

Trends in natural resource management in Australia's Monsoonal North: The conservation economy

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Acronyms and abbreviations

ACAP	Agreement on the Conservation of Albatrosses and Petrels
ACCU	Australian Carbon Credit Units
AQIS	Australian Quarantine Inspection Service
AWC	Australian Wildlife Conservancy
BHA	Bush Heritage Australia
BMP	Best Management Practices
CAE	Carbon Assessment Area
CAMBA	China-Australia Migratory Bird Agreement
CBD	Convention on Biological Diversity 1992
CER	Clean Energy Regulator
CLMA	Conservation and Land Management Act 1984
CPALSMIPA	Cobourg Peninsula Aboriginal Land, Sanctuary and Marine Park Act (NT)
Cth	Commonwealth
DPMC	Department of the Prime Minister and Cabinet
EOA	Environment Offsets Act 2014 (Qld)
EPA	Environmental Protection Act 1994 (Qld)
EPBC	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
ERF	Emission Reduction Fund
FullCAM	Full Carbon Accounting Model
GHC	Greenhouse Gas
GBR	Great Barrier Reef
IAS	Indigenous Advancement Strategy
IPA	Indigenous Protected Area
JAMBA	Japan-Australia Migratory Bird Agreement
LULUCF	Land Use, Land-Use Change and Forestry

MBI	Market Based Instruments
MSA	Meat Standards Australia
NAQS	Northern Australia Quarantine Strategy
NCA	Nature Conservation Act 1992 (Qld)
NGO	Non-Government Organisation
NHT2	Natural Heritage Trust (second tranche)
NLP	National Landcare Programme
NNPA	Nitmiluk (Katherine Gorge) National Park Act (NT)
NRM	Natural Resource Management
NT	Northern Territory
NWI	National Water Initiative
PA	Planning Act (NT)
PWCA	Parks and Wildlife Commission Act (NT)
QDAF	Queensland Department of Agriculture and Fisheries
QEHP	Queensland Department of Environment and Heritage Protection
QRRRA	Queensland Rural Adjustment Authority
Ramsar	Ramsar Convention on Wetlands
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SOC	Soil Organic Carbon
TPWCA	Territory Parks and Wildlife Conservation Act (NT)
UNFCCC	United Nations Framework Convention on Climate Change 1992
VMA	Vegetation Management Act 1999 (Qld)
WCA	Wildlife Conservation Act 1950 (WA)
WHC	World Heritage Convention 1972
WOC	Working on Country
WRA	Wild Rivers Act 2005 (Qld)
WWF	World Wildlife Fund

About the author

Gabriel Crowley has over 20 years' experience assisting natural resource managers meet their planning, management and conservation goals.

Her interest in natural resource management began on Cape York Peninsula in 1992, when she worked with pastoralists to reverse the decline of open grassy woodlands that have high conservation and pastoral values to development of fire and grazing management guidelines. She undertook similar collaborative work with landholders on Kangaroo Island for Glossy Black-Cockatoo conservation. Returning to northern Australia in 1998, she worked in Queensland Parks and Wildlife and the Tropical Savannas Cooperative Research Centre to support sustainable land management through production of fire and wildlife management guides and web-based tools.

She subsequently led the development of:

- Northern Territory's 2010-2015 Integrated Natural Resource Management Plan
- Queensland Government's \$10M Reef Policy Science Program to inform best practice cane farming and cattle grazing and prioritise investment in research gaps (2010-2011)
- Meat and Livestock Australia's 10-year Research, Development and Engagement Plan to improve fire management on northern grazing lands (2013)
- The research plan to inform Natural Resource Management across northern Australia (2014).

This report and its companion volume *Trends in natural resource management in Australia's Monsoonal North: The beef industry* are a continued expression of her commitment to support the information needs landholders and Natural Resource Management groups.

Gabriel is an Adjunct Principal Research Fellow with The Cairns Institute, Cairns, Australia.

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Disclaimer

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Executive summary

This report examines the conservation economy in the Monsoonal North of Australia. It first describes the drivers behind the development of a conservation economy in the region and why this is important. It then takes a step back to describe what a conservation economy is, and provides simple explanations for the concepts and terms that populate the literature. It identifies how investments are prioritised and where priority areas for conservation management are located in the Monsoonal North. Finally, it provides a compendium of conservation economy opportunities operating in the region, and examines prospects for future development.

The conservation economy has largely been driven by community concern over the deteriorating condition of our land, seas, water and atmosphere; by consumer demand for ethically and sustainably-produced products; and Indigenous people's desire to derive income from their traditional lands.

The conservation economy literature provides a framework for assessing the value of conservation management and who should bear the cost of this management. Its basic principles include recognition of the dependence of humans on ecosystem services and the valuation of managing those services. There is the expectation that production systems should be managed sustainably, and where it is profitable to do so, the producer should bear the cost of adopting sustainable management. Payment can be expected for conservation management that is beyond reasonable expectations, and provides public rather than private benefit.

Conservation economy priorities are driven by international conventions covering biodiversity conservation and social justice. As a signatory to these conventions, the Australia Governments has accepted obligations to list and protect threatened species and World Heritage sites; operate a protected area estate; mitigate climate change; adhere to sustainable development goals and alleviate poverty among Indigenous people in Australia and the third world. Non-government organisations (NGOs) also largely subscribe to these aims.

The Monsoonal North has extensive tracts of intact landscapes that are largely in good condition. It scores well in conservation prioritisation schemes based on these natural values, but poorly in schemes prioritising habitat fragmentation, land degradation and threatened species. Priority areas for biodiversity conservation largely coincide with areas of Indigenous held land, so are attractive areas for conservation investment that incorporates social justice goals.

External investment in the conservation economy in the Monsoonal North comes from governments, NGOs and the voluntary efforts of property owners and managers. Most funding comes from the

Australian Government, either through grants programs or fee-for-service arrangements. This funding has declined over the last decade, and disproportionately so in the Monsoonal North. This has left a sizeable dint in the region's conservation economy. However, funding for Indigenous cultural and natural resource management has been largely maintained, because Indigenous economic development continues to be a high national priority. The Australian Government has also established the *Emission Reduction Fund* as a marketplace to purchase emission reductions from land and agricultural management, and is considering a national marketplace for water.

The Queensland and Western Australian governments also subsidise conservation management through grant programs and conservation covenants, though this funding has also declined in recent years. In the Northern Territory, conservation agreements are brokered by the Natural Resource Management (NRM) body. Most NRM groups in the north also run devolved grants schemes, though these are funded by the Australian Government's National Landcare Programme.

Governments also regulate for adherence to duty-of-care principles in the management of weeds, pest animals, vegetation management and water quality management; and provide extension program and structural adjustment loans to support adoption of sustainable practices.

NGOs are increasing their presence in northern Australia, particularly working in partnership with Indigenous communities to support their cultural and natural resource management aspirations.

Indigenous communities are active participants in the conservation economy. Indigenous Protected Areas (IPAs) now constitute one-third of Australia's National Reserve System. Indigenous rangers are employed to undertake cultural and natural resource management, including protection of cultural heritage; transfer of Traditional Knowledge; weed, fire and feral animal management; and biodiversity monitoring and management. Fee-for-service arrangements operate for biosecurity surveillance, collection of marine debris and emission abatement.

The pastoral industry can also benefit from the conservation economy. However, other than entering into agreements to reserve parts of their land for biodiversity conservation and reducing methane emissions from cattle, this is unlikely to be in the form of external payments. Rather, adopting recognised best practice herd management will not only reduce emissions and improve land condition by decreasing grazing pressure, it will also increase profitability. Voluntary uptake of such practices is also likely to circumvent increased government regulation of the industry. Because such practices are profitable, they are unlikely to attract stewardship payments. However, assistance through the necessary transition can be provided through extension programs and structural adjustment loans.

In summary, the principal prospects in the conservation economy in the Monsoonal North are:

- Greenhouse gas abatement activities
- Indigenous Land and Sea Management supported by governments and NGOs
- Protection of high priority biodiversity on private or leasehold land funded through development offsets, and through government-funded programs
- Taking advantage of the inherent financial benefits of herd management to improve animal performance and land condition.

Hence, the conservation economy is operating in northern Australia and is likely to grow, but it is also subject to variation with shifting government policy and consequent market opportunities. Growth is most likely to be driven by the international priorities of conservation of listed threatened species, protection of World Heritage values, establishment of a protected area estate and alleviation of poverty among Indigenous people and in the third world, adherence to sustainable development goals and mitigation of climate change. These priorities are likely to inform future investments by governments, NGOs and private donors.

Introduction

Drivers of the conservation economy

Indigenous people across northern Australia are seeking opportunities to improve their livelihoods from their traditional lands as these are returned through Native Title¹⁻¹⁰. New forms of sustainable development and payments for environmental management are foremost amongst preferred options, in no small part because these options enable people to maintain and restore their connection to country. Indigenous organisations are, therefore, pursuing conservation economy opportunities as a way to restore social justice at the same time as improving cultural and environmental conditions. Governments, researchers and philanthropic organisations are assisting in these efforts.

The conservation economy is also being driven by broader community concerns about environmental degradation of agricultural land and expectations that primary producers should maintain and restore the environmental values of their lands¹⁰⁻²¹. Expectations include improving practices to maintain the natural resource base; reducing pollutants entering waterways and affecting the Great Barrier Reef (GBR); reducing water and energy consumption and carbon emissions; and preserving wildlife habitats. Similar expectations are affecting the behaviour of markets across the globe. Consumers are demanding products that are produced ethically and sustainably. As well as increased pressures on land managers, these expectations also provide opportunities to improve the profitability through

gained efficiencies; to secure market access by addressing consumer demands; and to derive income from off-reserve conservation management^{10-15,20,22-30}.

Climate change is another driver of the conservation economy, providing impetus for landholders to undertake management to capture atmospheric carbon in vegetation and to reduce emissions from land clearing, fire and agricultural production³¹⁻³⁵. Northern Australian land managers have been pioneers in some of these activities.

This report describes how these and other drivers (Table 1) are shaping a conservation economy in northern Australia that is improving both environmental conditions and livelihoods. It also examines future directions of the conservation economy and tries to separate the rhetoric from reality. Much of the writing on the conservation economy is highly theoretical, providing a framework that is only just starting to bear fruit in practice. So, wherever possible, this report provides real-world examples to demonstrate which of the various opportunities raised in the literature have most promise for current northern Australia natural resource managers and into the future.

Table 1. Key factors shaping the conservation economy

Pressures, drivers and enablers	Sources
Indigenous community aspirations and programs	
Pursuit of livelihood options that value culture and environmental health	1-8
Pursuit of sustainable development	1-8
Improvements in health of Indigenous people	9
Non-government organisation agendas and programs	
Land purchase for conservation	36
Programs to assist Indigenous communities obtain livelihoods through management of cultural and conservation values	37-40
Government legislation and policies	
Recognition of Native Title	1-8,41
Program supporting Indigenous management of traditional lands, e.g. Working on Country and Indigenous Protected Area programs	41-44
Registration and protection of Indigenous heritage sites	41
Increasing ratification of international agreements – covering changing climate, biodiversity loss, pollution and fuel, food and water security	10
Domestic environmental legislation and regulation including protection of critical biodiversity sites and number of protected areas	10,14,15,20,45
Industry and investors	
Increasing investment in energy infrastructure and biofuel production	20
New technologies improving production efficiency	10
New business models supported by digital technology	20
Landholder motivations	
Conservation ethic of landholders	18,36,46-50
Pressures on the environment and community concerns about them	
Biodiversity decline and species extinction	11-21
Increasing emergence and spread of weeds, pests, pathogens and diseases	10-15
Inappropriate fire regimes	10,14,15
Climate variability, natural disasters and climate change impacts on environmental and cultural values and community resilience	31-35
Carbon pollution, climate change and sea level rise	10-15,20,28-30
Declining water quality and its impact on freshwater and marine environments	10,14,15,51-54
	21
Sustainability of agricultural production	21,55-57
Pollution from industry	10-15
Agricultural practices causing land degradation, fertility decline, acidification, soil loss, salinisation and biodiversity loss	10-15
Unsustainable fishing practices	10,14,15
Unsustainable timber extraction and deforestation	11-15,20
Negative impacts of poorly managed tourism	10,15
Marine debris	15
Other community concerns	
Wilderness mentality	58-60
Social justice for Indigenous Australians	7
Animal welfare issues	61
Consumer expectations	
Ecologically sustainable and ethical production methods	20,29,61-64
Increased ecotourism markets and a shift from expenditure on physical products to experiential services	10-13,15,20

.../continued

Table 1. continued

Pressures, drivers and enablers	Sources
Knowledge systems	
Development of a knowledge base (Indigenous and western scientific) to support biodiversity conservation and ecosystem management	65-68
Development of social, cultural and economic valuation of ecosystem services and cultural values	69-73
Development of a knowledge base to support payment for environmental services schemes, including measuring and reporting	74,75
Development of a knowledge base to support sustainable production	67
Drivers for increased resource extraction	
Declining resource availability or condition and increased demand	15,20,76,77
Drivers for an increase in agricultural production	
Increased global population, wealth and food consumption	10- 15,20,29,78,79
International agreements facilitating trade in agricultural commodities	11- 13,20,29,78,79
Community expectations and attitudes	
Economic and employment growth	80,81
Small governments and low taxation	82
Lack of support for protection of Indigenous cultural heritage	83
Industry pressures	
Competition for access to resources (water, land, minerals)	20,77
Vested interests in the fossil fuel industry	84
Expectation of reduced environmental regulation	85
Market challenges	
Difficulties in costing environmental and cultural values	86
Poorly developed markets with few willing buyers	87-89
Legislation and policy	
Ineffective legislative and policy frameworks	90-94
Policy instability (including lack of bi-partisan support)	95-97
Watering-down of environmental policies (Green tape reduction)	85,98-102
Reduced funding to regional NRM	103
Reduced protection of cultural (especially Indigenous) heritage	a
Regulatory barriers	
Lack of certainty and flexibility of tenure	49,104,105
Unresolved Native Title claims	105,106
Weak Indigenous land and property rights	94,105,106
Environmental pressures causing ongoing degradation	
Climate change	33
Biosecurity risks (spread of weeds, pest animals, pathogens and diseases)	107
Rapid environmental declines	108,109
Financial disincentives	
Reduced land values and borrowing capacity as a result of taking land out of production	110

^a <http://www.abc.net.au/news/6695368>

Concepts and definitions

Writings about the conservation economy are often full of complex concepts and technical terms, and not all authors use the same terminology. This section explains the most important concepts in simple terms as they relate to natural resource management in northern Australia, only using jargon where it will help readers navigate the literature.

Ecosystem services

A conservation economy is based on protecting, restoring or improving the value of the services the ecosystem provides, so it is important to know what these services are. Ecosystem services are services provided by the environment that sustain human life and values¹¹¹. Examples include water purification, nutrient cycling, food, shelter and spiritual experiences. Different authors use different terms and classification systems to describe them (Figure 1). Most classifications are based on whether ecosystem services provide us with immediate products or experiences, or whether they keep the ecosystem functioning so that these products and experiences can continue to be produced into the future. Food and water fall into the first category, but so do experiences that fulfil our spiritual, cultural and recreational needs. Examples of how the environment nourishes these needs include the stories associated with sacred sites that help to explain connection to country, or awe-inspiring scenery and rugged landscapes that intensify tourism experiences. Soil formation and photosynthesis (required to produce food) and consumption of mosquito larvae by fish and frogs (which helps to limit spread of malaria and other diseases) are examples of services that benefit us as a society—though not ones we need to directly consume or experience. Other services that we do not directly experience, but we value as a society, include the persistence of wildlife and intact landscapes for future generations. An important distinction is between ecosystem services (which the environment provides) and environmental services (which people provide), although the terms are often confused²⁷. Participants in the conservation economy gain income or other benefits from managing the environment to maintain, restore or improve ecosystem services.

The ecosystem services framework does not recognise biodiversity as having its own intrinsic value. Rather, biodiversity is valued because it provides humans with food, water, other materials and cultural experiences. While some aspects of biodiversity, such as genes required to provide disease resistance to crops, are highly tangible and universally valued¹¹², biodiversity in itself is a cultural value that is not as widely shared.

		Classification of Millennium Ecosystem Assessment (2005)					
		Provisioning services	Cultural services	Supporting services	Regulating services		
		Classification of Hodge and Dunn (2001) as adapted by Greiner <i>et al.</i> (2009a)					
		Consumptive value	Non-consumptive value	Non-use value	Indirect value		Option value
Classification of Fisher (2009)	Final services	Active	Food Water Medicine Wood Fibre	Spiritual values Inspiration Ecological knowledge			
		Passive			Satisfaction that the environment is in good condition now and into the future (existence, bequest and philanthropic values)		Maximizing options for future use
	Intermediate services				Soil formation Photosynthesis Nutrient cycling Primary production Crop pollination	Nutrient cycling Food webs Water purification Flood mitigation Climate regulation	

Figure 1. Classification of ecosystem services used in the Millennium Ecosystem Assessment and as adapted by other writers

Source: Millennium Ecosystem Assessment (2005)¹¹¹; Greiner *et al.* (2009)²⁷; Fisher *et al.* (2009)¹¹³; Hodge and Dunn (2001)¹¹⁴

The conservation economy

The term “conservation economy” appears to have first been coined in the 1940s. The first recorded use of this term was in the 1949 Bulletin of the Montana State University (Missoula) Forest and Conservation Experiment Station¹¹⁵, in which it was stated “A *conservation economy* provides for sustained yield under natural conditions. Under an improvement economy, with modern techniques, the productivity of the resource may be raised and a higher sustained yields can be obtained” (p. 75). Since then a conservation economy has come to mean an economy in which healthy resources are not just sustained, but degraded resources are also restored¹¹⁶. An essential element of a conservation economy is assigning value to all ecosystem services provided by both natural environment and agricultural landscapes and incorporating these values into any assessment of economic worth.

The conservation economy does not involve “locking up” all resources to prevent them being exploited. Rather, it means making sensible decisions about natural resources to ensure their condition is maintained, so that they can continue to support livelihoods into the future. Nor is investment in the conservation economy a drain on economic resources. Numerous studies have shown the benefits protected areas and healthy wildlife populations can bring to a regional economy¹¹⁷⁻¹²². Moreover, improved environmental management can increase profitability by reducing input costs^{123,124} or increasing production^{125,126}. Finally, when the environment is valued economically, new economic opportunities can emerge, such as biofuel production¹²⁷. Some types of environmental services, such as biosecurity surveillance or carbon sequestration and emission abatement, will require investment from government, industry or philanthropic organisations, at least until self-sustaining markets emerge. But even these activities can provide a multiplier-effect that

benefits regional economies^{128,129} or protects the profitability of nearby enterprises by reducing their exposure to risks, such as weed spread¹³⁰ or climate change.

Many factors drive or enable the conservation economy. The foremost driver has been wide societal concern about environmental deterioration and third-world poverty. The conservation economy, therefore, originally focused on poverty alleviation through payments for conservation outcomes, particularly avoided deforestation¹³¹⁻¹³³. Early programs benefited from the support of philanthropic organisations. As well as drivers of the conservation economy, there are also many impediments (Table 1). A conservation economy can only develop where there is a supportive legal and policy framework; good understanding of the economic benefits of environmental management; and people willing to both provide the services and invest in them (see [Market and policy essentials](#)). These elements are at different stages of development for different types of conservation services and products in northern Australia.

The most familiar examples of the conservation economy involve direct payments for services by land or water managers, (e.g. stewardship payments^{23,134-136}; converting pastoral land to biodiversity reserves^{18,47}; carbon capture and emission abatement⁷⁴). However, a broad interpretation of the conservation economy includes any economic decisions in which natural resources are considered and protected^{137,138}. It also includes making decisions about resource use based on existing and future demands on those resources. These distinctions are important, because they mean that landholders can profitably invest in, and financially benefit from, improving their natural resource base—rather than be dependent on outside investors—and that strategic decisions by governments can improve environmental outcomes without necessarily compromising economic growth^{80,139}.

Decisions about resource allocation

Decisions governments make about resource allocation are meant to be made in the best interest of the nation. This is often narrowly interpreted as meaning financial gain and jobs. However, in the conservation economy, the concept of “best interest” is much broader, and includes social, environmental and cultural wellbeing¹⁴⁰. The literature on the conservation economy refers to measuring impacts on human, produced, natural and social capitals (Table 2), and conservation economists talk about quadruple bottom-line accounting¹⁴¹. These terms are used to ensure economic assessments go beyond jobs and profit to consider all the things society values.

Table 2. Capitals making up the conservation economy

Source: Stayner (2005)¹⁴²

Capital	Description
Human	Knowledge, health, skills, abilities
Produced	Built environment, income, financial wealth
Natural	Renewable and non-renewable resources
Social	Values, social function and relationships

We make quadruple bottom-line decisions in everything we do in our personal lives: choosing to be a farmer instead of a miner; going to the beach instead of working overtime; attending a spiritual or cultural ceremony; painting our daughter’s room hot pink instead of a more marketable cream. If we based our decisions only on financial gain, we would do none of these things. In a conservation economy, we also expect governments and industry to make decisions—such as whether to mine prime agricultural land, or dam a river in a World Heritage Area—based on all capitals in Table 2.

It is hard to expect governments to make decisions in this way when their own performance is most often assessed using only economic measures, such as employment statistics, quarterly growth, deficits or gross domestic products¹⁴¹. Adopting measures of environmental and social wellbeing—as has been attempted in State of Environment reporting¹⁴³ and Bhutan’s Gross National Happiness index¹⁴⁴—can shift the national conversation and community’s expectation of government towards the conservation economy.

The tension between these approaches is being played out in the controversy over the proposed Carmichael Coal Mine in the Desert Uplands region of Queensland. This furore highlights the lack of a structured decision-making framework in which all national, state and regional values can be considered¹⁰¹. Moreover, the current Australian Government has flagged that it intends to further reduce community input into how our resources are allocated by restricting legal challenges to environmental approvals to local landholders¹⁰². To avert such ad-hoc decision making and associated reactive politics, Dale identified steps that can be taken to form a robust quadruple bottom-line decision-making process:⁸¹

1. Implement stable, long-term land use planning
2. Reform the approvals system for major projects
3. Improve regional development and natural resource management
4. Encourage ‘ecosystem service markets’
5. Invest in new and innovative regional industries
6. Support Traditional Owners to plan their own future.

Another benefit of such a system would also improve the confidence of investors by providing certainty around community support for approved projects.

Instruments of the conservation economy

The conservation economy is enacted through numerous mechanisms for rewarding environmental management. These are often referred to as market-based instruments (MBIs), because they change the economics of the market in favour of goods and services that deliver a positive environmental outcome.

Which mechanism is most effective and applicable at achieving desirable environmental outcomes depends in part on who stands to gain most benefit from the management that needs to be undertaken¹⁴⁵. Where the public benefits from the landholder undertaking a service that the community demands but has little benefit to the landholder, then it is reasonable for the community to bear the cost, so positive incentives, especially payments are most applicable (Figure 2). If the landholder stands to gain through improved productivity, then it is considered reasonable that the landholder should bear the cost, and negative incentives, such as taxes and charges may be applicable. This is called the public-private benefit ratio. Examples of how private-public benefits are applicable in some northern Australian examples are provided in Figure 2.

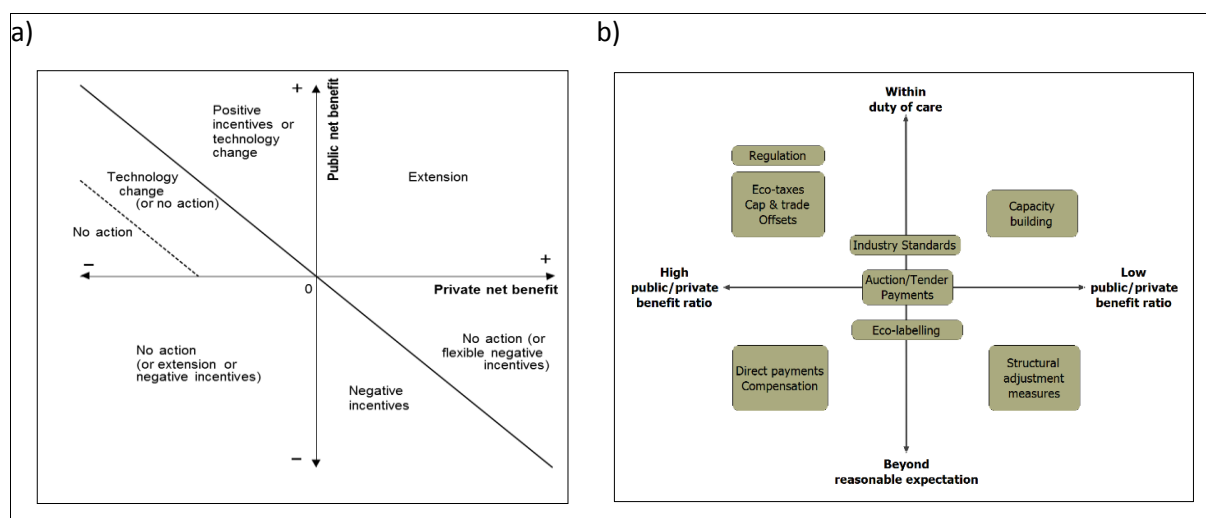


Figure 2. Identification of mechanisms to promote environmentally-responsible management in relation to private-public benefit and duty of care responsibilities

Sources: (a) Pannell (2015)¹⁴⁶; (b) Lockie (2013)¹⁴⁷

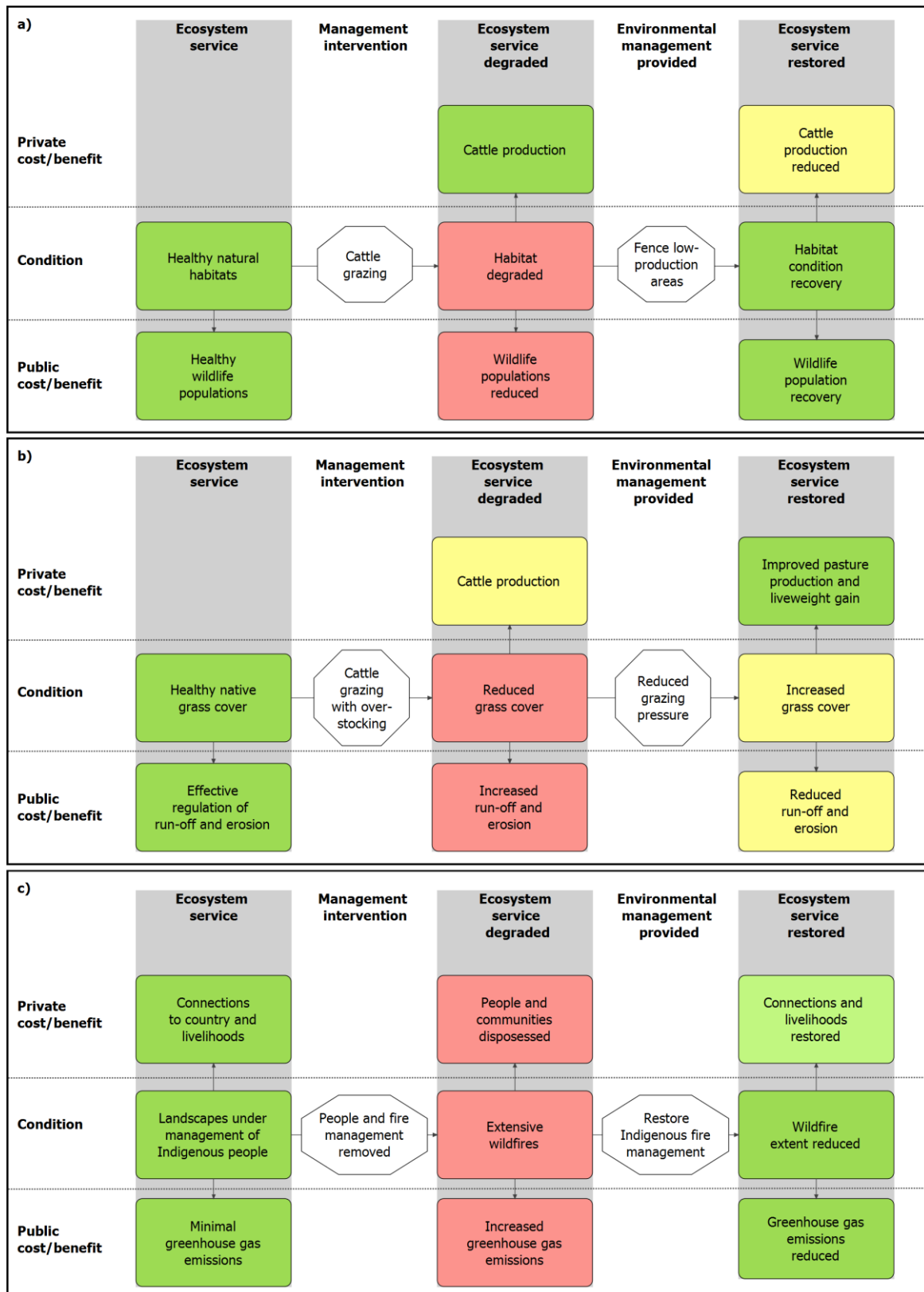


Figure 3. Comparison of the benefits of three forms of environmental management: (a) fencing pastoral land for wildlife conservation; (b) improving grass cover for both pastoral productivity and water quality; and (c) restoring fire management by supporting Indigenous ranger groups

Payments, taxes and charges affect profit margins, acting on the principle that profit is a powerful motivator. So, in theory, improvements in environmental management are most likely to be gained when more profit can be gained from managing sustainably than from degrading environmental resources^{48,49,148,149}. But profit alone does not determine uptake of sustainable management. Other influential factors include lifestyle choices, peer pressure, resistance to change, lack of knowledge or skills, distrust of information, and lack of financial capacity to restructure operations^{48,49,75,149,150}.

