so it is important to identify where these occur; threats they face; and appropriate management responses. Protection of the north's biodiversity values also involves maintaining the condition of extensive landscapes. So we need to know how to plan for land use while retaining representative native vegetation and essential habitat; and to achieve integrated pest, fire and grazing management. Wetlands are among the north's most valuable ecosystems, having high cultural, ecological and economic values. Information about the ecosystem services they provide will help establish fee-for-service arrangement for their management.

Problem/Opportunity	Research Solutions	Benefits	Scale ⁷	Potential research providers & partners ⁸	DOE/DPMC priorities & programs	Northern Australia Green Paper
Biodiversity Values & Threats						

⁷ Regions (if not specified then across all regions): BDT=Burdekin Dry Tropics; BM=Burnett Mary; CYP=Cape York Peninsula; FB=Fitzroy Basin

⁸ Research providers & partners (preliminary list only): AIMS=Australian Institute of Marine Science; AWC=Australian Wildlife Conservancy; BoM=Bureau of Meteorology; CDU=Charles Darwin University; DAFF=Australian Department of Agriculture, Fisheries & Forestry; DAFWA= Department of Agriculture and Food, Western Australia; DEC WA=Western Australia Department of Environment & Conservation; DNPSRR=Queensland Department of National Parks, Sport, Recreation & Racing; DOE=Department of Environment; EK=Environs Kimberley; GBRMPA=Great Barrier Reef Marine Park Authority; GU=Griffith University; ILC=Indigenous Land Corporation; JCU=James Cook University; NRM=Natural Resource Management groups; NT DLRM=Northern Territory Department of Land and Resource Management; NT DPIF=Northern Territory Department of Primary Industries & Fisheries; PWCNT=Parks and Wildlife Commission Northern Territory; QDAFF=Queensland Department of Agriculture, Fisheries & Forestry; QDNRM=Queensland Department of Natural Resources & Mines; QDSITIA=Queensland Department of Science, Information Technology, Innovation and the Arts; QEHP=Queensland Department of Environment & Heritage Protection; RDA=Regional Development Australia; RGC=Queensland Regional Groups collective; TNC=The Nature Conservancy; TOs=Traditional Owners; TRaCK=Tropical Rivers and Coastal Knowledge; TropWATER= Tropical Water & Aquatic Ecosystem Research, James Cook University; UQ=University of Queensland; UWA=University of Western Australia; WA DPaW=Western Australian Department of Parks and Wildlife; WAM=Western Australian Museum; WWF=World Wide Fund for Nature

Problem/Opportunity	Research Solutions	Benefits	Scale ⁷	Potential research providers & partners ⁸	DOE/DPMC priorities & programs	Northern Australia Green Paper
Lack of knowledge about condition of – and threats to – wetland flora & fauna impedes prioritisation of management actions to maintain biodiversity values	Assessment of condition of wetland threatened fauna & identify areas of critical habitat (especially for freshwater sawfish, speartooth shark, stygofauna, troglifauna)	Wetland management will be informed by understanding of values & threats	Regional	AIMS, AWC, CDU, DOE, TRaCK, UQ, UWA, WAM, private researchers DAFF, DAFWA, DEC WA, DNPSRR, GBRMPA, Industry, NRM, NT DLRM, NT DPIF, PWCNT, QDAFF, QEHP, RDA, TOs, WA DPaW, WWF	Biodiversity Climate change adaptation Indigenous Advancement Strategy (Culture and Capability)	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments Best practice planning & management
	Inventory, condition assessment of high value wetlands & development of management responses (e.g. Mitchel Springs, Boggomoss Springs, Fortescue Marsh, 80 Mile Beach, Roebuck Bay, Lower Ord Ramsar)	Wetland management will be informed by understanding of values & threats	Regional	CDU, JCU, TRaCK, TropWATER, UWA, private researchers DEC WA, EK, Industry, NRM, NT DLRM, QEHP, RDA, RGC, TOs		
Management of the north's biodiversity (especially critical weight range mammals) requires understanding of the drivers of biodiversity decline	Synthesise current knowledge about the drivers of biodiversity decline & appropriate management responses	More strategic allocation of resources to protect biodiversity	Northern Australia	AWC, CDU, JCU DEC WA, DNPSRR, DOE, Industry, NRM, NT DLRM, PWCNT, QEHP, RDA, RGC, TNC, TOs, WA DPaW	Biodiversity Climate change adaptation	Effective engagement with, & presence in, northern Australia Best practice planning & management More accessible information

Problem/Opportunity	Research Solutions	Benefits	Scale ⁷	Potential research providers & partners ⁸	DOE/DPMC priorities & programs	Northern Australia Green Paper
Climate Change Adaptation						
Management of the north's unique ecosystems, including the Great Barrier Reef & coastal wetlands, needs to be informed by projected climate change impacts	Extend & synthesise knowledge of climate change impacts on northern biodiversity to inform management	More strategic allocation of resources to protect key biodiversity assets & values	Northern Australia	BoM, CDU, CSIRO, JCU Industry, NRM, RDA, RGC, TOs	Biodiversity Climate change adaptation	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments More accessible information
Understanding of the impacts of Carbon Farming Initiative methodologies on biodiversity is required to ensure their adoption does not lead to loss of biodiversity & cultural values	Assessment of the burning regimes required to maintain biodiversity & cultural values while optimising carbon storage	More integrated approach to carbon farming & protection of biodiversity & cultural values	Regional (CYP)	AWC, CDU, GU, JCU, UQ, private researchers DEC WA, DNPSRR, DOE, ILC, Industry, NRM, NT DLRM, PWCNT, QEHP, RDA, RGC, TNC, TOs, WA DPaW	Biodiversity Climate change adaptation Indigenous Advancement Strategy (Culture and Capability)	Effective engagement with, & presence in, northern Australia Best practice planning & management
Ecosystem Services						
Improved knowledge of ecosystem services provided by wetlands (including carbon sequestration & storage & fish nurseries) is required for effective management of cultural, economic, carbon & biodiversity values	On-ground assessment of the ecosystem services provided by wetlands (including mangroves) & development of wetland-based carbon sequestration methodologies	More strategic management of wetland resources More land managers undertaking sustainable management practices	Regional (CYP)	AWC, CDU, JCU, TRaCK, private researchers Industry, NRM, RDA, RGC, TNC, TOs	Clean water Biodiversity Climate change adaptation Emission reduction fund Indigenous Advancement Strategy (Jobs, Land and Economy)	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments

Problem/Opportunity	Research Solutions	Benefits	Scale ⁷	Potential research providers & partners ⁸	DOE/DPMC priorities & programs	Northern Australia Green Paper
Improved knowledge of the role of wetlands (especially floodplains) in filtering pollutant entering marine environments is required for effective management of biodiversity values	On-ground assessment of the role of wetlands in carbon sequestration & storage	More strategic allocation of resources to protect marine environments	Regional (BM, FB, BDT)	CSIRO, JCU, QDISITIA, TropWATER DEC WA, DNPSRR, DOE, Industry, NRM, NT DLRM, PWCNT, QEHP, RDA, RGC, TOs, WA DPaW	Clean water Biodiversity Indigenous Advancement Strategy (Jobs, Land and Economy)	Effective engagement with, & presence in, northern Australia Comprehensive water resource assessments
Integrated Management						
Enduring improvement in biodiversity condition requires a more-integrated approach to managing threatening processes across the landscape than delivered through current short-term investment in priority weeds, pest animals or fire projects	Action research trialling a more integrated landscape-wide approach to managing biodiversity condition, linking with testing of condition indicators (see governance, policy & influence)	A more integrated approach to biodiversity values with long-term benefits	Regional	AWC, JCU, private researchers DEC WA, DNPSRR, DOE, Industry, NRM, NT DLRM, PWCNT, QEHP, RDA, RGC, TNC, TOs, WA DPaW	Biodiversity Indigenous Advancement Strategy (Jobs, Land and Economy)	Effective engagement with, & presence in, northern Australia Best practice planning & management

Implementing the plan

Natural Resource Management groups and RDAs seek strong partnerships in the delivery of this plan. While they have limited capacity to fund much of the research themselves, their involvement in environmental research programs brings many mutual benefits.

As partners in research planning, they bring considerable expertise regarding research impact and adoption; environmental management and planning; governance arrangements and achieving practice improvement. They can also draw on their extensive networks to provide two-way communication between researchers and stakeholders; facilitate access to research locations, partners and case studies; and ensure the eventual uptake of research findings.

Contributors to this plan consider action research to be the most productive research model to inform adaptive management and decision making, but acknowledge that the transaction costs of negotiating and undertaking such research can be prohibitive. NRM groups and RDAs can broker and manage such arrangements. Where they hold relevant expertise – such as in studies of management-practice uptake or program governance – NRM staff can also be active participants in action research projects. They can also coordinate citizen science projects undertaken within their regions.

Through their extensive networks, NRM groups and RDAs have the potential to bring to the table other research partners prepared to invest in research programs. This would include industry partners seeking improved understanding of management options, or other organisation prepared to invest in philanthropic ventures to improve livelihoods and environmental conditions.

Governance framework

Robust governance arrangements are required to ensure research programs meet the knowledge needs of NRM groups, RDAs and their stakeholder base (Table 1). These arrangements should incorporate principles covering research operations and engagement processes (Table 2).

Natural Resource Management groups and RDAs should be considered as partners in environmental research programs from the initiation of the research bid through to project delivery. Their involvements should be formalised through strategically-managed processes and partnership agreements that provide recognition of their roles, responsibilities and expectations. This will not only ensure they are embedded as key stakeholders in the research program, but will also assist these organisations to incorporate their roles and responsibilities into their own work programs and internal reporting arrangements.

Financial allocations will be required to cover activities undertaken by NRM groups and RDAs that are not recompensed by the certainty of receiving fit-for-purpose research outputs. Adequate time will also need to be allocated for these groups to undertake proper engagement with their own stakeholders as well as to engage with the research providers.

Level of involvement by NRM groups and RDAs in research programs and projects will vary with each group's capacity. However, while both NRM groups and RDAs have the capacity to be involved in program design, brokering partnerships and communicating findings, in general only NRM groups have sufficient capacity to be engaged at the project level in more day-to-day operation. In some instances, it may be appropriate for these groups to be involved through alliances such as the Northern RDA Alliance or the Regional Groups Collective.

Of primary concern to NRM groups and RDAs is that best practice engagement processes are used in any northern research program. This not only applies to engagement with NRM groups and RDAs but will all recognised stakeholders. Best practice engagement and communication with stakeholders are emphasised in the principles listed in Table 2.

Table 1: Governance framework for future northern Australian environmental research programs

Bid development
Include NRM/RDA representation on steering committee
Recognise NRM/RDA as equal partners with specific expertise and capacity
Identify products to be delivered that meet the needs and expectations of NRM/RDA
Program operation
Formalise roles and responsibilities through contractual arrangements
Allocate funding for NRM/RDA to undertake brokering and other activities
Develop communication and engagement plans that make use of existing NRM/RDA networks
High level oversight
Include NRM/RDA representation on steering committee
Include NRM representation in panels assessing program and project progress
Project operation
Include NRM/RDA representation on steering committees (as appropriate)
Each projects to deliver product(s) identified by end-user
Project schedules to - Identify project team (including NRM representatives, where appropriate) - Clearly articulate the roles and responsibilities of project team and other stakeholders - Develop communication and engagement plans (making use of existing NRM/RDA networks, where appropriate) - Identify products to be delivered - Define intellectual property rights - Define assessment criteria and milestones to be achieved before payment is made - Identify pathways to adoption (making use of existing NRM/RDA networks, where appropriate)
Roles NRM groups/RDAs
Buy a stake through cash contributions, operational support and/or brokering relationships with research partners and other investors (depending on capacity)
Participate in steering committees of program and projects (as appropriate)
Provide two-way communication between researchers and other stakeholders
Identify useful projects, products and modes of operation
Assess project progress and ratify milestone achievement
Provide regional-scale perspective and access to case studies and research locations
Host researchers (especially during field component)
Co-supervise students
Responsibilities of NRM groups/RDAs
Incorporate agreed roles and responsibilities into organisational work programs and reporting frameworks
Embed research involvement in NRM plans and RDA roadmaps as these are revised
Allocate a specific person to each project, and develop a succession strategy when person leaves role
Prioritise participation
Recognise that more rights bring more responsibilities

Table 2: Principles for the design and operation of northern Australian environmental research programs

Cross-program
Majority of research should inform decisions made about planning, prioritisation and/or management
Ensure outputs and outcomes meet stakeholder needs
Intellectual Property arrangements should be negotiated up front, with Intellectual property being shared between all contributors
Use a systems approach that integrates social, cultural, environmental and economic aspirations to provide mutual benefits
Apply subsidiarity
Provide flexible time-frames that recognise other's commitments and pressures
Engagement and communication
Recognise end-user standing
Develop an agreed set of definitions to describe the engagement process
Involve stakeholders as co-investors, research partners, or engaged end-users early in program, with appropriate input into prioritisation and design; project delivery and assessment; product evaluation; and the dissemination and uptake of research findings
Undertake engagement and communication through existing networks, particularly those provided by NRM groups and RDAs, and resource them to so do
Undertake extensive and inclusive engagement across all relevant sectors, and do not artificially limit research to specific geographic areas
Respect and incorporate different world views into the research program
Dedicate enough time and resources to engagement in each project, which may require extended program and project timeframes
Prioritise and allow enough time for Indigenous engagement
Formalise stakeholder engagement through processes such as strategic-level steering committees, advisory groups, MoUs, and milestone agreements
Organise communication programs to meet stakeholder needs, using appropriate language and formats
Take communication to the stakeholders, and coordinate with existing events
Make communication a two-way process, as an opportunity to shape programs and projects

Appendix 1. Background to the Research Plan

Roles of NRM groups and RDAs

Natural Resource Management groups are non-statutory bodies that facilitate improvement in sustainable environmental management across Australia⁹. They also work with managers, industry bodies, community groups, government agencies and researchers to broker relationships concerning natural resource matters and facilitate information exchange. They are also custodians for NRM plans, which provide regional frameworks for the sustainable management and development of biodiversity, land, sea, water and atmospheric resources. All NRM plans have been recently updated. Most now exist as continuous improvement processes that showcase information on the need for, best approach to and collaborative resourcing of resource management activities. The plans are supported by sophisticated online tools which act as a vehicle for exposing stakeholders to the latest research findings that apply to management of the environment at the scale and in the location in which they are operating

Regional Development Australia boards are regional groups formed through partnership between the three levels of government and the community to enhance regional economic, social and environmental sustainability¹⁰. The charter of RDAs is to drive and support the development of sustainable regional economies through strategic approaches to the resolution of major regional issues and diversification of industries across agriculture, tourism, mining and fisheries, underpinned by robust education and health services sectors and fit-for-purpose infrastructure. RDAs also act as brokers between industry, community groups and decision makers about regional development matters. Increasingly, RDAs and NRM groups across northern Australia collaborate in areas of environmental assessment, planning and policy development.

Natural Resource Management groups and RDAs need to draw on the best available information about environmental, economic, cultural and social values and vulnerabilities and management options to decide where to target their effort and investment, as well as to advise on resource use and management. Hence they are in a good position to identify which knowledge gaps most impede sustainable environmental outcomes and where investment in research will have the greatest positive impact. Many northern NRM groups have internally assessed their research needs, and some now commission their own research, considering that current research programs have not delivered useful outputs in some areas of concern; that the research is too theoretical; or that timeframes are too long to inform policy options and development. Hence NRM groups and RDAs are key stakeholders in national environmental research programs, and have valuable insights both into where research should be targeted and on how research programs would be best delivered to maximise impact.

⁹ <http://www.nrm.gov.au/about/nrm/index.html>

¹⁰ <http://rda.gov.au/rda-national-charter>

Previous northern environmental research programs

The National Environment Research Program (NERP) was funded by the Australian Government's Department of Environment (DOE) to *"improve our capacity to understand, manage and conserve Australia's unique biodiversity and ecosystems through the generation of world-class research and its delivery to Australian environmental decision makers and other stakeholders"*¹¹. It provides upwards of \$20,000,000 each year to support a range of themed research hubs as well as directly funding emerging environmental priorities. The first funding round commenced in 2011 and is scheduled to finish at the end of 2014. Two northern Australian hubs were funded in this round: the Tropical Ecosystems Hub – administered out of Cairns – has a research focus on Torres Strait, Great Barrier Reef and Wet Tropical rainforests; and the Northern Australia Hub – administered out of Darwin – has a focus on terrestrial and aquatic biodiversity, Indigenous livelihoods and land-use planning across the northern savanna region. These two hubs extended two earlier phases of research programs focusing on the sustainable environmental management of northern Australia (Table 3).

Table 3: Northern Australian research programs with a sustainable management focus

	North-eastern Australia	Northern savannas
Cooperative Research Centres (CRC)	CRC for Great Barrier Reef World Heritage Area (1999-2006) CRC for Torres Strait (2003-2006) CRC for Tropical Rainforest Ecology and Management (1999-2006)	CRC for Tropical Savannas Management (1995-2009)
Commonwealth Environment Research Facilities (CERF)	Marine and Tropical Sciences Research Facility (2006-2010)	Tropical Rivers and Coastal Knowledge Hub (2005-2010)
National Environment Research Program (NERP)	NERP Tropical Ecosystems Hub (2011-2014)	NERP Northern Australia (2011-2014)

The Department of Environment commissioned an assessment of the NERP program 2013. This review (Spencer, McVay, & Sheridan, 2014) concluded that the research supported by the program was of high quality and had improved knowledge about Australian biodiversity and ecosystems and assisted the Department of Environment to discharge its responsibilities under the *Environment Protection and Biodiversity Conservation Act*. Management of National Parks and Great Barrier Reef water quality and policy approaches to strategic assessments and regional sustainability planning were all highlighted as areas that benefited from NERP research.

Stakeholder engagement undertaken by NERP hubs was highly-rated in the review, with very productive partnerships having been developed between researchers and DOE. Departmental staff benefited from "on-call access to world-leading researchers for ad-hoc advice" (Spencer et al., 2014, p. 5) as well as from research findings delivered through more formal communications and publication channels. Nevertheless, some stakeholders believed NERP research findings had not adequately informed other policy development. Northern Australia was highlighted as an area in which NERP research would be essential to future policy development, particularly in relation to water resources, Indigenous livelihoods and development of Great Barrier Reef catchments.

¹¹ www.environment.gov.au/topics/science-and-research/national-environmental-research-program/about-program

Furthermore, a perceived narrow end-user base was of concern to many northern stakeholders, including the NRM community. These stakeholders expressed a desire to have more “input into defining the research priorities of the program” (Spencer et al., 2014, p. 44), and felt their interests had been better-served by earlier CRC and CERF research models, which had placed greater emphasis on engagement and collaborative research. So, while the NERP guidelines stated that NERP programs must be “end-user focused”, some northern stakeholders, notably NRM and industry groups, clearly felt marginalised.

The multi-year research plans of both northern NERP hubs listed the federal government agencies and its management authorities as the primary stakeholders (NERP Northern Australia Hub, 2011; NERP Tropical Ecosystem Hub, 2011). Both plans also recognised a wider end-user base and put processes in place for wider engagement. NERP TE’s plan included state government, industry, Indigenous partners, regional NRM organisations, Non-government organisations and RDAs as stakeholders (NERP Tropical Ecosystem Hub, 2011). It required project leaders to engage these end-users “throughout the process from the early stages of problem definition to the implementation of new practices and/or the uptake into new policy”, and stated that “the effectiveness of communications and knowledge brokering by the Hub will be just as important as its research portfolio” (NERP Tropical Ecosystem Hub, 2011, p. 8). This priority was backed by 7% of the budget dedicated to engagement and communication, and stakeholder participation in project selection. Of the 52 NERP TE projects, 18 listed NRM organisations as stakeholders, with a total of seven NRM groups being engaged. RDA was not listed as a stakeholder for any individual project.

NERP NA’s knowledge brokering program (11.5% of its budget) has also engaged widely across the north (NERP Northern Australia Hub, 2011). However, individual NERP NA projects only listed DOE (then called the Department of Sustainability, Environment, Water, Population and Communities) as the only end-user.

Discussion with NRM groups indicates that engagement at the project level varied across both programs and between individual researchers. Some NERP researchers were recognised as engaging well with NRM groups, and others being so disengaged as to being difficult to track down. This plan reflects a desire to ensure future investment in environmental research not only addresses issues of concern to NRM groups and RDAs, but also engages closely with these stakeholder to maximise the utility and adoption of research findings.

Future national research direction and processes

The Department of Environment has indicated a commitment to continued investment into environmental research through the National Environmental Science Program (NESP)¹². While the form in which investment will be made is yet to be determined, positive feedback provided in the NERP evaluation indicates that a departure from the hub funding arrangements is unnecessary. The final delivery model will partly depend on the Department’s research priorities, which are currently under review. Opportunity, therefore, exists to shape the next round of environment funding in northern Australia to meet the needs of northern stakeholders. Both northern NERP hubs are undertaking consultation to identify and synthesise these priorities and to identify the best research delivery model. This plan is part of this consultation. It has been funded as part of the knowledge brokering activities of the NERP TE Hub, with the active support of NERP NA. While it is designed to be a stand-alone plan representing the views of NRM groups and RDAs from across northern Australia, it will also feed into research directions developed by these hubs.

¹² www.environment.gov.au/topics/science-and-research/national-environmental-research-program

References

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Appendix 2. Research Plan Preparation

This section summarises the steps involved in the preparation of this plan. A comprehensive description of plan preparation is provided in the supplementary document.

Consultation processes

The senior management of all 11 NRM organisations and seven RDA boards from across northern Australia were invited to collaborate on the development of this research plan (Figure 1). The responses and contributions of these organisations is described in Table 4. Each group was contacted and asked to identify research priorities and issues under a semi-structured response framework (Table 5). Initial contact was made through email and responses were provided through combinations of email, phone calls and face-to-face meetings.

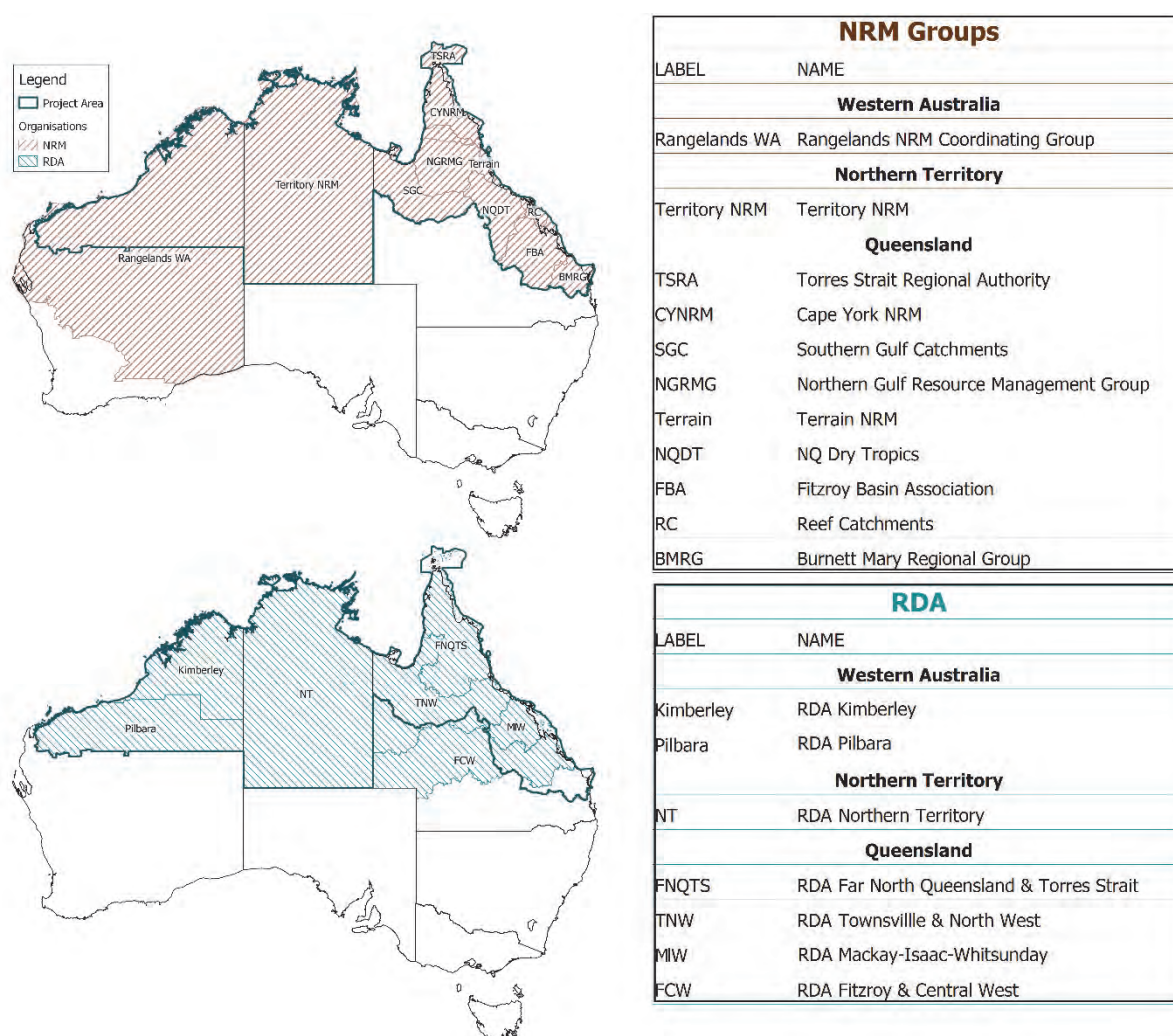


Figure 1: NRM groups and RDAs contributing to this report

Table 4: Contributors to the research plan

Name	Position	Email	Phone	Face-to-face meetings	Workshop
Torres Strait Regional Authority		✓	✓		✓
Damian Miley	Manager, Land and Sea Management Unit	✓	✓		
Shaun Barclay	Acting Manager, Land and Sea Management Unit				✓
Cape York NRM		✓	✓	✓	✓
Bob Frazer	Chief Executive Officer	✓			
Peta-Marie Standley	Program Manager	✓	✓	✓	✓
Northern Gulf Resource Management Group		✓	✓	✓	✓
Tim Hoogwerf	Operations Manager	✓	✓		
Richard Musgrove	Operations Manager				✓
Noelene Ikin	Former Chief Executive Officer			✓	
Southern Gulf Catchments			✓		
Bob Wilson	Chief Executive Officer		✓		
Terrain NRM		✓	✓	✓	
Carole Sweatman	Chief Executive Officer	✓			
David Hinchley	Land and Water Program Manager	✓	✓	✓	
Ian Sinclair	NRM Planning Coordinator			✓	
NQ Dry Tropics		✓		✓	✓
Scott Crawford	Chief Executive Officer	✓		✓	
Alastair Buchan	NRM Planning Coordinator	✓		✓	✓
Reef Catchments		✓		✓	✓
Rob Cocco	Chief Executive Officer	✓		✓	
John Franklin	Special Projects Manager			✓	✓
Fitzroy Basin Association		✓	✓		✓
Paul Birch	Chief Executive Officer	✓			
Piers Harper	Operations Manager		✓		✓
Burnett Mary Regional Group		✓			✓
Penny Hall	General Manager	✓			
Michael Moller	Sustainable Landscapes Team Leader	✓			
Emily Maher	Operations Manager				✓
Territory NRM		✓		✓	✓
Karen May	Executive Officer	✓		✓	
Diane Pearson	Program Manager	✓		✓	✓
Paul Donohoe	Program Manager – NRM Planning	✓		✓	
Rangelands WA		✓			
Grey Mackay	Program Manager (Kimberley)	✓			
RDA Far North Queensland and Torres Strait		✓		✓	✓
Sonja Johnson	Chief Executive Officer	✓		✓	
Jann Crase	Policy and Projects Officer	✓		✓	✓
RDA Townsville and North West Queensland Inc.		✓		✓	
Glenys Schuntner	Chief Executive Officer	✓		✓	
RDA Mackay-Isaac-Whitsunday		✓	✓	✓	
Andre Wessels	Chief Executive Officer	✓	✓		
Lauren Tambling	Executive Assistant	✓		✓	
RDA Fitzroy and Central West			✓		
Rees Banks	Executive Officer		✓		
RDA Northern Territory		✓	✓		
Kate Peake	Executive Officer	✓	✓		
RDA Kimberley			✓		
Chris Mitchell	Executive Officer		✓		
RDA Pilbara		✓			
Diane Pentz	Executive Officer	✓			

Table 5: Response framework used for data collection in this project

Environmental research priorities for northern Australia
Organisational research priorities
Priority investment areas
Priority research topics
Factors to be considered in research prioritisation
Governance framework
Engagement and communication principles and practices
Role of responding organisation
Integration of research findings into your business
Identification of stakeholders
Additional comments

Responses were collated and summarised in a consultation paper. The plan was finalised through feedback from contributors followed by a workshop held in Cairns on 11 June 2014. All contributors were provided with the opportunity to provide feedback to the final report. This comprehensive engagement process is reflected in the wide-ranging authorship of this research plan.

Identifying research priorities

Natural Resource Management groups and RDAs identified numerous research priorities in their individual responses. These were synthesised and organised into 12 research themes that were circulated in a consultation paper, and further coalesced into five research themes in the workshop. Research themes were populated with priority research needs identified both in the workshop and individual responses. Research needs were expressed as problems requiring solving or opportunities for knowledge building to enhance sustainable resource management and livelihoods. Potential research solutions and partnerships to deliver them were also identified, along with alignment to Australian government programs and priorities.

Developing a governance framework

Natural Resource Management groups and RDAs identified that useful research would only be delivered through governance arrangements that ensured stakeholders were seen as partners in the research program from bid development through to project delivery. However, each group had slightly different expectations about how this should be achieved and capacity to participate in such engagement processes. A flexible governance framework to ensure productive stakeholder partnership was therefore developed based on the workshop discussions and responses of individual contributing organisations.

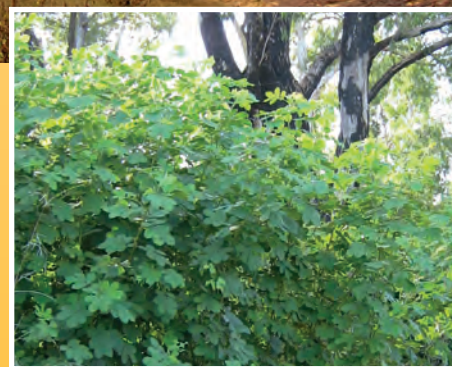
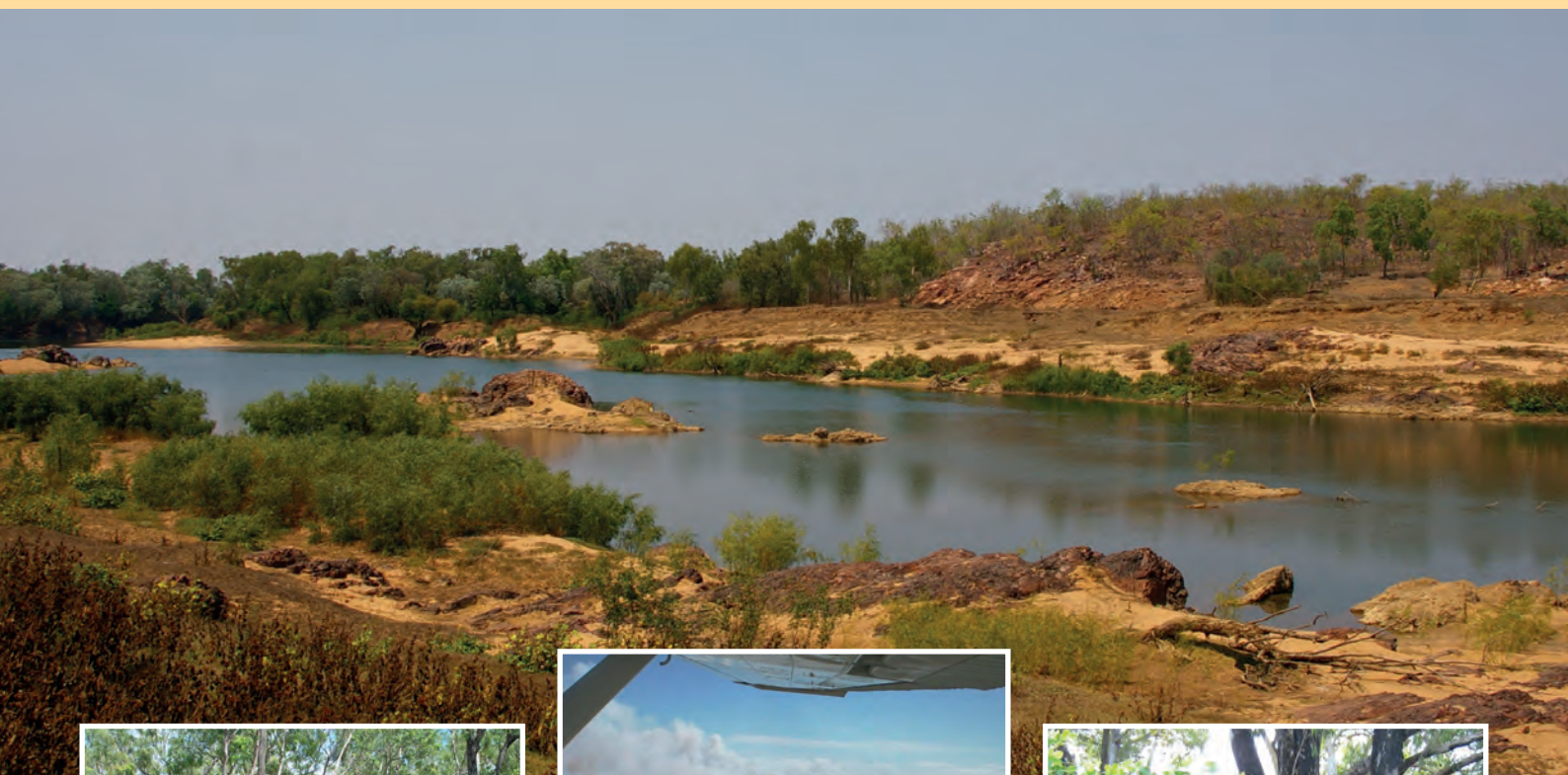


National Environmental
Research Program

TROPICAL ECOSYSTEMS *hub*

Supplementary Report

Environmental Research Plan for Natural Resource Management Organisations and Regional Development Australia Boards in Northern Australia



Crowley, G.M., Dale, A., Banks, R., Barclay, S., Birch, P., Buchan, A., Cocco, R., Crase, J., Crawford, S., Dielenberg, J., Donohoe, P., Edgar, B., Franklin, J., Frazer, B., Harper, P., Hinchley, D., Hoogwerf, T., Ikin, N., Johnson, S., Mackay, G., Maher, E., May, K., Miley, D., Mitchell, C., Moller, M., Morris, S., Musgrove, R., Peake, K., Pearson, D., Pentz, D., Schuntner, G., Sinclair, I., Standley, P.-M., Sweatman, C., Tambling, L., Wessels, A., and Wilson, B.



Australian Government
Department of the Environment



Supplementary document to

Environmental Research Plan for Natural Resource Management Organisations and Regional Development Australia Boards in Northern Australia

NERP TE Hub Project CF14

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Department of the Environment

Supported by the Australian Government's
National Environmental Research Program
Project CF14 Environmental Research Plan for Natural Resource Management Organisations and
Regional Development Australia Boards in Northern Australia

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National Library of Australia Cataloguing-in-Publication entry:

978-1-925088-37-3

This report should be cited as:

Crowley, G.M., Dale A., Banks, R., Barclay, S., Birch, P., Buchan, A., Cocco, R., Crase, J., Crawford, S., Dielenberg, J., Donohoe, P., Edgar, B., Franklin, J., Frazer, B., Harper, P., Hinchley, D., Hoogwerf, T., Ikin, N., Johnson, S., Mackay, G., Maher, E., May, K., Miley, D., Mitchell, C., Moller, M., Morris, S., Musgrove, R., Peake, K., Pearson, D., Pentz, D., Schuntner, G., Sinclair, I., Standley, P.-M., Sweatman, C., Tambling, L., Wessels, A., and Wilson, B. (2014) *Supplementary document to environmental research plan for natural resource management organisations and Regional Development Australia boards in northern Australia. NERP TE Project CF14 Final report*. Report to the National Environmental Research Program. Reef and Rainforest Research Centre Limited, Cairns (72 pp.).

Published by the Reef and Rainforest Research Centre on behalf of the Australian Government's National Environmental Research Program (NERP) Tropical Ecosystems (TE) Hub.

The Tropical Ecosystems Hub is part of the Australian Government's National Environmental Research Program. The NERP TE Hub is administered in North Queensland by the Reef and Rainforest Research Centre Limited (RRRC). The NERP Tropical Ecosystems Hub addresses issues of concern for the management, conservation and sustainable use of the World Heritage listed Great Barrier Reef (GBR) and its catchments, tropical rainforests including the Wet Tropics World Heritage Area (WTWHA), and the terrestrial and marine assets underpinning resilient communities in the Torres Strait, through the generation and transfer of world-class research and shared knowledge.

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Cover photographs: Gabriel Crowley: Daly River at Nancarrow, Rangers monitoring grasses, Sickledod infestation; Peter Thompson, Cape York Sustainable Futures: Smoke from aerial burns on Cape York Peninsula.

This report is available for download from the NERP Tropical Ecosystems Hub website:

<http://www.nerptropical.edu.au/research>

July 2014

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Abbreviations Used In This Appendix

ABS	Australian Bureau of Statistics
ANZECC	Australian and New Zealand Environment and Conservation Council
AG	Australian Government
AWC	Australian Wildlife Conservancy
BMRG	Burnett Mary Regional Group
BP	Best Practice management options
CC	Climate Change
CDU	Charles Darwin University
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CYNRM	Cape York Natural Resource Management
CYP	Cape York Peninsula
DAFF	Australian Department of Agriculture, Fisheries and Forestry
DOE	Department of Environment
FBA	Fitzroy Basin Association
FNQ-ROC	Far North Queensland Regional Organisation of Councils
FTE	Full Time Equivalent
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GIS	Geographic Information Systems
GQAL	Good Quality Agricultural Land
GRDC	Grains Research and Development Corporation
HAL	Horticulture Australia Limited
JCU	James Cook University
LGAs	Local Government Associations
MLA	Meat and Livestock Australia
MoU	Memorandum of Understanding
NERP	National Environmental Research Program
NERP NA	National Environmental Research Program – Northern Australia Hub
NERP TE	National Environmental Research Program – Tropical Ecosystem Hub
NGOs	Non-government organisations
NGRMG	Northern Gulf Resource Management Group
NP	National Park
NQ	North Queensland
NT	North Queensland Dry Tropics
NRM	Natural Resource Management
NT	Northern Territory
PWCNT	Parks and Wildlife Commission Northern Territory
QDAFF	Queensland Department of Agriculture, Fisheries & Forestry
QDNRM	Queensland Department of Natural Resources & Mines
QG	Queensland Government
RC	Reef Catchments
RD&E	Research, Development and Extension
RDA	Regional Development Australia
RDA MIW	Regional Development Australia Mackay-Isaac-Whitsunday

RDA FNQ&TS	Regional Development Australia Far North Queensland and Torres Strait
RDA TNW	Regional Development Australia Townsville and North West
RIRDC	Rural Industries Research and Development Corporation
RoCs	Regional Organisation of Councils
SGC	Southern Gulf Catchments
SRA	Sugar Research Australia
TOs	Traditional Owners
TS	Torres Strait
TSRA	Torres Strait Regional Authority
WA	Western Australia
WT	Wet Tropics
WWF	World Wide Fund for Nature

Acknowledgements

This project would not have been possible without the direct involvement of the Natural Resource Management (NRM) organisations and Regional Development Australia (RDA) boards. We thank them for their support.

Preparation of this document was funded as part of the National Environment Research Program Tropical Ecosystems Hub (NERP TE) Contestable Funds Project CF14 *Ongoing integration of NERP TE science into regional planning*, with institutional support from the Reef and Rainforest Research Centre (RRRC). We thank Julie Carmody and Wayne Spencer (RRRC) for their help and guidance. Collaboration with NERP North Australia led by Michael Douglas at Charles Darwin University extended the scope and impact of this project. We thank Michael for his cooperation and support.

We thank Katrina Keith, The Cairns Institute (TCI), James Cook University for proof-reading this document and, along with Jennifer McHugh and Maxine Goulston, TCI, and for assisting with the necessary processes and procedures that enabled us to undertake this project.

Peter Thompson, Cape York Sustainable Futures, is acknowledged for use of the photograph of smoke on the cover and the photograph on p 46; and Sally Witherspoon for the photograph on p 56. All other photographs are the property of Gabriel Crowley.

Executive summary

This report provides supplementary information describing the preparation of “An environmental research plan for Natural Resource Management organisations and Regional Development Australia boards across northern Australia”. The plan was compiled in collaboration with 11 Natural Resource Management (NRM) groups and seven Regional Development Australia (RDA) boards from northern Western Australia, the Northern Territory and northern Queensland.

This document provides a detailed description of the steps undertaken in the plan’s preparation. It covers the rationale for developing the plan; the contributors to the plan and the nature of their input; and the methods used for collecting and synthesising this input.

The plan was prepared to inform the next round of environmental research funding under the National Environmental Science Program (NESP). It also aimed to provide a platform from which all groups can progress their long term research agenda beyond NESP investment.

All NRM groups and RDAs across northern Australia were provided with a questionnaire to provide a framework for input to the plan. It covered research priorities; program organisation and design; stakeholder engagement; and the role of NRM groups and RDAs. Responses varied between organisations, with combinations of emails, face-to-face meetings and phone conversations. A draft document was prepared summarising this input, and identifying 12 initial research themes. These were refined and consolidated through feedback on the draft document and a workshop held in Cairns in June 2014, at which the research plan was finalised.

The research plan identified 48 potential projects to address 39 priority research needs organised under five research themes

- 1 Governance, policy and influence
- 2 Sustainable livelihood and agricultural options
- 3 Water resource planning and water quality improvement
- 4 Landscape planning for land use and management
- 5 Biodiversity and wetlands management

The plan also described the governance arrangements required to ensure research programs meet these knowledge needs.

Introduction

As part of the NERP TE Contestable Funds Project CF14 *Ongoing integration of NERP TE science into regional planning*, Natural Resource Management (NRM) groups and Regional Development Australia (RDA) boards were invited to participate in the preparation of an environmental research program for northern Australia. This plan aimed to meet their knowledge needs for planning, decision making and on-ground management to improve environmental conditions and livelihoods across northern Australia. This appendix reports on the processes used to obtain the initial responses; compile responses into a consultation paper, which was circulated among participants for feedback; and finalise the research plan through a workshop and further feedback.

Methodology

This project involved direct communication with 11 NRM groups and seven RDAs from across northern Australia (Table 1) to determine their research priorities and their views on the governance processes required to address them. To guide discussions with these groups, a structured response framework was compiled designed as a survey form and covering research priorities and program delivery (Figure 1).

Responses from groups were obtained through the following processes:

- An initial email request for participation, explaining context, and providing a response framework
- Meetings held with NRM and RDA organisations individually or collectively
- Follow-up discussions and email correspondence

All groups provided responses, which are presented in full in this appendix, and then synthesised to draw out key points and commonalities. An interim report was prepared summarising the responses from NRM groups and RDAs, which was circulated to all participating organisations and individuals. This report included a description of the aims and methods; the responses as raw data; and the response synthesis, including profiles of twelve research themes. Feedback from the groups was incorporated into the synthesis as presented in this appendix. This was followed with a workshop where the plan structure was finalised and populated. A copy of this draft plan was then circulated among contributors and feedback incorporated before finalising the plan as presented in this report.