Regulations or taxes and charges are considered the best mechanisms to address resistance to the adoption of sustainable practices where sustainable management is highly achievable and within expected levels of duty-of-care^{147,151}. Examples of where such mechanisms have been used include Queensland's Reef Regulations, which aims to reduce agricultural pollutants reaching the Great Barrier Reef¹⁵²; vegetation management regulations adopted by each of the northern state and territory governments¹⁵³⁻¹⁵⁶; and the Emissions Trading Scheme implemented by the Australian Government in 2009⁸², but since repealed^{82,157,158}.

Regulations may not seem an obvious part of the conservation economy as they are not designed to affect market dynamics, but compliance generally has an economic impact. Moreover, most aspects of the conservation economy require legislation, regulation and policy frameworks, whether to enable trading of carbon credits or biodiversity offsets or to establish ranger programs or Indigenous Protected Areas.

Financial incentives will be required to address intractable environmental problems that require landholders to adopt practices that are outside reasonable duty-of-care expectations, especially those that require structural adjustment of enterprises. Most financial incentives do not reward pre-existing good practice; rather, a new service must be provided¹⁵⁹. This is called additionality. Some see this as a perverse outcome of the conservation economy, as it rewards those prepared to improve bad practice, rather than those who have been undertaking good practice all along¹⁶⁰.

Lack of knowledge or skills can be addressed by extension^{123,124,128}. Extension services are an essential element of the conservation economy, not so much because they need to be subsidised financially, but because they help landholders understand their options and make the necessary adjustments to their management. So it is important that extension includes not only advice on management practices, but also on assessing the economic benefit of incorporating improved practices into business operations^{146,147,151}.

Motivations and barriers arising from ingrained personal attitudes are difficult to address, but can be chipped away through observation and experience of the benefits brought about by practice change.

Hands-on experiences and showcasing the efforts of trusted neighbours or industry champions are, therefore, also important elements of extension programs in the conservation economy.

So, while the conservation economy can provide payments directly to landholders, financial benefits can also be achieved through improved profitability or resource security.

In practice, there are essentially four elements to the conservation economy:

- Direct payments, including:
 - Livelihoods derived from payment for environmental work covering the full cost of work (e.g. ranger groups undertaking cultural mapping or feral animal control)
 - Partial payment (usually through auctions or tenders) where benefits are likely to accrue to both the provider and the purchaser (e.g. practice changes that reduce input costs as well reduce pollution)¹⁴⁷
 - Debt forgiveness or loan guarantees to allow structural adjustments to be made by providers in financial difficulty, where restructuring will provide both environmental benefit and improved enterprise viability^{161,162}
 - One-off subsidises for improving environmental conditions (e.g. fencing riparian areas).
- Taxes, charges and trading schemes, including:
 - Pollution trading schemes
 - Biodiversity offset programs.
- Financial benefits from improved industry viability, including:
 - New industry opportunities to meet the demand for products to reduce societal impacts on the environment (e.g. biofuel production, carbon storage and abatement)
 - Productivity improvements as a result of caring for the natural resource base or *natural capital* (e.g. reducing stocking rates to improve land condition and liveweight gain)
 - Price premiums and market security achieved through ecological certification.
- Planning decisions based on environmental and social values:
 - Resource allocation and planning decisions that include assessment of ecosystem services and environmental values, and the cost of replacing these services⁷²

- Formal recognition of landscape elements as green infrastructure (e.g. in water purification and storm-water control^{163-165,a}), although this is currently largely restricted to urban environments and water catchments.

Market and policy essentials

Like any other market, in addition to a product, payment for environmental service delivery requires willing providers (or sellers) and willing investors (or buyers) linked by a supply chain. Because of the complexities of regulations and high establishment costs, brokers are often involved in establishing links between buyers and sellers and aggregating the efforts of numerous land managers into a saleable commodity (Figure 4).

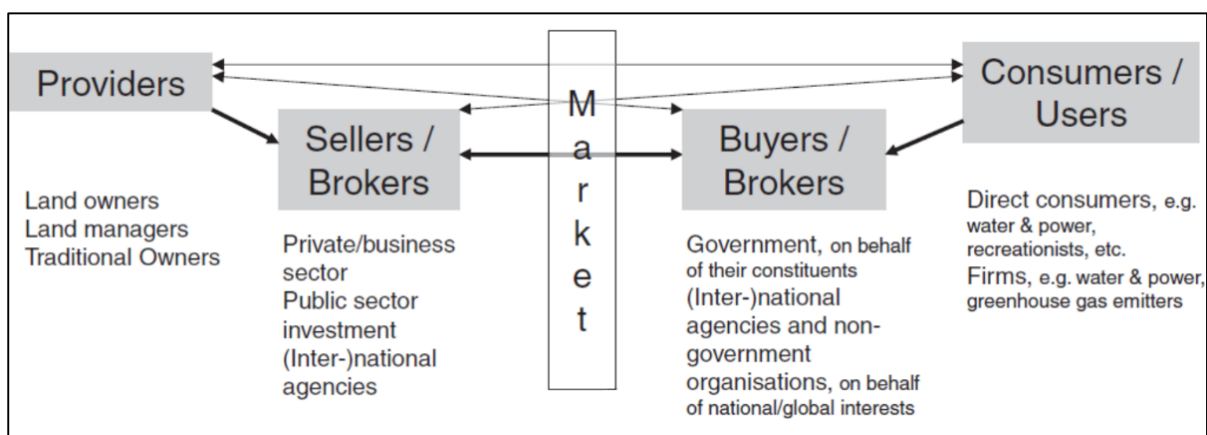


Figure 4. Market characteristics of the conservation economy

Source: Greiner *et al.* (2009)²⁷ The Rangeland Society and CSIRO: <http://www.publish.csiro.au/nid/202/paper/RJ08067.htm>

As discussed above, a number of policy elements are required to support payment for environment services^{138,152}. These include a means of measuring, valuing and verifying the services provided; setting pricing; and rules for exchange. The most sophisticated market for environmental services in Australia at present is the Australian Government's *Emission Reduction Fund* (ERF)¹⁶⁷. This has a policy and regulatory framework that approves both methodologies and projects, and establishes a market place that regulates sale and purchase.

^a For example protection of green infrastructure reduced the cost of stormwater control by \$3,500 to \$4,500 per housing lot in Maryland and Illinois¹⁶⁶

Markets for most products are driven by demand from the consumer¹⁶⁸. The conservation economy has largely been driven by a philosophical belief that the market should exist, or by providers believing they have a saleable product. For this reason, markets for the different services discussed above are all at different stages of development between concept and reality. Nature refuges, conservation agreements, ranger programs, biosecurity and emission reduction are already reaping payments for northern Australian natural resource managers (though mostly with an uncertain future), systems for payments through biodiversity offset schemes are in development, but debt for conservation swaps are only at the concept stage. The following sections describe the state of play for the wide range of carbon economy opportunities in the north, and what can realistically be expected in the future.

The final essential in the conservation economy is that the provider must have the right to undertake the project and sell the product^{6,169}. To undertake a land sector project, it is necessary to be the owner or leaseholder of the land on which the project is to be undertaken (or to have the consent of that owner) and for the project to be consistent with the allowed uses for that piece of land. For example, projects that are not related to livestock production might not be permitted on a pastoral lease, and will usually require permission from both the state and the Native Title holders⁶. Rights to provide the commodity being sold are also required. Each state and territory has a different set of rules dictating who owns the rights to carbon; and where Native Title holders have interests in carbon rights, their permission is required before a project can proceed⁶.

Prioritisation of conservation investment

Decisions made about investments in the conservation economy are based on the investor's priorities. While the processes investors use to determine those priorities are not always clear, they generally draw on prioritisation processes that have been undertaken at the international, national or state/territory level. Priorities are usually based on asset values, their condition, perceived threats to them, and capacity to protect and manage them¹⁷⁰. Priorities are then expressed spatially in the form of maps highlighting priority areas.

Biodiversity and cultural heritage

Protection of natural and cultural values are driven internationally by a number of international conventions, foremost being the World Heritage Convention 1972¹⁷¹ and the Convention on Biological Diversity 1992¹⁷². These conventions do not have explicit spatial conservation priorities, but they do have implications for where conservation effort will be invested.

The World Heritage Convention aims to protect “outstanding examples” of the world’s natural and cultural heritage based on 10 selection criteria. Currently listed World Heritage Areas occur across the globe (Figure 5).

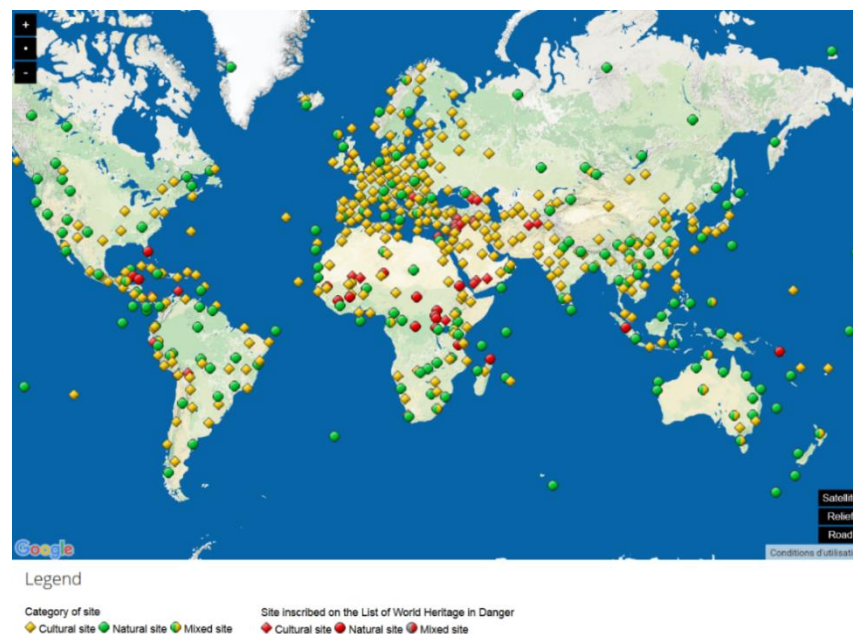


Figure 5. Global map of World Heritage properties

Source: United Nations Educational, Scientific and Cultural Organization (2016)¹⁷³

The Monsoonal North has five World Heritage Areas: Purnululu, Kakadu, Riversleigh, the Great Barrier Reef and a western sliver of the Wet Tropics (Figure 6). The need for properties to be “outstanding examples” imbues the convention with a spatial bias, meaning that further listings in northern Australia are unlikely unless they demonstrate outstanding values that are not possessed by current listed properties in Australia or in similar tropical environments¹⁷⁴.

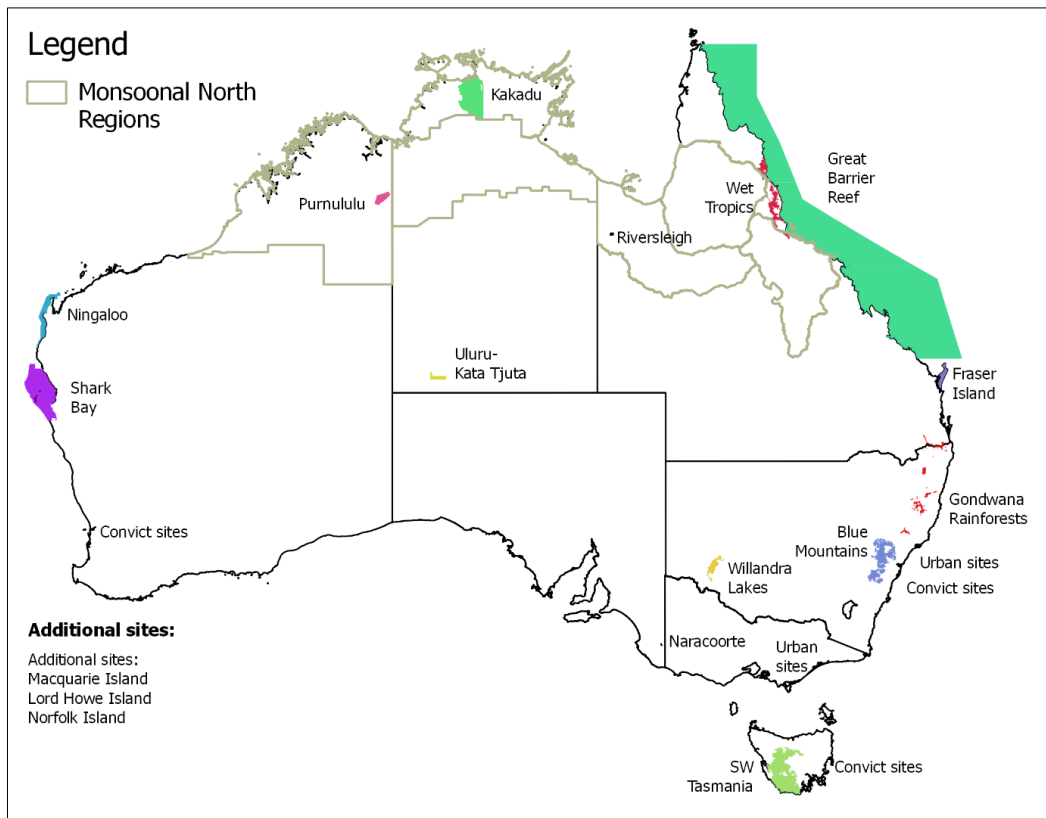


Figure 6. Australian World Heritage properties

Source: Department of the Environment (2015)¹⁷⁵

The Convention on Biological Diversity 1992 (CBD) obliges signatory countries to establish mechanisms to conserve biodiversity, including to:

- Protect ecosystems and natural habitats, and rehabilitate and restore degraded ecosystems
- Maintain viable populations of species in natural habitats and promote threatened species recovery
- Establish and manage a national reserve system and manage surrounding areas as buffers for biodiversity conservation
- Minimise the risk of invasive species to ecosystems, habitats and species
- Minimise the risk of modified organisms to biodiversity and human health
- Respect, preserve and maintain Indigenous knowledge, practices and innovation
- Assist ongoing sustainable use of biological resources, while ensuring biodiversity conservation
- Provide financial and other support for conservation, particularly in developing countries

- Legislate and regulate to:
 - Protect threatened species and populations
 - Address significant adverse effects on biological diversity
 - Ensure appropriate use of biological resources.

The strategic plan of the CBD has 20 targets, many of which have spatial implications, particularly those of achieving conservation of 17% of the world's terrestrial and inland water and 10% of coastal and marine areas; restoring of at least 15% of degraded ecosystems; and reducing the rate of habitat loss and species decline. However, specific areas in which these targets are to be met are not identified, nor are signatory countries obliged to meet specific area or species preservation targets. Being a signatory to CBD, the Australian Government is required to meet its objectives using the agreed mechanisms, but is not constrained in the way they are used or where they are used. All state and territory governments and the Australian Local Government Association have also undertaken to help Australia meet its international environment and heritage conservation obligations by signing the Heads of Agreement on Commonwealth and State roles and responsibilities for the Environment in the 1997 Council of Australian Governments (COAG)¹⁷⁶.

Spatial prioritisation of biodiversity conservation effort has mostly been done by NGOs or researchers. Individual prioritisation systems tend to focus on either high conservation value areas or areas where biodiversity is under significant threat¹⁷⁷. At an international level, northern Australia is a high priority for conservation in the systems based on biodiversity values, but a low priority in systems based on threats¹⁷⁷. Value-focused systems that prioritise parts of the Monsoonal North include those focusing on endemic bird areas¹⁷⁸, centres of plant diversity¹⁷⁹, mega-diversity¹⁸⁰, ecoregions¹⁸¹, undeveloped forests¹⁸² and minimum human impact¹⁸³. These prioritisation processes highlight the Kimberley, Top End and Cape York.

Australia's legal obligations to conserve natural and cultural heritage are addressed at the national, and state/territory level through systems that are supported through legislation. These include the establishment of national reserves, listing of heritage sites and listing of threatened species and communities (Table 3). Neither international conventions nor Australian legislation dictate the prioritisation of conservation effort to protect these assets. Instead, prioritisation of effort is undertaken at the policy and program level. Successive Australian Governments have prioritised managing threats over preserving values. The one exception has been the establishment of terrestrial and marine protected areas. However, even management of protected areas is only prioritised when they face significant threats (as in Reef 2050¹⁸⁴), and marine protection faces an uncertain future (see below).

Table 3. Australian national and state/territory-level conservation prioritisation systems

Commitment: ACAP, Agreement on the Conservation of Albatrosses and Petrels; Bonn Convention, Convention on the Conservation of Migratory Species of Wild Animals; CAMBA, China-Australia Migratory Bird Agreement; CBD 1992, Convention on Biological Diversity 1992; CLMA 1984, Conservation and Land Management Act 1984; CPALSMMPA, Cobourg Peninsula Aboriginal Land, Sanctuary and Marine Park Act (NT); EPA 1994, Environmental Protection Act 1994 (Qld); EPBC 1999, Environment Protection and Biodiversity Conservation Act 1999(Cth); JAMBA, Japan-Australia Migratory Bird Agreement; NCA 1992, Nature Conservation Act 1992 (Qld); NNPA, Nitmiluk (Katherine Gorge) National Park Act (NT); PA, Planning Act (NT); PWCA, Parks and Wildlife Commission Act (NT); Ramsar, Ramsar Convention on Wetlands; ROKAMBA, Republic of Korea-Australia Migratory Bird Agreement; TPWCA, Territory Parks and Wildlife Conservation Act (NT); VMA 1999, Vegetation Management Act 1999 (Qld); WCA 1959, Wildlife Conservation Act 1950 (WA); WHC 1972, World Heritage Convention 1972; WRA 2005, Wild Rivers Act 2005 (Qld)

Name	Assets	Metrics	Commitment	Source
National				
National reserve system	Terrestrial ecosystems	Comprehensiveness, adequacy and representativeness	EPBC 1999, CBD 1992	185
Marine reserve system	Marine ecosystems	Currently under review	EPBC 1999, CBD 1992	186
Threatened species list	Plants and animals	Population size and decline, distribution, probability of extinction	EPBC 1999, CBD 1992	187
Threatened ecological communities	Ecosystems	Extent and rate of decline, threatened species habitat value, condition, probability of extinction	EPBC 1999, CBD 1992	188
Migratory species	Migratory reptiles, birds, mammal & sharks	Movement across international boundaries	EPBC 1999, ACAP, Bonn Convention, JAMBA, CAMBA, ROKAMBA	189
World Heritage List	International heritage	10 IUCN natural and cultural criteria	EPBC 1999, WHC 1972	190
Commonwealth Heritage List	Natural and cultural heritage values of Commonwealth-owned places	Nationally significant natural or cultural values	EPBC 1999	191
National Heritage List	Natural and cultural heritage	Nationally significant natural or cultural values	EPBC 1999	192
National Estate List	Natural and cultural heritage	State/territory level or locally significant natural or cultural values	Repealed	192
Ramsar wetlands	Wetlands	Representativeness, rarity or uniqueness, biological diversity	EPBC 1999, Ramsar	193

.../continued

Table 3. continued

Name	Assets	Metrics	Commitment	Source
National (continued)				
Nationally Important Wetlands	Wetlands	Representativeness, ecological function, critical habitat, threatened species, cultural significance	None	194,195
National Biodiversity Hotspots	Plant and animal species	Integrity, biological diversity, endemic species	None	196
High Conservation Value Aquatic Ecosystems	Wetlands	Diversity, distinctiveness, vital habitat, Evolutionary history, naturalness, representativeness	None	197 198
Water Quality Hotspots (formerly Coastal Hotspots)	Coastal and marine environments	Conservation values threatened by water quality decline resulting from population pressure and poor land management	None	199
Wild Rivers	Rivers and floodplains	Alteration to flow regime	None	200
Important Bird Areas	Bird habitat	Diversity and abundance, rarity, threatened species, management potential	None	201
Western Australia				
Terrestrial protected areas	Terrestrial ecosystems	Comprehensiveness, adequacy, representativeness	CLMA 1984	185
Marine Protected Areas	Marine ecosystems	Comprehensiveness, adequacy, representativeness	CLMA 1984	202
Threatened species list	Plant and animal species	Population size, distribution, rate of decline, probability of survival	WCA 1950	203
Threatened ecological communities	Vegetation communities	Extent, individual occurrences, modification, decline, rehabilitation potential	None	203
Priority areas for conservation of Western Australian coastal fishes	Coastal fish	Species richness, endemism, biogeographic zoning	None	204
Northern Territory				
Protected Area Estate	Ecosystems	Comprehensiveness, adequacy and representativeness	TPWCA CPALSMPA NNPA PWCA	185
Threatened species list	Plant and animal species	Population size, distribution, rate of decline, probability of survival	TPWCA	205
Sites of Conservation Significance	Biodiversity values		None	206
Eco-Link	Broadscale biodiversity values	Connectivity	None	207,208
Sensitive vegetation communities	Vegetation communities	Communities sensitive to clearance (mangroves, monsoon rainforest, riparian vegetation, sandsheet and vegetation containing large trees with hollows suitable for fauna)	PA	209

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Table 3. continued

Name	Assets	Metrics	Commitment	Source
Queensland				
State reserve system	Protected area estate	Comprehensiveness, adequacy and representativeness	NCA 1992	185
Threatened species list	Plant and animal species	Lack of recent records; population size, distribution, rate of decline, probability of survival, habitat extent	NCA 1992	210
Regional ecosystem biodiversity status and vegetation management class	Vegetation communities	Extent of regional ecosystem relative to pre-clearing extent	VMA 1999	211
Critical habitat	Habitat essential for a viable population of protected wildlife or community of native wildlife	Not in use (none declared)	NCA 1992	212
Back on Track species prioritisation framework	Plant and animal species	Probability of extinction, consequences of extinction, potential for recovery	Policy	213,214
Biodiversity Assessment and Mapping Methodology (BAAM)	Ecosystems and species habitat	Critical habitat, threatened species, regional ecosystem biodiversity status, important wetlands, extent, representativeness, condition, biological diversity, context and connectivity	None	215
AquaBAAM	Aquatic ecosystems and species habitat	Critical habitat, threatened species, regional ecosystem biodiversity status, important wetlands, extent, representativeness, condition, biological diversity, context and connectivity	None	216
Great Barrier Reef protection measures	GBR water quality	Catchments and industries contributing to GBR pollution	EPA 1994	217
Wild Rivers	Rivers, floodplains and artesian basin	Lack of modification	WRA 2005 (Repealed)	91,218

Regardless of their robustness, prioritisation systems that are not obligated under international conventions appear to go in and out of favour. An example of this is the brief use of High Conservation Value Aquatic Ecosystems to prioritise Caring for our Country investment²¹⁹.

Moreover, despite a decade of science, consultation and planning, marine management plans that were scheduled to come into effect in July 2014 have been shelved. Instead, a review of marine planning is being conducted in order to deliver on the federal government’s election commitment for a ‘More Competitive and Sustainable Fisheries Sector’¹⁸⁶. While currently still available from the Department of Environment website²²⁰, much of the material that underpinned the abandoned plans is annotated with the following proviso:

Caution: archived content

This content may have been superseded, or served a particular purpose at a particular time. It may contain references to activities or policies that have no current application. Many archived documents may link to web pages that have moved or no longer exist, or may refer to other documents that are no longer available.

Even legislative commitments are subject to change when these fall outside international obligations, as has been demonstrated by revisions of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC) to expunge the National Estate and remove the requirement for threatened species recovery planning. There are also signs of dilution of conservation commitment at both state/territory and national levels. For example, on 28 Jan 2014, the 2005 Northern Territory Parks and Conservation Masterplan²²¹ could only be accessed online from the Northern Territory Cattlemen’s Association website. In its place, the Parks and Wildlife Commission of the Northern Territory is currently developing a *Parks Tourism and Recreation Masterplan*²²². In Queensland, as part of three sets of amendments to the *Nature Conservation Act 1992* in 2013, National Parks (Scientific), National Parks (Recovery), Wilderness Areas, World Heritage Management Areas and International Agreement Areas were removed from recognised protected area classes^a. Amendments currently under consideration to restore National Parks (Scientific)^b, if adopted, will not restore recognition of World Heritage Areas.