Table 1: Contributors to the research plan

Name	Position	Email	Phone	Face-to-face meetings	Workshop
Torres Strait Regional Authority		✓	✓		✓
Damian Miley	Manager, Land and Sea Management Unit	✓	✓		
Shaun Barclay	Acting Manager, Land and Sea Management Unit				✓
Cape York NRM		✓	✓	✓	✓
Bob Frazer	Chief Executive Officer	✓			
Peta-Marie Standley	Program Manager	✓	✓	✓	✓
Northern Gulf Resource Management Group		✓	✓	✓	✓
Tim Hoogwerf	Operations Manager	✓	✓		
Richard Musgrove	Operations Manager				✓
Noelene Ikin	Former Chief Executive Officer			✓	
Southern Gulf Catchments			✓		
Bob Wilson	Chief Executive Officer		✓		
Terrain NRM		✓	✓	✓	
Carole Sweatman	Chief Executive Officer	✓			
David Hinchley	Land and Water Program Manager	✓	✓	✓	
Ian Sinclair	NRM Planning Coordinator			✓	
NQ Dry Tropics		✓		✓	✓
Scott Crawford	Chief Executive Officer	✓		✓	
Alastair Buchan	NRM Planning Coordinator	✓		✓	✓
Reef Catchments		✓		✓	✓
Rob Cocco	Chief Executive Officer	✓		✓	
John Franklin	Special Projects Manager			✓	✓
Fitzroy Basin Association		✓	✓		✓
Paul Birch	Chief Executive Officer	✓			
Piers Harper	Operations Manager		✓		✓
Burnett Mary Regional Group		✓			✓
Penny Hall	General Manager	✓			
Michael Moller	Sustainable Landscapes Team Leader	✓			
Emily Maher	Operations Manager				✓
Territory NRM		✓		✓	✓
Karen May	Executive Officer	✓		✓	
Diane Pearson	Program Manager	✓		✓	✓
Paul Donohoe	Program Manager – NRM Planning	✓		✓	
Rangelands WA		✓			
Grey Mackay	Program Manager (Kimberley)	✓			
RDA Far North Queensland and Torres Strait		✓		✓	✓
Sonja Johnson	Chief Executive Officer	✓		✓	
Jann Crase	Policy and Projects Officer	✓		✓	✓
RDA Townsville and North West Queensland Inc.		✓		✓	
Glenys Schuntner	Chief Executive Officer	✓		✓	
RDA Mackay-Isaac-Whitsunday		✓	✓	✓	
Andre Wessels	Chief Executive Officer	✓	✓		
Lauren Tambling	Executive Assistant	✓		✓	
RDA Fitzroy and Central West			✓		
Rees Banks	Executive Officer		✓		
RDA Northern Territory		✓	✓		
Kate Peake	Executive Officer	✓	✓		
RDA Kimberley			✓		
Chris Mitchell	Executive Officer		✓		
RDA Pilbara		✓			
Diane Pentz	Executive Officer	✓			

Future environmental research for northern NRM and RDAs



Purpose of Questionnaire

This questionnaire provides a framework for capturing the environmental research priorities of Natural Resource Management and Regional Development groups in northern Australia.

Please use the questions to guide in-house conversations on this topic. Allan Dale and I will also be using this questionnaire as a guide for our discussions with NRM groups and RDAs. We will then invite you to a workshop to produce a report on northern NRM/RDA research priorities.

The framework covers the design of National Environmental Research Programs, including:

- Research priorities
- Program organisation and design
- Stakeholder engagement
- Role of NRM/RDA groups

Please let me know if there are other areas you wish to cover, by contacting me at any time at gabriel.crowley@jcu.edu.au

1. If you wish to submit your responses using this form, please complete these contact details

Organisation

Contact person or email

Figure 1: Copy of questionnaire used to structure input into research plan

Environmental Research Priorities for Northern Australia				
2. What are your priorities for research to improve the program delivery of your organisation?				
3. The following list attempts to provide a spectrum for prioritising environmental research investment across a spectrum from pure to more applied research. Please use this to indicate the emphasis you think should be placed on research investment.				
	Low	Medium	High	Critical
Understanding environmental function and threats				
Cultural knowledge, values and livelihoods				
Identifying sustainable livelihood options				
Identifying sustainable industry practices				
Identifying other environmental management and rehabilitation options				
Influencing practice change and adoption				
Understanding socio-ecological networks and building resilience				
Improving program governance, engagement and delivery				
Other (please specify)				
Notes and additional comments:				

Figure 2 (continued): Copy of questionnaire used to structure input into research plan

4. Please list three to five research areas that you think should be progressed over the next five years	
1	
2	
3	
4	
5	
5. What factors do you think should be considered in deciding how research funding should be spent?	
Engagement and integration	
6. Please provide any comments you have on how future research programs should engage and communicate with stakeholders	
7. What role(s) would you like your organisation to have in a National Environmental Research program to address NRM/RDA needs?	

Figure 2 (continued): Copy of questionnaire used to structure input into research plan

8. Please provide comment on the processes that you think would most improve the integration of research findings into your business	
9. If research is to be organized around cluster groups, what other stakeholder groups would be good to include in your cluster? This can include NRM groups, RDAs, Indigenous groups, or other groups	
1	
2	
3	
4	
5	
Notes:	
Is there anything we have missed?	

Figure 2 (continued): Copy of questionnaire used to structure input into research plan

Responses

Environmental research priorities for northern Australia

Q2. What are your priorities for research to improve the program delivery of your organisation?

Torres Strait Regional Authority

See Q4

Cape York NRM

Overview

- Scoping out priority ecosystem services opportunities identified in a recent CYP study
- Identification of alternative sustainable industries to improve resilience, focusing on innovative solutions to seemingly intractable problems (e.g. instead of continually battling weeds as a threat, find a production use for them)
- Prioritisation of wetlands for conservation and protection from sea-level rise in terms of connectivity, carbon abatement opportunities etc.
- Traditional knowledge and fire management
- Wetlands role in soil carbon storage and abatement opportunities from reducing feral pig damage
- Springs
- Emergent weed threats, especially relative to new arrivals (e.g. through hay and climate change impacts on current sleeper weeds). Also, strategies to minimise weed arrival and spread (e.g. growing own hay)
- Sensible clearance strategies that take soil types, rarity and other environmental values and issues into account. Also, what are the alternatives to clearance?
- Quolls

Desired improvements and knowledge outcomes from Regional Investment Strategy

General

- Research that enhances capacity of Indigenous communities and land managers to conserve and protect natural resources

Fire

- Develop capacities to aggregate carbon trading
- Adapt savanna burning methodology linked to climate, Indigenous Knowledge and specific ecosystem burning needs
- Identify and build case studies of tangible benefits of fire management across different land uses

Water

- Systematic understanding of water resources/ecosystems and their sustainable use
- Improved western and Indigenous knowledge and management of aquatic ecosystems
- Landholders implement property management plans that consider impacts on water resources and incorporate innovative ideas
- Improved monitoring and planning for water resources, including groundwater
- Improved mapping and protection of threatened ecological communities
- Increased understanding of Cape York aquatic resources, how they are managed and international best practice
- Improved understanding of issues, opportunities and environmental impacts, including water capture methods
- Collaborate with others for funding to research, monitor and record climate change impacts and sea levels and subsequent impacts on species and ecosystems
- Investigating and supporting the development of alternative economies which support sustainable use of water in a changing climate

- Monitoring and analysis of aquatic areas (fresh and salt for threatened species and ecosystems, including turtles, ghost nets, riparian habitats, wetland, birds, aquatic flora and fauna)
- Identify needs and opportunities for workshops and skills development for rangers and agencies implementing NRM on Country, particularly for fresh and salt water turtles and wetlands
- Support research which respond to issues of significance, knowledge gaps, emerging issues, and opportunities, such as mapping of springs, cultural and biological diversity of wetlands, blue carbon, water capture

Soil

- Far-reaching understanding of the fragility of Cape York soils and how to implement best practices that protect natural systems, while maintaining livelihoods
- Greater understanding of landholders, businesses, industries, visitors and residents of Cape York of the fragility of CYP soils, and how to care for soils while sustaining livelihoods
- Support research and projects that improve overall knowledge of soil quality and reduce erosion and flood plumes
- Support innovation and development of alternative economies such as soil carbon, minimum tillage and composting

Livelihoods

- A carbon economy is understood, explored and developed where appropriate including blue carbon
- Improve opportunities for communities to participate in the carbon economy
- Sustainable livelihoods are developed across Cape York which allow for local aspirations, skill development, environmental sustainability, career paths and personal and community wealth which enable people to stay in Cape York
- Develop environmental offsets from industrial development based around Indigenous stewardship
- Sector roundtables on livelihoods

Integrated Pest Management

- Support research innovation in integrated pest management including new control methods, and potential alternative livelihoods through ecosystem products (e.g. pharmaceutical uses of weeds)

Country and Biodiversity

- Improved biodiversity monitoring and country planning
- Improved mapping and protection of threatened ecological communities
- Increased understanding of Cape York biodiversity and improved management effectiveness

Southern Gulf Catchments

- Climate variability
- Control of woody weeds (e.g. prickly bushes)
- Water allocation, availability and storage
 - Off river storage
 - Impacts on pests and weeds
 - Longer term impact on community

Northern Gulf Resource Management Group

Region wide

- What are the condition and trends of the natural resources and community of the Northern Gulf NRM Region?
- Effective baseline monitoring, especially in the 'refugia' habitats
- Develop water quality standards consistent with the natural habitats of the gulf (ANZECC are not)
- How do we prioritise natural resources for management, considering thresholds and greatest potential impact?
- What drives people's decision making in natural resource management, including an understanding of socio-ecological networks? How do we measure and understand social trends?
- What does an adaptive planning and management look like and how does it work?
- What are the economic values of the regional landscapes and natural resources – economic valuation of ecosystem services, and how do we measure trade-offs?

- Local Science Capacity – working with NGRMG to define research questions and approach research together

Water

- What is the best mix of management practices to achieve agreed water quality improvements (pesticide, sediment and nutrients) that can be undertaken by individual land use sectors (e.g. parks as well as agriculture)?
- Flood risk mapping (sea-level rise and periodic inundation)
- Cause and management options to mitigate hillslope erosion in the headwaters of the Gilbert River Catchment and gully erosion in the Mitchell River Catchment?
- What are the source, distribution and hazard of heavy metals in the Mitchell River catchment?
- What are the natural chemical signatures of the riparian geochemical terrains (to benchmark natural metal and sediment characteristics so that anomalies can be detected and mitigated)?
- Standards developed for Gulf of Carpentaria rivers for future monitoring of these valuable assets that are under increasing national demand to inform future development and management
- Better understand McBride basalt ground water reserves, including the likely impact of extraction on springs

Climate change

- What species and habitat are most vulnerable to climate change?
- What are the implications for current farming systems under low, medium and high impact climate change scenarios for the Gulf savannah?
- How do we improve climate forecasting in regard to variability, and how do we encourage its use?
- Measuring soil carbon for sequestration for both intensive agriculture (cane and horticulture) and extensive beef grazing
- What are the adaptation strategies for more extreme weather events (i.e. cyclones, flooding) as a result of climate change?

Biodiversity

- What are the current and emerging threats to biodiversity?
- How to manage native pest species
- Identify the most critical habitats for landscape and species conservation given the impending development of our region into the future
- What are the main drivers and management interventions required/possible to improve management of biodiversity?
- How do we design and implement management responses?
- Develop practical models for joint management of areas of high biodiversity value (how to get an economic and management model that improves biodiversity)
- What are the ecosystem services provided by habitat in the region and where are they in the landscape?
- What is the impact of introduced grass species on native species' distribution and densities?
- What is the best design for functional landscapes?
- The limits of distribution of the 'isolated' population of greater gliders in Blackbraes NP
- Ecological research on the grunter (*Pomadasys kaakan*) in the Gulf of Carpentaria
- What are the appropriate systems and technologies to monitor (and eradicate if required) *Tilapia* in Gulf of Carpentaria rivers?
- What are the impacts on fish movement and breeding created by artificial barriers?

Agriculture / Industry / Land

- What are the opportunities for diversification within the agricultural sector that will also protect GQAL?
- How do we develop agricultural resilience in a functional landscape?
- How do we ensure security of food production to address the demands of the region and export markets?
- Developing tools to measure and provide 'standards' on the nutrition of fresh produce (e.g. impact of practices and food miles etc. on nutrition)?
- What are the most appropriate alternative/non-industrial farming systems for the region?
- What are appropriate and emerging crops and cropping systems for the Mareeba-Dimbulah Water Supply Area and the proposed Gilbert River Irrigation scheme?
- What practices and technologies can be implemented to maintain or improve land condition in the rangelands?
- Develop sub-catchment to regional scale prioritisation tools to manage pest plants
- Develop a grazing code of practice to detail preferred technology and practice for grazing landscapes in the Northern Gulf region and encourage uptake
- Develop a small miners code of practice to detail preferred technology and mining and rehabilitation best practices for landscapes in the Northern Gulf region (specifically along the Palmer River) to ensure minimal impact

Socio-Economic

- What are the likely impacts of forecast demographic change on natural resource management systems in the region?
- How do you maintain youth in rural and regional landscapes?
- What is the potential of co-governance and collaborative models for engaging Indigenous values and world views?
- How do you reach and engage with peri-urban and small landholders
- Who is the NRM community and are we effectively engaging?
- Better defined disaster threats – primarily floods, cyclones and storm surge (Karumba/ Burketown)
- Identify if true income can be generated from a 'conservation economy' (e.g. tourism potential, potential to harvest and raise native parrot/ cockatoo chicks for international trade, native grass seed collection)
- Does secondary school boarding improve education standards that in turn give these children a better start in life?
- Should immigrants spend time in remote/ regional areas to help remote/ regional economies

Governance

- How do you influence policy makers?
- How effective or perverse is environmental law in remote areas?

Terrain NRM

Region-wide

- What are the condition and trends of the natural resources and community of the Terrain NRM Region? What are useful indicators for assessing them given resourcing constraints?
- How do we most effectively prioritise management to improve the condition of communities and systems, considering thresholds and investment constraints?
- What drives people's decision making in natural resource management and how do we most effectively influence policy and decision-making? How do we better understand social trends?

Water

- What is the best mix of management practices (best practices on pesticides, sediment and nutrients and landscape management) to achieve agreed water quality improvements?
- What land use and management options are there to move beyond current best practice to reach required water quality goals?
- Spatial prioritisation – where in the landscape are the major threats to water quality (e.g. where are the major sites of gully erosion in the Wet tropics region and what are the appropriate methodologies for their repair?)

- Traditional Owner values related to water and water resource uses – Where in the landscape? What defines value and what are the management implications (TOs to refine and develop protocols etc.)?

Climate change (currently being addressed by Stream 2 Climate Change program, but gaps may remain)

- What species and habitats are most vulnerable to climate change, and how do we target management action and investment?
- What are the implications for current farming systems under low, medium and high impact climate change scenarios for the Wet Tropics?
- What are the best sequestration/adaptation opportunities in the Wet Tropics (e.g. can we increase soil carbon for sequestration in tropical soils and is it worthwhile? Biochar?)?
- Where in the landscape should sequestration activities be done and what is the mix of benefits and trade-offs (i.e. biodiversity, carbon, economic etc.)?
- What is the best design for landscape connectivity in face of projected changes and how do we get there?

Biodiversity

- What are the current and emerging threats to biodiversity (species, habits, wetlands, connectivity, significant areas etc.)?
- What are the main drivers of change and management interventions required/possible to improve management of biodiversity?
- Research on most effective management responses (corridors; fire, weed control, grazing, revegetation)
- Science to support species recovery plans for threatened species and ecological communities and planning for potential future Matters of National Environmental Significance
- What are the ecosystem services provided by habitat in the region and where are they in the landscape?

Agriculture

- What are the opportunities for diversification within the agricultural sector?
- How do we ensure security of food production to address the demands of the region and export markets?
- What are the most appropriate alternative/non-industrial farming systems for the Wet Tropics?
- Where are the major sites of gully erosion in the Wet tropics region and what are the appropriate methodologies for their repair?
- What are appropriate tree crops and tree-cropping systems for the Wet Tropics?

Socio-economics

- What are the likely impacts of forecast demographic change on natural resource management systems in the region?
- How do we maintain youth in rural and regional landscapes? Succession planning for farms and community groups
- How do we most effectively reach and engage with peri-urban and small landholders
- Who is the NRM community and are we effectively engaging?

NQ Dry Tropics

- | |
|---|
| <ul style="list-style-type: none"> • How to better inform policy – design monitoring and assessment systems that can deal with poor data quality • How to influence people's perceptions in a way that changes their behaviour • Assessment and management of significant wetlands, especially vulnerability to climate variability and sea-level rise • Understanding of pressure and drivers – providing a descriptive profile and assessment of implications (e.g. mining, climate change) • Understanding environmental function, as opposed to monitoring environmental demise • How to better inform policy – design monitoring and assessment systems that can deal with poor data quality |
|---|

Reef Catchments

- Reef Catchments' main priority is focused on GBR catchment management. It therefore has prioritised actions that help in sustainable cross-sectoral catchment management planning. These response elaborates on responses to Q4
1. GBR catchment management.
 - Prioritisation tools that assess the impacts on
 - GBR health
 - Social cohesiveness
 - Economic viability
 - Thresholds around the area of sugar production needs to maintain regional industry viability
 - Assessment of cumulative impacts/risks at scales relevant to on-ground decision making
 - What are the things that have impacts on the environment?
 2. Best practice adoption
 - How can the supply chain be encouraged to participate in the debate and what are the impediments to adoption?
 - What role can the market play?
 - Need assessment of economic ramifications of
 - No adoption
 - Early adoption
 - General adoption

Fitzroy Basin Association

1. GBR – information to inform decision making – prioritise investment of activities and areas based on cost/benefit analysis
Fitzroy Basin is the largest GBR catchment. There is adequate information to assess and prioritise efforts to control hillslope erosion, but stream-bank erosion is emerging as a greater issue, and information is lacking to assess investments; namely
 - Quantify erosion from gullies and riparian areas at a landscape scale
 - Identification of at risk land type
 - Relative merit of management at each location/land type (Management options are known (e.g. fence off, changed practices), but not the return on investment)
 - Public-private benefit ratios. Fencing riparian areas has minimal benefits to landholder
2. Groundwater resources – assessment of resources and their vulnerabilities to extraction and climate change to inform sustainable use
Need to know
 - Where are they located?
 - Where are the recharge areas?
 - Impacts of coal industry
 - Impacts of climate change
 - Implications for long-term sustainability of agricultural land use
3. Values of wetlands and floodplains and management responses to inform prioritisation of investment
 - Ecological values (biodiversity, fish passage) and resilience/thresholds
 - Water quality improvement and other ecosystems services
 - Metrics for assessment and prioritisation
4. Assessment of NRM effectiveness
 - Develop standardised methodology that can be used across time and regions to assess impact on adoption of improved management practices
 - Include short term assessment
 - What has been achieved within project timeframe?
 - and longer term assessment
 - How long were changes maintained?
 - Did they lead to wider adoption in the industry?
 - Feed back into prioritisation of investment decisions

Burnett Mary Regional Group

- Periodic assessment of the Great Sandy Strait seagrass extent and condition
- Strengthening our links in terms of upgrading data that is available for other GBR Reef regions and making it available to the Burnett Mary, so we can level the playing field a little more
- Putting a value on the ecosystem (ecological) service provided by the Baffle and Bustard Bay-Colosseum Inlet to the GBR and what the potential implications of mining/ urban development of those areas will mean in terms of reduced ecological function of the GBR/ fisheries / tourism etc.
- Mary River erosion study

Territory NRM

1. Identification of best practice (weeds, fire, ferals)
2. Scenario modelling
 - CC adaptation
 - Resilience
 - Building visual tools
3. Effectiveness of NRM work and capture costs of inaction
4. Valuing ecosystem service work
 - Economics
 - Consequences
 - Environmental accounts
5. Sustainable livelihoods – keeping people on country
6. Inform evidenced-based decision making and planning
7. Biodiversity – integrated approach to inform management responses

Rangelands WA

- Climate change impacts, severity of extreme events (storms, fire, rainfall, temperature, etc.)
- Cane toad migration southwards (Kimberley to Pilbara). Potential mitigation strategies/opportunities
- Processes affecting threatened and endangered species and communities

RDA Far North Queensland and Torres Strait

- Looking for opportunities to align NERP research with relevant elements of our Strategic Priority Packages, to inform the Regional Road Map and specific submissions. Key focus on how research interfaces and influences regional development policy. Strong cross cutting interest in planning and governance approaches. Supportive of measures to increase breadth and depth of engagement with stakeholders
- Regional indicators – State of the Region Report¹ (environment, social, cultural, economic)
- Energy – renewable energy – feed into NQ Energy Strategy²
- Water – water storage options (social and cultural criteria); assessment of decision making under the Water Act (social impact dimensions)
- Interested in relationship between NERP, and the proposed northern Agriculture/RIRDC CRC and any northern Australian CRC/research model from the northern Australian white paper
- Interested in resilience research (community, industry, environment)

RDA Townsville and North West

Four pillars of RDA TNW Roadmap are Water, Energy, Roads and Communications, as these are activities that affect all council areas in the region, but no one council has the resources to address. Research is required, or currently being undertaken to improve decisions made in these areas:

¹ <http://alga.asn.au>

² <http://www.rdafnqts.org.au/index.php/rda-initiatives/package-development>,
<http://www.rdatanwq.org.au/files/NQS%20Energy%20Water%20Climate%20Adaptation.pdf>

Water

- NQ Irrigation Strategy by CSIRO has recently reported on information needed to plan the expansion of irrigated agriculture in the Flinders-Gilbert³, but different regions have different issues
- Need information for planning to secure water supply and quality (especially for local government/ Richmond)
- Assessment of sustainability of water use and impacts of water infrastructure
- Water quality at ports
- See priority 1 in Q4

Energy

- Townsville Enterprise strategic energy study⁴ – information on energy efficiency is currently funded
- 30 year energy plan

Roads

- Prioritisation of investment in regional road to be prioritised on the basis of safety, access and productivity

Communications

- Submissions made by RDA to government about telecommunications infrastructure (e.g. National Broadband Network)

RDA Mackay-Isaac-Whitsunday

RDA Mackay-Isaac-Whitsunday's responsibilities include inland-draining catchments (Isaacs). Has prioritised actions that help in sustainable cross-sectoral catchment management planning. These response elaborates on responses to Q4

- Best practice adoption
- How can the supply chain be encouraged to participate in the debate and what are the impediments to adoption?
- What role can the market play?
- Need assessment of economic ramifications of
 - No adoption
 - Early adoption
 - General adoption

RDA Fitzroy and Central West

See Q4

RDA Northern Territory

RDA's main role relevant to environmental management is the identification of priorities in the region to pursue strategic development opportunities. Data are required for this prioritisation, but are unavailable or inadequate (poor scale and resolution, with most data for NT available at two regions – Darwin and elsewhere). So RDAs are developing their own indicators, metrics and baseline datasets. These include:

- Health
- Education
- Economic diversification
- Environment
- Capacity (labour and skills)

³ www.csiro.au/Organisation-Structure/Flagships/Water-for-a-Healthy-Country-Flagship/Sustainable-Yields-Projects/Flinders-and-Gilbert-Agricultural-Resource-Assessment-overview.aspx

⁴ www.townsvilleenterprise.com.au

The MyRegion website⁵ is attempting to provide a platform to capture and display these datasets, to enable comparisons to be made across regions and across time. But there is no ongoing commitment to this website, so another example of lack of continuity.

This lack of data has particular ramifications for efforts to improve Indigenous livelihoods.

RDA Kimberley

1. Water use planning
 - Help pastoralists harness water during wet season peak flow to increase production and recharge (e.g. shallow bunding) while improving erosion control and soil fertility
2. Fire management
 - We know how to burn, but we don't know how to achieve management, especially in remote areas
3. Feral animals
 - Especially cats and cane toads
 - Mechanisms for on-ground activity
4. Threatened species – identification of threats and management responses
5. Sustainable industries that can provide export opportunities

RDA Pilbara

Highest priorities are:

- Water resource planning
- Policy development
- Alternative livelihoods and agriculture
- Minimising environmental footprints
- Adapting to climate variability and climate change

Of next level priorities are:

- Achieving best practice management on-ground
- Water quality improvement
- Biodiversity
- Wetlands

⁵ <http://myregion.gov.au/>

Q3. The following list attempts to provide a spectrum for prioritising environmental research investment across a spectrum from pure to more applied research. Please use this to indicate the emphasis you think should be placed on research investment.

	Low	Medium	High	Critical
A. Understanding environmental function and threats	(FBA...	.. FBA)	CYNRM RDA FNQ&TS	NGRMG NQDT SGC Territory NRM Rangelands WA RDA MIW RDA NT
B. Cultural knowledge, values and livelihoods	(FBA...	.. FBA) Rangelands WA RDA MIW	CYNRM NGRMG NQDT Territory NRM RDA NT	RDA FNQ&TS
C. Identifying sustainable livelihood options	FBA	RDA MIW	NGRMG Territory NRM Rangelands WA RDA NT	CYNRM NQDT RDA FNQ&TS RDA TNW
D. Identifying sustainable industry practices		FBA RDA MIW	CYNRM NGRMG NQDT Territory NRM Rangelands WA RDA FNQ&TS	RDA TNW RDA NT
E. Identifying other environmental management and rehabilitation options	RDA FNQ&TS	CYNRM Territory NRM Rangelands WA RDA NT	NGRMG NQDT FBA	RDA MIW
F. Influencing practice change and adoption		RDA FNQ&TS	CYNRM NGRMG NQDT Territory NRM FBA Rangelands WA RDA NT RDA MIW	
G. Understanding socio-ecological networks and building resilience		Territory NRM (FBA... RDA FNQ&TS	NQDT ... FBA) RDA NT RDA MIW	CYNRM NGRMG Rangelands WA
H. Improving program governance, engagement and delivery	Rangelands WA (FBA...	Territory NRM ... FBA) RDA FNQ&TS	CYNRM NQDT RDA NT RDA MIW	

Notes

Cape York NRM

In reference to A (above): Specifically Improving methodologies for assessing significant environmental areas (re: development approvals and offsets) (see Priority 1 in Question 4).
In reference to G (above): Specifically building resilience (see Priority 4 in Question 4).

Northern Gulf Resource Management Group

Economic valuation of ecosystem services should be considered Critical.
Prioritising knowledge gaps that impact sustainable NRM (as opposed to continued research in traditional areas) should be considered Critical.

Terrain NRM

In reference to F (above): More emphasis is needed on social science – what drives behaviours and decision-making, effective interventions etc. – similar to “practice change and adoption” above but broader. Rate this as Critical.

Fitzroy Basin Association

Informing and prioritising NRM investment should be considered Critical

RDA Northern Territory

Notes and additional comments: These areas are prioritised based on perceived regional needs, not just those of RDA NT.

Q4. Please list three to five research areas that you think should be progressed over the next five years

Torres Strait Regional Authority

1	Baseline monitoring systems (key ecosystem features), biodiversity monitoring and reporting
2	Ecosystem services and their economic value to development of Torres Strait
3	Climate change adaptation and projected impacts
4	Climate change impact on target fish species – economic and social impacts
5	Identification of intrinsic and extrinsic barriers to the implementation of actions and strategies by communities as identified through research projects

Cape York NRM

1	Improving methodologies for assessing significant environmental areas (re: development approvals and offsets)
2	Prioritisation of wetlands for conservation and protection from sea-level rise on the basis of connectivity, carbon abatement opportunities etc.
3	Emergent weed threats, especially relative to new arrivals and strategies to minimise weed arrival and spread
4	Identification of alternative sustainable industries to improve resilience to climate change etc.
5	Systematic understanding of water resources/ecosystems and their sustainable use
6	Integrative fire management, incorporating Indigenous Knowledge, to obtain multiple benefits, including carbon abatement. (Very important to maintain momentum built on CYP)

Southern Gulf Catchments

1	Climate variability
2	Control of woody weeds (e.g. prickly bushes)
3	Water allocation, availability and storage

Northern Gulf Resource Management Group

1	Identifying environmental threats and values to form a baseline across northern Australia
2	Prioritising knowledge gaps that impact sustainable NRM (as opposed to continued research in traditional areas)
3	Economic valuation of ecosystem services

Terrain NRM

1	Climate change – vulnerability, adaptation, strategies, sequestration/abatement opportunities, trade-offs and implications (cost/benefit analysis)
2	Biodiversity (species, communities, wetlands, significant areas, connectivity) – Main drivers and threats, and management interventions
3	Agricultural futures – identify sustainable systems for future conditions – concentrating on diversification and innovation
4	Reef health – Landscape level approach across land use, ecosystem management and best practices
5	Governance and influence – How do you influence decision making. What are the best institutional arrangements?
6	How to measure and report condition and trend in community and natural resources and incorporate into appropriate management responses, given resource constraints

NQ Dry Tropics

1	Landscape function in dry tropics, disruptions to function and effective management responses
2	Carbon in tropical Australian landscapes and management responses
3	Wetland management – with a focus on the ecosystems of the aquatic-marine interface (mangroves, coasts, estuaries, floodplains) including identification of values, landscape interactions, threats and management responses
4	Sustainable livelihoods – beyond agriculture – alternatives that work in sympathy with the landscape
5	Intelligent management of protected areas that overcomes current difficulties (too difficult, too expensive) and may include multiple-use options

Reef Catchments

1	GBR catchment management. Assessment of all land-uses and their impacts – with a stronger emphasis on sustainable development (people, planet, profit and trade-offs), cross-sectoral and with more uniform geographic spread of project activity
1a	Assessment and management of impacts of development (e.g. coal mining and associated infrastructure)
1b	Understanding of landscape function to inform management (e.g. connectivity)
2	Mechanisms for best practice adoption
3	Enhancing resource use efficiency to minimise environmental footprint (water, energy, land etc.)

Fitzroy Basin Association

1	Inform investment in management of GBR catchments by improving knowledge of stream-bank and gully processes and costs and benefits of management responses
2	Improve knowledge of ground water resources and their sustainable use to prioritise management effort
3	Improve knowledge of the values and resilience of wetlands and floodplains to prioritise management effort
4	Standardised assessment of NRM Effectiveness

Burnett Mary Regional Group

1	Periodic assessment of the GSS seagrass extent and condition
2	Extend data to assess impact of catchment management on GBR Reef to the Burnett Mary
3	Wetland ecosystem services and impacts of development (as relates to Baffle and Bustard Bay-Colosseum)
4	Mary river erosion study

Territory NRM

1	Landscape design
2	CC adaptation – especially values, vulnerability and management responses for floodplain and coastal systems
3	NRM livelihoods
4	Scenario modelling – visual outputs
5	Cost-benefit analysis of management interventions, especially in relation to Gamba grass spread

Rangelands WA

1	Water – nutrients in Ramsar, fracking, agriculture/industry
2	Mitigating nutrient and sediment loads in waterways (Ramsar, major rivers)
3	Integrated catchment management (fire and invasive species)
4	Landscape and ecosystem function analysis
5	Sustainable models for Indigenous ranger programs to deliver environmental outcomes

RDA Far North Queensland and Torres Strait

1	Water – future water storage, innovative water use and management (domestic, major projects), water quality, efficiency for industry
2	Energy – alternative energy sources (biofuels), regional energy supplies, remote/rural supply
3	Sustainable regional development frameworks – how to really deliver social, cultural, environmental and economic outcomes
4	Water – future water storage, innovative water use and management (domestic, major projects), water quality, efficiency for industry

RDA Townsville and North West

1	Improve data needed for water planning across region
2	How to manage for best outcomes in coastal areas (sustainable development)
3	Employment opportunities for Indigenous people in remote and regional areas (environmental management, tourism, mining jobs)

RDA Mackay-Isaac-Whitsunday

1	Understanding environmental factors
2	ID technologies and rehabilitation options to limit impact
3	Assessment and management of impacts of coal mining and associated infrastructure, including clean coal production
4	Mechanisms for best practice adoption
5	Enhancing resource use efficiency to minimise environmental footprint (water, energy, land etc.)

RDA Fitzroy and Central West

1	Water resource planning
2	Water quality
3	Policy development
4	On-ground best practice
5	Minimising environmental footprint
6	Adapting to climate variability

RDA Northern Territory

1	Ground and surface water research and modelling to underpin resource allocation in face of planned agricultural development
2	Critical analysis of governance and service delivery Programs delivery prevents long-term progress and maintenance of community commitment. Destructive aspects include the short-term funding arrangements, frequent priority-shifting and inappropriate performance measures. Great effort is put into projects that are not given the time to succeed. Need to identify systems that will deliver and real change and progress
3	Enabling technologies to improve capacity and minimise environmental footprints in

	remote areas – e.g. renewable energy, telecommunications, transport
4	Primary production-based alternative sustainable economic opportunities and sustainable management practices
5	Integrated landscape planning – combining town-planning, industry guidelines, environmental assessment and management policies, conservation planning to provide an enduring strategic direction for northern development that has commitment from all stakeholders

Notes and additional comments: These areas are prioritised based on perceived regional needs, not just those of RDA NT

RDA Kimberley

1	Water use planning
2	Achieving effective fire management
3	Identifying effective feral animal control mechanisms
4	Threatened species – identification of threats and management responses
5	Sustainable industries that can provide export opportunities

RDA Pilbara

1	Water resource planning
2	Policy development
3	Alternative livelihoods and agriculture
4	Minimising environmental footprints
5	Adapting to climate variability and climate change

Q5. What factors do you think should be considered in deciding how research funding should be spent?

Torres Strait Regional Authority

GBR, ecologically, in research design is treated as one system (i.e. include Torres Strait as part of the GBR)

Northern Gulf Resource Management Group

- Stakeholder (community and industry) and science input needs should be used to set the research priorities
- Researchers seeking funds need to prove public support for their research
- There needs to be identification of research gaps in terms of where little or no field research has occurred and then there needs to be incentives (by the Australian Government) to have researchers invest in riskier (unchartered) applied science
- There needs to be more investment in determining environmental threats and values to form a baseline across northern Australia to enable more research to be conducted in gaps/geographical holes like the Northern Gulf region

Terrain NRM

- Majority of research funding should go towards informing decisions about resource use and management at various scales but also recognising the need for blue-sky research (say up to ~20% of funding)
- Research should stand up to cost/benefit and gap analysis
- Need a mix of research delivering usable outputs in the short-term and longer term research for more in-depth understanding of complex problems or processes
- Funding priority to be given to research proposals that use co-research approaches described below
- Maintain continuity of effort where this is needed to address knowledge needs, rather than just keep researchers employed in same fields

NQ Dry Tropics

- The type of research focus and investment that has been dedicated to the Wet tropics and the GBR needs to be extended to the dry tropics, as this is where the greatest development pressures are
- The research should be management drive, and have applicable outcomes
- Reef research needs to be broadened to fill in the research gaps in aquatic-marine interface (mangroves, coasts, estuaries, floodplains)
- Prioritisation should not mean that research is excluded just because it was not made a priority. The message should be that we value and can use a variety of research far beyond the few themes that we identified here. Continuation of good work in some areas (Reef) or opening of entirely new areas not listed (human population dynamics) should not stop or be seen as highly beneficial just because they were not a top six priority.

Reef Catchments

- If current NERP hubs are refunded, there needs to be a rethink of the definition of "Tropical Ecosystems", to include environments other than GBR, TS and WT. Also, research effort needs to have a more uniform geographic distribution through these environments, and not be focused between Townsville and Cairns. If this is not rectified, the NERP projects will be of limited use to Reef Catchments.
- Processes used to prioritise NERP investments should align to other prioritisation processes, e.g. QG prioritisation of Reef RD&E; AG (DOE/DAFF) Reef rescue prioritisation; QDAFF Sustainable Agriculture; QDNRM water security
- Universities should be treated as a subset of stakeholders, not the primary stakeholder driving NERP investment

- Program investment should be allocated to two sorts of research; blue-sky research (~10%) and research with tangible outcome deliverables that will directly address a management issue (~90%). The latter should be linked to a product (service/management practice/ tool, e.g. modelling/decision-making software) that a stakeholder is willing to invest in /use. This means that the project to develop this product needs good engagement to ensure the product is fit-for-purpose.
- Need to have sound science, but also social context to ensure applicability and environmental impact – NRMs are in a good position to help focus research in this regard

Fitzroy Basin Association

Research hub should be set up around theme – not geographic area

Investment should be based on

- Alignment of programs and outcomes – e.g. should have consistency with the various sustainable agricultural strategies
- Program should have clear objectives, rather than be based on a defined geographic area
- Projects should be able to develop applicable findings – e.g. produce tools that can inform on-ground management
- Socio-economic research needs to be more practical – e.g. go beyond understanding motivations and barrier to what do we do about them?

Territory NRM

- Alignment to NT Integrated Natural Resource Management Plan
- Relevance and applicability to on-ground activity
- Applicability across northern Australia and to a range of stakeholders
- Analysis of gaps – documenting what research is already done/going on
- Brings in outside researchers where identified expertise is needed
- Still maintain local capacity, but also build it with opportunities for new research areas or to host visiting researchers

Rangelands WA

- Prioritisation of potential threats impacting natural landscapes (relatively intact ecosystems)
- Little knowledge available about state of the environment and threatened species at risk of extinction
- Linking research to environmental and production outcomes to ensure pastoral by-in to environmental initiatives
- Utilisation of existing projects and resources to minimise duplication

RDA Far North Queensland and Torres Strait

- End-users' needs (policy application and on-ground uptake)
- Where will the biggest impact be? What is the problem that we are looking to solve?
- How will it align with government(s) priorities?
- Need strategic investment to deliver regional scale outcomes – look at processes and systems
- Appreciate difficulty in balancing ongoing research effort (and capacity and knowledge); addressing emerging or anticipated issues; and filling gaps (Greenfield science-v- science synthesis). Suggest criteria and process around this
- Appreciate different academic culture regarding control of research projects and access to funding – educative process around mutually beneficial outcomes and directions
- Do need an appropriate level of accountability without overloading researching with bureaucracy and report writing. Suggest milestone payments could be worked into NERP system

RDA Townsville and North West

- Do not duplicate effort, so build on existing networks and initiatives. RDA has a coordinating role that could be very useful to make sure duplication does not happen

RDA Mackay-Isaac-Whitsunday

- Prioritise based on balance between environmental consequences and economic impact
- Avoid emotional reactions from community

RDA Northern Territory

Projects must have on-ground benefits, working with a stakeholder who is prepared to apply outcomes.

RDA Kimberley

Program should be

- Outcome-focused
- Depends on project – should be of benefit to all of Northern Australia (e.g. Water futures) but with studies in agreed, representative locations

Engagement and integration

Q6. Please provide any comments you have on how future research programs should engage and communicate with stakeholders

Torres Strait Regional Authority

1. Native title implications WILL affect approvals to community. Ensure either time is allowed for appropriate consultations as part of the Guidelines or in designing the guidelines; pre-proposal stage which is used to seek approval from native title holders
2. Financial support for a dedicated FTE – liaison officer to be housed within TSRA Land and Sea Management Unit or another organisation which is the conduit between community, researchers and end-users

Cape York NRM

From CYP Regional Investment Strategy

- Acceptance of a more diverse range of local, traditional and scientific knowledge systems
- A resilience thinking approach that achieves an acceptable balance between the integrated, complex and often competing socio-ecological systems
- Cultures of collaboration, adaptive learning, knowledge transfer, implemented management, learning by doing, and action research
- Right people speaking for and working on Country, and appropriate protocols for project operation when direct involvement of TOs is not possible
- Two-way communication and information sharing activities to provide new opportunities and relevant support
- Bring new ideas and innovations through Representation on behalf of CYP alternative economies “Think Tank”
- Support citizen science

Northern Gulf Resource Management Group

- Action learning
- “End-users” need to include community and industry stakeholders not just the Australian Government
- Stakeholder (community and industry) and science input needs should be used to set the research priorities
- The timeline for developing submissions needs to be extended and allow for broad consultation/engagement

- Better collaboration and cooperation would be formed and, with it better research results, if a percentage of research was conducted as residencies with groups based in regions where the research was being conducted
- Improved investment in citizen science

Terrain NRM

- Need a co-research approach wherever possible
 - Early partnerships to define research questions and develop action-research together with managers – will ensure that questions are as relevant as possible, maximise use of findings and facilitate learning together
- Important for Traditional Owners to be engaged from the start to respect traditional knowledge, to set up proper protocols for its collection, storage and use, and to ensure that traditional and local knowledge is not lost and is able to contribute to better management decisions

NQ Dry Tropics

- A longer funding cycle is required to allow real gains to be made and for stakeholders to see program as worthwhile
- Program must demonstrate user involvement in research, including
 - Design of management questions
 - User involvement as researchers
 - Review of progress
 - Communication and dissemination of research findings
- The program needs the right governance structure that includes stakeholder engagement
- Move away from individual stakeholders to partnerships with the organisations, so that engagement is values at both ends, and for stakeholder organisations to have serious commitment
- Programs should be linked to improving capacity and education
- Each project will need a different engagement process

Reef Catchments

- Both the program and the projects should have their own engagement and communication plans
- These will vary depending on project focus and objectives, particularly between projects that have tangible outcome deliverables, and those that are blue-sky research. Where Reef Catchments is a stakeholder in these projects, the engagement will depend on the type of project and should be defined and negotiated at the start.
- Resourcing of engagement should be built into projects
- NRM groups and alliances are well-positioned to engage with a broader stakeholder base

Fitzroy Basin Association

- Researchers need to
 - Design research around end-user needs
 - Come to the regions and explain their research
- Projects need to communicate what they are doing and their findings throughout projects

Territory NRM

- Steering committee with NRM practitioners
- Regular communications and presentation to community and landholders
- Bring people along throughout using an adaptive management approach
- Get stakeholder buy-in through close collaboration
- Produce outputs that stakeholders will read
- Stakeholder engagement needs resourcing – e.g. NRM involvement may require a funded position depending on roles
- Need to be addressing Integrated NRM plans and become integrated into NRM business

Rangelands WA

- Holistic approach – including multiple stakeholders/groups/ideas/points of view
- Practical on-ground outcome/change of practice focus for research
- Include existing on ground practitioners and community groups in developing research opportunities, priorities and delivery
- Communication with community groups before, during and after
- Respect for contemporary and traditional knowledge

RDA Far North Queensland and Torres Strait

- Regular forums
- Provide broad overview of multiple projects and more detailed sessions for those wanting to get into the nitty gritty
- Briefs (easily digestible) outlining implications/benefits of research
- newsletters / webinars etc.
- About making research relevant to stakeholders and easy for them to understand implications
- Science communication critical – need to have strong understanding of stakeholders – think NERP probably good regarding NRM and some government agencies e.g. WTMA etc. but would be challenged in engaging and meeting research needs and communicating with bus sector etc...or some industries
- Regional Economic Development Research Forum – how NERP research is relevant for economic development, involve industry bodies, regional economic development groups etc... and government

RDA Townsville and North West

- Councils in rural and remote areas are critical for uptake of on-ground actions and engagement. They can be key partners or have input into prioritisation and assessment

RDA Mackay-Isaac-Whitsunday

- Both the program and the projects should have their own engagement and communication plans
- These will vary depending on project focus and objectives, particularly between projects that have tangible outcome deliverables, and those that are blue-sky research. Where RDA MIW is a stakeholder in these projects, the engagement will depend on the type of project and should be defined and negotiated at the start
- RDAs are well-positioned to engage with a broader stakeholder base
- Active involvement of community, business and government is required

RDA Northern Territory

- Ongoing engagement and ownership to ensure implementation of research findings. How to do this will differ depending on project focus and objectives
- Link engagement and communication to existing networks and communication opportunities. Don't create new ones. Don't expect stakeholders to turn up to, or gain value from, academic talk-fests
- Commit to doing communications properly. Websites, newsletters, and presenting at meetings of stakeholder alliance (e.g. Northern Australia RDA alliance, Kimberley to Cape alliance)

RDA Kimberley

- Open community consultation and communication
- RDA Kimberley would be supportive of an engaged process

Q7. What role(s) would you like your organisation to have in a National Environmental Research program to address NRM/RDA needs?

Cape York NRM

CYNRM would like to

- Be active collaborators and research partners, including community practitioners
- Identify levels of involvement and engagement appropriate to individual projects
- Contribute to developing criteria for project models (recognising that each project will need a different model of engagement)
- Engaged
- Collaborative
- Participation
- Co-generative
- Contribute to defining parameters and processes for research e.g. delivery of milestones-achievement (approval by partnership/end-user panel)

Southern Gulf Catchments

SGC would like to

- House researchers
- Assist in project delivery
- Sit on advisory panels etc., where relevant

Northern Gulf Resource Management Group

NGRMG has strong research priorities and already commission its own research, so is in a position to influence research direction and not just be an “end-user”. Its role should be as a research-partner. Some examples are that NGRMG can draw together on-ground experience of local people (e.g. about where species occur or how to kill cats) about issues which might otherwise be thought of as knowledge gaps. NGRMG can also coordinate citizen-science, with the local people collecting information that would be more expensive to collect by researchers having to drive long distances.