Therefore, although Australian and state and territory governments are obliged to list and protect threatened species and conserve biodiversity through a national reserve system, the mechanisms that they choose to employ to do this are subject to change. Australia’s Biodiversity Conservation Strategy 2010-2030²²³ (currently under review) proposes action in “priority areas” but neither explains where these are, nor provides any criteria for identifying them. The National Landcare Programme has no priority areas, but sub-programs that spatially bias investment by prioritising

^a *Nature Conservation and Other Legislation Amendment Act (No. 2) 2013 (Qld)*

^b *Nature Conservation and Other Legislation Amendment Bill 2015 (Qld)*

populous areas and degraded landscapes (see [National Landcare Programme and Green Army](#)). Consequently, prioritisation schemes can be used to inform investment, but there is no obligation for governments or other investors to invest according to them. Hence, the currency of prioritisation schemes listed in Table 3 is unclear. Nevertheless, the science that underpins them is still robust, and is likely to inform investment by NGOs, and, potentially by future governments.

Consistent with prioritisation at the global level, prioritisation of conservation effort at the national level is more likely to rate northern Australia highly when based on protection of values than it is when based on threats. In the Monsoonal North, threatened species are numerous only in the Burdekin Dry Tropics and the eastern edge of the Northern Gulf (Figure 7a), and threatened communities have been identified only in the Burdekin Dry Tropics and at scattered locations in the Queensland gulf regions (Figure 7b). The Monsoonal North also contains two priority areas for water quality improvement: the Burdekin Dry Tropics to protect the Great Barrier Reef, and Darwin Harbour (Figure 8).

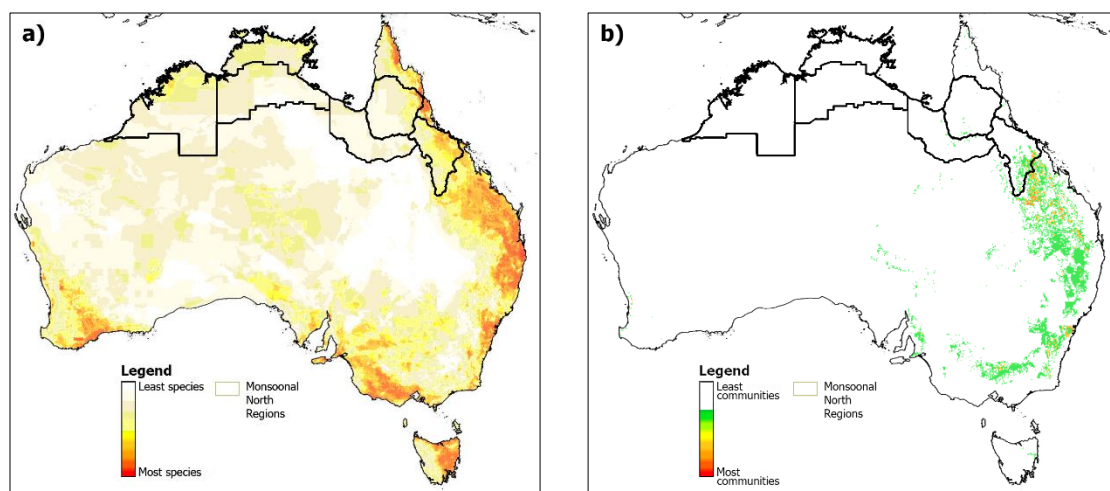


Figure 7. Priority areas based on relative abundance of (a) nationally threatened species, (b) nationally threatened communities in relation to the Monsoonal North regions

Source: (a) Environmental Resources Information Network (2008)²²⁴; (b) Environmental Resources Information Network (2008)²²⁵



Figure 8. Priority areas for water quality improvement

Source: Department of the Environment (2015)¹⁹⁹

Northern Australian landscapes score well on measures of intactness and low levels of disturbance (Figure 9a-c). The Kimberley and Kakadu and coastal sections of the Gulf Savanna and Burdekin Dry Tropics have high concentrations of migratory species (Figure 9d), and the Kimberley and Einasleigh and Desert Uplands regions of Queensland are recognised biodiversity hotspots (Figure 10). Within the Monsoonal North, combining prioritisation systems based on values and threats highlights the relative importance of the Kimberley and Top End for protection of *in situ* biodiversity values and the Burdekin Dry Tropics for GBR Water Quality improvement (Figure 11).

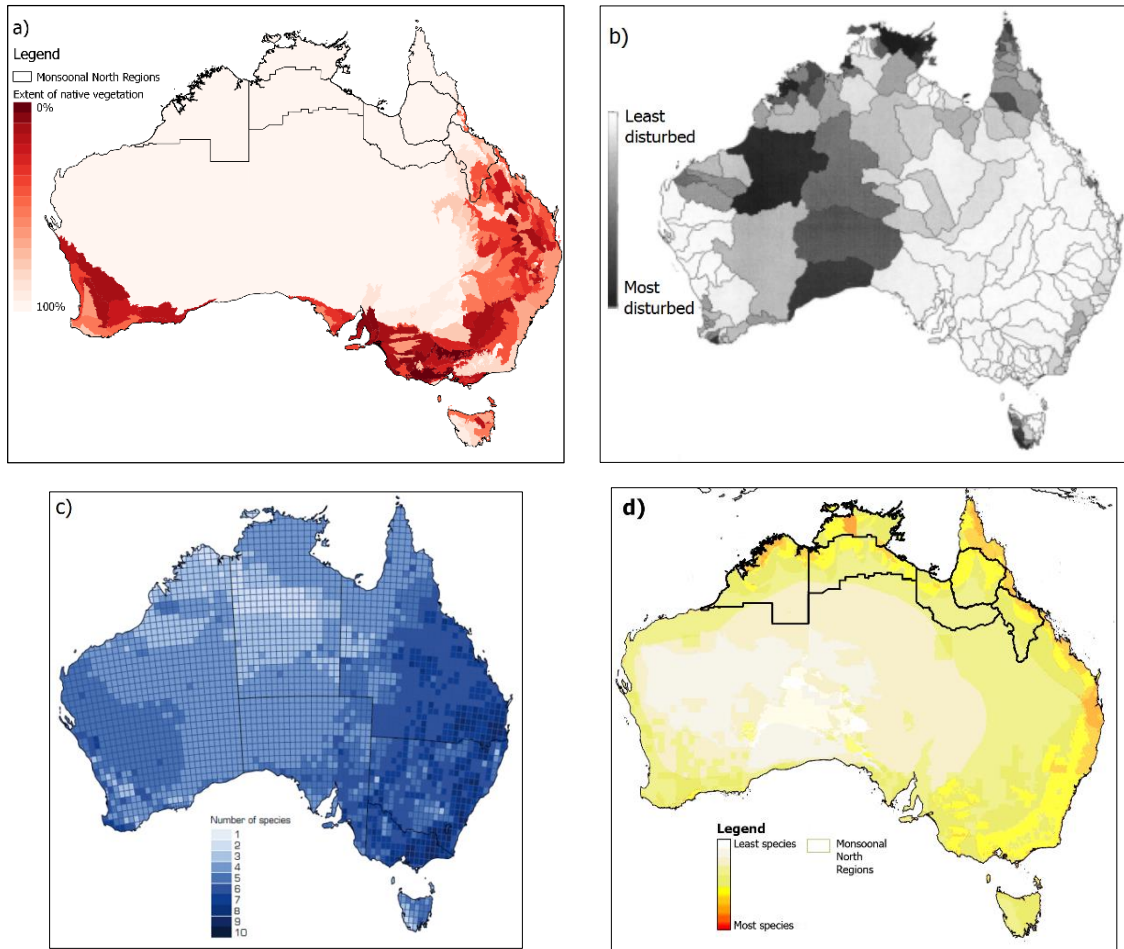


Figure 9. Prioritisation of Australian landscapes based on naturalness a) bioregional extent of native vegetation, b) least disturbed river systems, c) number of invasive vertebrate species present and d) migratory species

Sources: a) adapted from National Land and Water Resources Audit (2002);²²⁶ b) Adapted from Stein et al. (2001)²⁰⁰; c) West (2008)²²⁷ and d) ERIN (2009)²²⁸

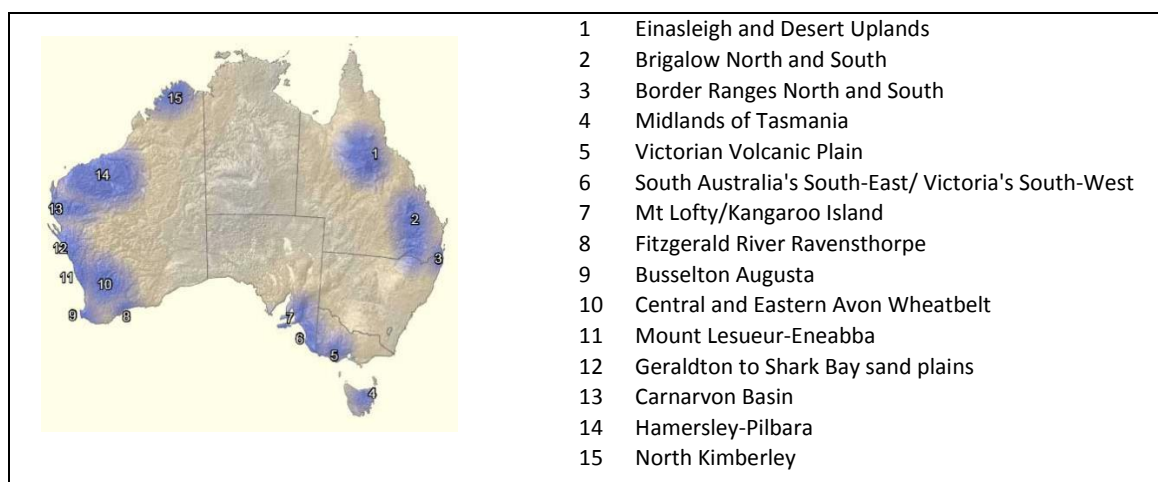


Figure 10. Australian biodiversity hotspots

Source: Department of the Environment²²⁹

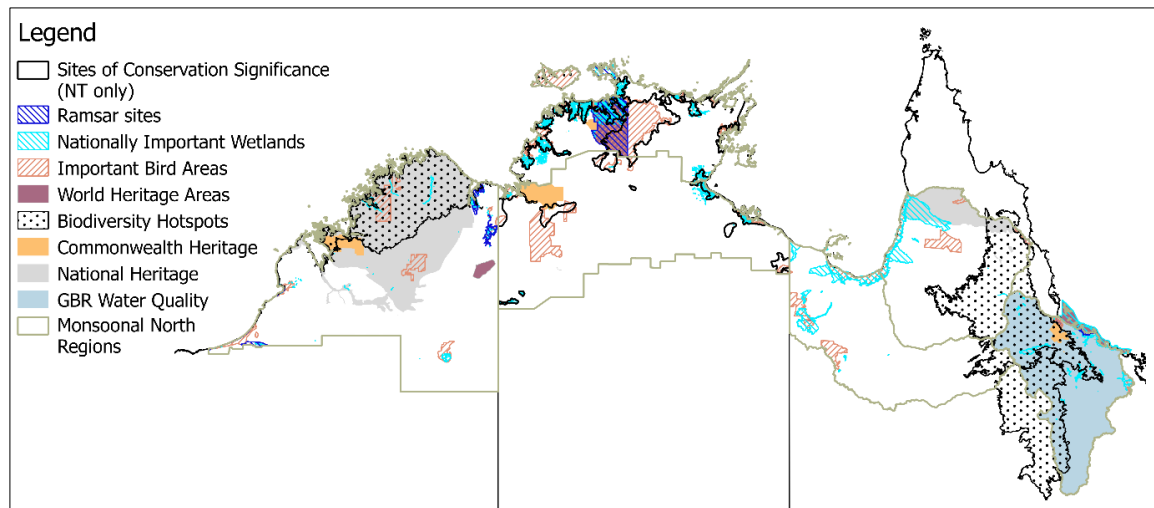


Figure 11. Priority areas for biodiversity and heritage conservation in the Monsoonal North

Source: see Table 3

It is now accepted that biodiversity conservation effort is best invested in areas that are most resilient to climate change. This does not negate the importance of addressing current knowledge gaps and threats. Rather, it means extending knowledge about species and environments and targeting measures to protect species in areas that are most likely to remain viable habitats for the most species in times of climatic stress^{230,231}. Areas of high elevation are considered particularly important for retaining species vulnerable to heat stress, but are generally lacking in the Monsoonal North.

Modelling based on climate surfaces has shown that habitat suitability for a range of species is expected to decline through the Monsoonal North, but increase in the Burdekin Dry Tropics; and remain high in parts of the Kimberley, Top End and Northern Gulf and the gulf region straddling the Northern Territory-Queensland border (Figure 12). These projected changes incorporate a combination of species loss and species gain (Figure 13). Highest losses are expected in the region between Darwin and Kununurra and highest species gains are expected in the Einasleigh Uplands. Species loss is likely if habitat becomes unsuitable as modelling predicts. However, species gain is less certain because of barriers to dispersal caused by areas of unfavourable climate, habitat and land use²³². Therefore, high emphasis is placed on areas that are likely to remain suitable for their current suite of species and connectivity to facilitate species movement^{231,233}. The areas likely to have the most stable climate in the Monsoonal North are the North Kimberley, eastern Top End and Einasleigh Uplands (Figure 14). Caution should be used when interpreting these models as they are based on the available network climate recording stations, which does not necessarily

capture regional variability, and the cannot capture the effect of climate driven disturbances, such as cyclones.

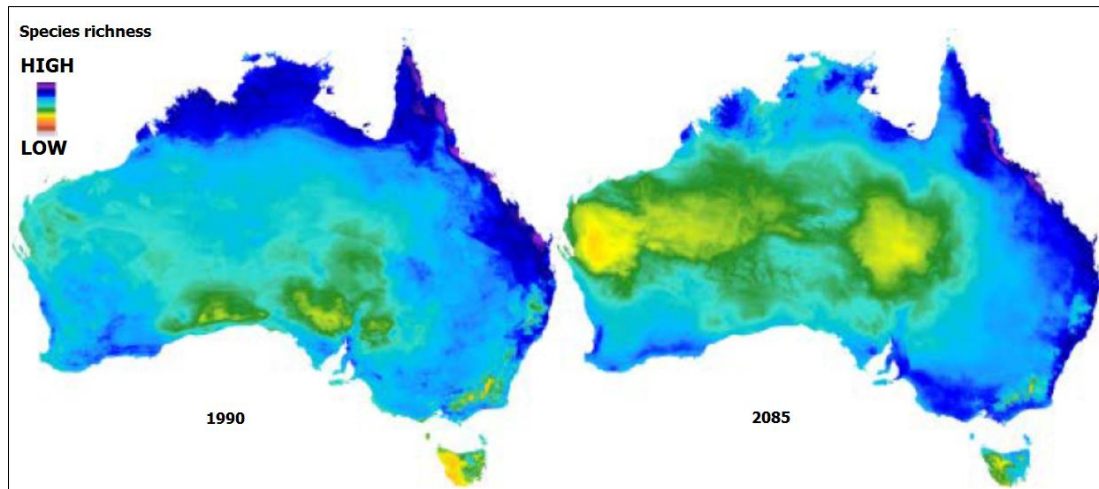


Figure 12. Projected changes in richness of bird, mammal, reptile and amphibian species, as measured by habitat suitability

Source: Reside et al. (2013)²³⁴

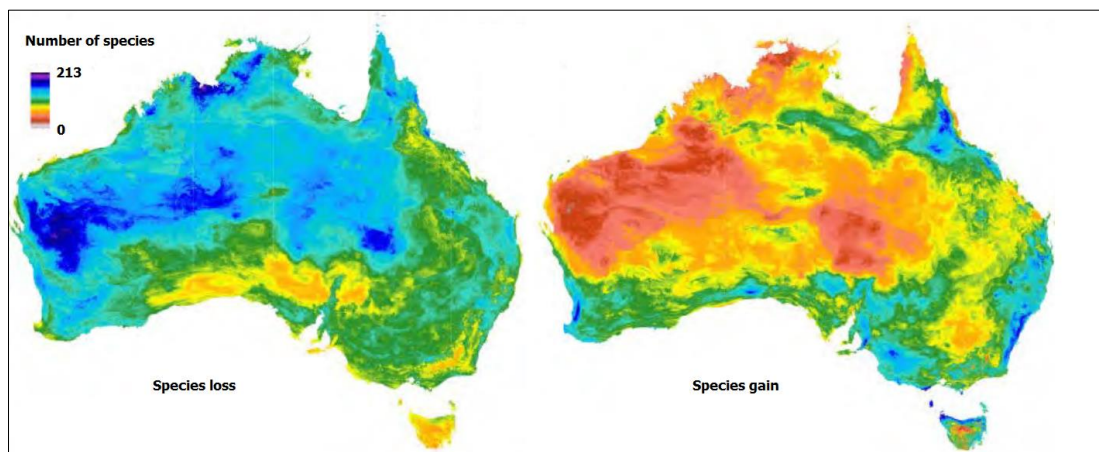


Figure 13. Projected loss and gain of bird, mammal, reptile and amphibian species by 2085 as measured by habitat suitability

Source: Reside et al. (2013)²³⁴

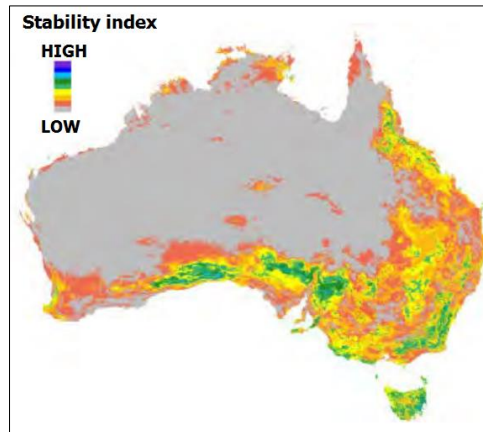


Figure 14. Projected stability of habitat suitability

Source: Reside et al. (2013)²³⁴

Strengthening connectivity was the concept behind the Trans-Australia Eco-Link project²³⁵, which planned to provide habitat corridors between Kakadu National Park, reserves in the Darwin area, Litchfield National Park and Gregory National Park in the Monsoonal North, as well as extending the corridor through central Australia to the Southern Ocean (Figure 15)^{207,208}. While dedicated funding is no longer available for this project, the principles behind the Trans-Australia Eco-link corridor continue to be supported by the South Australian Government^a. The project is no longer supported in the Northern Territory.

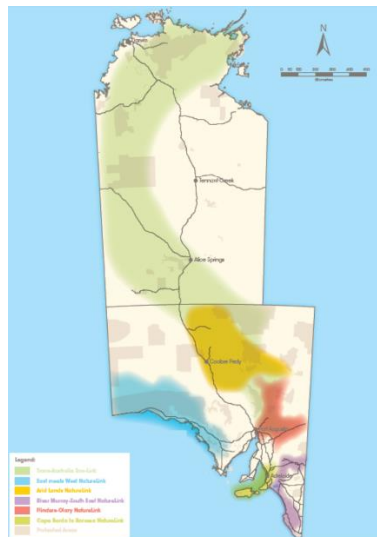


Figure 15. Trans-Australia Eco-Link corridor

Source: South Australian Department of Environment and Heritage (2010)²³⁵

^a Personal communication from Conservation and Land Management Branch, Department of Environment, Water and Natural Resources, 25 September 2015

Incorporating climate change considerations (i.e. focusing on areas with expected highest habitat stability and making provision for movement across the landscape by maintaining habitat condition) into prioritisation of conservation effort largely reinforces the importance of the areas and activities prioritised under the current climate (Figure 11). It consequently places additional impetus for conservation efforts in the North Kimberley and Einasleigh Uplands, and perhaps shifts the emphasis in the Top End to eastern Arnhem Land.

Activities that are recognised as critical for biodiversity conservation in northern Australia include management of fire, weeds pest animals, total grazing pressure and protection of water-remote areas^{108,236-244}. These activities need to be backed by strategic research and planning. Declining mammal fauna has been shown to benefit from cattle exclusion in studies in the Kimberley²⁴⁵ and exclusion of cats in the Northern Territory²⁴⁶. While the value of a diverse fire regime has been questioned²⁴⁷, we do know that several species of plants and animals can be eliminated by widespread, intense fires²⁴⁸, and that a patchy fire regime allows species to recolonise burnt areas as the vegetation recovers²⁴⁹.

Measures to address biodiversity decline in the north have traditionally included the establishment of protected areas by state, territory and federal governments, NGOs and Indigenous groups^{7,36,242,250,251}. Reservation of lands in conservation reserves provides areas with minimal pressures from grazing and weeds, but the value of these reserves is influenced by the condition of land across the region²⁵². Therefore, maintaining habitat outside reserves in good condition, as directed by the Biodiversity Convention, is also essential.

Biosecurity surveillance

Australia is currently free of many of the pests, parasites, diseases and pathogens that are found in neighbouring countries^{253,254}. These non-native organisms have the potential to affect agricultural crops, livestock, native biodiversity and human health. The risk of them entering Australia is forecast to increase as a result of agricultural expansion and intensification along with increasing global travel and trade and climate change^{107,253,255,256}. Priority areas for averting biosecurity risks in remote areas are Cape York Peninsula extending into the Northern Gulf, the Top End and parts of the Kimberley, Gulf Savanna and Southern Gulf (Figure 16).



Figure 16. Sources of biosecurity risks for northern Australia

Source: Department of Agriculture (2012)²⁵⁷

<http://www.nerptropical.edu.au/sites/default/files/publications/files/NAQS%20Overview.pdf>

Weed and pest animal control

Many of the weeds and pest animals already in northern Australia have a substantial impact on biodiversity, cultural values, water quality and agricultural production^{16,17,237,258-263}. There are both private and public benefits to controlling weeds and pest animals. A study in north Queensland and the Daly River region of the Northern Territory showed that pastoral properties on which weeds and pest animals are managed well have the best production and conservation outcomes^{264,265}, and effective management reduces weed and pest animal impacts on adjoining conservation and pastoral lands²⁶⁶⁻²⁶⁸.

A certain level of control is expected of agricultural and pastoral producers, and therefore comes under duty-of-care provisions of the legislation in all jurisdictions^a. However, the intractable nature of some weeds means that governments are willing to subsidise their control for wide public benefit²⁶⁹. Subsidised weed and pest animal control has been a central part of government sponsored NRM programs since their inception²⁷⁰⁻²⁷² and continues to be so²⁷³. However, the amount of funding available is declining. Australian Government NRM funding (which covers weed and pest management) peaked between 2008 and 2012²⁷⁴. Queensland Government funding for weed control peaked between 1995 and 2003 with the SWEEP program¹³⁰. However, a renewed commitment to weed and pest animal management was promised in the Agricultural Competitiveness White Paper, with an additional \$50m being allocated over four years from July 2015, along with \$50m to improve biosecurity emergency response capacity²⁷⁵. Though not stated in the White Paper, it is likely that this funding will be delivered through the National Landcare Programme.

Marine debris

Vast volumes of human-generated rubbish (including plastics and abandoned nets) drift about in the world's oceans, posing a serious threat to marine biodiversity^{276,277}. Untold numbers of animals become entangled in nets and plastic bags, affecting their ability to catch food or causing them to drown. Others ingest plastics, causing them to suffocate or starve. Animals that are affected include sea turtles, whales, dolphins, dugong, sharks, rays and seabirds²⁷⁷⁻²⁸¹.

Most marine debris is plastic waste, which is most abundant in Australian and adjacent waters along the coast between Townsville and Rockhampton (Figure 17). Metal and glass waste is also

^a Western Australia: *Biosecurity and Agriculture Management Act 2007*; Northern Territory: *Weeds Management Act and Territory Parks and Wildlife Conservation Act*; Queensland: *Land Protection (Pest and Stock Route Management) Act 2002*

significant²⁸². Discarded fishing nets (ghost nets) are significant in northern waters, with 90% of ghost nets found in the northern Gulf of Carpentaria (Figure 18). The areas in the Monsoonal North that are the highest priority for removal of marine debris are, therefore, the Gulf of Carpentaria for nets and the coast of the Burdekin Dry Tropics for plastic.