Terrain NRM

Terrain's and other research partners' roles will include

- Refine research questions and approach
- A role in deciding on funding allocation and/or manage funds to commission research
- Design of contract deliverables and outcomes (with capacity to modify through project as required)
- Facilitate two-way knowledge exchange
- Run or facilitate engagement processes with their own stakeholders (e.g. community and Landcare groups)

NQ Dry Tropics

NQDT would like to engage with NERP through partnership arrangements that are resourced and normalised through an MoU to

- Help frame management questions to ensure research aligns with environmental planning and management needs
- Review of program and project progress
- Play a partnering / brokerage role in research knowledge transfer (the educator bridge between academia and community/industry) including marketing of tangible decision support and training package material

Continual engagement will allow for a better two-way learning with managers having better appreciation of research and researchers having better understanding of management needs

- Engagement processes should be dependent on the nature of the research (thematically rather than geographically-driven, or based on jurisdictional boundaries)

Change terminology from end-user (which suggests bottom-feeder) to a term that recognises importance of relations (e.g. research partner)

Reef Catchments

Reef Catchments

- Can share in engagement of their stakeholder bases, the communication of research findings and outputs to a wider stakeholder base to ensure two-way communication
- Should have a more integrated engagement role at program level and (where appropriate) project level
 - Identify priority areas and projects and metrics for selection
 - Identify critical success factors and metrics for assessment
 - Participate in annual review of program/project progress
- Can be cash-investors and leverage additional funds

Fitzroy Basin Association

FBA would like to

- Be involved in program selection and prioritisation
- Be involved in steering committee representation where research is relevant
- Assess progress and give strategic direction
- Advise on engagement to region and on which mechanisms work for different sectors
- Be a conduit for engagement – bridge communication between researchers and broader stakeholder community

Territory NRM

Territory NRM would be prepared to

- Sit on steering committee
- Advise and direct to ensure applicability of research
- Review progress and advise on change of direction if required
- Assess milestones achievement
 - Milestones should be clear, with some relating to undertaking research and others specifically about communication outputs and dissemination
- Assist communication and dissemination
- Be project partners
- Host researchers
- Co-supervise research students

Rangelands WA

- Apolitical and access to a broad stakeholder network
- Guidance on regional priorities, issues and linking with broader project opportunities

RDA Far North Queensland and Torres Strait

- Advisory and end user
- RDA research needs analysis across our Regional Road Map, Strategic priority packages, submissions and other collaborative work would help identify our top priorities and how we could progress – this is flagged to be developed over the next few months
- Could be a very useful role for RDA in advising on policy interface and how to align research efforts to maximize impact on regulatory and business world

RDA Townsville and North West

RDA TNW would like to facilitate communication with stakeholders (councils and 1,000 members in region) to

- Advocate uptake of project findings
- Provide feedback to NERP from stakeholders
- Communication and dissemination of research findings through social media and newsletters

RDA Mackay-Isaac-Whitsunday

RDA MIW can engage stakeholder bases, the communication of research findings and outputs to a wider stakeholder base to ensure two-way communication.

RDA Northern Territory

RDA NT

- Would like to have input into identifying priorities
- Can identify stakeholders and partnerships, extending them beyond entrenched stakeholder base
- Keeping RDA informed will allow broader dissemination of information and outputs to a wide stakeholder base, and help with application of research findings in the long term

RDA Kimberley

RDA Kimberley would be prepared to

- Assist with stakeholder engagement in region
- Be part of the program process (e.g. advisory bodies, steering committee)
- Help with two-way information dissemination and communication (especially get input on what is achievable on-ground)

Q8. Please provide comment on the processes that you think would most improve the integration of research findings into your business

Cape York NRM

See Q7.

Depending on the type of research, CYNRM would like an action research model, with an action researcher/practitioner funded to work from within NRM body across NERP projects. This would minimise transaction costs, and increase the capacity of CYNRM to participate and to draw value from the research projects.

Southern Gulf Catchments

- Hold workshops/information sessions in relevant communities
- Make general research findings available electronically in simple to understand language
- Provide simplified summaries of relevant material

Northern Gulf Resource Management Group

- A North Queensland Science Network, including local research consultants included in network
- Integrating local and traditional knowledge and science
- Base monitoring research on the information needs of the managers and communities and then fed to research and government programs

Terrain NRM

- If proper engagement and co-research arrangements are in place, these result in strong partnerships and information flow will follow
- Other actions to enhance evidence-based decision making include:
 - Co-location of researchers with NRM groups
 - Science synthesis in simple, useable formats

NQ Dry Tropics

As long as the governance structures and MoUs are in place, then research findings will flow through to immediate stakeholders and thereby to end-users. This includes clear project delivery agreements that enunciate what is being purchased from the researcher, and which may include:

- Research
- Answers to management questions
- Improved knowledge about an environmental or related system

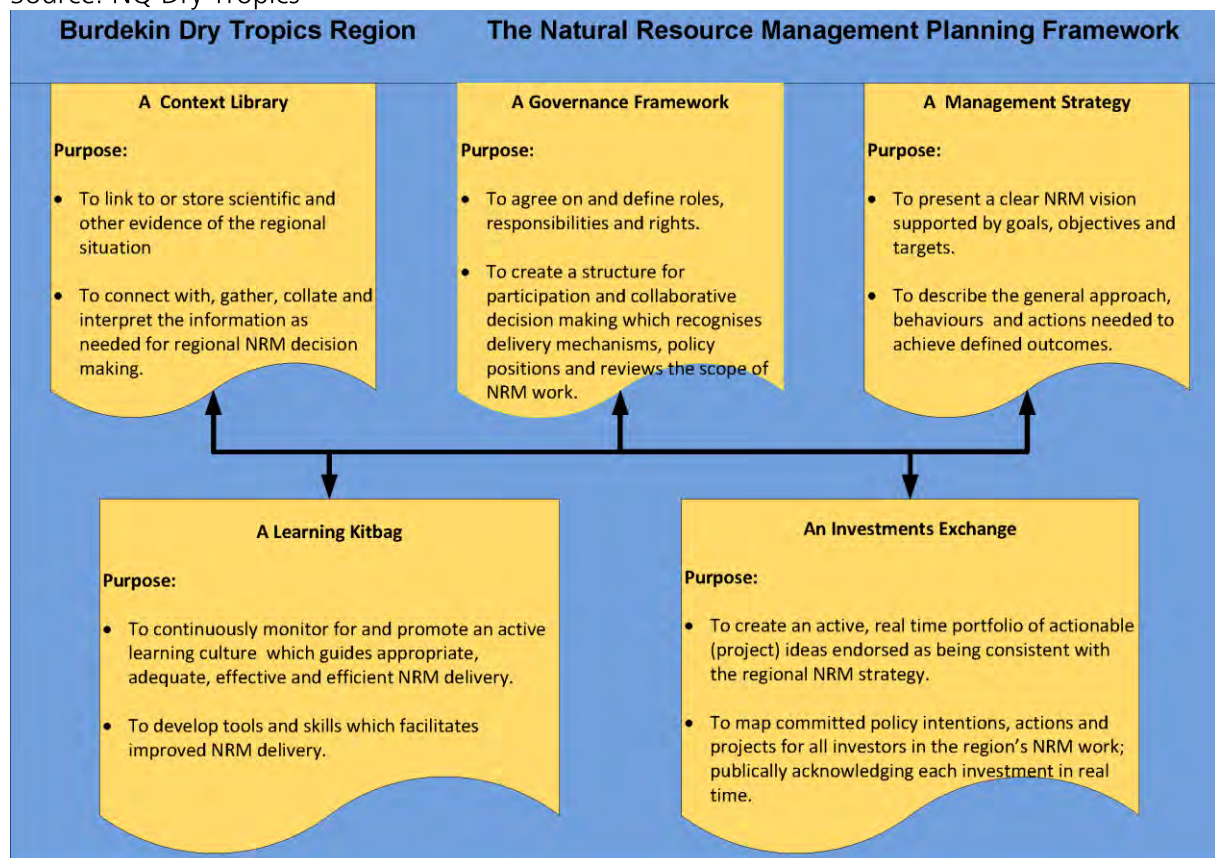
Proposed structure of NQ Dry Tropics planning process (see below) will

- Provide a mechanism for NQ Dry tropics to identify regional research (Management strategy)
- Facilitate communication of NERP research findings within and beyond the organisation to stakeholders (Management strategy, Context library and Learning kitbag)

Form research partnerships (Investment exchange)

Figure 2: Burdekin Dry Tropics Natural Resource Management Planning Framework

Source: NQ Dry Tropics



Reef Catchments

- Make sure governance structure includes end-user representative group with regular opportunities to meet to provide critical advice, and assessment of progress
- There should be a centralised repository with simple synthesis that points to research outputs
- Part of the budget of all projects should be dedicated to synthesis and dissemination
- Onus of dissemination should be shared between all stakeholders. At present there are too many platforms, and these need rationalising or the effort to find and use them will mean they are not effective
- Effective and ongoing engagement will help NRMs get early value from projects (including just through developing a culture of information exchange)
- Annual get-togethers of stakeholders around specific themes

Fitzroy Basin Association

The following processes would be useful for FBA to make best use of the research

- Consult FBA about best processes at the project level
- A coordinator to identify the relevant science and its applications
- Synthesis and summary of not just relevant research but how it informs practice change
 - Describe findings
 - What do they tell us?
 - How should they inform decision making?

Territory NRM

- Visualisation tools – 3D modelling (Melbourne University)
- Engagement based on Integration & Application Network, University of Maryland, Center for Environmental Science⁶
- Communication is essential – appropriate to audience
 - Present to communities in which research is happening
 - Present to regional forums
- Research advisory group
- Colocation of researchers and co-supervision of students

Rangelands WA

- Plain English scientific language
- Research needs to be relevant to regional priorities
- Best practice methodologies which integrate NRM gaps (knowledge, skills and capacity building for groups and community)
- Access links to research findings
- Shared communication and dissemination to regional stakeholders

RDA Far North Queensland and Torres Strait

- Access to research outcomes in digestible format
- Opportunity to talk with researchers around policy implications of research (help identify how to take forward etc.)

RDA Mackay-Isaac-Whitsunday

- Make sure governance structure includes end-user representative group with regular opportunities to meet to provide critical advice, and assessment of progress
- Effective and ongoing engagement will help NRMs/RDAs get early value from projects (including just through developing a culture of information exchange)

RDA Northern Territory

Better communications

- Direct communication would be great, but demanding on everyone's resource, so can be extended through
 - Good informative and easily navigable websites
 - Newsletters with simple and brief project summaries and updates
 - Using simple language and formats that are match to clientele/end-users

RDA Kimberley

- Time communication activities around regional schedule (wet season is a good time for meetings in the Kimberley)
- Programs need to have long term funding as in short-term projects engagement and communications drop off
- Hold forums at least in the towns, and where possible, in the communities

⁶ <http://ian.umces.edu/>

Q9. If research is to be organised around cluster groups, what other stakeholder groups would be good to include in your cluster?

Torres Strait Regional Authority

1	Indigenous stakeholders
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Cape York NRM

1	RDAs
2	Industry
3	Interest groups alliances (e.g. FNQ-ROC)

Notes: Research should be organised around themes, rather than just geographic groupings, with opportunities for participation across geographic areas. i.e. project involvement should not be limited by geographic boundaries but by relevance (e.g. CYNRM and other regions have interest in cat control).

Southern Gulf Catchments

1	Gulf Savanna
2	RDAs
3	Mount Isa Economic Zone
4	Beef Crisis /SGC Catchments Limited Pastoral Industry Advisory Group/AgForce/ National Farmers' Federation
5	Rangelands NRM Alliance
6	Traditional Owners

Notes: Depends on level of project

Northern Gulf Resource Management Group

1	Indigenous groups (e.g. Traditional Owner groups, Land Councils)
2	RDAs
3	LGAs
4	Industry groups (e.g. Northern Gulf Graziers Group, Gulf of Carpentaria Commercial Fishing Association, Mareeba-Dimbulah Vegetable Growers Association)
5	Local researchers (e.g. consultants, State Government agencies, JCU, CDU)

Notes: NGRMG works constructively with the region's Indigenous groups and LGAs

Terrain NRM

1	NRM groups (engaging with their stakeholder base)
2	Industry representative groups (e.g. agriculture, tourism)
3	State/federal agencies
4	Traditional Owners
5	LGAs

Notes: Selection of stakeholders will depend on the issue being addressed

NQ Dry Tropics

1	All decision makers and managers of natural resources (including other NRMs)
2	LGAs
3	State government
4	GBRMPA
5	Indigenous communities

Notes: NRM bodies can engage with smaller organisations with less capacity

Reef Catchments

1	NRM bodies, especially Fitzroy/Burdekin
2	Port/infrastructure developers and managers
3	RoCs
4	RIRDC
5	TOs – with local engagement essential (direct or through NRM)

Notes: NRM bodies are in a good position to provide a coordinating role to ensure two-way engagement with these groups. So it is not necessary to have all players at the NERP table, but to engage NRMs/RDAs to provided communication and engagement. Engagement processes should be theme dependent

Fitzroy Basin Association

1	Reef alliance (5 major reef catchments with industry linkages)
2	Industry groups (QFF, AgForce etc.)
3	Where biodiversity is the focus then NRM groups across bioregion (FBA, NQDT and BMRG)

Notes: Makeup of stakeholder groups will depend on research focus and the desired outcome of the engagement process (e.g. guidance or information dissemination).

Territory NRM

1	RDA
2	Industry Groups (e.g. NT Cattlemen's Association, NT Agricultural Association, NT Horticultural Association)
3	TO representation
4	NT and Federal Governments, specifically PWCNT

Notes: Representation will vary with research focus

Need to make sure stakeholder rep groups really represent stakeholder base

Alignment across NRM regions is ideal, but often impractical and requires institutional support

Rangelands WA

1	Indigenous (e.g. Kimberley Land Council, Yawoorroong Miriuwung Gajerrong Yirrgeb Noong Dawang Aboriginal Corporation, and site specific corporations)
2	Pastoral (e.g. Land Care District Committees, Kimberley Cattlemen's Association, Pastoralists and Graziers Association of Western Australia)
3	Biosecurity (Kimberley Rangelands Biosecurity Association)
4	Environmental (Environs Kimberley, AWC, WWF, etc.)
5	Government (local and state agencies)

RDA Far North Queensland and Torres Strait

1	Regional economic development groups e.g. Advance Cairns, Gulf Savannah Development, Cape York Peninsula Sustainable Futures
2	LGAs
3	Chambers of commerce
4	Industry bodies
5	Prescribed bodies corporate

RDA Townsville and North West

1	NRMs
2	LGAs, Remote Area Planning and Development Board, Regional Organisation of Councils, Regional Economic Development Sub-Committee of the North Queensland Regional Organisation of Councils
3	Chambers of Commerce, Townsville Enterprise, Mount Isa to Townsville Economic Development Zone, Gulf Savannah
4	QG Regional Managers' Coordination Network (channel for broader QG engagement)
5	Industry bodies – AgForce, MLA, Industry clusters, Qld Resources Council

Notes: Other than LGAs, who are important for on-ground delivery, these stakeholders take on big strategic issues

RDA Mackay-Isaac-Whitsunday

1	Whitsunday Regional Organisation of Councils
2	Mackay-Whitsunday Regional Economic Development Committee
3	Other RDAs
4	NRM groups

Notes: RDAs are in a good position to provide a coordinating role to ensure two-way engagement with these groups. So it is not necessary to have all players at the NERP table, but to engage RDAs to provided communication and engagement. Engagement processes should be theme dependent.

RDA Northern Territory

1	Northern RDA alliances
2	LGAs
3	Agricultural industry associations and agribusiness sector (to reach producers)
4	Kimberley to Cape Network
5	NT Government and advisory bodies

Notes: RDAs are in a good position to provide a coordinating role to ensure two-way engagement with these groups. So it is not necessary to have all players at the NERP table, but to engage RDAs to provided communication and engagement. Engagement processes should be theme dependent.

RDA Kimberley

1	LGAs
2	NRM groups
3	Traditional Owners

Additional comments

Northern Gulf Resource Management Group

How do we communicate information in a simple and informative manner to landholders and policy makers?

Reef Catchments

- Need to consider historical context and understand the constraints to development of NERP. Will the same structures and focus be in place, and how much room is there for new structures and foci? What are the engagement processes, and will they be the same as before?
- Reef Catchments was consulted in the program / project prioritisation of NERP TE, but there was little subsequent engagement. Projects were good, but would have been more useful with ongoing serious engagement.
- GBR project topics were relevant to Mackay-Whitsunday, but a low level investment and physical presence of researchers in this region (and further south) limited their applicability
- Reef Catchments would like to see invitations to co-invest in NERP to
 - Ensure that stakeholders needs are met
 - Stakeholders are committed and can justify a reasonable level of involvement
 - NRM groups can help leverage more fund through relationships with industry and other partners
- However, there would need to be a process for recognition of funds that are derived from AG/QG as an investment (and statement of priorities) – rather than just dismissed as double-dipping
- Payment on delivery is essential, with project schedules clearly defining milestones with agreed outcomes, which can be a tranche of scientific enquiry (blue-sky) or a tangible deliverable
- While decisions about major projects are made at the regional level, environmental decisions are made at the state and national level. Need to address this disconnect

Fitzroy Basin Association

Some NERP project leaders have engaged well with NRM groups.

Paddock to Reef is a good example of research that is well integrated with end-users.

NRM groups are getting better at evaluation through annual processes and can share this information with research programs.

Rangelands WA

There is an opportunity for greater integration with NRM groups to facilitate development, delivery, communication and adoption of research initiatives.

RDA Far North Queensland and Torres Strait

From community engagement there are some micro research issues that have been identified:

- Accurate data on natural disasters
- Community capacity and engagement in NRM data – NRM info already exists for Land Managers but community scale (SLA or Catchment scale) data is required
- Community's attitudes and motivation about the environment
- Number of farms, landholders and other businesses/groups providing environmental offset services (and type of offset e.g. koala habitat or vegetation management offset)
- Number of businesses and households seeking to participate in voluntary carbon markets and extent of offset activity
- Average greenhouse gas emissions figures for peak period vehicle movements on roads
- Local government area or catchment scale data to support the National Water Initiative⁷

⁷ <http://www.nwc.gov.au/nwi>

- Land management data – catchment scale data concerning grazing and agricultural land management practices e.g. fertilizer usage, fencing of riparian zones to exclude stock
- Nature based tourism activities – number and economic value
- Greenhouse gas emissions – quantity of gas emissions (little consistency at GIS in the percentage of green space available, with the latter, Local government area level data not available too)
- Endangered species – no region-wide list of endangered species available, also need mapping of concentrations and numbers and population projections (including issue of cyclones)

Synthesis of responses

Research priorities

Targeting investment

NRM groups and RDAs supported research being undertaken in all areas of NRM activity – from foundational ecological research through landscape planning and management to program delivery (Q3; Figure 3).

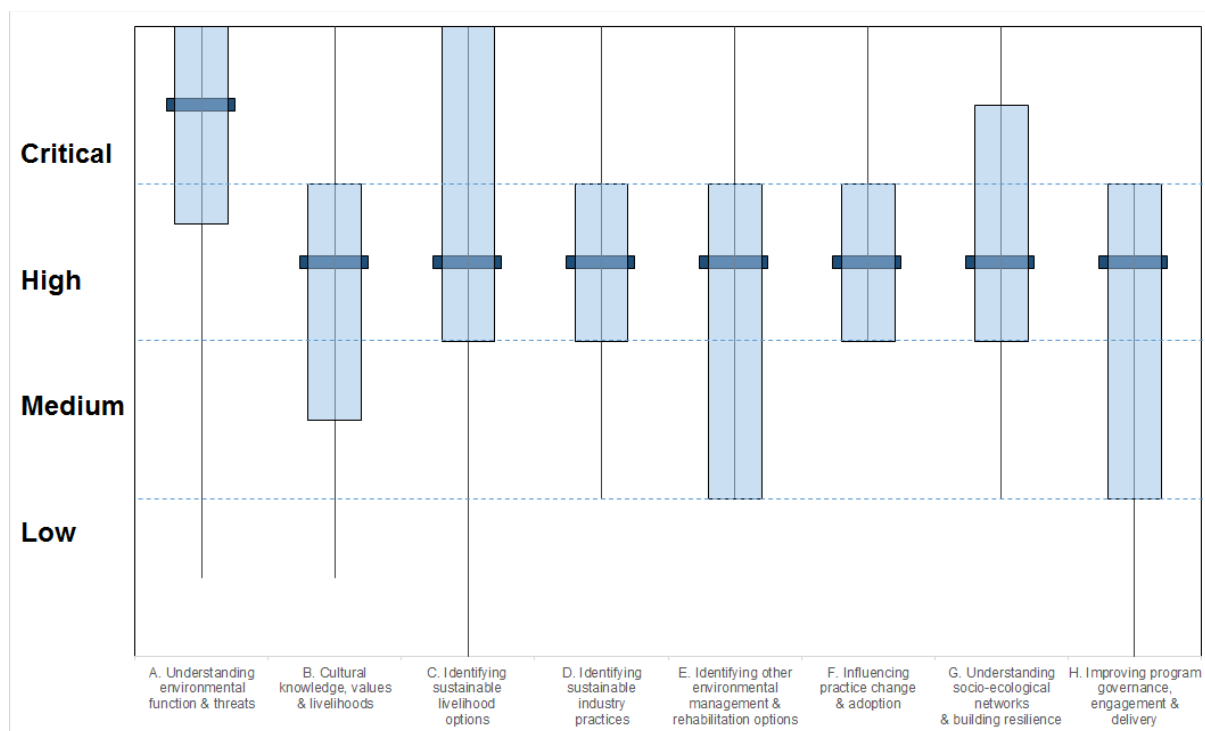


Figure 3: Priority areas for investment of research funding – NRM and RDA combined

The highest priority for investment jointly identified by both NRM groups and RDAs was research to improve understanding of environmental function and threats. Many groups stressed that research invested in this area should focus on informing management, rather than simply identifying values and threats.

The next highest priority across both sectors was identification of alternative sustainable livelihood options, particularly for Indigenous people. In more remote areas, identification of options outside the agricultural sector was emphasised, but in more intensely developed areas, there was greater interest in new agricultural crops.

NRM groups also emphasised the importance of improving understanding of socio-ecological networks and community resilience building (Figure 4). While there was recognition of the importance of effective and egalitarian policy and program governance, research was not necessarily seen as the solution to achieving this. Any interest shown in governance research was more likely to be focused on ensuring NRM policies and programs lead to enduring improvements in social and environmental outcomes. This situation may reflect the difficulties facing natural resource institutions integrating the governance and social sciences into their priorities and processes (see Dale, Taylor & Lane, 2002).