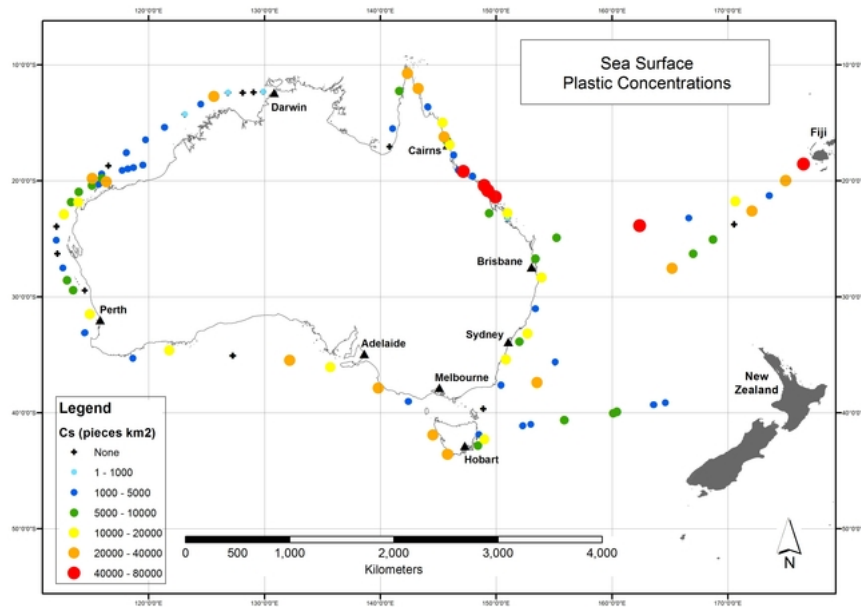


Figure 17. Distribution of plastics in Australian and adjacent waters

Source: Hardesty and Wilcox (2014)²⁸³

<https://theconversation.com/the-oceans-are-full-of-our-plastic-heres-what-we-can-do-about-it-31460>

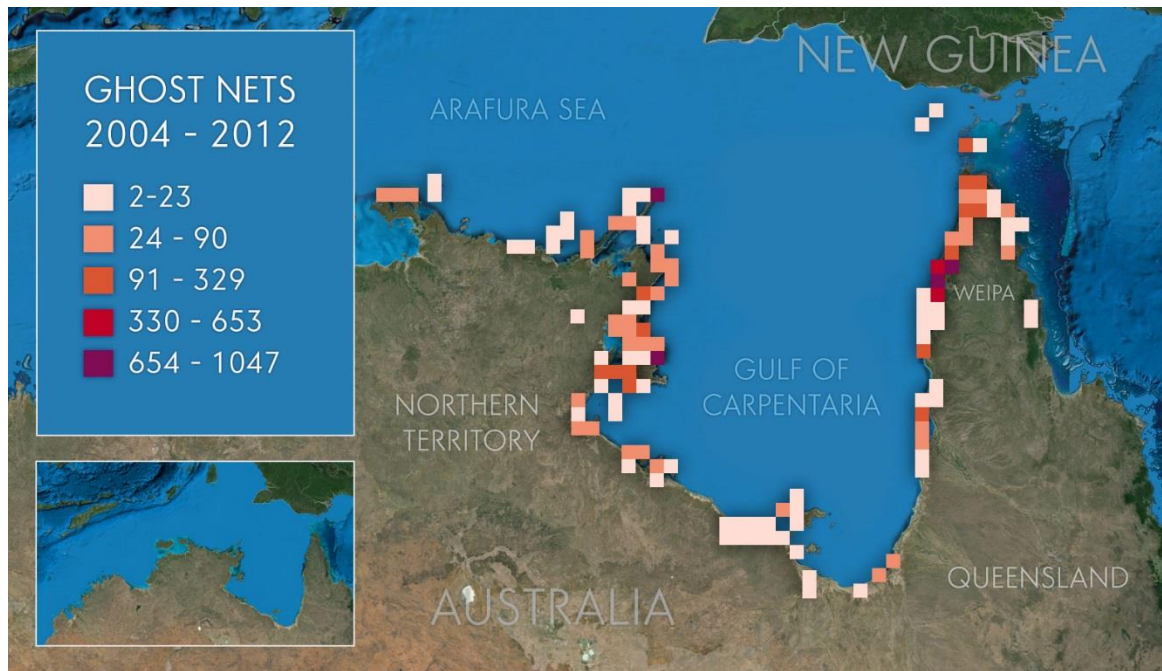


Figure 18. Abundance and distribution of ghost nets from 2004 – 2012

Source: Ghost Nets Australia <http://www.ghostnets.com.au/the-problem/where-does-the-rubbish-come-from/where-are-the-hotspots>

Carbon investments

Internationally, action on climate change is coordinated through the United Nations Framework Convention on Climate Change 1992 (UNFCCC)²⁸⁴, to which Australia is one of 195 signatories. The aim of the convention is “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (p. 9). UNFCCC commits parties to report on emission generation and develop plans to reduce emissions and their impact on climate change. While individual countries commit to emission reduction targets through the protocols, mechanisms for doing so are left to the discretion of the country. UNFCCC also commits signatories to supporting climate change mitigation in developing countries by contributing to the Global Environment Facility.

As part of the Kyoto Protocol, UNFCCC expected OECD^a countries to reduce their GHG emissions to 5% below 1990 levels by 2012. Because of its heavy dependence on fossil fuels, Australia only undertook to limit growth in emissions over this period to a level that was 8% above 1990 levels,

^a Members of the Organisation for Economic Cooperation and Development (OECD) in 1992, which includes 32 first-world countries and 12 countries with economies in transition

but, in fact, managed to limit this growth to 2.5%²⁸⁵. Australia has subsequently committed to reducing its emissions to 5% below 2000 levels by 2020 (and 26-28% below 2005 levels by 2030).

Australia's reduction in greenhouse gas emissions up to 2012 were largely achieved through Land Use, Land-Use Change and Forestry (LULUCF) (Figure 19), mostly as a result of state governments imposing regulations limiting vegetation clearance²⁸⁵. However, changes to vegetation clearing regulations (along with improving profitability of the agricultural sector as a result of increasing commodity prices) are expected to increase emissions from the land use sector (Figure 20a).

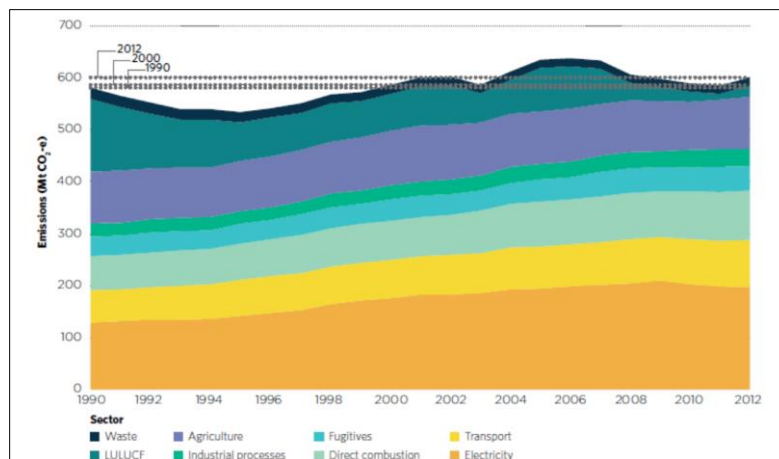


Figure 19. Australian greenhouse gas emissions by sector

Source: Climate Change Authority (2014)²⁸⁵

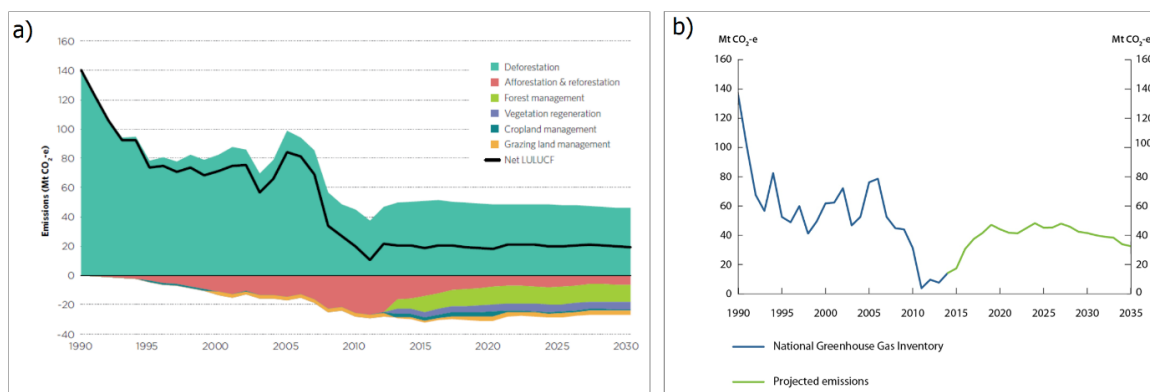


Figure 20. Historical and projected Australian GHG emissions from land use, land use change and forestry before (a) and after (b) accounting for changes to vegetation management legislation

Source: Department of the Environment (2015)²⁸⁶

The GHG emission projections shown in Figure 20a indicate that forest and vegetation regeneration and forest management are seen as particularly important in helping Australia meet

its 2030 greenhouse gas emission reduction target. Avoided deforestation also becomes important to avert the spike in emissions as a result of an expected resurgence of tree clearance (Figure 20b). The graph also indicates that improvement to management of crop and grazing lands is expected contribute only a small portion of emission reductions from LULUCF.

Emissions from agriculture (which accounts for approximately 17% of Australia’s GHG emissions) are accounted separately from those generated by LULUCF, and include livestock digestive processes; manure management; nitrous oxide emissions from cropping and pastureland soils; and burning of savannas and crop residue. Total agricultural emissions are expected to remain unchanged through to 2020 and then escalate as a result in expansion of cropping and livestock production (Figure 21). Efforts to improve efficiency are therefore important.

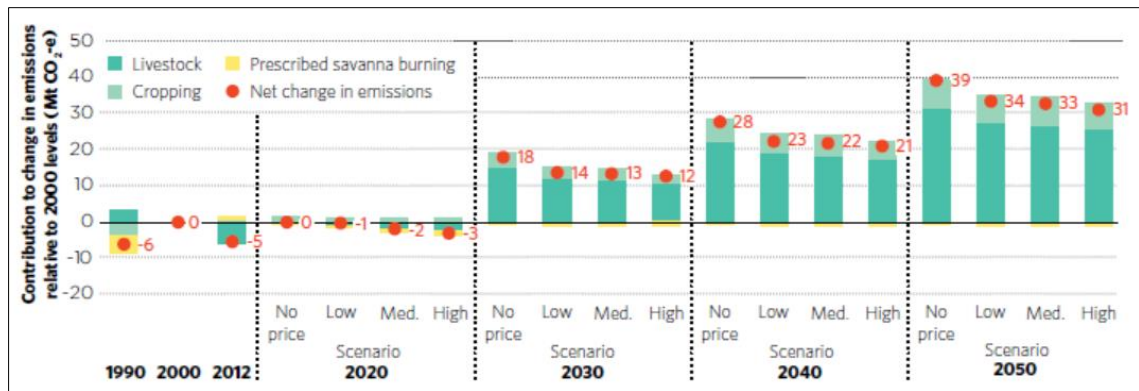


Figure 21. Historical and projected contribution of livestock, cropping and savanna burning to Australian GHG emissions
Source: Department of the Environment (2015)²⁸⁶

Most states and territories reduced their GHG emissions between 2000 and 2013²⁸⁷. Only Western Australia’s emissions substantially increased, largely as a result of increased energy production. Queensland consistently ranks as one of the highest GHG emitters, producing 29% of Australia’s emissions in 2013. It also produced the most agricultural emissions (31%), notably from livestock (34%). While most jurisdictions had achieved net carbon storage through LULUCF (with abatement from reforestation and forest management more than compensating for emissions from deforestation), LULUCF in Queensland generated net emissions of 25.2 Mt CO₂-e (a measure of warming potential of GHGs based on the amount of carbon dioxide required to produce the same level of warming). This was because Queensland generated by far the most emissions from vegetation clearance (48%), despite emissions from this source being reduced by 63% since 2000. Only three jurisdictions generated substantial emissions from savanna burning: Northern Territory (40%), Queensland (30%) and Western Australia (30%).

Australia's ERF has approved several methodologies that enable landholders in northern Australia to derive income from storing carbon or reducing GHG emissions in line with the Kyoto Protocol. These cover avoided deforestation, tree planting and regrowth, reducing the spread of late dry season fires, reducing emissions from livestock and increasing soil carbon. Unfortunately, there is no scope for developing a wetland restoration method under the ERF, despite tropical wetlands sequestering large amounts of carbon each year, as wetlands are not recognised as valid carbon sinks under the Kyoto Protocol^{288,289}. Priority areas for approved methods or methods that are under development are discussed below.

Avoided deforestation

Carbon credit generation through avoided deforestation can only be derived from land that still has native vegetation cover^a and can be legally cleared^b. Currently an approved methodology only applies where a permit to clear was issued before 1 July 2010. However, it is possible that a future methodology may be approved for land that can be cleared without a permit, which is now the case on pastoral lands in Western Australia, North Territory and Queensland¹⁵³⁻¹⁵⁶. Were this to occur, areas of the highest priority (and highest profitability) will be the areas currently storing the most carbon. Carbon storage is greatest in areas of greatest biomass (as indicated by the productivity index), but also affected by climate, soil and vegetation type²⁹⁰. So, most carbon is stored in the tall forests along Australia's eastern seaboard and in the country's far south-east and south-west. Much less carbon is stored in arid environments. Although large amounts can accumulate in arid land vegetation following high rainfall, it is then released during dry conditions²⁹¹. These patterns mean that the highest carbon stocks in the Monsoonal North are in the Top End, North Kimberley and eastern parts of Northern Gulf as shown in Figure 22, and, though not included in this figure, it follows that carbon storage will also be high in the highest rainfall areas of the Burdekin Dry Tropics.

^a With trees of at least 2m high providing at least 20% crown cover

^b ERF methods: Avoided deforestation, Avoided deforestation 1.1, Designated Verified Carbon Standard Projects

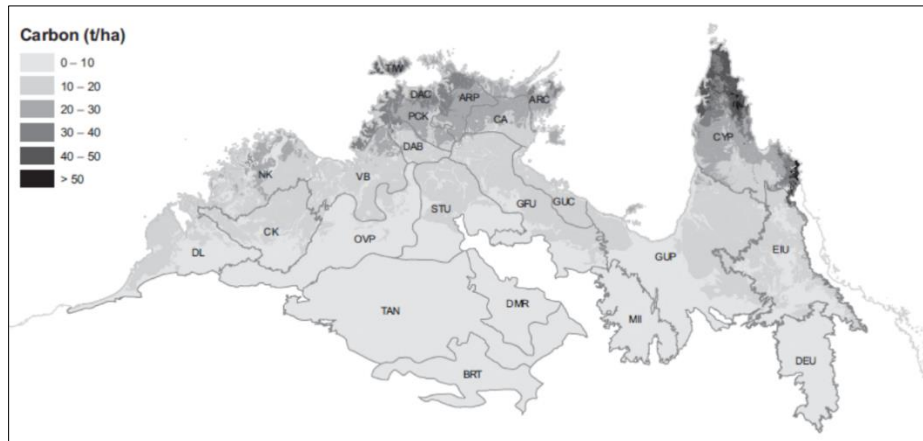


Figure 22. Estimated above-ground tree carbon stocks in northern Australian savannas

Source: Cook et al. (2015)²⁹²

Tree planting and regrowth

Carbon credits can also be generated by allowing native vegetation^a to regrow on land that has been cleared^b or by undertaking environmental planting^c. Cleared land can also be converted to forest through planting of non-native trees^d. In these cases, potential carbon storage will be greatest in the areas that originally supported the tallest forests. Therefore, priority areas (and most profitable areas) for regrowth and tree planting will be cleared land in the same geographical areas that are a priority for avoided deforestation. The greatest potential for establishing forests from one of these methodologies in the Monsoonal North will, therefore, be in the Burdekin catchment (Figure 23a), because this is where land clearing has been most extensive (as indicated by the extent of native vegetation mapped in Figure 9a).

Tree planting and regrowth can also have biodiversity benefits, and may, therefore, attract a price premium where the purchaser is interested in investing in both biodiversity and carbon. Unfortunately, the areas that are a priority for tree planting and regrowth in the Monsoonal North are a low priority for biodiversity conservation, as few of the communities that would be re-established are currently considered threatened (Figure 23e). Hence, modelling shows that revegetation based on carbon and biodiversity values will be profitable in very few areas north of the tropic, and these are largely confined to the high rainfall zones of the east coast and inland from Darwin²⁹³.

^a With the potential for trees of at least 2m high to provide crown cover of at least 20%

^b ERF method: Native Forest from Managed Regrowth

^c ERF methods: Reforestation and afforestation 2.0, Reforestation by environmental or mallee plantings – FullCAM (Full Carbon Accounting Model)

^d ERF methods: Reforestation and afforestation 2.0, Measurement based methods for new farm forestry plantations

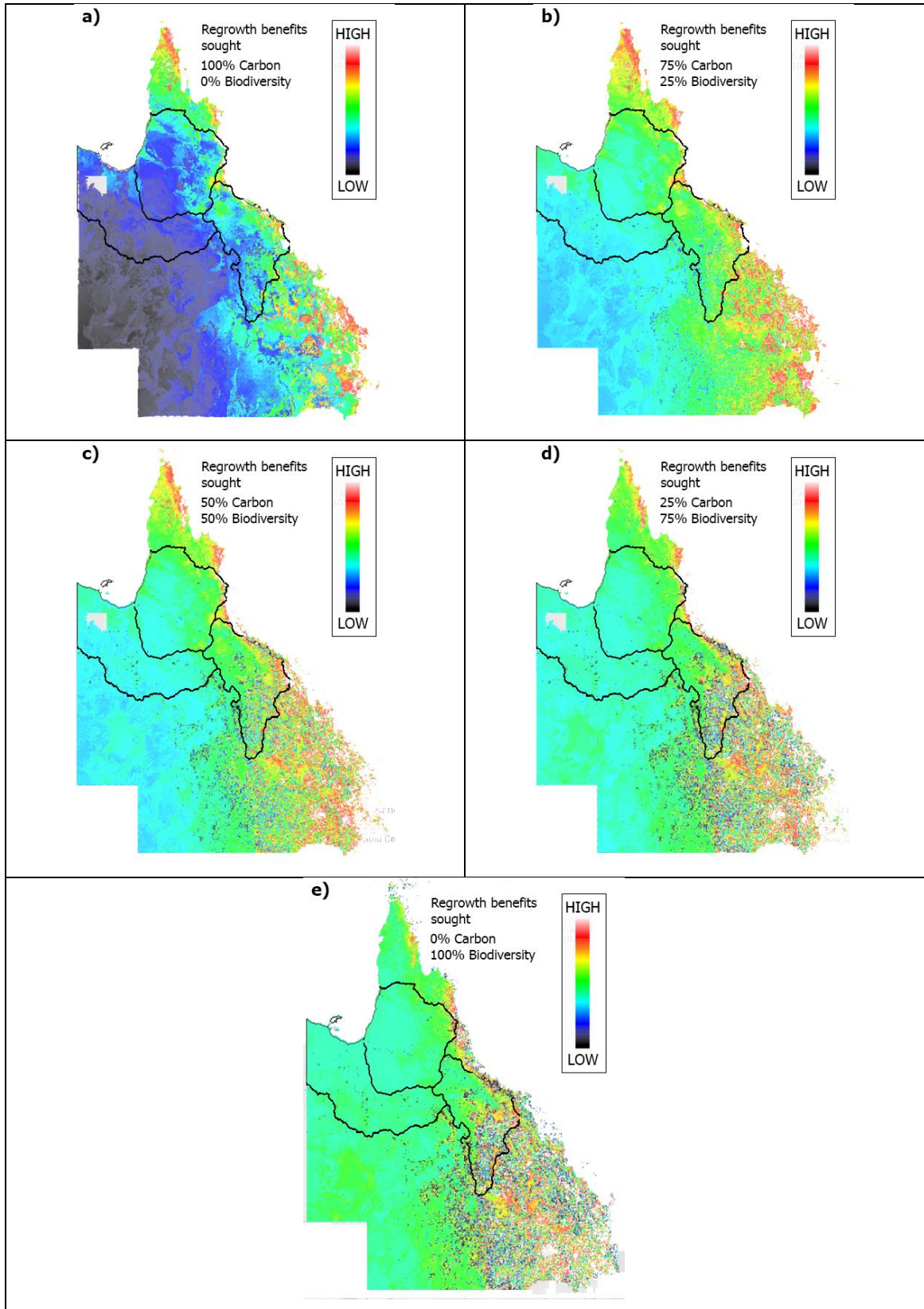


Figure 23. Priority areas for reforestation in Queensland based on varying combinations of carbon and biodiversity values

Source: Department of Environment and Heritage Protection (2015)²⁹⁴

Fire management

Modifying burning regimes to reduce emissions from late dry season fires in tropical savannas is applicable across much of the Monsoonal North^a. Under the Savanna Burning (and Savanna Fire Management) methods, it is the methane and nitrous oxide products of burning that provide the carbon credits, as it is assumed that these GHGs remain in the atmosphere for several decades longer than carbon dioxide does.

As is the case for methods that involve sequestering carbon in trees, managing savanna fires will be most effective at abating emissions in areas that have the greatest biomass, as long as these areas are not too wet to carry fire. The original Savanna Burning method was, therefore, restricted to areas receiving more than 1,000 mm annual average annual rainfall. While the recently approved Savanna Fire Management method extends to areas receiving down to 600 mm, low annual biomass production in these areas makes projects less profitable than projects in the higher rainfall zone.

Areas where modifying savanna burning is viable depends on the price of carbon (Figure 24). At \$60/tonne, projects should be viable across most of northern Australia²⁹⁵. At the 2015 price of about \$15/tonne, the viable area is considerably reduced, but still provides the basis of a carbon economy across sections of the north.

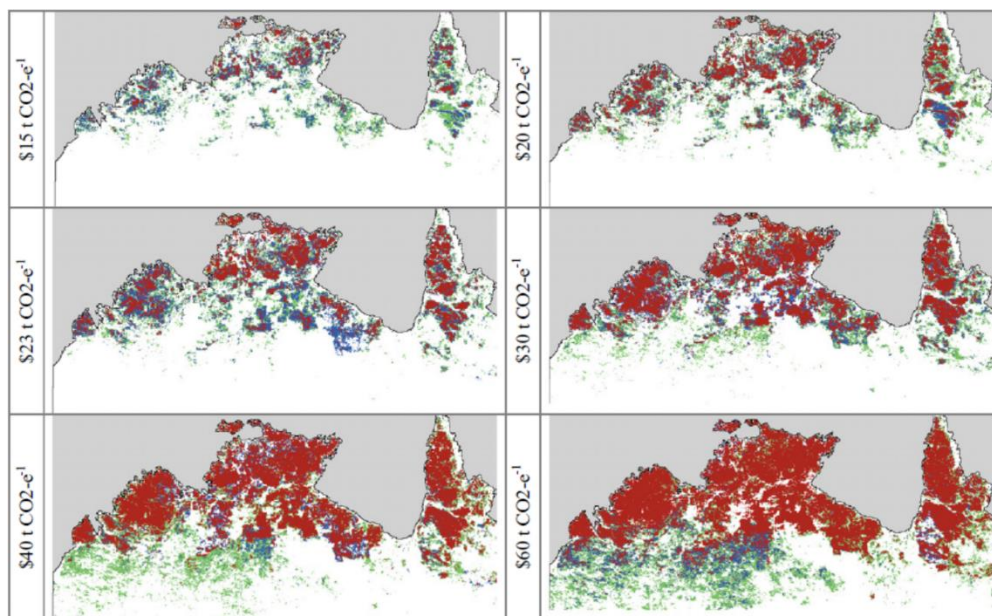


Figure 24. Viability of managing fire to reduce carbon emissions achieving reductions of 25% (red), 34% (blue) and 48% (green) under six carbon prices

Source: Heckbert et al. (2012)²⁹⁵

^a ERF methods: Savanna Burning (repealed), Savanna Fire Management

Reducing methane emissions from beef cattle

Cattle produce methane through enteric fermentation (microbes living in the digestive system converting carbohydrates to methane, which is then belched back into the atmosphere)²⁹⁶. Enteric fermentation accounts for 66% of Australia's agricultural GHG emissions, and around 10% of Australia's total emissions²⁸⁷. It is, therefore, the highest priority agricultural emission source to target for reduction. Conversion of carbohydrates to methane in the gut also reduces the efficiency at which cattle convert forage to protein by as much as 12%²⁹⁷, so reduction in enteric fermentation has productivity benefits as well as emission reduction benefits. ERF methods have been approved for reducing methane emissions by replacing urea with nitrate licks^a and reducing the number of cattle required to produce each kilogram of beef^b.

The Monsoonal North carries about one-fifth of the Australian beef cattle herd, so includes some of the highest priority areas for reducing enteric emissions in the country (Figure 25, Table 4). In 2010-11, highest cattle numbers in the Monsoonal North were found in the McKinlay district of the Southern Gulf and the Burdekin Dry Tropics, so these are the areas in which emission reduction is the highest priority. However, many properties in these areas now have reduced stock numbers as a result of three years of drought²⁹⁸. The properties with the largest herds are found in the Kimberley and Gulf Savanna subregion of the Northern Territory, so efforts to reduce emissions on individual properties would have the most impact in these areas.

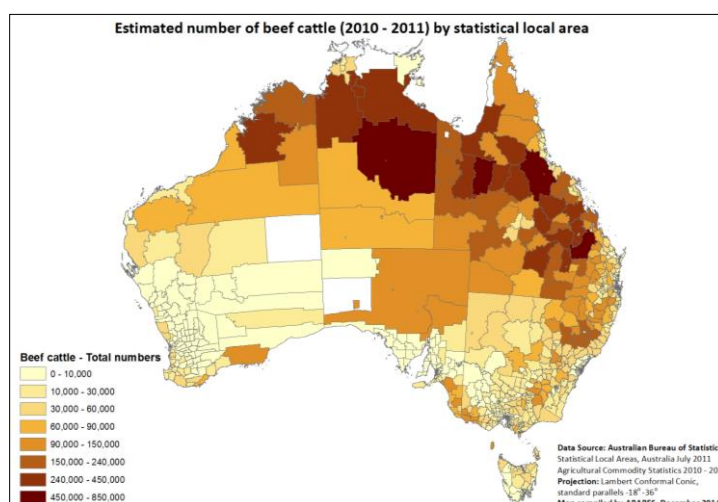


Figure 25. Numbers of beef cattle in Australia in 2011

Source: ABARES

^a ERF method: Reducing greenhouse gas emissions in beef cattle through feeding nitrate containing supplements

^b ERF method: Beef cattle herd management

Table 4. Number of beef cattle operations in the Monsoonal North in 2010-11, and their relative importance

Source: Australian Bureau of Statistics (2015)²⁹⁹; Cowley et al. (2014)³⁰⁰

	Kimberley	Top End	Gulf Savanna	Southern Gulf	Northern Gulf	Burdekin Dry Tropics	Total
Number of cattle businesses	68	40	108	272	313	750	2,233
Percentage of Australian cattle herd	2.6	0.5	3.3	5.3	3.2	5.0	20.0
Average herd size	10,400	3,800	8,400	5,400	2,800	1,900	3,500

Soil carbon

An ERF method has been approved to measure soil carbon sequestered by adjusting grazing land management^a. However, as there is currently no reliable way to identify practices guaranteed to improve soil carbon and the transaction and financial costs of establishing a project are likely to be prohibitive (see [Sequestering soil carbon](#)), it is impossible to identify the priority areas for undertaking such a project.

Water

Water allocation

Water is needed to sustain the environment, agriculture, fisheries and humans^{301,302}. The Monsoonal North contains many of Australia’s premier water resources. Eight of the 10 river systems with the highest runoff are found in the Monsoonal North (Figure 26). Minimal amounts of water are extracted from these systems³⁰³. There is great pressure for using northern water resources for agriculture and other development^{301,304-306}. Northern catchments also have a low level of disturbance (Figure 9b), so water extraction could severely degrade environmental and cultural values.

River system integrity

River systems have been prioritised for conservation based on their naturalness³⁰⁷. This led to the conservation of Queensland Rivers under the now repealed *Wild Rivers Act 2005* (Qld) (Figure 27). While these declarations have since been repealed, these rivers would still be priority areas for conservation management.