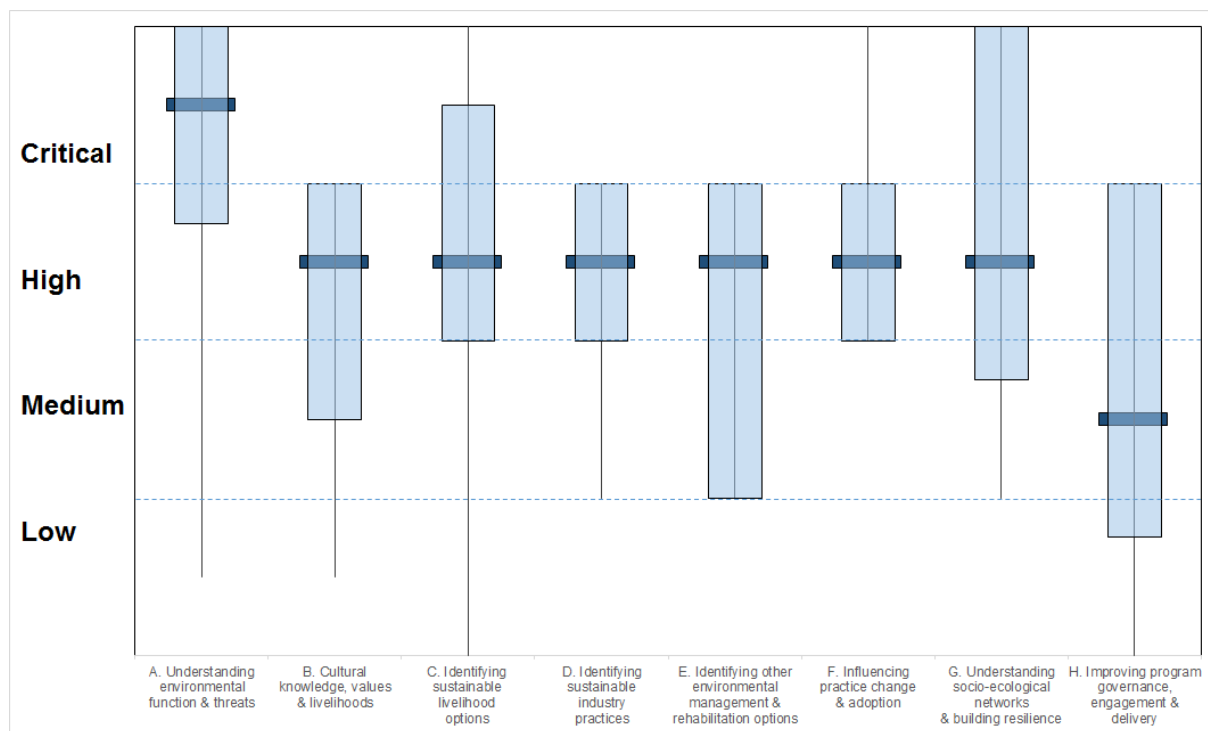


Figure 4: Priority areas for investment of research funding – NRM only

RDAs also emphasised the need for research to develop sustainable industry practices (Figure 5). Research into rehabilitation received low overall support, but was considered critical in regions with high mining activity.

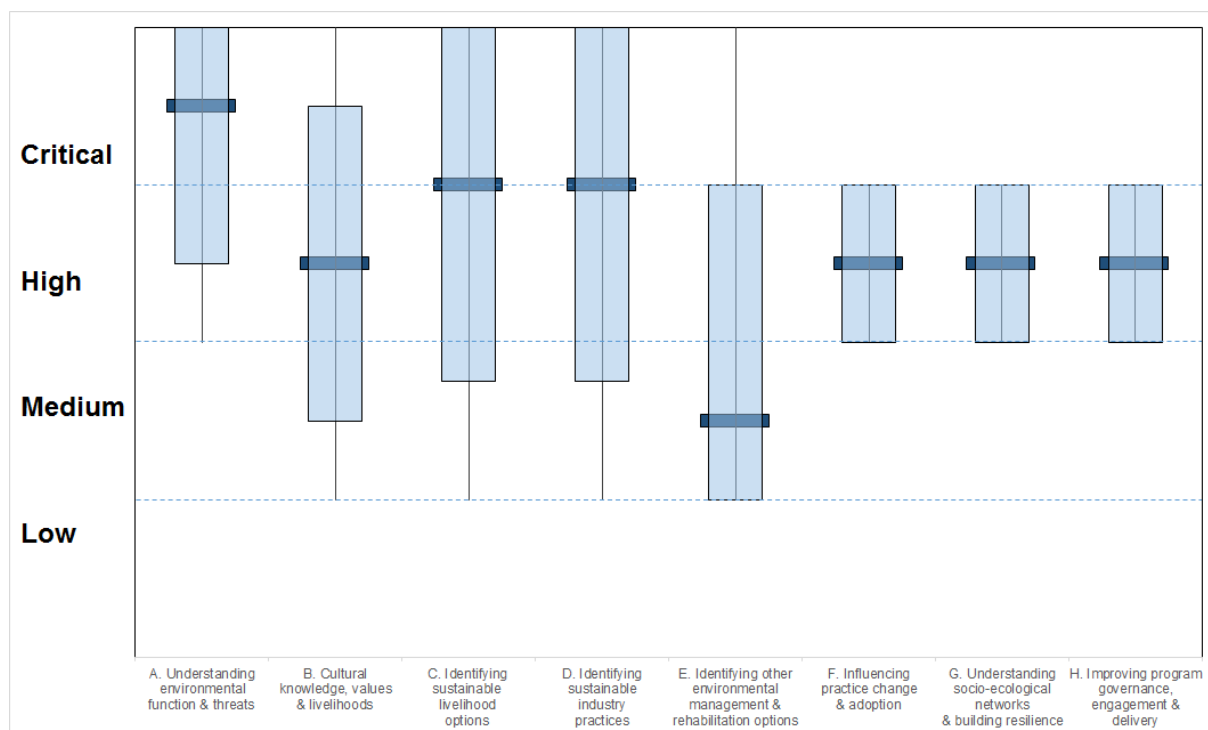


Figure 5: Priority areas for investment of research funding – RDA only

Framing research priorities

NRM groups and RDAs listed a number of factors that should be taken into consideration when framing national environmental research programs (Q5). There was broad consensus that any future environmental research program directions should be based on a clean-slate prioritisation, with identification and prioritisation of research gaps (NGRMG, Territory NRM, FNQ&TS, RDA Kimberley) through a combination of stakeholder (community and industry) and researcher input (NGRMG). Processes and systems would need to be put in place to ensure strategic investment to deliver regional-scale outcomes (RDA FNQ&TS).

Most NRM and RDAs have already run their own research prioritisation processes as part of developing their plans or roadmaps – as well as for their internal operations – and most have been part of wider prioritisation processes. They therefore saw the importance of aligning research prioritisation with existing plans and strategies, including: NRM plans and RDA roadmaps; Reef RD&E; Reef Rescue prioritisation; sustainable agriculture strategies; and water security (RC, FBA, Territory NRM, RDA FNQ&TS).

A fresh prioritisation approach was preferred over unquestioned continuation of investment in already well-researched areas, a process which was perceived to have led to the neglect of frontline environmental issues (NGRMG, NQDT, RC, Territory NRM). Readily identified gaps in the current NERP TE Hub program included:

- Exclusion of environments outside the GBR, Torres Strait and Wet Tropics, in particular, the dry tropics, where there is greatest development pressure (NQDT, RC)
- Low investment in ecosystems of the aquatic-marine interface of the GBR region (mangroves, coasts, estuaries, floodplains) (NQDT, FBA)

A robust prioritisation process, however, was also expected to identify a wider range of issues – including emerging or anticipated issues – worthy of research. These would include the research priorities identified by NRM groups and RDAs, as presented in the following sections. However, there was recognition that current programs deliver many valuable outputs. Hence, identification of new priorities should not necessarily mean the withdrawal of research funding from existing high quality research (NQDT).

Given the range of research programs available to address industry development (e.g. RIRDC, MLA, SRA, GRDC, HAL and potentially a northern agricultural CRC), baseline environmental research assessing ecosystems values and threats was considered the highest priority by some groups (see Targeting investment), with a balance between environmental consequences and economic impact (RDA MIW). As well as investing in biophysical research, research that improves understanding of the social context was considered essential to ensure applicability and environmental impact (Terrain, RC, FBA). This work needs to be more practical than much of the socio-economic research that has been undertaken historically by going beyond simply developing an understanding of motivations and barrier to adoption of better practices to identifying what can be done to ensure ongoing uptake and improvement in environmental outcomes (FBA). NRMs are in a good position to help focus social research in this regard (RC).

There was overwhelming support for an emphasis on research with applicable outcomes (NGRMG, Terrain, NQDT, RC, FBA, Territory NRM, Rangelands WA, RDA FNQ&TS, RDA NT, RDA Kimberley). To achieve this, the majority of research funding should be invested in projects to inform decisions about resource use and management and program investment. Some groups consented to a small percentage of funding (~10-20%) being allocated to blue-sky research (Terrain, RC). Useful research outputs identified included science synthesis; strategic management options; modelling/decision-making software; and policy advice (NQDT, RC, FBA, Territory NRM, RDA FNQ&TS). Such outputs can be delivered within the relatively short timeframes currently provided by NERP, while more in-depth research aimed at improving understanding of complex problems or processes may require longer funding cycles (Terrain).

There was a preference for research hubs to be established around themes or objectives, not geographic areas (FBA, CYNRM). In a theme-based program, distribution of research effort and stakeholder involvement should not be constrained to a small geographic area (TSRA, CYNRM, RC). Where it is based around a biome or bioregion (e.g. GBR, Brigalow Belt), effort and engagement should be equitably spread across the area (TSRA, RC, FBA). For example, investment in GBR and associated water quality research should be extended outside the area between Townsville and Cairns (TSRA, RC, FBA, BMRG). Some groups felt that research outcomes should be applicable across northern Australia and to a range of stakeholders, but with focal studies in agreed, representative locations where it is likely to achieve most impact (Territory NRM, RDA FNQ&TS, RDA Kimberley).

At the project selection level, it was considered that research proposals should stand up to cost/benefit and gap analysis (Terrain). Researchers seeking funds should be required to demonstrate public support for their research by forming partnerships with stakeholders who are prepared to invest in and apply their outputs (NGRMG, RC, Rangelands WA, RDA FNQ&TS, RDA NT).

Universities were viewed as a subset of stakeholders, and should not be treated as the primary stakeholder driving NERP investment (RC). However, there was recognition that different performance indicators drive priorities within research institutions and NRM groups or RDAs, and that program design would need to ensure mutually-beneficial outcomes (RDA FNQ&TS). It was also suggested that additional incentives may be required to attract researchers into applied research areas that are perceived as low-value or risky (NGRMG). While the importance of maintaining local research capacity was recognised, continuity of project funding for a researcher was deemed justified only where this met a prioritised knowledge need (Terrain, Territory NRM). If expertise in an identified area of research need is not available locally, then it was considered desirable that outside researcher organisations should be engaged, or outside researchers employed, seconded or hosted by northern institutions (Territory NRM).

Finally, it was considered important that operational efficiencies be achieved by dovetailing with existing projects, initiatives resources and networks to minimise duplication (Rangelands WA; RDA NT). RDA and NRM networks can support such efficiencies.

Research priorities extending across northern Australia

Research priorities identified by NRM groups and RDAs were drawn into 12 thematic areas (Figure 6, Table 2). The most highly ranked themes across northern Australia were water and landscape planning; alternative sustainable livelihood options and best practice management adoption.

Table 2: Research themes derived from NRM and RDA responses

THEME	
1	Influencing policy development
2	Water resource planning
3	Landscape planning
4	Sustainable livelihood and agricultural options
5	Achieving on-ground best practice
6	Intelligent condition and trend assessment
7	Water quality improvement
8	Efficient resource production and use to minimise footprint
9	Carbon abatement and sequestration options
10	Climate vulnerability and adaptation
11	Biodiversity values, threats and management responses
12	Coastal to freshwater wetland values, ecosystem services and management

The first four themes aim to ensure development of northern Australia is based on sound understanding of environmental, cultural and social values, economic opportunities – with intelligent management of trade-offs – and that the economic benefits of development are equitably shared. The remaining themes feed into one or more of these core themes by delving more deeply into understanding, monitoring and/or managing specific assets.

- Theme 1 examines how to achieve real and long-term improvement in the condition of northern Australia's environmental, cultural, social and economics assets through influencing the policies and programs of government, political parties and other interest groups
- Theme 2 considers water assets and needs and the relative merits of allocating water for different purposes
- Theme 3 identifies where in the landscape different land uses and management are most appropriate both individually and in an integrated matrix
- Theme 4 identifies sustainable economic and employment options that are sympathetic with the north's rich environmental and cultural values
- Theme 5 identifies best management practices to achieve desired outcomes and knowing how these are best implemented for long-term benefit
- Theme 6 develops tools for monitoring and evaluating impact of NRM on environmental, social, economic and cultural condition in order to demonstrate where the best return on investment can be gained

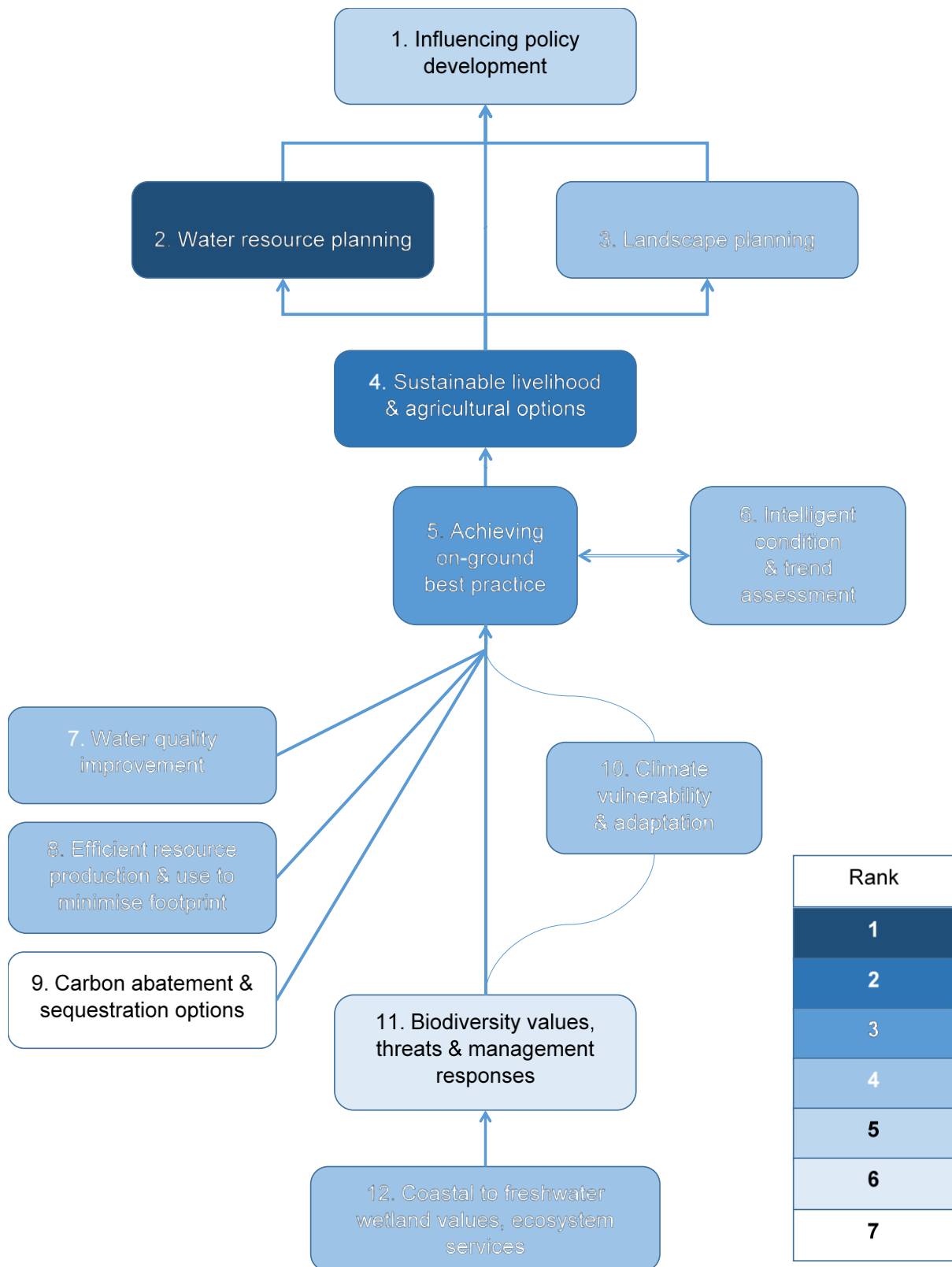


Figure 6: Relationship between and ranking of environmental research themes identified in this report

Subsequent themes provide a deeper understanding that will inform decisions made about resource use and management.

- Best practice management will be examined in finer detail for water quality improvement (Theme 7); minimising environmental footprints, particularly with regard to energy and water (Theme 8); and carbon stocks (Theme 9).
- Planning for environmental management, resource use and NRM jobs will be facilitated by a more comprehensive understanding of biodiversity values (especially ecosystem services), threats and appropriate management responses (Theme 11), particularly with regard to wetlands (Theme 12), and the impacts of climate variability and climate change (Theme 10)

These 12 themes aims to achieve real and long-term improvement in environmental conditions based on an improved knowledge base and its integration into policy and practice.

Emerging regional priorities across NERP TE regions

GBR health is still a major concern for organisations operating in the reef catchments. However, these groups require additional information about impacts of non-agricultural land use and best practice management to improve GBR water quality, especially regarding the building and maintenance of roads and other infrastructure (Theme 7). A shift in research focus from hillslope erosion to identifying contributions of gully and stream bank erosion was considered essential if Reef Plan targets (State of Queensland, 2013) are to be achieved. Such broadening will help in decisions about the best investments to reduce water pollution across the entire region. Groups at either end of the GBR also identified a need to intensify GBR research beyond the regions around Townsville and Cairns.

Understanding the options for economic diversification, with an emphasis on Indigenous employment in NRM is a high priority throughout north-east Queensland (Theme 4). This includes employment in monitoring and evaluation programs, as well as environmental management, and participation in the carbon economy (Theme 9). Emphasis on providing Indigenous people opportunities to maintain linkages with traditional estates while undertaking NRM was stressed in many responses. While much effort has already be invested into climate change research in the region, ongoing improvements in the climate change knowledge base was considered essential for future economic planning (Theme 10).

Emerging regional priorities across NERP NA regions

Understanding the options for improving Indigenous employment in NRM was considered equally important across the regions of current NERP NA research focus (Theme 4). Ensuring that development of northern Australia was based on an understanding of environmental values, economic opportunities and trade-offs was also highly rated (Theme 2 and Theme 3). How to achieve integrated NRM for multiple outcomes was seen as the next step, going beyond the simple mechanics of how to manage fire or kill weeds to how to make it happen on an ongoing basis and provide long-term environmental and employment benefits (Theme 5).

Gap filling in areas and ecosystems without a current NERP focus

Water (Theme 2) and landscape planning (Theme 3) based on an understanding of biodiversity values (Theme 11) were the highest priorities in regions not currently covered by a NERP research focus. These are the areas and ecosystems with the greatest development pressures from mining and agricultural development and associated infrastructure. The lack of research attention in these drier ecosystems hampers sustainable land use water resource planning.

Water quality issues and soil conservation were also identified as issues that extend beyond the GBR catchments (Theme 7). Management of hillslope, gully and stream bank erosion was considered an issue regardless of whether catchments flow into the GBR or other marine environments.

Theme profiles

A profile is provided for each research theme. These provide a summary; considerations; information on regional variation in responses; and maps indicating the organisations that identified elements in the theme as being either a *Moderate* or *High* priority. Emerging priorities are also summarised in the areas of current research focus by NERP TE and NERP NA, as well as for regions outside current intensive NERP investment. It should be noted that absence of a medium or high priority rating does not indicate lack of support for a research theme, only that it was not raised in responses to date. NRM groups and RDA boards will have the opportunity to refine their priorities and the list of themes before this report is finalised.

Theme 1 Influencing policy development

Summary

Efforts to improve environmental, social, cultural and economic outcomes will only be effective if they are supported at all levels from on-ground practice to policy development. This theme addresses the difficult task of ensuring environmental research and planning at the regional level have the attention of policy makers and other high level stakeholders. A recent review of NERP

(Spencer, McVay, & Sheridan, 2014) showed that, while research outputs and advice were incorporated into some policy decisions made by Department of Environment, this was inconsistent and appeared to depend on personal relationships developed between researchers and bureaucrats. An assessment has yet to be done about how successful NRM plans and RDA roadmaps have been in influencing government programs and industry positions and what factors most favour higher levels of influence.

This theme will therefore assist and support NRM groups and RDAs to measure and enhance their influence on relevant policy and program design by all levels of government (and associated government budgetary processes), as well as on industry standards and sustainability initiatives. An assessment will also be undertaken of the extent to which policy makers have drawn on a good understanding of the issues and the relative advantages, disadvantages and trade-offs to develop evidence-based policy, and the contribution of other factors such as expediency under short time-frames or lobbying for development, conservation or other political agendas. It will identify which activities have had the most influence and how this insight can be used to effect greater improvements in social, cultural, environmental and economic outcomes.

Relationship to other themes

Theme 5 addresses mechanisms to increase on-ground best adoption.

Theme 6: This research will inform the type of monitoring and reporting required to influence particular policy development.

All other themes will provide a strong evidence-base to support policy development.



Theme 2 Water resource planning

Summary

Agricultural and mining expansion across northern Australia is placing increasing pressure on water resources and associated ecosystems. Current and projected demand requires construction of surface water storage or extraction of groundwater. Before water is committed to new developments, information is required on the availability of supply, rates of groundwater recharge, and impact of storage and extraction on cultural and environmental values and other dependent industries and communities.



Regional variation and considerations

- Mapping and monitoring of water resources to assess capacity, quality and environmental impact of capture and storage is needed to inform allocation. This includes likely impacts on fisheries; water-dependent ecosystems (especially springs); distribution of riparian weeds and pest animals; and sustainability of current and proposed agricultural land use
- CSIRO has undertaken a thorough water resource assessment for the proposed expansion of irrigated agriculture in the Flinders-Gilbert area of north Queensland¹, but similar assessments are required in other areas of proposed agricultural expansion or affected by extraction
- Impact of coal mining on groundwater quality and availability is a concern in the Fitzroy, Mackay-Whitsunday and Kimberley regions
- ANZECC water quality standards have been identified as inapplicable in the Northern Gulf
- Cultural values must be considered in any decision about water resource use
- Decision support based on social, environmental and economic assessment is required to identify best practice water management in each setting (e.g. off-stream storage versus in-stream storage versus aquifer recharge) as well as allocation
- Planning to improve water use efficiency is required at all levels down to the property scale
- Town water quality and security is a particular concern in the north-west Queensland

Relationship to other themes

Water storage, groundwater extraction and fracking have implications for water quality (Theme 7), wetland health (Theme 12) and biodiversity (Theme 11).

Theme 4: Planning for sustainable agricultural development will be dependent on an understanding of water resources.

Theme 10: Water resource planning needs to be cognisant of likely climate change impacts.

Theme 8: More efficient water use will help to reduce environmental footprints.