^a ERF method: Sequestering carbon in soils

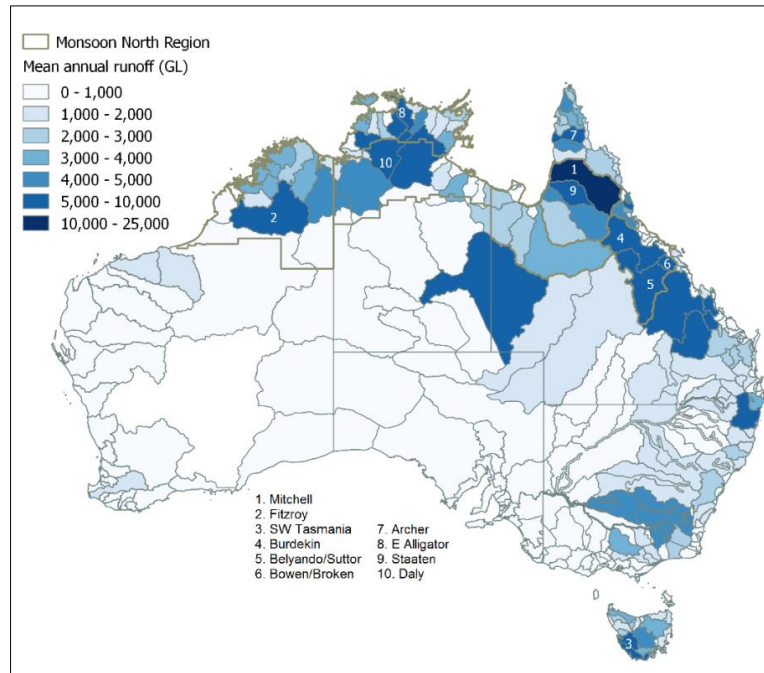


Figure 26. Map of Australian catchments highlighting the 10 catchments with the highest average annual runoff

Source of data: Geoscience Australia (2004)³⁰⁸

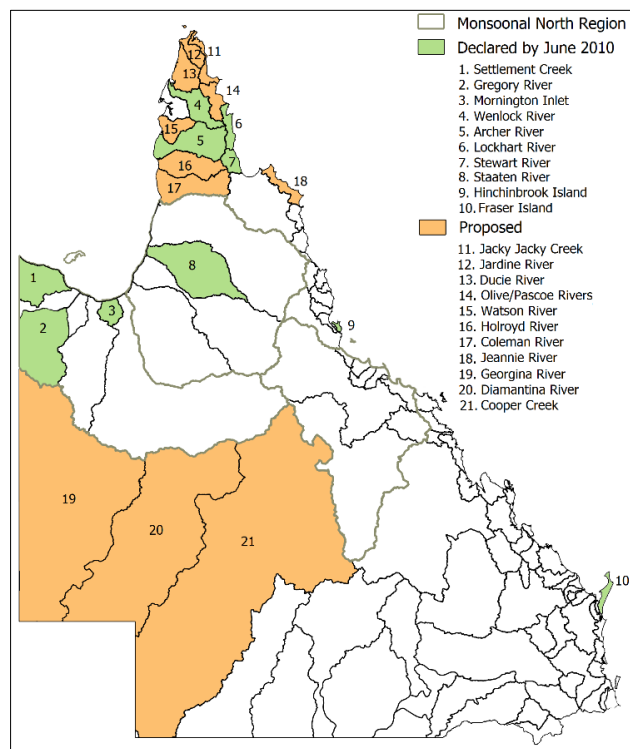


Figure 27. Status of Queensland Wild River declarations in June 2010

Source: Status extracted from Anna Bligh (2009)³⁰⁹ House of Representatives Standing Committee on Economics (2011)³¹⁰. Catchment boundaries based on Geoscience Australia (2004)³⁰⁸, *Water Act 2000 (Qld)* and *Water Resource (Gulf) Plan 2007*

Water quality protection

Land management practices that pollute runoff through loss of soil, fertilisers or pesticides adversely affect wetland, coastal and marine environments³¹¹⁻³¹⁷. As noted earlier, Darwin Harbour and GBR catchments have been identified as priority areas for water quality improvement at a continental scale. While Darwin Harbour is mainly affected by heavy metals and sewerage from urban and industrial land³¹⁸⁻³²¹, water extraction for agriculture is causing aquifer drawdown³²², which in turn affects water quality at the end of the dry season³²³.

Loss of sediment from grazing lands and nutrients and pesticides from cane production have a serious impact on the Great Barrier Reef, contributing to crown of thorns outbreaks³²⁴⁻³²⁷. Both these agricultural industries are important land uses in the Burdekin Dry Tropics (Figure 28), and have been identified as posing a high-level risk to GBR health³²⁸. Hence, the Burdekin Dry Tropics have been identified as a highest priority area in the Reef Water Quality Protection Plan⁵³ (Figure 29).

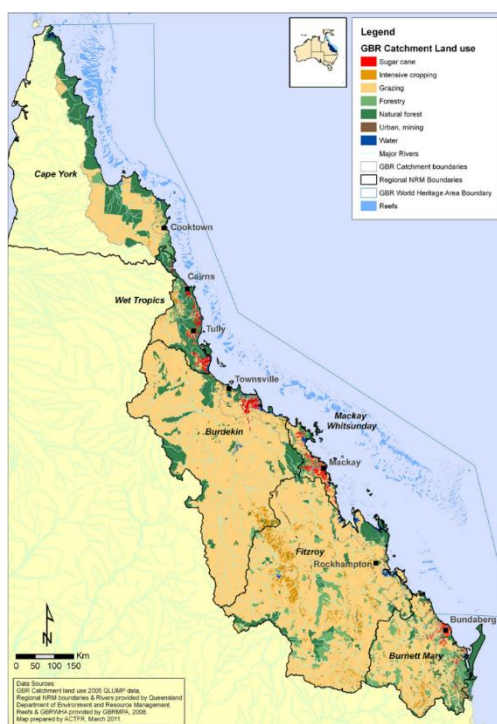


Figure 28. Land uses in Great Barrier Reef catchments

Source: Waterhouse et al. (2012)³²⁷

Region	Overall relative risk	Priority pollutants for management		
		Nitrogen	Pesticides	Sediment
Cape York	LOW			
Wet Tropics	VERY HIGH			
Burdekin	HIGH	*		
Mackay Whitsunday	MODERATE			
Fitzroy	HIGH			
Burnett Mary	UNCERTAIN**			

Figure 29. Prioritisation of pollutant management in the Great Barrier Reef Catchments

Source: Reef Water Quality Protection Plan (2013) ©State of Queensland

Grazing land stewardship

Much had been made of the potential for grazing land managers to derive additional income from conservation and stewardship arrangements^{18,27,46-48,329}. The sustainable management of agricultural lands provides numerous public benefits. These include securing national food production and export income; maintaining a labour-force to address pests, weeds and fire issues; maintaining biodiversity; improving water quality; and preserving lands in a condition that does not preclude future (known and unknown) uses of the land³³⁰⁻³³². Agricultural stewardship payments aim to protect and restore lands for these benefits³³². The emission reduction benefits of improving grazing land management have already been discussed (see [Reducing methane emissions from beef cattle](#)), showing that the areas in which improved grazing practices will have the greatest emission reduction benefits are the Burdekin Dry Tropics and the McKinlay district of the Southern Gulf.

Indigenous economic development

Australia has endorsed the *United Nations Declaration on the Rights of Indigenous Peoples*^a, which asserts, “Indigenous peoples have the right of self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development”. The declaration is non-binding, but Australia’s endorsement indicates a commitment to its principles.

^a The declaration was opposed by the Howard Coalition Government in 2007, then endorsed by the Rudd Labor Government in 2009³³³

Australian Indigenous leaders consider self-determination to be their highest priority, which means being able to choose whether to use their lands for conservation or other purposes, and whether to be employed as rangers or in other professions^{2,60,334,335}. Many Indigenous Australians wish to fulfil their own obligations to land and culture, and to gain at least part of their livelihoods from undertaking cultural and natural resource management^{7,336,337}. Evidence of this is the number of active Indigenous ranger groups and the number of Indigenous Protected Areas that have been established in the last decade (see [Non-government organisations](#)).

In contrast to prioritisation of biodiversity and cultural heritage values, investments in Indigenous development are difficult to prioritise spatially, especially if it is Indigenous people themselves who are to determine how their communities and lands are to be developed. However, spatial considerations include where the highest populations of Indigenous people live and where the most extensive areas of Indigenous-held lands are located.

In the Monsoonal North, the greatest concentration of Indigenous-held lands is in the Kimberley and the Top End, which is also where most non-urban Indigenous people live (Figure 30). This coincides with the areas of most intact landscapes and highest concentration of recognised biodiversity and cultural heritage values described above. These areas are, therefore, most likely to attract funding for Indigenous cultural and natural resource management. Surveys indicated that residents of Australian cities were willing to subsidise ecosystem service delivery by Indigenous Australians by between \$878m to \$2b per year³³⁸. A preference was shown for funding feral animal control (37%), coastal surveillance (20%), weed control (18%) and fire management (14%). However, no binding commitments were made and there is no mechanism in place for these funds to be collected.

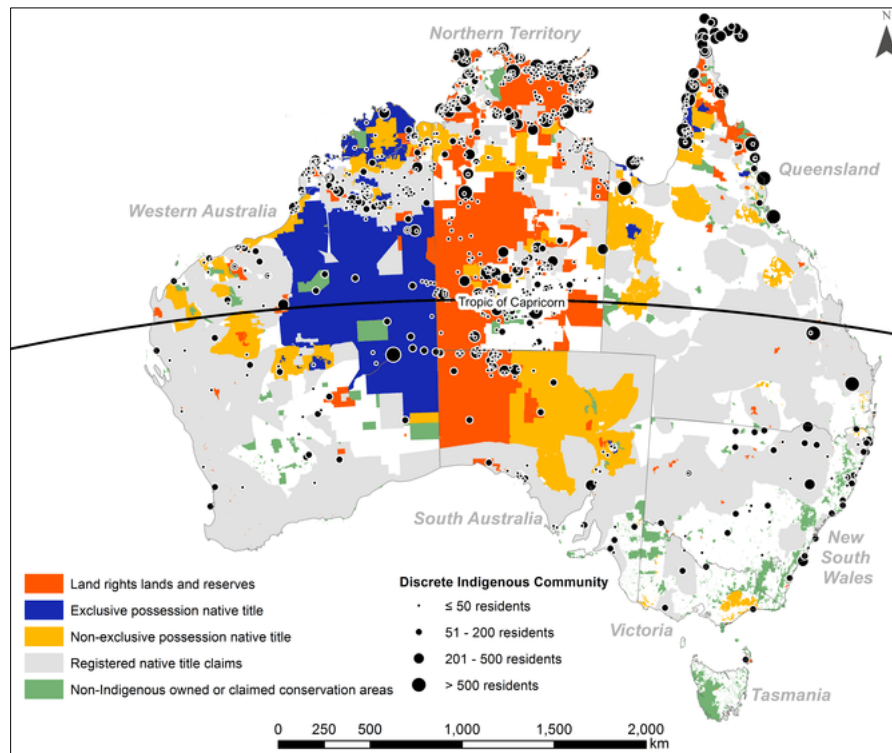


Figure 30. Indigenous estate and discrete Indigenous communities, 2010

Source: Altman (2014)³³⁹

Conservation economy opportunities for the Monsoonal North

As the preceding discussion demonstrates, there are many priority areas in the Monsoonal North for particular conservation economy activities. This current section outlines the mechanisms that are in place to turn these priorities into livelihoods. Conservation economy mechanisms in the region range from regulations to impose sustainable practices that are considered to be well within the “duty of care” of landholders to the purchase of land for achieving conservation objectives that are well beyond “reasonable expectations” (Figure 31). Between these extremes are options for voluntarily undertaking sustainable production and conservation management that have improved profitability benefits (towards the duty-of-care end of the spectrum) and full-fee payment for service (towards the beyond-reasonable-expectations end). Financial rewards operate in the areas of strong public benefit; and extension programs and structural adjustment loans focus on where private benefit dominates. The tension between incentive and regulatory approaches is in a state of flux, with a shift from a regulatory approach to carbon emissions and vegetation and water quality management favoured by Labor governments to self-regulatory and incentive based approaches favoured by conservative governments. Whether this shift is maintained will be influenced by the extent of voluntary uptake. So, while industry usually argues

for self-regulation supported by extension programs (such as the grazing BMP), should such approaches fail to find traction, regulation is likely to be reimposed—as has been threatened with a return to regulation of water quality management by the sugar cane industry^a.

This section explains the role of governments in regulating and financing the conservation economy realm in the Monsoonal North, and the prospect for future regulation and support. It describes current NGO activity in the conservation economy in the region and examines the directions this is likely to take. It describes how Indigenous communities are both participating in the conservation economy and driving its development; and identifies the activities they are currently undertaking and the potential for expansion. Finally, it examines the extent to which the pastoral industry is identifying, promoting and implementing sustainable practices and diversifying into conservation and carbon management to improve enterprise viability, and identifies the most promising future options for this industry.

^a www.abc.net.au/news/6740140

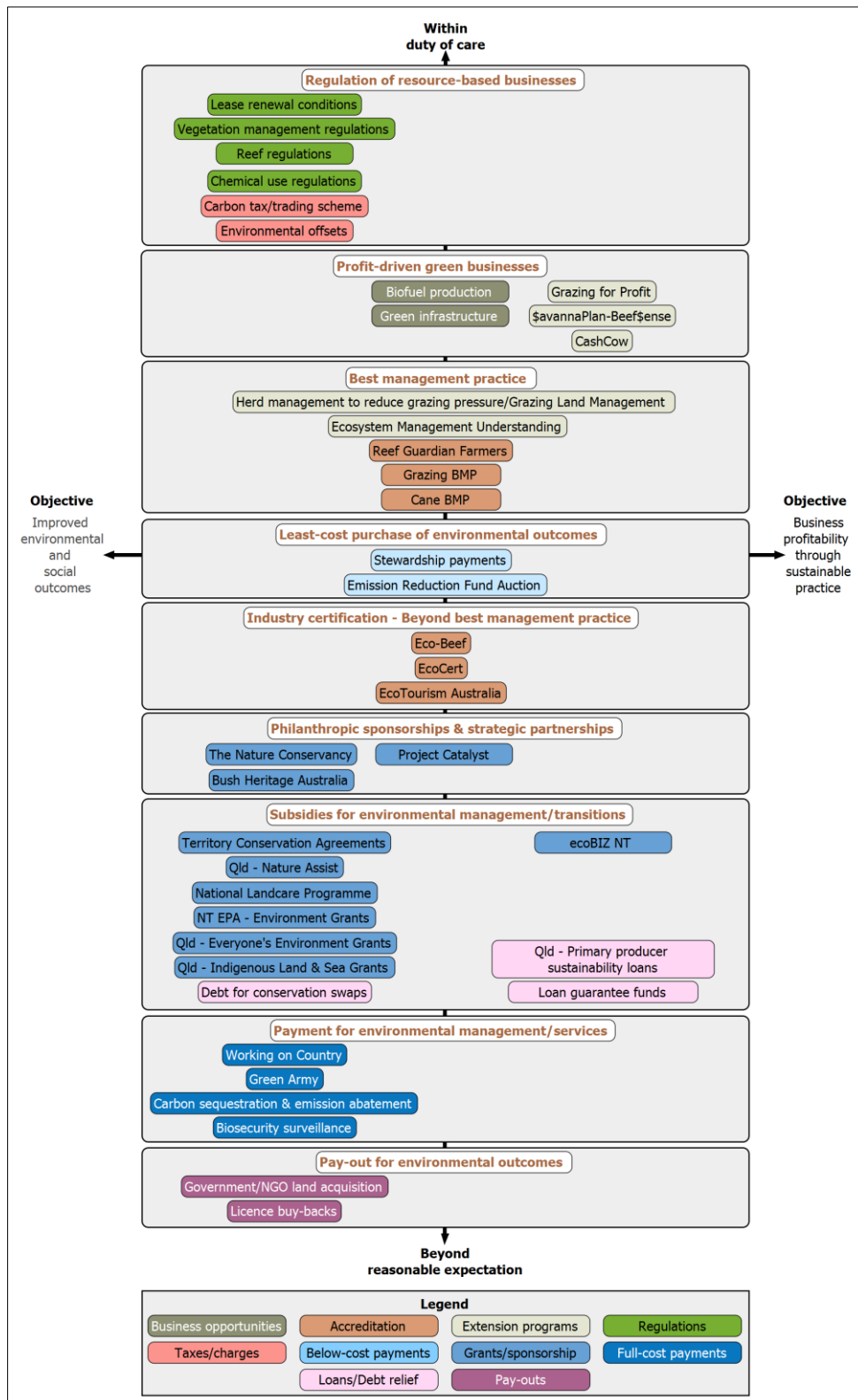


Figure 31. Monsoonal North conservation economy opportunities presented on the Lockie matrix

Throughout this section the numerous government and non-government grants available to support efforts to improve livelihoods and sustainability are described. These and other funding opportunities can be found using various grant search tools^a. Two developing areas that are beyond the scope of his report are the growing market for alternative energy and reliable low-cost energy supplies (which are providing new business opportunities in biofuel and renewable energy production)^{127,340-342}, and the recognition of ecosystem services in the form of green infrastructure, such as water purification, sewerage treatment and stormwater control^{163,164,343}.

Australian Government funding programs

Several Australian Government programs provide financial support for cultural and natural resource management (Table 5). The nature of these programs has changed with changes in administration (see Table 6). Some programs are targeted at specific outcomes, such as Indigenous cultural and natural resource management, GBR water quality or GHG emission reduction. Others are more general, and provide support for a broad range of activities to improve environmental conditions or agricultural sustainability. Funding rounds are usually announced annually, and may cover a period of 6 months to several years.

Historically, the Monsoonal North (which covers approximately 20% of Australia’s land surface) has received a disproportionately low percentage of funding from most NRM grants programs. This can be attributed to the priorities of these programs not aligning with the biodiversity values of the region, but being focused on land rehabilitation and employment¹⁰³, as discussed earlier. Indigenous NRM, reef water quality and cat research and control are exceptions to this pattern.

Current and recent Australian Government programs supporting the conservation economy are detailed below. Other conservation economy initiatives of the Australian Government, their offsets program and ERF are dealt with in later sections of this report (see [Environmental offset programs](#) and [Carbon economy](#)).

^a

Fund	Link
Australian Government Grant Finder	http://www.business.gov.au/grants-and-assistance/grant-finder
Western Australian Grants Directory	http://grantsdirectory.dlg.wa.gov.au
Northern Territory grant website	http://www.nt.gov.au/ntg4/Subject?myLevel=3&myRefPoint=cn=Community%20Links,cn=Grants%20and%20Funding
Queensland Government grant website	http://www.qld.gov.au/community/community-organisations-volunteering/funding-grants-resources
Community Grant Guru	http://community.grantready.com.au

Table 5. Recent funding by current Australian Government programs for natural and cultural resource management

Source: Department of the Environment (2016)³⁴⁴; Department of the Prime Minister and Cabinet (2014, 2015)^{345,346}

Notes: N/A = not available; information from most recent funding round only; *components of the Jobs, Land and Economy Programme

Focus	Funding period	Budget	Grant limit	Monsoonal North	
				Projects (%)	Funds (%)
Indigenous Advancement Strategy – Jobs, Land and Economy Programme					
Providing Indigenous employment and business opportunities in land management	2014-18	\$2.5 b	N/A	N/A	N/A
Working on Country*					
Indigenous NRM	2014-16	\$19.4 m	N/A	63.6	90.5
Indigenous Protected Areas*					
Protection of cultural and natural and resources on Indigenous lands	2013-18	\$78.3 m	N/A	36.4	36.2
National Landcare Programme					
<i>Environment stream</i>	2014-15	\$2.5 m	\$20,000	3.5	4
<ul style="list-style-type: none"> • Invasive species management • Sustainable agriculture • Erosion management • Capacity building 					
<i>Agriculture stream</i>	2014-15	\$2.5 m	\$20,000	5.1	6.4
<ul style="list-style-type: none"> • Invasive species management • Revegetation • Habitat fencing • Indigenous land and sea country planning • Indigenous ecological knowledge • Capacity building 					
<i>Regional funding</i>	2014/15	\$450 m	N/A	N/A	ca 6.0
<ul style="list-style-type: none"> • Lead, prioritise and support regional NRM • Build and broker NRM partnerships • Support Indigenous NRM • Contribute to Australia’s national and international conservation obligations 	- 2017/18				
Threatened Species Strategy					
Creating safe havens for species most at risk	2015-	\$2.7 m	N/A	0	0
Improving habitat	2015-	\$0.7 m	N/A	0	0
Intervening in emergencies to avert extinctions	2015-	\$0.6 m	N/A	0	0
Tackling feral cats	2015-	\$2.7 m	N/A	28.6	18.0
20 Million Trees					
Tree planting for revegetation and emission abatement	2014-2015	\$9 m	\$100,000	0	0
Green Army					
Employment scheme to:	2014-2015	\$175 m	Labour (& material up to \$10,000)	3.8	N/A
<ul style="list-style-type: none"> • Restore native vegetation restoration • Regenerate wetlands • Restore heritage • Protect habitats 					
Reef Trust					
Phase I - On-ground action - Innovative, targeted investment to improve water quality, restore coastal ecosystem health and enhance species protection	2015-	\$8 m	N/A	50.0	ca 15
Phase I – Species management	2015-	\$7 m	N/A	Reef-wide	
Heritage					
Community heritage and icons grants	2014-15	\$0.28 m	\$10,000	6.7	7.1
Emissions Reduction Fund					
Market-based GHG emission reduction from land, agriculture, waste, energy and fuel sectors	2015	\$660 m	N/A	7.9	ca 9.8

Table 6. Past funding rounds of discontinued Australian Government sources of funding for natural and cultural resource management

Sources: Department of the Environment (2016)³⁴⁴

Notes: N/A = not available; information from most recent funding round only

Focus	Funding period	Budget	Grant limit	Monsoonal North Projects (%)	Funds (%)
Caring for our Country					
<i>Environmental stewardship</i> 10 to 15-year agreements to improve the condition and extent of nationally-threatened ecological communities	2008-	\$50 m	N/A	0	0
Caring for our Country 2					
<i>Target Area Grants</i> <ul style="list-style-type: none"> • Central Australian Connection • Cape York • Kimberley • Tasmania • South-west Western Australia • Urban waterways and coastal environments 	2013-14	\$36.6 m	\$2.5 m	6.5	5.9
<i>Innovation grants</i> <ul style="list-style-type: none"> • Improving sustainability of food production and fishing • Reducing weed and pest impacts on agriculture • Capacity building 	2013-14	\$21.3 m	\$1.5 m	8.2	6.5
<i>Reef Rescue</i> Support land management practices to reduce sediment, nutrients and pesticides in runoff to the Great Barrier Reef	2013-14	\$61 m	N/A	14.3	24.6
<i>World Heritage grants</i>	2013-14	\$36.1 m	N/A	14.3	1.7

Part of the reason for this under-funding is the lack of a coherent strategy to address national NRM needs that recognises biodiversity values as well as threats. Australia’s Biodiversity Conservation Strategy²²³ is meant to be the guiding framework for Australian biodiversity conservation policies and programs. However, this strategy is currently under review^a and has effectively been replaced by “The Plan for a Cleaner Environment”³⁴⁷, with its four pillars of Clean Air, Clean Land, Clean Water and National Heritage, each with isolated and somewhat idiosyncratic sub-programs.

Indigenous Protected Areas

About one-third of Australia’s National Reserve System is in Indigenous Protected Areas (IPAs)³⁴⁸ (Figure 32). Traditional Owners can establish an IPA over land or sea that they have decided to manage for biodiversity and cultural resource conservation. Designation as IUCN Category VI (A *Protected Area managed mainly for the sustainable use of natural ecosystems*) enables Indigenous people to continue to derive livelihoods from hunting and harvesting. As part of Caring for our

^a National Reserve System Team, Department of the Environment, personal communication, 8 Sep 2015

Country, the Australian Government budgeted \$50 m to support the planning and consultation required to establish IPAs between 2008 and 2013. IPA funding can also be used to establish co-management arrangements over non-Indigenous protected areas. The program was extended in 2013, with a further \$78 m provided up until 2018³⁴⁹, and again in October 2014, providing \$7.2 m for 14 IPAs under the Job, Lands and Economy Program of the Indigenous Advancement Strategy (IAS)³⁵⁰. In 2013-14, 579 Indigenous rangers were employed under IPA funding (490 casual, 59 part-time and 30 full-time positions)³⁵¹. Future applications for funding for IPAs will be assessed against all Job, Lands and Economy applications to IAS on a competitive basis (see [Indigenous Advancement Strategy](#)).

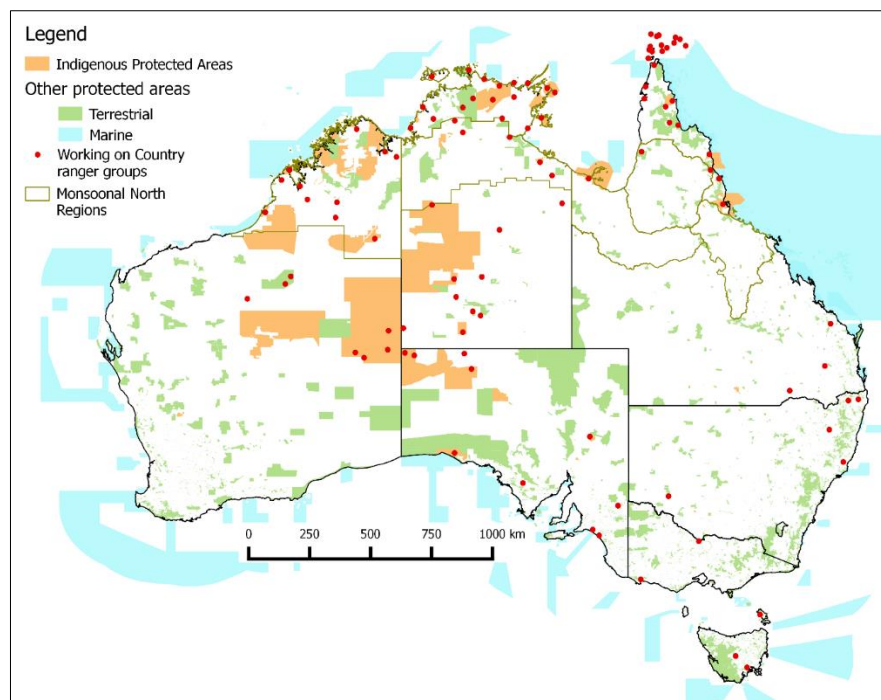


Figure 32. Location of Working on Country ranger groups and Indigenous Protected Areas

Source: Ranger groups: <http://www.environment.gov.au/indigenous/workingoncountry/index.html>
 Protected areas: <http://www.environment.gov.au/fed/catalog/main/home.page>

Working on Country

Since 2008, the Australian Government Working on Country (WOC) program has provided wages to Indigenous rangers to fulfil their Caring for Country aspirations and protect and manage environmental and heritage values^{42-44,352,353}. The original commitment was \$90 m to fund 300 rangers over five years. Funding was subsequently increased to \$244 m over this period. A second \$320 m five-year program commenced in 2013. The Working on Country program has been effective at increasing the income of Indigenous participants and their communities and reducing

welfare dependence³⁵². In 2013-14, 1,612 Indigenous rangers were employed under WOC funding (877 casual, 342 part-time and 392 full-time positions) in over 100 ranger groups across Australia³⁵⁴, about one-third of which are based in the Monsoonal North (Figure 32)³⁵¹.

The WOC program provides funding on a competitive basis to ranger groups or host organisations to support employment and targeted traineeships. Funding is only available to Indigenous groups and the majority must be used to employ Indigenous people. The area on which the work is to be done must have a current environmental management plan, and permission must be obtained from Traditional Owners and other interested parties before an application can proceed. Work undertaken by WOC rangers has included cultural mapping; management of cultural sites; intergenerational knowledge transfer; fire management; weed and feral animal control; monitoring and management of threatened species and their habitats, and fire management. Further applications for WOC funding are likely to be assessed against all Job, Lands and Economy applications to IAS on a competitive basis (see [Indigenous Advancement Strategy](#)).

Indigenous Carbon Farming Fund

In 2014, the Australian Government's Indigenous Carbon Farming Fund provided \$4.2 m to help Indigenous Australians benefit from carbon farming opportunities³⁵⁵. Activities funded included education, consultation, feasibility assessments and development of methodologies applicable to Indigenous participants. Although \$22.3 m was committed over 5 years, no further funding rounds have been announced.

Indigenous Advancement Strategy

In 2014, the Australian Government developed a \$4.9 b Indigenous Advancement Strategy (IAS) to replace more than 150 different Indigenous programs^{356,357}. Programs replaced by this strategy include Indigenous Protected Areas, Community Development Employment Projects, Indigenous Carbon Farming Fund and Indigenous Heritage Programme³⁴⁶. Organisations previously funded under any of these programs must now apply under the six IAS programs.

IAS objectives include increasing Indigenous employment and businesses engaging in land management. Programs relevant to Indigenous participation in the conservation economy are the \$2,500 m Jobs, Land and Economy Programme (Table 7) and the \$240 m Remote Australia Programme.

Table 7. Funding for the Jobs, Land and Economy Programme of the Indigenous Advancement Strategy

Source: Department of the Prime Minister and Cabinet (2015)³⁴⁶

	2014-15 (\$m)	2015-16 (\$m)	2016-17 (\$m)	2017-18 (\$m)	Total (\$m)
Committed funding	513	491	480	466	1,949
Uncommitted funding	52	122	187	185	546
Total funding	565	613	667	651	2,495

The Jobs, Land and Economy programme commits to:

- Long-term Indigenous employment in land and sea management
- Training and skill development to support long-term employment
- Development of Indigenous businesses and community enterprises
- Settlement of land rights claims and changes in land tenure to facilitate economic development
- Building capacity of Native Title corporations to promote sustainable economic and social benefits, and meet their statutory obligations.

Activities eligible for funding under this program include:

- Provision of jobs, particularly enduring jobs, in land and management and other activities
- Provision of employment, training and skill development for job seekers in remote Australia
- Development of Indigenous businesses and community enterprises
- Various measures relating to lease negotiation, land tenure reform and Native Title claims
- Five-year commitments made to continue Working on Country and the Remote Jobs and Communities Programme continue under IAS.

The Remote Australia Programme focuses on home ownership and improving facilities, services and employment opportunities in remote Indigenous communities. Other IAS objectives cover education and training and improving the safety and equity of remote communities.

The first funding round, announced in March 2015 and extended in May 2015, granted \$1 b to 996 organisations to deliver 1,350 projects. While information is available on the grants awarded, this information is not in a format that can be easily analysed³⁴⁵.

National Landcare Programme and Green Army

Australia's premier program for supporting natural resource management is the National Landcare Programme (NLP)³⁵⁸, which includes the 20 Million Trees Programme and is supported by the Green Army³⁵⁹. NLP has four strategic objectives, which are focused on funding the

community to deliver the Australian Government’s national and international obligations (Table 8). This approach extends Caring for Our Country’s departure from the bottom-up agenda setting of Natural Heritage Trust (NHT2), in which priorities were set at the regional level through regional NRM bodies^{103,360}.

Table 8. Strategic objectives to address Australia’s national and international obligations

Source: Department of the Environment and Department of Agriculture (2015)³⁵⁸

Strategic objective	National and international obligations addressed
Communities are managing landscapes to sustain long-term economic and social benefits from their environment	<ul style="list-style-type: none"> • Protect and restore ecosystem function, resilience and biodiversity • Manage invasive species that threaten ecosystems, habitats or native species
Farmers and fishers are increasing their long term returns through better management of the natural resource base	<ul style="list-style-type: none"> • Manage agriculture and aquaculture sustainably to conserve and protect biological diversity and reduce greenhouse gas emissions and increase carbon stored in soil
Communities are involved in caring for their environment	<ul style="list-style-type: none"> • Build community awareness of biodiversity values, skills, participation and knowledge, including Indigenous knowledge and participation, to promote conservation and sustainable use of biological diversity
Communities are protecting species and natural assets	<ul style="list-style-type: none"> • Reduce loss of natural habitats, degradation and fragmentation • Protect or conserve Matters of National Environmental Significance including management of World Heritage Areas, Ramsar wetlands, national heritage • Reduce the number of nationally threatened species and improve their conservation status

The focus of the NLP on restoring degraded landscapes and of the Green Army on increasing youth employment means these programmes currently offer limited scope for biodiversity protection in northern Australia. NLP funding has been concentrated in the southern and eastern parts of Australia (Figure 33a). This geographic bias is even more pronounced for Green Army projects (Figure 33b), which are concentrated in the most populous areas, and 20 Million Trees providers, which are concentrated in the most intensively developed areas requiring revegetation (Figure 33c). The proportion of funding allocated to regional bodies has also declined since a peak in 2003-08, reducing the capacity of NRM groups to assist landholders transition to the conservation economy²⁷⁴. Except for the Green Army and 20 Million Trees programs, all remaining NLP funds have been committed until 2018^a. Hence, this funding imbalance is unlikely to change in the next three years. The only new opportunities for land managers to finance conservation projects over this period will be through devolved grant schemes operated by individual NRM bodies under their current funding arrangements with the Commonwealth^b.

^a Department of the Environment, personal communications, 19 October 2015; Department of Agriculture, personal communications, 19 October 2015

^b Department of the Environment, personal communications, 19 October 2015

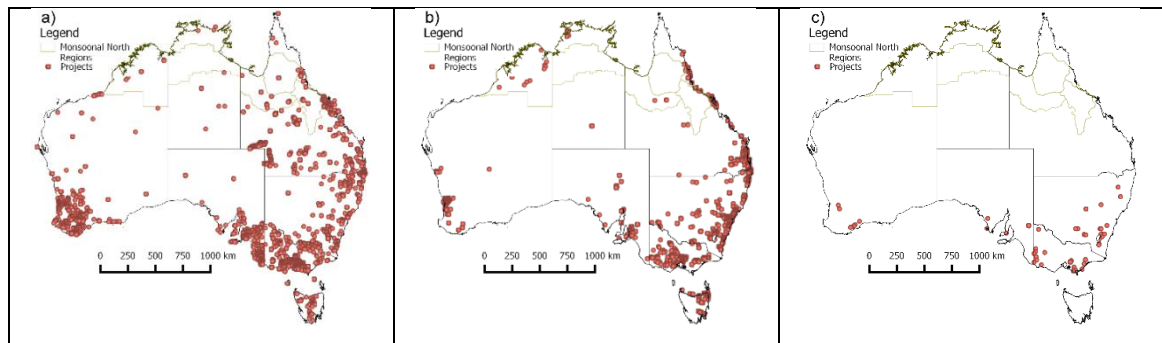


Figure 33. Distribution of (a) National Landcare Programme projects (National stream only), (b) Green Army projects and (c) 20 Million Trees service providers in relation to the Monsoonal North region

Source of data: Atlas of Living Australia (2015)³⁶¹

Threatened Species Strategy

The Australian Government's Threatened Species Strategy³⁶² makes the commitment to improve the conservation status of 20 mammal and 20 bird species by 2020. Of these priority species, only the Golden Bandicoot *Isodon auratus*, Alligator Rivers Yellow Chat *Epthianura crocea tunneyi* and, possibly, the Night Parrot *Pezoporus occidentalis* occur in northern Australia. Given the restricted distribution of these species, this work is likely to involve only a small number of Traditional Owners, rangers and pastoral land managers. The commitments to control feral cats and improve habitat have the most potential for broad community involvement in the north, including through:

- Controlling feral cat eradication from Groote Eylandt
- Protecting significant vegetation communities, wetlands and marine ecosystems
- Re-establishing vegetation connectivity and natural pathways such as wildlife corridors
- Revegetating riparian and coastal zones which link aquatic and terrestrial environments
- Best practice management of our reserve system
- Broad landscape-scale revegetation and management of weeds.

Great Barrier Reef water quality improvement

Since 2008, the Australian Government has supported water quality improvement in Great Barrier Reef (GBR) catchments³⁶³. Initially this was through the \$200 m Reef Rescue program. The current program, Reef Trust, includes \$3 m to promote best practice grazing in the Burdekin and Fitzroy catchments to reduce of sediment entering the reef in Phase One³⁶⁴. Extension services and ongoing mentoring will be provided to help graziers identify and adopt improved practices to reduce erosion and improve profitability. The program will focus on reducing grazing pressure in high risk areas of the property to reduce runoff and erosion, and the formation and expansion of

gullies and scalds. Practices promoted will include stock exclusion; improving ground cover; strategic placement of infrastructure; and establishing monitoring sites. It is not clear if any of these funds will be available to subsidise on-ground action. However, Phase Two includes \$5.4 m to subsidise the stabilisation of gullies on grazing lands in priority areas³⁶⁵. It also includes \$3 m to engage cane farmers in the Burdekin to improve their fertiliser and pesticide use. Future funding will be supplemented through the Australian Government's Offsets program which will derive income from developments adversely affecting reef health.

Western Australia

The Western Australian Government has a strong commitment to conservation through a State Reserve System and is actively pursuing the establishment of new National Parks through a new Indigenous joint-management model, particularly in the Kimberley. Outside the reserve system, the Western Australian Government supports community conservation efforts through its Community Grants program. These initiatives are described in the following sections. Western Australia also uses environmental offsets to counterbalance unavoidable environmental damage from development (see [Environmental offset programs](#)).

The Department of Agriculture and Food, Western Australia³⁶⁶ assists producers to adopt sustainable practices through its extension services and Land Conservation District Committees³⁶⁷ and oversees biosecurity surveillance and management. It also has an Indigenous Landholder Service³⁶⁸ that supports business development strategic planning, governance, training and environmental management and provides extension services^a. In addition, the Small Business Development Corporation³⁶⁹ assists in business development and Tourism Western Australia³⁷⁰ assists in establishment and accreditation of ecotourism businesses. Kimberley Land Council³⁷¹ and Rangelands NRM Western Australia³⁷² also assist Traditional Owners and other land managers enter the conservation economy and adopt sustainable land management practices. Finally, the Western Australian Farmers Federation³⁷³ and the Pastoralists and Graziers Association of Western Australia³⁷⁴ provide advice and support to their constituents regarding sustainable practices and options for diversifying into the conservation economy.

^a In January 2016, the services were under review.

Indigenous engagement

Western Australia's Indigenous Reconciliation Action Plan commits the Western Australian Government to improving relations with Indigenous people and to addressing Indigenous disadvantage³⁷⁵. As part of this plan, changes were made to the *Conservation and Land Management Act 1984* (WA) in 2012 to promote joint management of National Parks and allow Indigenous customary activities to be undertaken in National Parks³⁷⁶. These activities pave the way for establishing National Parks on Indigenous land and sea country, while ensuring that Traditional Owners retain control over their lands and Indigenous communities have continuing use and access and benefit through employment and appropriate economic development. However, the Western Australian Government also over-rode customary rights in the Kimberley when considering a substantial development proposal at James Price Point, although this proposal has now been withdrawn^{377,378}. This suggests a willingness of the Western Australian Government to support Indigenous self-determination as long as this is consistent with the state's economic agenda.

Kimberley Science and Conservation Strategy

Western Australia's approach to biodiversity conservation in the Kimberley is delivered through its \$81.5 m Kimberley Science and Conservation Strategy (Figure 34). This strategy has five streams:

- Marine and terrestrial protected areas to be jointly managed with Indigenous people
- Landscape scale management of fire, introduced animals and weeds
- Training and employment for Aboriginal rangers
- Knowledge building and access
- Facilities to support cultural and nature-based tourism.

Indigenous involvement and employment in land management are key aspects of the strategy. So far, at least 20 Indigenous rangers have been employed full-time in the West Kimberley, and additional Traditional Owners are casually engaged in park management on a fee-for-service basis. Fire management and control of feral grazing animals are priorities for addressing environmental degradation³⁷⁹. Funding over 2015-16 is \$9 m, which includes \$1.2 m for working with Traditional Owners to establish jointly-managed national parks in the north Kimberley; and \$3.5 m for ongoing fire, weed and feral animal management in partnership with Aboriginal ranger groups, Traditional Owners, NGOs and pastoralists as part of the Landscape Conservation Initiative. A newsletter is periodically published to report on the strategy's progress³⁸⁰.

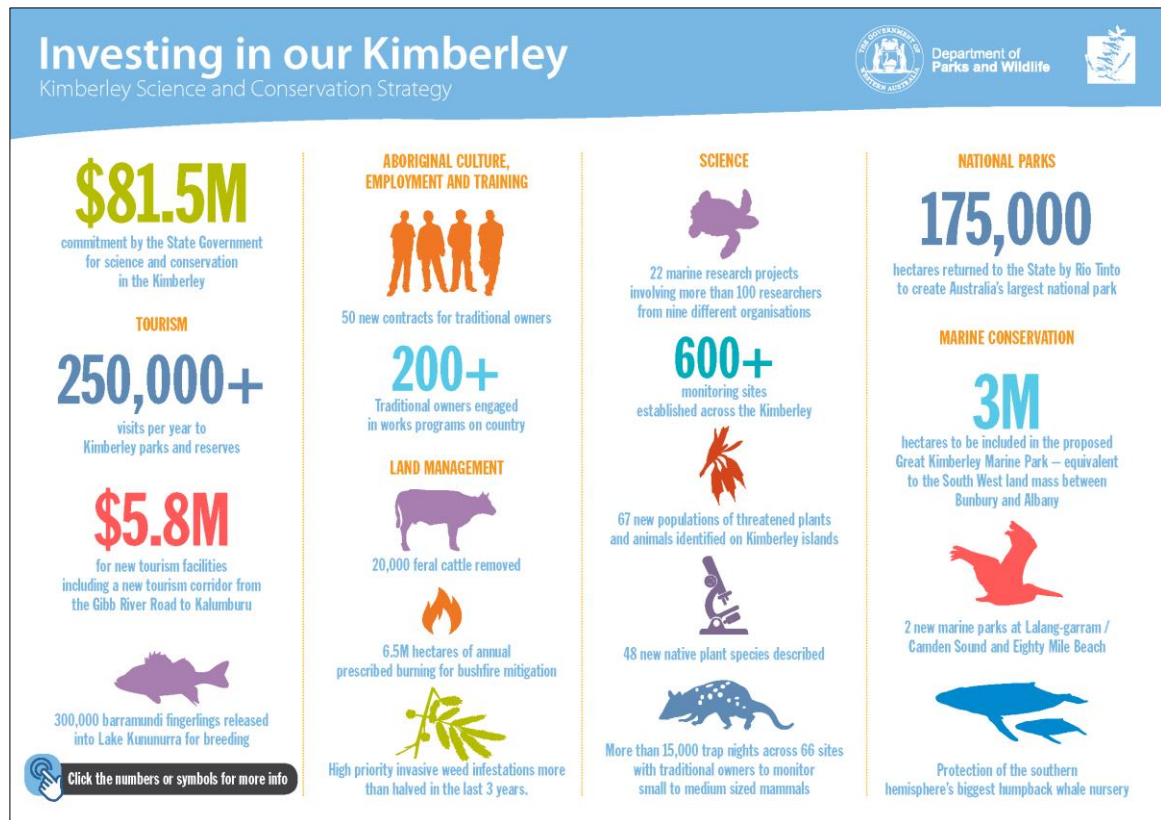


Figure 34. Kimberley Science and Conservation Strategy

Source: Government of Western Australia (2011)³⁸¹

Conservation covenants and Land for Wildlife

The Western Australian Nature Conservation Covenant Program enables landowners to enter into conservation covenants to protect the nature conservation values of their properties. Highest priority areas for pursuing covenants include:

- Threatened flora or fauna, communities or habitats, or vegetation not well-represented in local or regional conservation reserves
- Land that provides of corridors or buffers to other important bushland areas
- Land adjacent or close to other protected areas.

The program contributes to the cost of legal advice; tax concessions may be available on permanently covenanted land and rate relief may apply. The Department of Parks and Wildlife helps to develop management guidelines and may provide funding for fencing if this is required.

The Western Australian Government also supports Land for Wildlife as a non-binding voluntary scheme for landholders wishing to conserve wildlife habitat on their properties. Advice is provided to participating landholders on the best management options to achieve conservation outcomes.

Community grants

The Western Australian Government supports community conservation efforts through a grants program (Table 9). In previous rounds, only a small percentage of project funding has been awarded to projects in the Kimberley. The vast majority of this funding has been awarded to projects to control invasive species (Figure 35).

Table 9. Current Western Australia government sources of funding for undertaking cultural and natural resource management projects

Source: Natural Resource Management, Western Australia (2015)³⁸²

N/A = not available

Scheme	Focus	Annual Budget	Grant limit	Monsoonal North	
				Projects (%)	Funds (%)
Western Australia - Western Australian Government – Natural Resource Management Office					
Community Action Grants	Habitat management Biodiversity conservation	\$4,000,000	\$55,000	4.8	7.2
Community Capacity Grants	Capacity building	N/A	N/A	N/A	N/A

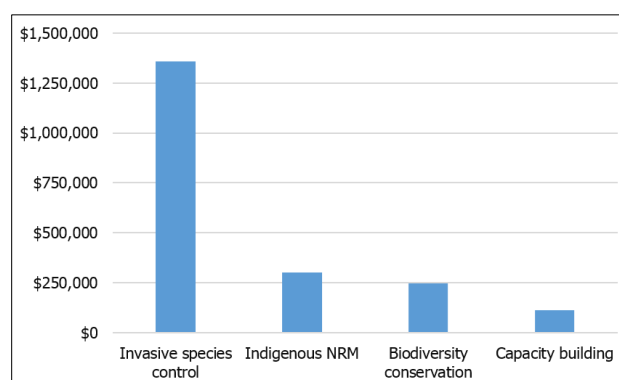


Figure 35. Allocation of Western Australian Community Grants in the Kimberley, 2010

Source of data: Natural Resource Management, Western Australia (2015)³⁸²

Northern Territory

Support for conservation economy activities in the Northern Territory is provided by various government agencies and non-statutory bodies. The Department of Land and Resource Management helps landholders and Indigenous rangers build their capacity to monitor and manage biodiversity and establish wildlife-based enterprises. The Department of Industries and Fisheries assists landholders develop profitable and sustainable enterprises based on natural resources; including assisting wildlife enterprises develop management practices and protocols. It

also coordinates biosecurity surveillance and response. The Environmental Protection Agency oversees development processes to ensure adverse impacts are sensibly managed and runs a pollution and waste grants program. The Northern Territory does not have a formalised environmental offsets program, but offsets may be required for certain developments (see [Environmental offset programs](#) for a description of the Northern Territory's uses of offset requirements in development approvals).

The Department of Business³⁸³ assists in business development, Indigenous workforce participation and industry strategic planning, and has recently produced a strategic plan for the crocodile farming industry³⁸⁴. Tourism NT³⁸⁵ assists the establishment and accreditation of ecotourism businesses. Territory NRM³⁸⁶, Northern Land Council³⁸⁷, Tiwi Land Council³⁸⁸ and Anindilyakwa Land Council³⁸⁹ all support development of conservation economy enterprises and adoption of sustainable practices in the Northern Territory section of the Monsoonal North. Finally, NT Farmers³⁹⁰ and the Northern Territory Cattlemen's Association³⁹¹ provide advice and support to their constituents regarding sustainable practices and options for diversifying into the conservation economy.

Territory NRM has adopted responsibility for several of the roles that are undertaken by state governments in other jurisdictions. These functions include providing strategic direction and support for community-based NRM by engaging with all stakeholders across the Northern Territory to identify priorities and formulate practical actions plans. It also brokers conservation agreements and runs a community grant scheme to support environmental management and capacity building projects.

Department of Land and Resource Management

Strategic direction for environmental management in the Northern Territory is provided by the Department of Land and Resource Management Strategic Plan (Table 10). This plan emphasises collaborative arrangements with Indigenous people and other Northern Territorians to improve environmental knowledge, conserve biodiversity and promote sustainable development. Rather than directly funding these sectors, the plan prioritises working with them to provide advice and build capacity.

Table 10. Elements of the Department of Land and Resource Management Strategic Plan relating to the conservation economy

Source: Department of Land and Resource Management (2015)³⁹²

Strategies	Goals	Outcomes
<i>The capacity and capability of the Northern Territory's natural resource assets are assessed, and outcomes of use and management, monitored</i>		
Work with Aboriginal elders and custodians to conserve biocultural knowledge of the Territory's flora and fauna, and promote its application in natural resource management		<ul style="list-style-type: none"> • Indigenous knowledge of the Territory's flora and fauna is documented and available for future generations • Biocultural knowledge is utilised for land and water management and economic outcomes
<i>Enable economic growth through the allocation of natural resource assets for best and sustainable use</i>		
Ensure that impacts on the natural resources are within acceptable limits in the allocation and use of land for development purposes		<ul style="list-style-type: none"> • Sustainable use of natural resources • High quality advice provided to consent authorities
Identify and promote economic opportunities through the sustainable use of wildlife		<ul style="list-style-type: none"> • New businesses in the use of wildlife are developed and existing businesses are supported and maintained
Support the pastoral estate through contemporary pastoral legislation to drive economic growth		<ul style="list-style-type: none"> • Pastoral industry is supported and developed • Condition of the pastoral estate is maintained
<i>Threats to natural resources and regional communities are managed through shared responsibilities and partnerships</i>		
Provide extension services to assist landholders in the sustainable use of the natural resources		<ul style="list-style-type: none"> • Access to contemporary information and advice on land and water management and conservation • Better landholder compliance with legislation
Manage the impacts of feral animals and weeds on productive and natural systems		<ul style="list-style-type: none"> • Impacts of feral animals and weeds on key environmental and cultural systems are reduced
Facilitate greater industry capacity and action to mitigate impacts at development sites		<ul style="list-style-type: none"> • Guidelines and standards are developed and adopted for minimising adverse impacts on land, water and native flora and fauna
Build community capacity to mitigate the negative impacts of wildfire, weeds and feral animals		<ul style="list-style-type: none"> • Increased community involvement in awareness and mitigation programs • Landholders take responsibility for managing fire, feral animals and weeds on their land

The Department of Land and Resource Management develops management plans, regulates and monitors sustainable use of native plants and animals under its Strategy for Sustainable Use of Wildlife³⁹³. The strategy is based on the principle that “sustainable use of wildlife helps conserve significant native species and their habitats, while also providing economic opportunities for Territory landowners and businesses”³⁹⁴. Commercial use is, therefore, allowed as a means of providing an economic incentive to protect the species and its habitat. Sustainable use programs are currently in place for cycads, saltwater crocodiles, freshwater crocodiles and magpie geese, and a management plan for harvesting Oenpelli Pythons is currently under development³⁹⁵.

Conservation agreements

In the Northern Territory, voluntary conservation agreements are brokered by Territory NRM through its Territory Conservation Agreements program. The aim of the program is to assist landholders manage for both production and biodiversity conservation. A 10-year contract is

drawn up that describes how the land is to be managed based on input from the landholders, Territory NRM and independent reviewers. Assistance provided to the landholder includes:

- Funding to support management for conservation and production benefits for 10 years
- Assistance in developing a site conservation plan
- Advice on labour and external funding sources
- Assistance accessing expert advice and support.

There are currently more than 20 Territory Conservation Agreements covering over 20,000 ha.

Department of Primary Industries and Fisheries

The Northern Territory Department of Primary Industries and Fisheries Industry Development Plan sets the direction for assisting primary producers to develop and manage sustainable production systems, including for wildlife enterprises (Table 11). The plan also includes strategies and actions for improving Indigenous employment and business development, including through biosecurity surveillance.

Table 11. Elements of the Department of Primary Industries and Fisheries Northern Territory Industry Development Plan relating to the conservation economy

Source: Department of Primary Industries and Fisheries, Northern Territory (2013)³⁹⁶

Actions	Objectives Strategies	Outcomes
<i>Optimal sustainable use of the Territory's natural resources</i>		
Develop and promote more efficient and environmentally sound production systems		
<ul style="list-style-type: none"> • Improve production and environmental management through innovation • Encourage and support industry best practice in animal welfare • Continue work to optimise sustainable and productive use of NT rangelands 		<ul style="list-style-type: none"> • Cutting-edge primary industries engaging in best practice environmental management and animal welfare • Improved production through better utilisation of NT rangelands
Manage the Territory's aquatic resources to benefit all Territorians		
<ul style="list-style-type: none"> • Develop transparent resource allocation principles • Invest in the development of co-management frameworks • Negotiate for security and certainty of access to aquatic resources 		<ul style="list-style-type: none"> • Security of access to the Territory's aquatic resources for industry and the community • Whole-of-community involvement in aquatic resource management • A positive public perception of the seafood industry • Development opportunities for all user groups

Table 11. Continued

Actions	Objectives Strategies	Outcomes
Biosecurity		
<i>Develop and implement an NT Biosecurity Strategy</i>		
<ul style="list-style-type: none"> Finalise and publish the NT Biosecurity Strategy 		<ul style="list-style-type: none"> An overarching strategy Shared responsibility for biosecurity in the Territory
<i>Increase community involvement in biosecurity</i>		
<ul style="list-style-type: none"> Develop a plan of community biosecurity awareness targets, identifying specific exotic (and endemic) problems Develop a NT biosecurity community awareness program aimed at increasing community pest and disease surveillance and compliance Encourage Aboriginal communities to be involved in biosecurity surveillance and response preparedness 		<ul style="list-style-type: none"> The Territory community is actively engaged in biosecurity surveillance enabling early, cost-effective responses and increased compliance
<i>Protect the reputation of the Territory as a producer of quality primary produce</i>		
<ul style="list-style-type: none"> Maintain and improve controls for major pests and diseases to support industry development and protect the Territory's environment Effectively monitor and regulate the use of agricultural and veterinary chemicals 		<ul style="list-style-type: none"> Minimal disruption to production of Territory primary produce caused by major pests and disease Territory products recognised as premium quality, pest, disease and chemical-free
<i>Respond to biosecurity incursions</i>		
<ul style="list-style-type: none"> Maintain an effective capability to respond to biosecurity emergencies Develop enhanced surveillance for exotic pests and diseases to ensure early detection of incursions 		<ul style="list-style-type: none"> Costs and social consequences of emergency responses are minimised by early detection and rapid response Increased likelihood of eradication
Indigenous participation		
<i>Support Aboriginal employment</i>		
<ul style="list-style-type: none"> Provide a mentoring service specifically targeted at assisting Aboriginal people to develop sustainable industries on their land and seas Partner with Registered Training Organisations to deliver culturally appropriate training Undertake research to identify issues that constrain employment of Aboriginal people and develop strategies to overcome these constraints Utilise the skills and knowledge of Aboriginal Territorians in primary production research projects 		<ul style="list-style-type: none"> Skilled and appropriately trained Aboriginal people employed in primary production industries across the Territory Aboriginal knowledge is utilised to benefit all primary production industries
<i>Encourage business development</i>		
<ul style="list-style-type: none"> Encourage and support the establishment of Aboriginal-owned businesses Facilitate partnerships between Aboriginal Territorians, communities, all levels of government and industry Encourage primary production industries to be involved in training and business opportunities in remote communities 		<ul style="list-style-type: none"> Profitable and culturally appropriate businesses are established and developed sustainably with sound governance Successful implementation of the third tranche of the Indigenous Pastoral Program

Funding and grant programs

There are two grant programs in the Northern Territory, one administered by the Environment Protection Authority and the other by Territory NRM (Table 12). The first—once broader in scope—now concentrates on waste and pollution management. Territory NRM's Community grant scheme is a devolved grant scheme funded through the National Landcare Programme. It

makes funds available to address priorities identified in the Northern Territory Integrated Natural Resource Management Plan³⁹⁷:

- Weed management
- Erosion management
- Pest management
- Marine debris removal
- Fire management
- Community participation and engagement
- Indigenous knowledge transfer
- Management plan development
- Indigenous employment and business
- Revegetation/rehabilitation
- Management practice change
- Training and skills development
- Conservation actions for threatened species.