¹ www.csiro.au/Organisation-Structure/Flagships/Water-for-a-Healthy-Country-Flagship/Sustainable-Yields-Projects/Flinders-and-Gilbert-Agricultural-Resource-Assessment-overview.aspx

Theme 3 Landscape planning

Summary

Northern Australia's future development needs to be well planned to maintain the region's unique ecological and cultural values, and enhance its long-term economic viability and community resilience. This theme will therefore develop and populate planning decision-support tools through improved understanding of:

- Environmental, cultural and economic assets
- Landscape function and processes, including ecosystem services and connectivity
- Pressures, drivers and long-term economic outlooks (including population growth, development agendas, market forces and climate change)
- Benefits, impacts and trade-offs of current and potential land uses (including mining, agriculture, carbon sequestration, conservation) and associated infrastructure



Decision support tools supporting trade-off analysis should facilitate assessment of the relative environmental, cultural, social and economic costs and benefits of specific alternatives (e.g. reforestation for carbon sequestration versus growing fuel crops) as well as appropriateness of land uses in specific locations (e.g. restricting clearing to less erodible soils; siting of rail corridors to minimise impact on landscape connectivity).

Regional variation and considerations

- Greatest need is in areas of northern Australia ear-marked for agricultural or mining expansion, notably in areas of outside areas of current NERP focus
- Staging of research and timing of outputs need to be scheduled to inform decisions, planning and policy development

Relationship to other themes

Landscape planning should be based on understanding of biodiversity values, processes and management principles – such as protection of critical habitat and maintenance of connectivity (Theme 11); and how these are likely to be affected by climate change (Theme 10).

Landscape planning should also deliver real improvements in social, cultural, environmental and economic outcomes through sustainable and equitable water allocation (Theme 2) protection of GQAL to ensure regional food security (Theme 4) and protection of water quality (Theme 7). Effectiveness of landscape planning in this regard will depend on identification and uptake of best practices (Theme 5).

Theme 9: This theme will identify where carbon farming is most appropriate in the landscape.

Theme 4 Sustainable livelihood and agricultural options

Summary

Development of the north should be both sustainable and to the benefit of the whole community. This means identifying new economic opportunities that are compatible with the region's high ecological values and provide sustainable employment. Potential areas for investigation should include agricultural (e.g. food and tree crops; biofuels) and alternative livelihoods (e.g. eco- and cultural-tourism; sustainable wildlife, plant and seed harvesting; environmental mapping and monitoring; carbon farming; alternative fuel generation); as well as using offset schemes to transfer economic gains realised from development to support NRM. Feasibility assessments, including pilot programs, are required to determine whether new opportunities can provide long-term employment and economic solutions.



Regional variation and considerations

- Agricultural diversification is a higher priority in the more developed regions and Indigenous employment opportunities in NRM in more remote areas
- CYNRM has identified priority opportunities to pursue employment in ecosystem service delivery, but funding is required for feasibility assessment and start-up
- Local communities should have a role in determining which livelihood options should be pursued
- Innovative solutions – such as using weeds for biofuels or pest animals for compost – should be sought to address seemingly intractable problems
- Investment in new industries and employment opportunities should enhance community resilience and allow Indigenous communities to maintain relationships with traditional estates
- Indigenous training and skill development should be linked to real employment opportunities

Relationship to other themes

Theme 2 Sustainable agricultural development will depend on an understanding of water resources.

Theme 3 Assessment of new economic opportunities should be integrated with landscape planning and ensure protection of GQAL.

Theme 6 Identification of sustainable employment options in NRM will be facilitated by an improved understanding of the impact of NRM on environmental condition and trend.

Potential employment opportunities include sustainable use and management of wetlands (Theme 12); mapping environmental assets and monitoring environmental conditions (Theme 6); and carbon sequestration and emission abatement (Theme 9).

Theme 11 New crops and agricultural practices (e.g. biofuels) should not pose threats to biodiversity.

Theme 5 Achieving on-ground best practice

Summary

Many industries have developed Best Practice management options (BPs) to maximise economic returns and minimise environmental impact. In northern Australia, focus has been on improving soil conservation in the grazing industry and fertiliser and pesticide efficiency in the sugar and horticultural industries to the benefit of GBR water quality. BPs are required for a range of other regions, industries and practices (e.g. mine rehabilitation). Mechanisms for improving BP adoption (such as maintaining grazing land condition), should be developed by improving understanding of the NRM community and how to overcome barriers to adoption; improving producer understanding of issues, solutions and trade-offs; and bringing market forces into play. Where appropriate, BPs should be incorporated into industry guidelines.



BPs are also required for a range of NRM activities, such as governance and engagement and achieving integrated NRM across the landscape through combined cultural, fire and biodiversity management. BPs need to be regionally appropriate, taking into account the specific values and vulnerabilities of the areas being managed, as well as cultural knowledge, values and aspirations. Practical demonstration is also required of how BP adoption can be sustained to produce long-term benefits.

Regional variation and considerations

- BPs should include cradle-to-grave approaches, ranging from prevention to treatment; be integrated to avoid perverse outcomes; and be delivered through an adaptive management planning framework
- BPs should include innovative solutions, such as turning weeds into economic assets
- Engagement strategies are required to influence BP adoption by periurban communities and managers of small landholdings

Relationship to other themes

Theme 3: Effectiveness of landscape planning depends on identification and BP adoption.

Theme 7: Water quality improvement is dependent on the development of BPs for minimising sediment, nutrient and pesticide management.

Theme 11: BP implementation is required to maintain the integrity of the north's biodiversity values.

Theme 9: Development of carbon sequestration and abatement methodologies needs to be informed by local values and aspirations.

Theme 6 *Intelligent condition and trend assessment*

Summary

Monitoring to assess environmental, cultural, economic and social conditions is required to determine where management intervention is required and to assess its effectiveness, thereby assisting prioritisation of NRM investment. Monitoring systems developed in more populous areas do not transfer well to vast, data-poor northern landscapes. Simple indicators are required that can be used in regular rapid assessments, with more comprehensive assessments used only for targeted purposes. Condition and trend should therefore readily inform planning and management decisions to improve environmental, cultural, economic and social conditions.



Regional variation and considerations

- Condition and trend assessment should be based on both Indigenous and western scientific knowledge
- Monitoring should encompass the range of assets identified in State of Environment reporting. However, specific assets identified as requiring regular monitoring and reporting include seagrass beds; wetland condition; river health; human health, education and capacity; and economic diversification
- ABS statistics are inadequate for condition assessment through remote areas
- ANZECC water quality standards have been identified as ill-fitting northern conditions

Relationship to other themes

Theme 4: Monitoring and reporting of trend and condition can provide Indigenous employment and support investment in environmental management, including through offset programs.

Theme 3: Condition and trend assessment should be used to inform landscape planning by highlighting areas of exceptional values and likely impacts of new developments.

Theme 12: Wetland assessment will be aided by the development of a robust and regionally appropriate set of condition metrics.

Theme 11: Condition and trend monitoring is required to prioritise and evaluate biodiversity management.

Theme 1: Tracking condition and trend will provide an instrument to influence policy development, and allow assessment of policy effectiveness in improving environmental, cultural, economic and social outcomes.

Theme 7 Water quality improvement

Summary

Efforts to improve water quality have focused on management of fertilisers, herbicides and sediment in the cane, grazing and horticultural industries in the Great Barrier Reef (GBR) catchments. Reduction of sediment pollution has focused on improving grazing land condition to reduce hillslope erosion. However, other industries, land uses and landscapes contribute to pollution of northern waterways. In particular, road building and maintenance have been identified as major sediment sources, and recent research has highlighted the role of gully and stream banks erosion. In light of this work, Best Practice (BP) guidelines to reduce erosion and its impact on water quality have been developed for the Normanby catchment (Shellberg & Brooks, 2013), but are also applicable across northern Australia. However, prioritisation of investment in efforts to improve water quality requires further advances in understanding of the role of land type, vegetation condition and land management practices, and the effectiveness of remediation efforts. This theme will produce and calibrate decision support tools to allow both spatial prioritisation of pollution reduction efforts and identify industry-specific guidelines on the efforts they can take to reduce sediment, nutrient and herbicide losses.



Regional variation and considerations

- This research needs to be extended beyond current focal areas in the GBR catchments
- Sources of heavy metal contamination in the Mitchell River need to be identified and remediation options developed
- The low level of private benefit delivered by remediation of stream banks, gullies and highly degraded lands needs to be taken into account when assessing the relative merit of rehabilitation strategies

Relationship to other themes

Theme 2: Water storage, groundwater extraction and fracking all have water quality implications.

Theme 5: Uptake of BPs to improve water quality will be informed by studies into mechanisms to increase BP adoption and the development of management practice codes.

Theme 12: Wetlands play a significant role in filtering pollutants from land-based activities.

Theme 8 Efficient resource production and use to minimise footprint

Summary

Provision of water, energy, transport and communications is essential for maintaining our ability to manage natural resources across northern Australia, but pose significant challenges and inefficiencies, especially in remote areas. Research is required to identify innovative and cost-effective ways to provide these services, while minimising their environmental footprint. High priorities include identification of low-maintenance renewable energy options and ways to improve water use efficiency and extend availability. Solutions should be scale-dependent, from as simple as solar pumps on bores for filling watering troughs to as complex as efficient rail systems. Assessment of impacts of any new technologies, practices or associated infrastructure will be required to ensure minimal adverse environmental social, cultural or economic impacts.



Regional variation and considerations

- Emphasis is required on remote communities, followed by rural and regional communities
- Exploration of cost effective, resource efficient, innovative energy generation and distribution should facilitate economic and social growth

Relationship to other themes

Theme 2: More efficient water use will help reduce environmental footprints.

Theme 9 Carbon abatement and sequestration options

Summary

The carbon economy is a growing but uncertain area for deriving income through natural resource management. Currently-approved methodologies⁸ for carbon sequestration and emission abatement applicable to NRM in northern Australia include *Savanna Burning*;

Native forest protection projects; *Reforestation and afforestation*; *Native forest from managed regrowth*; and *Environmental plantings*. Feasibility other options applicable to northern Australia needs to be assessed and appropriate methodologies developed.



This theme will investigate several options such as biochar; blue carbon; wetland management; and fire management in areas receiving less than 1,000 mm, or where cultural or environmental values are not compatible with a shift from late dry season to early dry season fires. It will include a cost-benefit analysis for participating each scheme, including opportunity costs associated with changes in land management, as well as the costs associated with project approval, monitoring and reporting. It will investigate options for integrating carbon farming into property and catchment management, and assess the relative benefits of carbon farming in different parts of the landscape. It will identify, develop and promote informed policy options to deliver effective carbon abatement and sequestration across northern Australia.

Regional variation and considerations

- Development of carbon sequestration and abatement methodologies needs to be informed by local values and aspirations

Relationship to other themes

Theme 5: Best practice guidelines will be developed for incorporating carbon farming with integrated fire, weeds and pest animal management under different environmental settings and scenarios.

Landscape planning (Theme 3) informed by biodiversity assessments (Theme 11 & Theme 12) and climate change vulnerabilities (Theme 10) will identify the parts of the landscape in which carbon farming is most appropriate.

⁸ www.climatechange.gov.au/reducing-carbon/carbon-farming-initiative/methodologies/methodology-determinations

Theme 10 Climate vulnerability and adaptation

Summary

Climate extremes pose significant challenges to maintaining improvements to environmental health. Northern Australia has experienced more than its fair share of droughts, floods and cyclones in recent years, and these are expected to increase in frequency with climate change. In the longer term, increases in temperate and sea-level and changes in rainfall distribution and seasonality will place further pressure on environmental conditions, human resilience and industry viability.



Significant advances have been made in incorporating climate change science into NRM planning through the DOE's Regional NRM Planning for Climate Change Fund⁹. However, NRM groups seek ongoing information on specific climate vulnerabilities and adaptation strategies. Ongoing research needs identified include:

- Identification of areas, species, ecosystems and industries vulnerable to climate extremes and/or climate change
- Implications for industry viability under different climate scenarios
- Appropriate management interventions and adaptation strategies to respond to climate change and extreme events
- Ongoing monitoring to allow responses to climate change impacts as these occur
- Improvement in climate forecasting and integration into property management
- Incorporating extreme climatic events – floods, cyclones and storm surges – into disaster relief policy

Regional variation and considerations

- Mapping of flood zones and inundation events is a high priority in the Northern Gulf

Relationship to other themes

A sound knowledge of likely climate change impacts is required for water resource planning (Theme 2); development of new economic and employment opportunities (Theme 4); biodiversity threat assessment and management (Theme 11 & Theme 12); and policy development (Theme 1). Theme 6: Rapid assessment tools will help track the impacts of climate change.

⁹ www.environment.gov.au/cleanenergyfuture/regional-fund/

Theme 11 Biodiversity values, threats and management

Summary

Biodiversity underpins the unique character of the north and its natural resource values. Direct management may be required of high-value species and habitats, so it is important to identify where these occur; threats they face; and appropriate management responses. Protection of the north's biodiversity values also involves maintaining the condition of extensive landscapes. So we need to know how to plan for land use while retaining representative native vegetation and essential habitat; and to achieve integrated grazing, fire and pest management. Monitoring is also needed for prioritising and evaluating biodiversity management. As some of the highest biodiversity values occur on Aboriginal lands, it is important to identify co-management arrangements and opportunities for Indigenous employment in their management.



Regional variation and considerations

Cultural values are included in international definitions of biodiversity and Indigenous knowledge should be used alongside western science in assessment of values, threats and management responses.

Species that were singled out as requiring specific research included:

- Northern Quoll (*Dasyurus hallucatus*) (Cape York Peninsula)
- Javelin Grunter (*Pomadasys kaakan*) (Northern Gulf)

Threats identified as requiring research on impact and management responses included:

- Woody weeds that transform high value riparian areas; introduced grasses; and emergent weeds
- Pest fish species and barriers to fish passage

Relationship to other themes

Theme 2: Water storage and groundwater extraction have implications for biodiversity.

Theme 4: Development of new crops and agricultural practices should minimise threats to biodiversity.

Theme 3: Landscape design should incorporate biodiversity values, processes and management principles.

Theme 5: BP implementation is required to maintain the integrity of the north's biodiversity values.

Theme 6: Condition and trend monitoring is required to prioritise and evaluate biodiversity management.

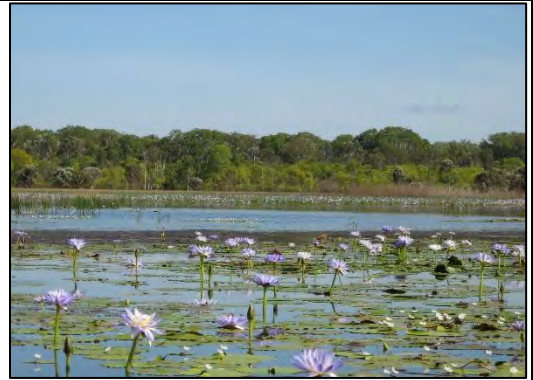
Theme 12: Wetlands play a significant role in maintaining biodiversity health and connectivity.

Theme 10: Biodiversity threat assessment and management responses requires a sound knowledge of likely climate change impacts.

Theme 12 Coastal to freshwater wetland values, ecosystem services and management

Summary

Wetlands are among the north's most valuable ecosystems, having high cultural and scenic values and providing critical habitat, fish nurseries, carbon sequestration, nutrient cycling and pollutant filtering. They are possibly also its most vulnerable, subject to damage from weeds, pest animals, overgrazing, water extraction and climate change. Mapping of fresh and saline wetlands (including springs, swamps, lakes, floodplains and mangroves); quantification of the ecosystem services they provide; assessment of their condition; and identification of the threats to them will assist prioritisation of investment in their management.



Regional variation and considerations

- High value coastal wetland ecosystems are crucial for Indigenous livelihoods, particularly in the Torres Strait, Cape York, the Gulf, Kakadu and Arnhem Land
- In north-east Queensland, there was an emphasis on extending GBR research to include assessment of the role floodplains and coastal wetlands in maintaining reef water quality
- Wetland assessment and prioritisation for management should be based on both Indigenous and western scientific knowledge
- Prioritisation of wetland management needs to be informed on the long-term outlook for each wetland, particularly vulnerability to climate change

Relationship to other themes

Theme 2: Water storage and groundwater extraction have implications for water quality.

Theme 4: Valuation of ecosystem services provided by wetlands will help justify employment in wetland mapping, monitoring and management, particularly in maintenance of their capacity to sequester carbon (Theme 9).

Theme 3: Understanding of wetland values is requisite for sustainable landscape planning.

Theme 6: Wetland assessment will be aided by the development of a robust and regionally appropriate set of condition metrics.

Theme 11: Wetlands play a significant role in maintaining biodiversity health and connectivity.

Theme 10: Prioritisation of wetland management needs to consider climate change vulnerability.

Governance framework

Stakeholder identification

NRM groups and RDAs considered that engagement in environmental research will be effective only if it is appropriately inclusive. Anyone involved in the management of the land, water or sea across northern Australia was recognised as a stakeholder, although their level of engagement would depend on the research theme and the type of outcome intended (Q9; Table 3).

Table 3: Environmental research stakeholders identified by NRM groups and RDAs

	CYNRM	FBA	NGRMG	NQDT	Rangelands WA	Reef Catchments	SGC	Terrain NRM	Territory NRM	TSRA	RDA FNQ&TS	RDA Kimberley	RDA MIW	RDA NT	RDA TNW	Total
Industry representative groups	+	+			+		+	+	+		+			+	+	9
NRM groups		+		+		+		+				+	+		+	7
RDAs	+		+			+	+		+	+			+			7
LGAs			+	+				+			+	+		+	+	7
Indigenous communities/ Traditional Owners			+	+	+			+	+		+	+				7
State/ Federal government agencies and authorities				+	+			+	+					+	+	6
Alliances and special interest groups	+	+			+		+							+		5
Regional economic development groups							+				+		+		+	4
Regional organisations of councils	+					+							+		+	4
Research organisations and consultants	+		+			+										3
Port/infrastructure developers						+										1

NRM groups

NRM groups considered themselves to be key stakeholders of environmental research programs, with the capacity to extend stakeholder engagement and communication through their own networks (e.g. Traditional Owners, small community groups and individual land managers) and develop extension and education materials. In some cases, NRM subcommittees (e.g. the Southern Gulf Pastoral Industry Advisory Group) were nominated as the appropriate point of engagement with future environmental research programs.

RDAs

RDAs and NRM groups considered RDAs to be key stakeholders, again with the capacity to extend stakeholder engagement and communication through their own networks. These included LGAs, LGA alliances and enterprise groups.

Industry representative groups

Industry representative groups were identified as key stakeholders across northern Australia. Depending on the program emphasis, their participation was deemed appropriate at either the program or project level. Those listed included

- AgForce
- Agribusiness sector

- Agricultural bodies
- Canegrowers Mackay
- Gulf of Carpentaria Commercial Fishing Association
- Industry clusters
- Kimberley Cattlemen's Association
- Mareeba District Fruit and Vegetable Growers Association
- Meat and Livestock Australia
- National Farmers' Federation
- Northern Beef Crisis Committee
- Northern Gulf Graziers Group
- Northern Territory Agricultural Association
- Northern Territory Cattlemen's Association
- Northern Territory Horticultural Association
- Port/infrastructure developers and managers
- Queensland Farmers' Federation
- Queensland Resources Council
- Regional Economic Development Corporation in RDA MIW area
- Tourism bodies
- Western Australian Pastoralists and Graziers Association

Local Government

Local Government Associations (LGAs) were identified as a key stakeholder group in Queensland and Western Australia. However, the level at which they should be engaged would depend on the outcome being sought. LGAs were seen as integral to achieving on-ground outcomes and identifying research locations and partners. However, LGAs were seen as having a limited capacity to participate in program design or evaluation. Where this is the case, RDAs saw themselves as best-placed to facilitate engagement and communication with these organisations.

Indigenous communities/ Traditional Owners

Traditional Owners were recognised as primary stakeholders in all regions. However, views on the means by which they should be engaged varied. In some areas, appropriate TO representative groups, such as Land Councils or Prescribed Body Corporates, could be easily identified; in others NRM groups had appropriate engagement structures in place. However, there was a strong feeling that TOs in each region should be asked how they should be engaged, rather than assuming existing structures were appropriate.

State/ Federal government agencies and authorities

State and federal government agencies and associated authorities and advisory bodies were identified as stakeholders. Specific mention was made of the Great Barrier Reef Marine Park Authority and National Park agencies. The Queensland government's Regional Managers' Coordination Network was identified as an effective channel for broad Queensland government engagement. Throughout discussions, it was evident that NERP's current emphasis serving the needs of the federal government was viewed as unfortunate.

Alliances and special interest groups

Groups that have formed to address specific issues were seen as ideal stakeholders for reaching specific target audiences, and for spreading the transaction costs of stakeholder engagement. Those listed included:

- Australian Wildlife Conservancy
- Environs Kimberley

- Kimberley Rangelands Biosecurity Association
- Kimberley to Cape Network
- Land Conservation District Committees
- Northern RDA Alliance
- Rangelands NRM Alliance
- Reef Alliance (5 major reef catchments with industry linkages)
- WWF

Regional economic development groups

Groups with an economic development agenda were identified as stakeholders by RDAs. These groups were viewed as grappling with big issues around economic development and sustainability. Those listed included:

- Remote Area Planning and Development Board
- Chamber of Commerce
- Advance Cairns
- Gulf Savannah
- Cape York Sustainable Futures
- Townsville Enterprise
- Mount Isa to Townsville Economic Development Zone
- Regional Economic Development Corporation in RDA MIW area

Regional organisations of councils

Regional organisations of councils are alliances of neighbouring LGAs in Queensland that tackle issues of common interest. They are often involved in NRM, especially weed management, and so were viewed as legitimate stakeholders. Those listed included

- Far North Queensland Regional Organisation of Councils
- Regional Economic Development Sub-Committee of the North Queensland Regional Organisation of Councils
- Whitsunday Regional Organisation of Councils

Research organisations and consultants

Other researchers and research organisation were seen as important to engage in future research programs. Those listed included

- Charles Darwin University
- James Cook University
- Local consultant researchers
- Rural Industries Research and Development Corporation
- State Government agencies

Port/infrastructure developers

Only one mention was made of port/ infrastructure developers. However, the scope for these individual organisations to cause adverse impacts (particularly to GBR water quality) suggests that effort should be made to include them in the stakeholder base for water quality research.

Engagement processes

NRM groups and RDAs had clear views on the engagement processes that they consider necessary to provide research of value to their organisations and broader NRM initiatives (Q6 and Q7). They believed that engagement should be about making sure the program delivers

products that can be incorporated into their operations (FBA), and not about being delivered products at the end of the process and told to use them (NGRMG, NQDT). Therefore engagement processes need to be designed to meet this objective, and not be about signing off on research just to get it over the line.

Terminology and definitions

Some groups were concerned about the use of particular terminology and thought it was important that everyone involved in a research program should have the same understanding of the terms used. Many responses included a discussion of the difference between an *end-user* and a *research partner*. In addition, there was discomfort around what many researchers considered as adequate engagement, so the first step in the engagement process should be to define terms and the types of processes that these encapsulate (CYNRM).