Table 12. Current Northern Territory sources of funding for undertaking cultural and natural resource management projects

NB: N/A = not available

Scheme	Focus	Round	Budget	Grant limit	Monsoonal North		Source
					Projects (%)	Funds (%)	
Environment Grants	Waste and pollution management	2015-16	\$375,000	\$45,000	61.2	53.0	³⁹⁸
Territory NRM Community grants	NT INRM plan priorities	2015-16	\$600,000	\$25,000	84	N/A	³⁹⁹

Queensland

Queensland Government programs are in place to support Indigenous cultural and natural resource management; conservation on private land; establishment of sustainable businesses based on natural resources; adoption of sustainable practices; and structural readjustment to improve sustainability of primary production. These initiatives are described below. In addition, the Queensland Government’s Business and Industry Portal⁴⁰⁰ directs users to information and support on business development, including for Indigenous development, alternative fuel generation, carbon sequestration and ecotourism ventures.

The Queensland Government's Aboriginal and Torres Strait Islander Economic Participation Action Plan⁴⁰¹ aims to promote sustainable economic development in regional and remote Indigenous communities. Strategies for achieving this include increasing the number of rangers employed in the Department of Environment and Heritage Protection's Indigenous Land and Sea Ranger Program; expanding this program through industry partnerships; and reforming tenure arrangement to improve Indigenous access to business finance.

The NRM groups supporting conservation economy activities across the Queensland sections of the Monsoonal North are Southern Gulf Catchments⁴⁰², Northern Gulf Resource Management Group⁴⁰³ and NQ Dry Tropics⁴⁰⁴. Land councils supporting Indigenous land and sea management in the region are Carpentaria Land Council Aboriginal Corporation⁴⁰⁵, Balkanu Cape York Development Corporation⁴⁰⁶ and North Queensland Land Council⁴⁰⁷. There are also a number of small catchment groups that work closely with landholders and Indigenous ranger groups. Finally, AgForce⁴⁰⁸ and various smaller industry bodies provide advice and support to their constituents regarding sustainable practices and options for diversifying into the conservation economy.

Department of Environment and Heritage Protection

The priorities of the Queensland Department of Environment and Heritage Protection (QEHP) are described in its strategic plan (Table 13). Great Barrier Reef water quality improvement is one of its highest priorities. Threatened species recovery, minimising environmental damage from development and sharing information with stakeholders also rate highly.

Table 13. Elements of the Queensland Department of Environment and Heritage Protection strategic plan relating to the conservation economy

Source: Department of Environment and Heritage Protection (2015)⁴⁰⁹

Strategies	Priorities Goals	Outcomes
Conserving nature and heritage		
Enhance Queensland's ecosystems		
<ul style="list-style-type: none"> • Improve the water quality of Queensland's coast, waterways, catchments and wetlands • Protect and conserve Queensland's ecosystems and species, and increase the state's protected area estate • Minimise negative interactions between wildlife and communities 		<ul style="list-style-type: none"> • Water quality improvement measured through performance scorecards and report cards, including Healthy Waterways and Gladstone Harbour • Improved results for threatened species through the Back on Track program • 17% of land gazetted as protected area estate by 2035
Protecting the Great Barrier Reef		
Protect the Great Barrier Reef		
<ul style="list-style-type: none"> • Provide clear accountability for the state's contribution to the Reef 2050 Long-Term Sustainability Plan • Establish and support a high-level taskforce providing advice on ways to protect the reef 		<p>Based on the 2009 baseline continued progress towards targets of:</p> <ul style="list-style-type: none"> • Up to 80% reduction in nitrogen run-off from key catchments such as the Wet Tropics and the Burdekin by 2025 • Up to 50% reduction of sediment run-off from key catchments such as the Wet Tropics and the Burdekin by 2025
Conserving nature and heritage		
Protect significant heritage places		
<ul style="list-style-type: none"> • Promote the value and understanding of Queensland's heritage through programs and education initiatives • Regulate and support the management and protection of places with state heritage value 		<ul style="list-style-type: none"> • The most significant places in Queensland accurately captured in the state's heritage registers
Enabling responsible development		
Stimulating economic growth and innovation		
Ensuring sustainable management of natural resources		
Avoid, minimise or mitigate impacts on the environment		
<ul style="list-style-type: none"> • Regulate environmentally significant activities based on best practice project assessment and approval and a contemporary compliance framework that focuses on high-risk activities • Oversee the development and delivery of whole-of-government climate change mitigation and adaptation programs • Administer the environmental offsets framework to minimise impacts on the environment • Implement programs to reduce unlawful waste activities and promote increased re-use and recycling 		<ul style="list-style-type: none"> • Improved environmental results for air quality and waste as shown through State of the Environment reporting and the annual State of Waste Report • 80% of environmental problem-solving projects completed and outcomes reported • 80% of Queensland coastal councils with Coastal Hazard Adaptation Strategies in place by 2019
Providing responsive and integrated government services		
Work collaboratively and productively with industry, business and community		
<ul style="list-style-type: none"> • Provide evidence behind decisions and greater access to performance data • Implement a 5 year science and research program to inform policy and monitor performance • Promote private sector investment in environment and heritage protection • Educate, and engage with, communities about the state's ecosystems and species 		<ul style="list-style-type: none"> • 80% of EHP services and transactions available online by 2019 • 20% of departmental programs funded by private sector investment by 2025 • 5 year rolling science and research program developed by December 2015

The plan does not include capacity building or pursuing strategic partnerships to support Indigenous development or conservation management. Nevertheless, in line with the Queensland Aboriginal and Torres Strait Islander Economic Participation Action Plan, QEHP provides funding for Indigenous rangers. In 2014, the \$9.1 m the Indigenous Land and Sea Ranger Program provided numerous full-time environmental management jobs for Indigenous people in Indigenous organisations²¹⁷. This included 26 rangers in five ranger groups in the Monsoonal North (Figure 36). Activities undertaken by these rangers included:

- Preserving cultural sites and stories
- Weed and feral animal management
- Fire management
- Biodiversity surveys on local species and habitats
- Supporting disaster recovery efforts
- Visitor management and education
- National Park management.

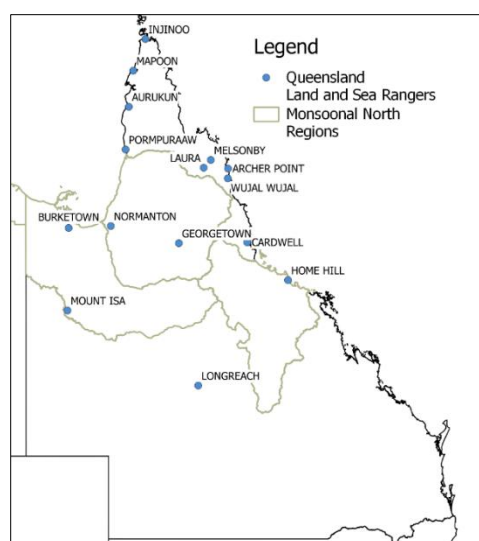


Figure 36. Queensland Indigenous land and sea management ranger groups

Source: Queensland Government (2016)⁴¹⁰

Alignment with the Economic Participation Action Plan would appear to ensure a long-term commitment to this program. In addition, QEHP's Indigenous Land and Sea Ranger grant program⁴¹¹ provided \$500,000 for ranger groups to undertake cultural and natural resource management projects in 2014-15, with a subsequent funding round recently closed. Activities funded by these grants include:

- Cultural heritage site management (recording, protection and training)
- Protected species monitoring and conservation
- Habitat restoration
- Weed and feral animal management
- Fire management
- Erosion control
- Country planning.

QEHP also operates a number grant programs to support cultural and environmental management (Table 14). Also relevant to the conservation economy are two discontinued grant schemes operated by QEHP or its predecessor. An environmental stewardship program (Vegetation Incentives Program) operated in 2005/6. This was mostly used to establish Nature Refuges on the Atherton Tablelands⁴¹². It was not successful in attracting bids from across the Monsoonal North, partly because the payments expected by landholders exceeded the market value of the land to be sacrificed. The Department also funded development of sustainable management practices in relation to dugongs, turtles and other marine resources using funds provided by the Commonwealth’s Caring for our Country program in 2013. Funding for this program was not continued under the National Landcare Programme.

QEHP has also established an environmental offsets program, which is described in more detail in a subsequent section of this report (see [Environmental offset programs](#)).

Table 14. Current and previous Queensland sources of funding for undertaking cultural and natural resource management projects

NB: N/A = not available

Scheme	Focus	Period	Budget	Grant limit	Monsoonal North		Source
					Projects (%)	Funds (%)	
Current funding rounds							
Indigenous Land and Sea Ranger Program	Indigenous NRM	2014-15	\$0.91 m	\$100,000	27.3	28.3	⁴¹³
Indigenous Land and Sea Ranger grants	Indigenous NRM	2013-15	\$1.94 m	\$100,000	27.3	28.3	⁴¹³
Everyone’s Environment Grant	<ul style="list-style-type: none"> • Conservation • Urban Wild Spaces Pilot Projects • Heritage • Research 	2011-14	\$12 m	\$100,000	6.8	10.3	²¹¹
NatureAssist		N/A	N/A	N/A	N/A	N/A	⁴¹⁴

Table 14. continued

Scheme	Focus	Period	Budget	Grant limit	Monsoonal North		Source
					Projects (%)	Funds (%)	
<i>Previous funding rounds</i>							
Vegetation Incentives Program	Protect and manage high quality non-remnant vegetation in Queensland under a conservation covenant or agreement (delivered by Greening Australia)	2005-6	\$12 m	\$20,000	0	0	412
Indigenous Sea Country Management Grants	Develop sustainable management of dugongs, turtles and other marine resources	2013	\$1.96 m	\$200,000	18.8	29.9	415

Nature Refuges and NatureAssist

Queensland landholders may enter into conservation agreements to reserve land on their properties as a Nature Refuge^a. The aim of the Nature Refuge program is to conserve and control the use of significant cultural and natural resources. However, it also allows landholders to continue using the land for purposes that are compatible with conservation goals. For example, grazing may be allowed in some Nature Refuges if this is not considered detrimental to the recognised conservation values of the Nature Refuge.

While any landholder can approach the Queensland Government with a proposal to establish a Nature Refuge, QEHP will invest most effort in securing agreements in priority areas^b. Formerly focusing on threatened species and communities, the priorities are currently being reviewed to maximise protection of significant conservation values, connectivity and resilience to predicted climate change. Considerable effort is being invested in identifying areas that both currently support highly biodiverse areas and have the highest likelihood of continuing to do so under a range of climate change projections. Priority areas will include land that contains conservation values not already protected under the existing protected area estate. There are likely to be several priority areas in the Monsoonal North region. In the former version of the program, assessment of Nature Refuge proposals was either undertaken by QEHP or outsourced to the Queensland Trust for Nature⁴¹⁶. It is not clear if these arrangements will continue under the revamped scheme.

^a *Nature Conservation Act 1992* (Qld)

^b No map of priority areas was publicly available at 5 September 2015

Queensland currently has 491 Nature Refuges⁴¹⁷, including 66 in the Monsoonal North region (Table 15). Nature Refuges protect 3.94 million ha of habitat across the state. Around half of the Nature Refuges in the Monsoonal North were signed up between 2007 and 2012, when landholders could receive an extension of 10 years in return for managing part of their property as a Nature Refuge under the repealed Delbessie Agreement⁴¹⁸.

Queensland legislation requires that declaration of the Nature Refuge must specify the reason for its establishment and the period of its duration, and that the landholder must enter into a conservation agreement covering:

- Management responsibilities of the landholder and the Queensland Government
- Any support (including financial assistance and technical advice) to be provided by the Queensland Government, specifying how such assistance is to be used
- A list of land uses and management activities that are restricted, prohibited or require a permit
- Conditions that would result in the landholder being required to repay financial assistance or the conservation agreement being terminated.

There is no provision in the legislation for conservation agreements over land that is not protected as a Nature Refuge.

Table 15. Nature Refuges in the Monsoonal North region

Source: Department of the Environment (2015)⁴¹⁹

Region	Nature Refuges	
	(no.)	(ha)
Northern Gulf	27	615,397
Southern Gulf	6	243,009
Burdekin Dry Tropics	33	377,568
Total	66	1,235,974

Subject to certain conditions, Nature Refuge boundaries may be changed; a Nature Refuge may be revoked; and conservation agreements may be altered or terminated. Compulsory declaration of a Nature Refuge may occur under special circumstances, in which case, a conservation covenant will be prepared prescribing management and use. Nature Refuges and conservation agreements and covenants are generally binding on current and subsequent landholders and any other people with an interest in the land.

Nature Refuges do not provide protection from mining, and Queensland's environmental offsets legislation does not require offsetting or reparation of damage to a Nature Refuge's environmental values caused by any development^a. However, offset arrangements may fund the establishment and management of Nature Refuges that protect or restore the conservation values affected by a development (see [Environmental offset programs](#)).

Government assistance is not available for Nature Refuges declared as a condition of a government-funded acquisition or licence. For other types of Nature Refuges in priority areas, funding may be available under NatureAssist for management actions such as fencing, soil stabilisation and management of weeds and pest animals and fire to protect conservation values⁴¹⁴. The Queensland Government has committed \$5 m over 2015-16 to continue securing and managing Nature Refuges under this program⁴²⁰. Funding under NatureAssist was originally awarded through a competitive tender process¹¹⁰. The restructured Nature Refuges program is likely to make strategic investments to maximise its conservation goals in priority areas. Formerly, NatureAssist partners (Southern Gulf Catchments, Northern Gulf Resource Management Group, NQ Dry Tropics and AgForce) assisted landholders negotiate the establishment and management of Nature Refuges. It is not clear if such arrangements will continue when the program restarts. Current information of Nature Refuges can be obtained from Land Management Online⁴¹⁷.

Department of Agriculture and Fisheries

The approach of the Queensland Department of Agriculture and Fisheries (QDAF) to assisting primary producers develop and manage sustainable production systems is described in its strategic plan (Table 16). It includes developing research, development and extension partnerships, and supporting producers to develop capacity to assess and manage risks and adverse environmental impacts. The plan also includes strategies and actions for improving Indigenous employment and business development, including through biosecurity surveillance.

^a *Environment Protection Act 1994* (Qld)

Table 16. Elements of the Queensland Department of Agriculture and Fisheries Strategic Plan relating to the conservation economy

Sources: QDAF (2015)⁴²¹ **NB:** Priorities specific to forestry and fisheries are not included

Priorities	Services Strategies
Connect industry to opportunity	
<i>Drive innovation and productivity through research, development and extension</i>	<ul style="list-style-type: none"> • Improve the uptake of innovative technologies and practices • Partner with industry and research bodies to build research, development and extension capability across Queensland
<i>Improve sustainability of agriculture</i>	<ul style="list-style-type: none"> • Advocate for protection of agriculturally important land and water • Support producers to manage risks associated with extreme weather events, climate change and climate variability • Improve management practices to reduce the impacts of agriculture on the environment • Develop energy-, input- and resource-efficient food and fibre production systems
<i>Support a modern and capable workforce</i>	<ul style="list-style-type: none"> • Support industry to improve rural job services and skills development to meet rural workforce needs • Facilitate partnerships between training providers and universities to enhance skills-based training
Manage biosecurity risks	
<i>Improve flexibility and adaptability of biosecurity service delivery</i>	<ul style="list-style-type: none"> • Implement a risk-based investment strategy for biosecurity resources that aligns with state, national and international priorities • Benchmark service delivery against other jurisdictions
<i>Expand shared responsibility and partnerships</i>	<ul style="list-style-type: none"> • Develop state and local government weed and pest animal partnerships and frameworks to support shared decision-making and service delivery • Implement shared responsibility with other agencies, industries, businesses and individuals through co-investment, partnering, contracting and capability building
<i>Improve biosecurity information management</i>	<ul style="list-style-type: none"> • Develop the Biosecurity Information Management System
<i>Continue to build biosecurity capability and emergency preparedness</i>	<ul style="list-style-type: none"> • Review the state's biosecurity capability • Implement the Biosecurity Emergency Preparedness Program to improve the capability of biosecurity management and surveillance and detection systems to identify and respond quickly to threats and outbreaks • Expand partnerships with industry, local government, community and private providers to better manage pest and disease outbreaks
<i>Enhance product value</i>	<ul style="list-style-type: none"> • Manage agricultural chemical use and food contaminants, and ensure animal welfare standards meet community expectations

Sustainability loans

The Queensland Rural Adjustment Authority (QRAA) provides low interest loans of up to \$650,000 to primary producers to cover capital costs of improving the viability, environmental sustainability and climate resilience of their enterprises⁴²². Primary producers employed full-time in their enterprise can apply for these loans. They must demonstrate that they need financial assistance for the intended work, but not be financially over-extended. They must have the ability to repay the loan, and have sound prospects for achieving commercial viability. The loans cannot be used for debt restructuring. A management plan must be submitted with the application explaining how the activities financed will contribute to the intended outcomes. An enterprise that is already financially over-extended is not eligible for this or other assistance, such as drought relief loans.

The relevance of these loans to the pastoral industry is discussed in the [Sustainable Grazing](#) section.

Environmental offset programs

Under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (*EPBC Act*), developments must take measures to avoid adverse impacts on significant environment assets, and minimise (mitigate) such impacts wherever possible⁴²³. Restoration may also be required after the development has been completed. Environmental offsets policies come into play for damage that cannot be avoided, mitigated or restored (i.e. for residual damage)⁴²⁴. Offsets schemes require the developer to invest in land or management to provide alternative habitat for the species or other significant asset that will be affected by the development. Under the national scheme, offsetting applies to all assets that are protected under international agreements (e.g. threatened species and communities, migratory species, significant wetlands and World Heritage Areas). While there are currently no formalised schemes covering GHG emissions at the national level, the Western Arnhem Land Fire Abatement project was essentially a carbon offset project developed through negotiations with the Northern Territory Government to deliver emission abatement and social benefits to an Indigenous community^{425,426}, and Western Australia's use of offsets is largely to replace carbon lost in land clearance.

Offset actions must maintain or improve the conservation of the affected asset, but developers may be encouraged to design offsets that also contribute to overall environmental, economic and social wellbeing. Offset actions to protect or restore biodiversity assets are usually undertaken outside the area of the development, but in the same bioregion or subregion. Actions frequently involve protection and management or restoration of threatened communities or threatened species habitat, but may also include land purchase and research that benefits the affected asset. Except where the environmental damage being offset is deemed to be only temporary, offset areas must be permanently protected and managed for conservation of the affected asset. Depending on the jurisdiction, developers may choose to undertake the offset activity themselves; contract a third party to do so; or pay the government an amount required to cover the cost of the offset activity. Payment amounts vary depending on the costs involved and may cover land purchase, establishment costs, and ongoing maintenance and administration, as well as incentive payments. Duration and scheduling of payments also vary, but should continue as long as maintenance is required. Hence, landholders willing to undertake conservation management may

be funded to do so through an offset program, as long as their land provides appropriate habitat values.

There is considerable debate about the legitimacy of offsetting environmental damage. Some see it as a licence to pollute or create environmental damage⁴²⁷⁻⁴³⁰. The concept of ecological equivalence is problematic, making identification of suitable replacement habitat difficult^{431,432}. Some assets may also be impossible to offset, particularly where a development site contains unique habitat, or where knowledge does not exist to replicate the essential characteristics of habitat that will be destroyed⁴³³. This is the concern for the habitat of the Black-throated Finch *Poephila cincta* that will be destroyed by the Carmichael Coal Mine in Queensland's Desert Uplands⁴³⁴. Moreover, even where such knowledge exists, the time taken to regenerate new habitat is likely to be longer than that taken to destroy the existing habitat⁴³⁵⁻⁴³⁷. Hence, even the best designed biodiversity offsets programs are likely to lead to net biodiversity loss.

The Australian Government⁴²³ and the states of Western Australia⁴³⁸ and Queensland^a have formalised environmental offsetting policies (described in detail below). Each jurisdiction provides guidelines and tools to help the developer calculate the likely impact of their proposed development and formulate and cost a proportionate response to address the residual damage and to allow the government to assess the adequacy of the proposed offset actions. Western Australia and Queensland jurisdictions maintain offset registers in which offset areas and actions are recorded. Bilateral agreements between the Australian and state and territory governments should eventually result in all offset programs being delivered through state and territory governments⁴³⁹. This is presently only the case for New South Wales.

Western Australia

In Western Australia, the only legislation mentioning offsetting is the *Environmental Protection Act 1986* (WA), which stipulates that offset conditions can be imposed on permission to clear native vegetation. This can involve financial contributions or establishing and maintaining native vegetation outside the development area. However, Western Australia does have an offsets policy that requires residual environmental damage caused by development to be offset by counterbalancing improvements to environment assets⁴³⁸. Moreover, any proposal likely to have a significant effect on the environment can be referred to the Environmental Protection Authority, who will advise the Minister of Environment on whether the development should go ahead and, if so, what conditions should be attached. Impacts on matters of environmental significance covered by the Western Australian Offsets policy include all matters covered under the *EPBC Act*,

^a *Environmental Offsets Act 2014* (Qld)

as well as matters of state significance (such as wetlands and species listed as threatened in Western Australia).

Northern Territory

The Northern Territory Government has no offsets legislation. However, the Northern Territory Environment Protection Authority has released offset guidelines that may be taken into consideration before a development is approved⁴⁴⁰. Moreover, the Northern Territory Government can impose offsetting conditions on any development approval as it did when it arranged for ConocoPhillips to underwrite the Western Arnhem Land Fire Abatement project as a condition of developing its natural gas processing facility on Darwin Harbour^{426,441}.

Queensland

In Queensland, offsetting conditions are regulated under Queensland's *Environment Offsets Act 2014* (Qld) (*EOA 2014*). This legislation covers, but is not restricted to, the following environmental assets:

- Nationally threatened species and ecosystems, migratory species, internationally important wetlands, a National Heritage place and World Heritage Areas^a
- Queensland protected plants, animals and areas^b
- Queensland declared fish habitat^c
- Queensland marine conservation park zones^d
- The Great Barrier Reef Marine Park^e
- Declared areas of high nature conservation value and endangered regional ecosystems^f
- High ecological value waters^g
- A water resource^h
- Other environmental matters listed under a local planning scheme, policy or other instrument, such as a strategic environmental or cropping area, a priority living or agricultural areaⁱ.

Under *EOA 2014*, the proponent of any development or action likely to degrade an environmental asset may be required to offset this impact by undertaking or financing activities to restore the

^a *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

^b *Environment Protection Act 1994* (Qld). NB. Nature Refuges are excluded from many provisions of the Act

^c *Fisheries Act 1994* (Qld)

^d *Marine Parks Act 2004* (Qld)

^e *Great Barrier Reef Marine Park Act 1975* (Cth)

^f *Vegetation Management Act 1999* (Qld)

^g *Environmental Protection (Water) Policy 2009* (Qld)

^h *Water Act 2007* (Cth)

ⁱ *Sustainable Planning Act 2009* (Qld) and *Regional Planning Interests Act 2014* (Qld)

condition of that asset. They may also be required to provide “a social, cultural, economic or environmental benefit”.

Carbon economy

There are several approved methods for deriving carbon credits from land or agricultural management in Australia (as described in *Prioritisation of conservation investment: Carbon investments*). These methods allow income to be earned from storing carbon or reducing the emissions of GHGs (carbon dioxide, methane and nitrous oxide) through Australia’s ERF, which was established under the *Carbon Credits (Carbon Farming Initiative) Act 2011* (Cth). ERF-approved projects generate Australian Carbon Credit Units (ACCUs) that can be sold or traded domestically or internationally (Figure 37). Projects must use ERF-approved methods, and the projects themselves must also be approved and audited to determine how many ACCUs have been earned. Once credits have been earned they can be sold through the government reverse auction (tender) process directly or through a third party, or into the voluntary market (Figure 38). For a project to be approved, a proponent must establish that they have the right to manage carbon and the right to undertake a project on the land⁶. The permission of Native Title owners, where they are not the project proponents, will be required where Native Title exists. Ownership of carbon resources is approached differently in the different states and territories, and needs to be clearly defined before project approval^{442,443}.