For the sake of this report, *end-users* is applied to stakeholders who are consulted at the start of the program to have input into project design, but may then have minimal involvement until outputs are ready for testing and implementing. They may then be involved in broader stakeholder engagement, and the dissemination and uptake of research finding through wider networks. *Research partners*, on the other hand, is used to refer to stakeholders that are actively engaged throughout the research, having regular opportunities to meet to provide critical advice and assess progress, and may have direct involvement in the research delivery. NRM groups and RDA that expected to play a more active role preferred to be considered *research partners*, while those with less capacity to participate seemed to be more comfortable with being called *end-users*.

Processes and MoUs will be required to ensure that the pivotal role of research partners and end-users is recognised and that they can build their responsibilities into their programs (NQDT, RDA FNQ&TS). This should include stakeholder representation on strategic-level steering committees or advisory committees (FBA, Territory NRM, RDA Kimberley).

Engagement plans

Engagement and communication plans should be developed and implemented for both the program and individual projects (NQDT, RC, Territory NRM, RDA MIW). These will vary depending on project focus and objectives, with projects that aim to produce tangible deliverables having a higher level of engagement than those that involve blue-sky research (NQDT, RC, RDA MIW). Funds allocated to engagement should be identified in each project budget, with at least some being allocated to the engagement costs incurred by stakeholders. Depending on the level of engagement required of each organisation (particularly where they are a stakeholder for multiple projects), funding may need to cover the cost of that organisation employing a liaison officer (TSRA). If engagement is to go beyond tokenism, adequate time also needs to be allowed for the engagement process (TSRA, NGRMG, Rangelands WA). A longer funding cycle would also allow real gains to be made and for stakeholders to see the program as worthwhile (NQDT).

Engagement schedules should identify organisations as stakeholders, rather than individuals, and processes should be put in place to ensure continuity when the contact person in the project or the stakeholder group moves on (NQDT). They should also identify what the stakeholder is expected to deliver both through engagement processes and as project outcomes, as well as what the stakeholder can expect to receive in these areas.

Stakeholders as co-investors and research partners

If the aim of engagement is to deliver science that will be incorporated into on-ground action, then engagement processes should ensure stakeholders have confidence that they will obtain a useful product as a result of being involved in the research. Stakeholders are most likely to get what they require when they are the buyer (RC). Some NRM groups would prefer to do this by co-investing and leveraging other funding opportunities through their networks (RC). This would ensure that the stakeholders are in a position to drive research program priorities and direct project investment.

Stakeholder buy-in can also be gained through close collaboration (Terrain, Territory NRM). To achieve this, the program must demonstrate user involvement in research, including design of management questions; user involvement as researchers; review of progress and communication and dissemination of research findings (NQDT). Few groups interviewed were confident that research outputs would be useful to them if they do not have input into the program's research focus, operation and deliverables.

Stakeholders as end-users

As described above, end-users have a less hands-on role than research partners, but this role is also important. After identifying their expectations of the research, an end-user must have confidence in the processes designed to deliver useable outcomes. This necessitates keeping end-users well-informed of progress and providing them with opportunities for feedback, even if they are not directly involved in the project delivery or progress reviews (CYNRM, Terrain, NGRMG, NQDT, RC, RDA TNW, RDA MIW, RDA NT, RDA Kimberley). This will maximize the chance of successful adoption.

Stakeholders as co-researchers

At the program level, the co-research model was seen as the best model of engagement likely to result in adoption of research findings into on-ground adoption (CYNRM, Terrain, NGRMG, Territory NRM). For key projects, this would involve either action learning or citizen science (CYNRM, NGRMG) using an adaptive management approach (Territory NRM).

Inclusive engagement

As discussed earlier, NRM groups and RDAs supported engagement across a broad base. In particular, they wanted engagement of the NERP program to extend beyond the Australian government to include community and industry stakeholders, with research institutions being treated as one subset of stakeholder groups (NGRMG, RDA MIW). Engagement should not just be about who is consulted, but acceptance of a more diverse range of local, traditional and scientific knowledge systems and points of view (CYNRM, Rangelands WA). Several NRM groups are using resilience thinking approaches to achieve an acceptable balance between the integrated, complex and often competing socio-ecological systems (CYNRM). So engagement may require researchers to adopt, or at least understand, this approach to problem-solving (CYNRM). A more integrated approach to engagement should be achieved through a culture of collaboration, adaptive learning, knowledge transfer, implemented management, learning by doing, and action research (CYNRM). Existing on-ground practitioners and community groups should be consulted at the start of the project, and be given the opportunity to develop research priorities and choose whether to be involved in its delivery (TSRA, CYNRM, Rangelands WA, RDA Kimberley).

Inclusive engagement also means not limiting research and engagement to an artificially-constrained geographic area (CYNRM, NQDT). Research concerning the GBR should be applied

across the entire GBR (TSRA, RC, FBA, BMRG) and research relevant across northern Australia should not be constrained to a single area or stakeholder group (NQDT). This should be achieved by research that is thematically-driven (CYRMN, NQDT).

Prioritising Indigenous engagement

Proper stakeholder engagement is costly and takes time and resources, particularly when it involves Traditional Owner consultation and approvals (TSRA). Indigenous engagement needs to be a priority for any program where Indigenous interests are involved, with adequate time allocated to do the job properly. As with all stakeholders, engagement with Indigenous communities needs to occur from the start and continue throughout the program, with respect for their perspectives, knowledge and opinions (TSRA, CYNRM, Terrain, Rangelands WA). Protocols need to be established for working with Indigenous people or on lands where Indigenous interests exist. This includes making sure that the right people speak for and work on Country, and developing appropriate protocols for project operation when direct involvement of TOs is not possible (CYNRM). Protocols also need to be established for any collection, storage and use of Traditional Knowledge and to ensure its continuity so that it contributes to improved management decisions (Terrain).

Useful outcomes and outputs

Stakeholders are only likely to be interested in engaging with a research program if they expect it to deliver useful products (NQDT). So the prioritisation and planning process must include mechanisms for ensuring stakeholder needs will be met by producing useful outcomes and outputs. This includes aligning priorities to the NRM plans and RDA road maps (Territory NRM) and decision-support requirements (FBA). Useful products for NRM and RDAs are described in *Framing research priorities* on page 41.

Milestones

Having clear milestones was seen as part of good engagement as it provides the investors, research partners and end-users with confidence that the program will meet expectations to deliver useful products (Territory NRM). In any project, some milestones may report on research effort, but others must include specific deliverables. Milestones that are specifically about communication outputs and dissemination were also specifically requested (Territory NRM). There was broad agreement that milestone payments should be paid only on milestone achievement, and that including operational milestones should be adequate to keep the researchers employed through times of low output (RC, Territory NRM). This did not mean that the groups supported onerous milestone reporting. Indeed the need to minimise bureaucratic processes and report writing was stressed (RDA FNQ&TS).

Co-location

Better collaboration and cooperation would be formed and, with it better research results, if a percentage of research was conducted as residencies with groups based in regions where the research was being conducted (NGRMG).

Communication

Solid and committed investment in communication activities was considered essential to ensuring research findings were applied (Terrain, SGC, RC, Territory NRM, RDA FNQ&TS, RDA NT, RDA Kimberley). Depending on the project this could include:

- Best practice methodologies which integrate NRM gaps (knowledge, skills and capacity building for groups and community) (Rangelands WA)
- Informative and easily navigable websites that provides a centralised repository with simple overviews that point to research outputs (SGC, RC, Rangelands WA RDA NT)
- Newsletters or enewsletters with simple and brief project summaries and updates (RDA,-FNQ&TS, RDA NT)
- Webinars (RDA FNQ&TS)
- Forums in key locations, such as central towns, and in the communities where the research is being undertaken (SGC, FBA, Territory NRM, RDA FNQ&TS, RDA Kimberley)
- Annual get-togethers of stakeholders around specific themes (RC)
- Synthesis and summary of not just relevant research but how it informs practice change (Terrain, SGC, FBA, RDA FNQ&TS)
- Visualisation tools e.g. 3D modelling undertaken see Bennett et al. 2010¹⁰ (Territory NRM)

Use of simple, audience-appropriate language and formats was seen as essential in all communications (SGC, Territory NRM, Rangelands WA, RDA FNQ&TS, RDA NT), as well as incorporating local, traditional and scientific knowledge (CYNRM NGRMG). Simple navigation tools are also required to help access relevant information, as the current plethora of websites was seen as confusing, with the effort needed to find and use them rendering them ineffective (RC).

Effective communication was seen as being a two-way exchange of experience and expertise (CYNRM, Terrain, NQDT, RC, RDA MIW, RDA NT, RDA Kimberley). Stakeholders have valuable experience to share about identifying problems and assessing whether proposed solutions are likely to be achievable on-ground in their own environments and industries (RDA Kimberley). Forums and other communication and engagement processes should therefore be an opportunity for input into projects, rather than just information sessions about project progress. One suggestion was that forums be held in two stages: first, overviewing multiple projects, describing what research is planned, then followed up with more detailed sessions for those wanting more detail or to get involved (RDA FNQ&TS). Their timing also needs to be scheduled around regional events and activities e.g. wet season is a good time for meetings in the Kimberley (RDA Kimberley). Presenting at, or dovetailing with existing events was also viewed as important (RDA FNQ&TS). One response was that you should not expect stakeholders to turn up to, or gain value from, academic talk-fests (RDA NT).

Communication activities need to be allocated a sizeable portion of the program budget, and the budget of all projects should be dedicated to synthesis and dissemination (RC). However, the onus of information dissemination can be shared between all stakeholders, with NRM groups and RDAs playing a role here (RC, Rangelands WA, RDA TNW).

Using existing networks

Efficiency of stakeholder engagement can be achieved by working through existing processes and programs. In particular, NRM groups and their alliances and RDAs and their alliances are well-positioned to engage with a broader stakeholder base (RC, RDA TNW, RDA MIW, RDA NT). Other opportunities for integration or alignment include:

- Previous consultation done for other prioritisation process
- Linking with internal NRM or RDA prioritisation processes (CYNRM, RDA FNQ&TS)
- RDAs helping to form linkages with local government on-ground activities in rural and remote areas (RDA TNW)

¹⁰ Bennett, R., Pettit, C., Aurambout, J.-P., Sheth, F., Senot, H., Soste, L., and Sposito, V. Visualizing climate change impact with ubiquitous spatial technologies. In 'Joint international conference on theory, data handling and modelling in geospatial information science, ISPRS Technical Commission II, Hong Kong', 2010, pp. 461-466.

Role of NRM groups and RDAs

NRM groups and RDAs had clear views on the roles their organisations should play in future environmental research programs (Q6 and Q7). All groups desired a higher level engagement than has been possible under the current round of NERP. Any regional variation was based more on organisational capacity rather than on interest. Formalised identification of roles through an MoU was seen as desirable, ensuring that involvement continued through the life of the research program (NQDT).

NRM groups

Most NRM groups saw themselves as being active *research partners* (see Terminology and definitions). However, NRM groups with low capacity were more likely to see themselves as *end-users*. NRM group participation in future environmental research programs was seen as desirable at all levels, including program design, project selection, performance criteria, progress assessment and dissemination of communication, as discussed earlier in this chapter.

Many NRM groups already buy their own research (e.g. NGRMG) or operate devolved grant schemes for other purposes. They also have that capacity to co-invest and leverage funds from other organisations (RC). So as well as participating and contributing to a NERP program administered externally, they could manage and distribute NERP funds through devolved grants to projects that both deliver on the needs of their own organisations and align with NERP criteria (Terrain).

RDAs

RDAs were more likely to see themselves as *end-users* than as active *research partners*. Most have limited capacity for involvement through the course of program delivery. Hence they typically saw their role topping and tailing the research program, helping to prioritise research areas through broader stakeholder consultation at program start-up and helping to communicate program findings as these are released.

Broader stakeholder engagement

NRM groups and RDAs have strong capacity to undertake or facilitate engagement with a wide and diverse range of stakeholders (CYNRM, Terrain, FBA, RC, Rangelands WA, RDA MIW, RDA Kimberley), as well as to advise on which mechanisms work for different sectors (FBA). This includes engagement at the program or project level. They can help to broaden the engagement beyond the entrenched stakeholder base (RDA NT). The importance of allocating enough time and resources for groups to undertake this engagement was stressed (TSRA).

Project steering and design

Most groups consulted were interested in participating in project steering and design (CYNRM, NGRMG, SGC, NQDT, Terrain, FBA, Territory NRM, Rangelands WA, RDA Kimberley, RDA FNQ&TS, RDA NT). Participation would be contingent on the program priorities and relevant project outcomes and outputs. Roles identified included

- Input into program priorities and direction
- Program design (including engagement processes and terminology)
- Project selection
- Deciding on funding allocation

Some groups explicitly mentioned that these roles should be undertaken as part of a steering committee and/or advisory body (FBA, Territory NRM, RDA Kimberley). NRM groups and RDAs should not only be invited to participate in these processes, but also to advise on their design (FBA). One suggestion was that NRM groups and RDAs help define different terms, including

types of engagement (e.g. collaborative; participatory; co-generative), as well as the type of processes that were expected in each case (CYNRM).

Input into the identification of program priorities and direction that could be provided by these groups would include advice on aligning research with different policy platforms, including their own plans and road maps, as well as the broader policy environment. This alignment would help maximise impact on the formulation of government and industry policy, regulations and programs, as well as on pathways to uptake by industry and other stakeholders (RDA FNQ&TS). Identified priorities would be used to decide on strategic direction (FBA).

Input into program design would include defining or refining research questions and identifying the most applicable deliverables (Terrain, Territory NRM). These groups also have expertise they are willing to contribute to designing selection criteria and metrics; critical success factors and their assessment; and shaping milestone requirements (CYNRM, Terrain, RC).

Progress assessment

Several NRM groups considered their involvement in program and project review was essential to ensuring usable outputs. This could involve participating in annual review of program/project progress, assessing milestones achievement and advising on any required change of direction (Terrain, NQDT, RC, FBA, Territory NRM).

Communication

A core role of NRM groups and RDA is communication and dissemination of research findings through their existing communication programs. Their newsletters and social media activities reach thousands of stakeholders across different sectors. Most groups expressed a preparedness to use these processes to disseminate the outputs of future environmental research programs that meet the needs of their stakeholder base (Terrain, RC, FBA, Territory NRM, RDA TNW, RDA NT, RDA Kimberley). One suggestion was that NMRM groups may also be more effective than some researchers at communicating research findings and their implications (FBA), and are adept at procuring extension and education packages (NQDT). They can also be effective advocates for the uptake of research findings into management and policy (RDA TNW).

Feedback to NERP

Importance was placed on two-way communications with stakeholders (see Communication program). NRM groups and RDAs believed they have a role in facilitating this at all stages from priority setting, identification (or dismissal) of knowledge gaps, and project design to feedback on usefulness of project outputs (CYNRM, Terrain, NGRMG, NQDT, RC, RDA TNW, RDA MIW, RDA NT, RDA Kimberley).

Operational support and project participation

Many NRM groups were interested in supporting researchers, either hosting them in their own organisations (SGC, Territory NRM) or co-supervising research students (Territory NRM). They could also assist in on-ground project delivery, linking researchers with their own field staff (SGC). They could coordinate citizen-science, with the local people collecting information that would be more expensive to collect by researchers having to drive long distances (CYNRM, NGRMG).

Some groups were interested in active research participation, with NRM staff and/or their stakeholders being involved in collecting data and participating in analysis and interpretation (CYNRM, NGRMG). This would build on the research already undertaken in these organisations.

Integration of research findings into NRM and RDA business

The key to ensuring NRM groups and RDAs use research findings is to produce outcomes and outputs that are relevant to these organisations' priorities (Terrain, NGRMG, NQDT, RC, Rangelands WA, RDA MIW). Retrofitting communications by engaging end-users late in the day will not only mean outputs are a poor fit, but this process will also alienate people.

NRM groups and RDAs identified several mechanisms for ensuring the integration of research findings into their planning and operations. These were (1) governance mechanisms that developed effective partnerships with research partners and end-users; (2) action research that directly involves NRM groups and their stakeholders in research; (3) simple operational arrangements to aid information flow; and (4) investment in effective communication dissemination of fit-for-purpose communication products.

Program governance

Many groups stated that the best way to ensure useful products were produced and incorporated into NRM/RDA business was through robust and effective governance arrangements that involved research partners and end-users in program design and delivery (Terrain, NQDT, FBA, Territory NRM, RDA FNQ&TS, RDA MIW).

Summarising from the previous sections, most NRM groups saw themselves as active research partners, while some RDAs and low-capacity NRM groups were more likely to see themselves as end-users. For end-users to gain value maximum from research, they need to be consulted at the start of the program; have input into project design and identify their commitment to investing in specific outcomes and outputs; and then evaluating these before they are finalised. They will also be involved in broader stakeholder engagement, and application and dissemination of research findings through wider networks. In addition to these roles, research partners would have input at all stages, with regular opportunities to meet to provide critical advice and assess progress, and may have direct involvement in the research delivery. This could be through a strategic steering committee, or a more broadly based research advisory group (FBA, Territory NRM, RDA Kimberley).

Such arrangements should develop clear project delivery agreements that enunciate what is being purchased from the researcher (NQDT) and strong partnerships that ensure projects stay on track to deliver useful outcomes (Terrain, NQDT, RC). Effective and ongoing engagement should also help NRMs/RDAs get early value from projects (including through the resultant culture of information exchange) (NQDT, RC).

Partnership processes and MoUs will not only acknowledge the pivotal role of research partners and end-users, but will ensure that they can build their responsibilities into their organisation's programs (NQDT, RDA FNQ&TS).

Action research

Action research that involves NRM staff and/or their stakeholders was viewed by some groups as a most effective mechanism for ensuring stakeholders had ownership of research findings, and would therefore be more likely to incorporate them into their management (CYNRM, NGRMG, NQDT). This would minimise transaction costs and increase the capacity of NRM groups to participate and to draw value from the research projects (CYNRM).

Operational arrangements

Long-term funding will help to ensure effective communication and engagement, which are more likely to be neglected in short-term projects (RDA Kimberley). A coordinator should be appointed to identify the relevant science and its applications (FBA), and this person should work from within the NRM/RDA sector, rather than as a communication officer of the relevant NERP hub.

Opportunities that facilitate direct communication between researchers and NRM groups and RDAs should be pursued (SGC, Terrain, Territory NRM, RDA FNQ&TS, RDA NT). These can be as simple as co-location of researchers and NRM groups; co-supervision of students; creation of a science network (NGRMG); or holding meetings to talk with researchers about policy implications of research (RDA FNQ&TS).

Timing the delivery of outputs and activities to meet stakeholders' needs was also seen as desirable (RDA FNQ&TS). This includes:

- Avoiding meetings during NRM/RDA reporting periods or proposal
- Producing policy analysis in time for it to be considered in submissions for policy reviews

Communication program

See the Communication section on page 63 for the views of NRM groups and RDAs about communication needed to facilitate research findings being incorporated into their activities.

Workshop

A workshop was held on 11 June 2014 to consolidate the information collected in the consultation process in order to develop a final environmental research plan to meet the information needs of NRM groups and RDAs. This section described the workshop processes used to refine and populate the research plan.

All organisations contributing to the plan were invited to send representatives to the workshop. Attendees are listed in Table 1. In addition, administrative staff from both northern NERP hubs attended to provide advice on how the plan would inform submissions by the hubs to future National Environment Science Programs.

Research priorities

Workshop participants prioritised the 12 themes identified in the interim report for discussion and decided to consolidate them further down to five research themes (Table 4). These combined themes were then discussed individually to identify research needs and potential projects for addressing them. Research needs were framed as problems needing solving or opportunities to be grasped. Practical solutions were then identified to ensure research projects were designed to produce applicable outputs that would be of use to NRM groups, RDAs and their respective stakeholders. Research providers and other stakeholders were identified for each project, where possible. Alignment with Australian government programs and priorities were also identified. These elements were combined with those from the synthesis of responses to provide the research priorities detailed in the research plan in the main body of this report.

Table 4: Research themes identified in the workshop and their relationship to the themes identified in the interim report

Research plan	Consultation report
1. Governance, policy & influence	1. Influencing policy development 6. Intelligent condition & trend assessment 5. Achieving on-ground best practice 8. Efficient resource production & use to minimise footprint 9. Carbon abatement & sequestration options 10. Climate vulnerability & adaptation
2. Sustainable livelihood & agricultural options	4. Sustainable livelihood & agricultural options 8. Efficient resource production & use to minimise footprint 9. Carbon abatement & sequestration options
3. Water resource planning & water quality improvement	2. Water resource planning 7. Water quality improvement 8. Efficient resource production & use to minimise footprint 10. Climate vulnerability & adaptation
4. Landscape planning for land use & management	3. Landscape planning 8. Efficient resource production & use to minimise footprint 10. Climate vulnerability & adaptation
5. Biodiversity & wetlands	11. Biodiversity values, threats & management responses 12. Coastal to freshwater wetland values, ecosystem services & management 5. Achieving on-ground best practice 9. Carbon abatement & sequestration options 10. Climate vulnerability & adaptation

Governance framework

The workshop identified key elements to be included in the governance of programs designed to deliver this research plan to maximise the utility of the research outputs. These included broad principles and practical mechanisms for implementing them. These elements were combined with those from the synthesis to provide the governance framework described in the research plan in the main body of this report.

Plan finalisation

A draft research plan was prepared based on the research themes and governance framework identified in the workshop, and further populated from the synthesis of responses from individual NRM groups and RDAs. This was circulated among all contributors, and their feedback was incorporated before the plan was finalised. The result was the final version of the research plan as presented in “An environmental research plan for Natural Resource Management organisations and Regional Development Australia boards across northern Australia”.

The plan identified 48 potential projects to address 39 priority research needs organised under five research themes

- 1 Governance, policy and influence
- 2 Sustainable livelihood and agricultural options
- 3 Water resource planning and water quality improvement
- 4 Landscape planning for land use and management
- 5 Biodiversity and wetlands management

Priority knowledge needs were presented as NRM-related problems that needs solving or opportunities to be grasped. Potential research approaches were then identified to deliver practical and applicable solutions to assist NRM groups, RDAs and their respective stakeholders to improve sustainable management of nature resources and build community resilience.

The plan also described the governance arrangements required to ensure research programs meet these knowledge needs. To an extent only limited by their institutional capacity, NRM groups and RDAs saw themselves as partners in the broader business of environmental research programs. They also considered that such partnerships need to operate from the initiation of research bids through to project delivery. They desired research partnerships with NRM groups and RDAs to be formalised through strategically-managed processes and partnership arrangements that provide recognition of their roles, responsibilities and expectations.

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