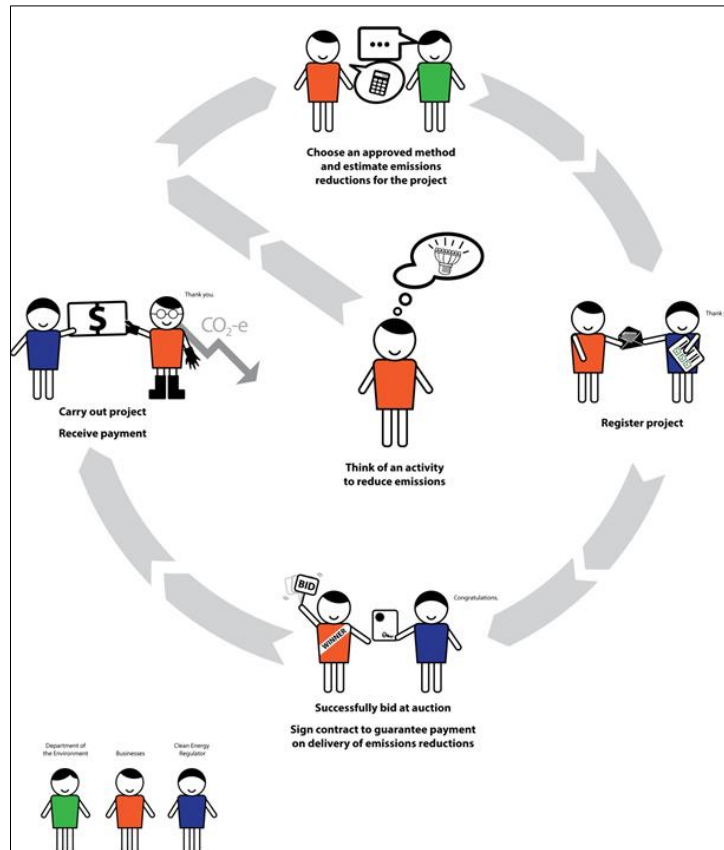


Figure 37. Steps involved in establishing and acquitting an ERF project with sale to the Clean Energy Regulator

Source: Commonwealth of Australia (2015)⁴⁴⁴

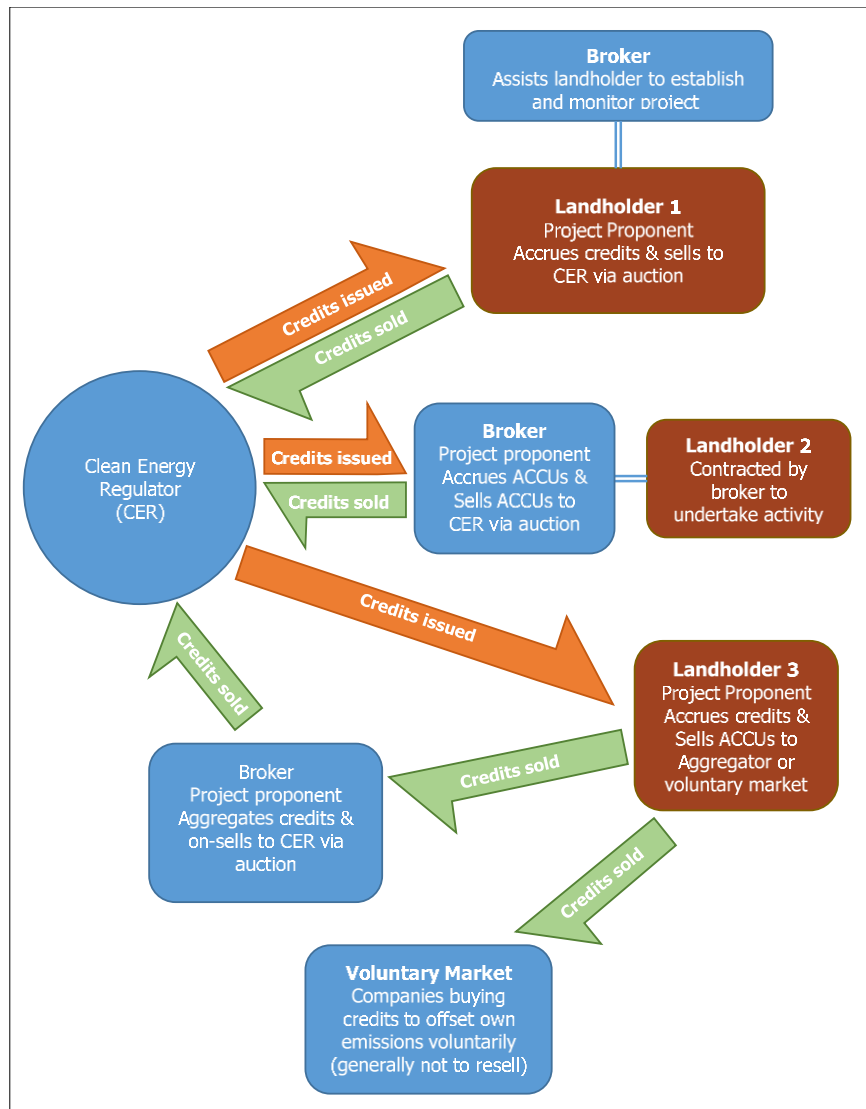


Figure 38. Options for landholders to participate in the carbon market

Project establishment, accounting and auditing procedures are all complex and costly, so only projects that generate high numbers of ACCUs are likely to be financially viable⁶. An economic assessment of a range of sample carbon projects indicates that fire management projects have the highest net earning potential, followed by herd performance and managed regrowth (Table 17). Avoided clearing was not viable in the example given, and the viability of using nitrate licks instead of urea licks was questionable. The viability of soil carbon projects was not assessed (but see [Sequestering soil carbon](#)).

Table 17. Estimated income and costs of sample ERF carbon projects on pastoral properties

Source: Cohn (2015)⁴⁴⁵

Method	Project period	Annual income	Establishment cost			Periodic costs			Net annual income
			Project registration	Base map	Audit	Monitoring /sampling	Audit	Site visit	
<i>Fire management</i> ^a 8,700-15,000 km ² Gulf Savanna	25 years	\$100-160k	\$10k	\$20-30k [†]	\$11k	\$3.5k	\$9k	\$1k	\$88-150k
<i>Herd performance</i> ^b 10,000-15,000 breeders Kimberley/Gulf Savanna	7 years	\$300-600k	\$10k	N/A	\$13k	\$3.5k	\$9k	\$1k	\$27-70k
Managed regrowth ^c 1,000 ha Cape York Peninsula	25 years	\$50k	\$10k	N/A	\$10-15k	\$3.5k	\$9k	\$1k	\$34k
<i>Nitrate licks</i> ^d 30,000 breeders	7 years	\$18k	\$10k	N/A	\$13k	\$3.5k	\$9k	\$1k	\$4k
Avoided clearing ^{e*} 1,000 ha Desert Channels	20 years	\$6k	\$10k	N/A	\$10-15k	\$3.5k	\$9k	\$1k	\$0

*Currently no method covers avoided clearing in Queensland, as the current method requires a permit for clearing to have been issued before 2010. †Additional cost, not included in original presentation

There are several caveats to this economic assessment. First, economic viability of emission abatement projects depends on the level of emissions generated before project activities are undertaken (called the baseline) and the capacity for reducing these emissions. For example, a fire management project is unlikely to be viable on a property that already has effective fire management; and a herd management project is unlikely to be viable on a pastoral enterprise that is already following best practice management. Secondly, this assessment does not take into account brokerage or aggregation costs, which may be a set fee or a percentage of project income, or a combination of the two. Finally, it does not include cost savings that can be made from combining activities, such as coordinated fire management, across several properties into a single project. Conversely, it is important to note that savings cannot be made by combining activities from different methods within a single project area, as these must be accounted in separate projects.

^a ERF methods: Savanna Burning (repealed), Savanna Fire Management

^b ERF method: Beef cattle herd management

^c ERF method: Native Forest from Managed Regrowth, Reforestation and Afforestation, Reforestation and Afforestation 1.2

^d ERF method: Reducing greenhouse gas emissions in beef cattle through feeding nitrate containing supplements

^e ERF methods: Avoided deforestation, Avoided deforestation 1.1, Designated Verified Carbon Standard Projects

The only ERF-registered projects in the Monsoonal North at the time of writing involved fire management and soil carbon (Table 18). Carbon credits had been earned from several fire management projects, but not from soil carbon—and the prospect for successful carbon projects is uncertain (see [Sequestering soil carbon](#)). Lack of registered projects replacing urea licks with nitrate licks (even though this method was originally approved in August 2014 and amended in June 2015) probably reflects the low level of income that can be expected from this practice change^{445,446}. Approval of the herd management method in September 2015 meant there had been no opportunity for projects using this method to be registered before this report was prepared. Both herd management and adjusting cattle diets are considered to have potential to reduce methane emissions from cattle while improving enterprise viability⁴⁴⁶. Approved ERF methods are described in more detail in the remainder of this section.

Table 18. Number of approved carbon projects at 18 September 2015

Source: Clean Energy Regulator (2015)⁴⁴⁷

NB: Methods available from Department of the Environment website⁴⁴⁸

	Monsoonal North					Rest of Australia	Total
	Kimberley	Top End	Gulf Savanna	Northern Gulf	Burdekin Dry Tropics		
<i>Land or agricultural management</i>							
Fire management ^a	6	7	3	12		20	48
Soil carbon ^b			1		1	8	10
Avoided deforestation ^c						55	55
Tree planting ^d						192	192
Reforestation/regrowth ^e						32	32
Nitrate licks ^f							0
Herd management ^g							0
<i>Other</i>							
Piggeries ^h						10	10
Waste ⁱ		1			3	104	108
Transport and fuel ^j						6	6
Urban/commercial ^k						3	3
Total	6	8	4	12	4	430	464

^a ERF methods: Savanna Burning (repealed), Savanna Fire Management

^b ERF method: Sequestering carbon in soils

^c ERF methods: Avoided deforestation, Avoided deforestation 1.1, Designated Verified Carbon Standard Projects

^d ERF methods: Reforestation and afforestation 2.0, Reforestation by environmental or mallee plantings - FullCAM

^e ERF method: Native Forest from Managed Regrowth, Reforestation and Afforestation, Reforestation and Afforestation 1.2

^f ERF method: Reducing greenhouse gas emissions in beef cattle through feeding nitrate containing supplements

^g ERF method: Beef cattle herd management

^h ERF methods: Destruction of methane generated from manure in piggeries 1.1, Destruction of methane from piggeries using engineered biogasifiers

ⁱ ERF methods: Alternative waste treatment, Landfill gas, Capture and Combustion of Methane in Landfill Gas from Legacy Waste, Coal Mine Waste Gas

^j ERF methods: Aviation, Industrial Electricity and Fuel Efficiency, Land and Sea Transport

^k ERF methods: Aggregated Small Energy Users, Commercial Buildings, Commercial and Public Lighting

Carbon policy is yet to settle, with policy moving from the Labor Government's 2011 Clean Energy Future program (with carbon trading and the Carbon Farming Initiative) to the Coalition Government's 2014 Direction Action program (with the ERF)⁶. So far both versions have provided opportunities for the land management sector to store carbon and reduce greenhouse gas emissions, but lack of bipartisan support for the Emissions Reduction Fund^a and the Labor Party's plan to reinstate an emission tradition scheme^b leaves land managers with uncertainty about deriving income from carbon storage and emission reduction into the future.

Fire management to abate nitrous oxide and methane

Bushfire smoke emits 2 to 3.5 billion tonnes CO₂-e globally each year⁴⁴⁹, and produces about 1.5% of Australia's greenhouse gas emissions, the majority of which is generated from fires in northern Australia⁴⁵⁰. Bushfire emissions contain methane and nitrous oxide, which remain in the atmosphere for many years, and carbon dioxide (CO₂). However, as CO₂ is assumed to be reabsorbed when the plants regrow after fire, its emission from bushfires is not included in GHG emission accounting⁴⁵¹. Even so, the emissions of methane and nitrous oxide from bushfires have significant global warming impacts⁴⁵².

Savanna Fire Management (or previously Savanna Burning) projects reduce the amount of methane and nitrous oxide lost to the environment by strategically burning firebreaks in the early dry season (before August) to reduce the spread of wildfires in the late dry season. Part of the emission reduction is gained from reducing the total area that is burnt and part from their patchiness. The steps involved in establishing a Savanna Fire Management include:

- Define a project area and demonstrate a right to undertake a carbon project in this area
- Assess the average extent of fires and calculate average annual emissions for a 10 (in the high rainfall zone) or a 15 year baseline period (in the low rainfall zone) to determine if the project is viable
- Register the project with the Clean Energy Regulator (CER)
- Create and verify a base map for the eligible fuel types in the project area
- Develop a plan for reducing extent of late dry season fires, that must include using early dry season burning
- Get the project plan audited and approved by the CER
- Undertake fire management and record management and fuel use as required

^a <http://www.abc.net.au/news/6696666>

^b <http://www.abc.net.au/news/6621198>

- Assess the extent of early and late dry season fires, calculate emissions and compare with baseline amounts, taking into account emissions produced from fossil fuels used in project management
- Generate an offsets report and submit to CER
- Submit to audits as periodically required
- Accrue carbon credits for emissions reduced and sell these through an appropriate market.

Savanna Fire Management has rapidly become the most lucrative form of payment for environmental services in northern Australia. By 18 September 2015, 1.3 million credits had been derived from fire management projects in the Monsoonal North and a total of 16.4 million credits accrued from land sector activities across the whole of Australia. The original Savanna Burning methodology only applied in areas receiving at least 1,000 mm average annual rainfall, so most projects registered by September 2015 were in this zone (Figure 39). Following the release of the Savanna Fire Management method in March 2015, projects could be established in areas receiving 600-1,000 mm annual average rainfall, and two projects had been approved in this zone by September. There is considerable scope to increase the number of projects in the Monsoonal North, particularly in the low rainfall zone. A method currently under development that improves accounting for carbon sequestration in fine fuel and woody debris^a, thus increasing the number of carbon credits that will generated from fire management projects. Under current ERF rules, any projects transferring between methodologies will need to establish a new baseline, which will includes the emission reductions already achieved under any existing project in the same project area.

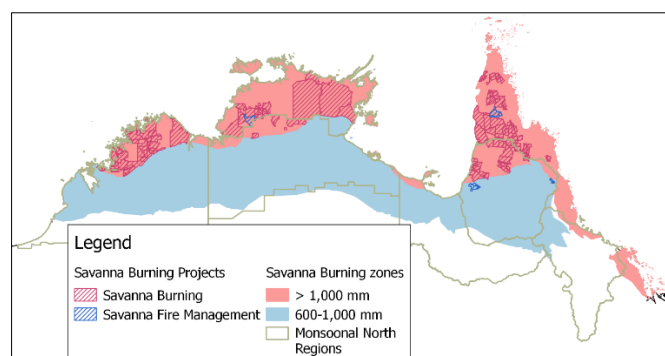


Figure 39. Savanna burning and fire management projects registered by 18 September 2015 in relation to rainfall zones

Source: Clean Energy Regulator (2015)⁴⁴⁷

^a See ERF methods: Savanna Burning (repealed), Savanna Fire Management for definitions of fine fuel and woody debris

Adjusting cattle diets to reduce methane emissions

As described earlier, methane emissions from cattle are a significant source of GHG emissions, accounting for 66% of Australia’s agricultural emissions, and around 10% of Australia’s total emissions²⁸⁷. There are several options for reducing methane emissions from cattle without reducing production (Table 19). While a method using nitrate lick blocks instead of urea is approved^a, its economic viability is questionable. The options for which an approved methodology appears most promising involve feeding cattle marine algae and including *Leucaena* in the forage system. Planting *Leucaena* for forage has the added benefit of increasing production. However, because of its weed potential, *Leucaena* should only be used in accordance with the *Leucaena* Network’s Code of Practice⁴⁵³.

Table 19. Options for reducing methane emissions from northern beef cattle through dietary adjustment

Source of assessment: Meat and Livestock Australia (2015)⁴⁴⁶

Practice	Production increase	Potential emission reduction		Method prospect	Source
		Enterprise	Australia-wide		
	(%)	(%)	(T CO ₂ -e)		
Replacing urea lick with nitrate	0	6	363,000	Approved	454
Marine red algae	8	60	3,296,000	Promising	455,456,b
<i>Leucaena</i>	22	20	112,000	Promising	457
Bioactive compounds from plants	3.5	25	1,373,000	Moderate	458
Grape marc fed to feedlot cattle	0	10	145,000	Poor	459,460

Improving herd genetics and management to reduce methane emissions

Other approaches to reducing methane emissions from cattle are genetic improvement of the herd and improving herd management to reduce the number of cattle required to produce each kilogram of beef and the time each animal spends in the grazing system (Table 20). Improved herd management has an approved ERF methodology^c that makes a modest contribution to emission reduction, but has long-term profitability benefits. Genetic modification of the herd is more problematic, as selection for reduced emissions can select for animals with other undesirable traits, such as low growth rates, and the required genes may not be passed down the generations or may take several generations to infiltrate the entire herd⁴⁶¹. However, research into this area is ongoing, and a suitable method may eventually be developed.

^a ERF method: Reducing greenhouse gas emissions in beef cattle through feeding nitrate containing supplements

^b <http://www.abc.net.au/6867066>

^c ERF method: Beef cattle herd management

Table 20. Options for reducing methane emissions from northern beef cattle through herd management

Source of assessment: Meat and Livestock Australia (2015)⁴⁴⁶

Practice	Production increase	Potential emission reduction		Method prospect	Source
		Enterprise	Australia-wide		
	(%)	(%)	(T CO ₂ -e)		
Best management practices for reproductive performance and feed utilisation	20	3	286,000	Approved	30,462,463
Genetic improvement	0.8	6	487,000	Poor	461

Improving herd management involves adopting a range of best management practices that have been proven to improve reproductive performance, reduce the proportion of reproducing animals in a herd and increase animal growth rates (Table 21). One of the confounding effects is that that emissions reduced through improved performance may be offset if it enables the volume of meat being produced to increase. Any increase is accounted for by basing emission calculations on the entire herd. However, the practice change is still considered desirable as it reduces the emissions per kilogram of meat produced and increases enterprise profitability.

Table 21. Examples of herd management for reducing methane emissions from northern beef cattle

Source: Wiedemann (2015)⁴⁶⁴ based on Wiedemann et al. (2015)³⁰

Practice	Impact on productivity
Fencing and additional water points	<ul style="list-style-type: none"> Allows introduction of herd segregation and priority feeding of some herd classes Reduces overgrazing near water points and improves access to better quality pasture, improving condition scores, pregnancy rates and weaning weights
Rotational grazing	<ul style="list-style-type: none"> Improves feed quality for breeding cattle with the aim of increasing condition scores, pregnancy rates and weaning weights
Herd segregation / supplementation	<ul style="list-style-type: none"> Allows targeted supplementation of second calving heifers Reduces handling of herds with young calves at foot, reducing the incidence of mis-mothering and mortality in calves prior to weaning
Irrigation or forage cropping	<ul style="list-style-type: none"> Cropping and/or irrigation will: increase growth rates of steers, and reduce stocking pressure on rangeland areas, improving breeder herd performance
Increased selection pressure, culling and reduced breeder numbers	<ul style="list-style-type: none"> Culling unproductive animals should result in higher feed availability for the remaining herd and may contribute to higher fertility over time, resulting in higher pregnancy rates and higher growth rates in calves prior to weaning

The steps involved in undertaking a herd management project include:

- Define a project area and demonstrate a right to undertake a carbon project in this area
- Demonstrate that the land has not been cleared of native vegetation for the purpose of the project
- Decide on the management actions to be adopted

- Calculate baseline emissions (using 3 years of positive liveweight gain within the 7-year period before start of project) using the Beef Herd Management Calculator⁴⁶⁵ by entering information about:
 - Herd numbers and composition
 - Liveweight gain
 - Cattle diet
 - Birth and purchase of new cattle
 - Sale and destination of cattle and average weight at sale
 - Diet (for years in which this is an identified activity)
- Identify the project activities to be undertaken in each year of the 7-year project
- Register the project with the CER
- Have the project audited and approved by the CER
- Undertake the management change and keep records of herd composition and management as required
- Calculate emissions each year and compare with baseline, accounting for emissions from fossil fuels used in project management
- Generate an offsets report and submit to CER
- Submit to audits as periodically required
- Accrue carbon credits for emissions reduced and sell these through an appropriate market.

Pilot studies have indicated that profits made through improving herd management can increase revenue of a large cattle enterprise by 6-10%^{445,464}. The cost of changing management; requirements for detailed record-keeping; and resistance to practice change may be disincentives to uptake of this method^{57,466,467}.

Tree planting and managed regrowth

Replanting cleared vegetation^a or simply allowing it to regrow by managing grazing pressure, feral animals and weeds^b increases the amount of carbon stored in the trees and shrubs. The amount of carbon stored at each site will depend on the type of the original vegetation and the soil and climate of the site. Assisting natural regrowth is a more viable option than is tree planting, but in most areas will only be profitable with a carbon price that is more than twice the current \$13.95/t^{468,469}. A hypothetical regrowth project undertaken at Laura in the Cook Shire, just outside

^a ERF methods: Reforestation and afforestation 2.0, Reforestation by environmental or mallee plantings - FullCAM

^b ERF method: Native Forest from Managed Regrowth, Reforestation and Afforestation, Reforestation and Afforestation 1.2

the Northern Gulf NRM region was assessed as profitable⁴⁴⁵. However, a Queensland-wide assessment found that regrowth projects become profitable in Cook Shire only once the carbon price reaches \$30/t, and will not be profitable at all anywhere in the Queensland section of the Monsoonal North⁴⁶⁹. This should have little consequence as limited vegetation clearance means the Monsoon North is not a priority for regrowth projects (see [Prioritisation of conservation investment](#)).

The steps involved in a managed regrowth project include:

- Define a project area and demonstrate a right to undertake a carbon project in this area
- Demonstrate that the land has previously been cleared of native vegetation for pastoral use
- Calculate baseline emissions using FullCAM^a by entering information about the size and location of the site and its previous management
- Prepare a site management plan (e.g. fencing to control stock grazing pressure, weeding) to demonstrate that regrowth will occur
- Register the project with the CER
- Get the project audited and approved by the CER
- Undertake and keep records of necessary management as required
- Calculate emissions each year and compare with baseline, subtracting emissions from fossil fuels used in project management
- Generate an offsets report and submit to CER
- Submit to audits as periodically required
- Accrue carbon credits for emissions reduced and sell these through an appropriate market.

Sequestering soil carbon

In a grazed landscape, soil carbon concentrations are highest around the bases of perennial grasses (Figure 40). Therefore, poor grazing management that eliminates perennial grasses reduces the amount of carbon entering the soil. Reducing vegetation cover also increases soil temperature, which, in turn accelerates decomposition of soil organic matter⁴⁷⁰. Hence, improvements to grazing management practices have potential to increase soil carbon and to contribute to Australia's GHG emission reduction targets^{471,472}. An ERF method has been developed for *Sequestering carbon in soils in grazing systems*^b.

^a Full Carbon Accounting Model²⁹⁰

^b ERF method: Sequestering carbon in soils

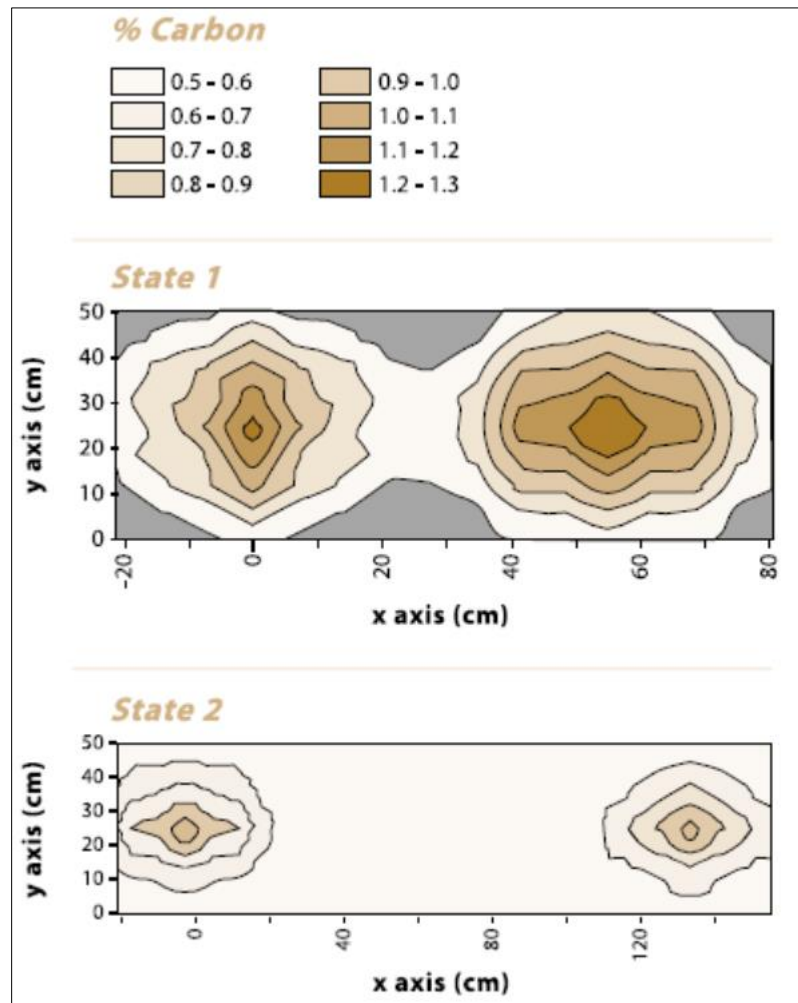


Figure 40. Soil carbon concentration in relation to perennial grass tussock in good condition land (left) and poor condition land (right)

Source: Ash et al. (2002)⁴⁷³

However, a review of the science indicates that soil carbon concentrations cannot be predictably linked to any set of management regimes⁴⁷⁴⁻⁴⁷⁶. While, in any one location, carbon is likely to be found in highest concentration around plants, this pattern is not necessarily repeated across the broader landscape^{477,478}. In fact, landscape-scale studies have variously shown: (1) no difference in carbon between grazed and ungrazed areas; (2) lower carbon in grazed than in ungrazed areas; and (3) higher carbon in grazed than in ungrazed areas⁴⁷⁹⁻⁴⁸². Failure of carbon to respond predictably to changes in grazing pressure at the landscape-scale has been attributed to the effects of soil texture and condition⁴⁸³; nitrogen fertilisation from dung (which influences organic matter production)^{470,481}; differences in the relative cover of shrubs and grasses⁴⁸⁴; differences in the relative cover of C3 and C4⁴⁸⁵ plants⁴⁸⁶; fire regime⁴⁸⁷⁻⁴⁸⁹; activity of termites and other soil biota⁴⁹⁰; and variations in temperature, rainfall and soil moisture⁴⁷⁰. As a result, improved grazing

management may just be making carbon available for loss through another pathway, such as fire, termites or soil respiration.

The uncertainty of how management affects soil carbon is recognised by the ERF. In contrast to other methods (in which practices are linked to carbon storage and abatement outcomes through equations and models), the soil carbon method requires rigorous sampling to be undertaken to demonstrate changes in soil carbon. This involves baseline sampling and resampling before each carbon crediting report is submitted^a. The requirements of the methodology are presented here, as their complexity and expense will affect the viability of soil carbon projects and the willingness of landholders to participate.

At each sampling period, the project area is divided into one or more carbon estimation areas, each of which is divided into three or more strata (Figure 41). A sample is taken from each stratum and combined to form a composite sample. This is repeated at least three times to form three composites across the project area.

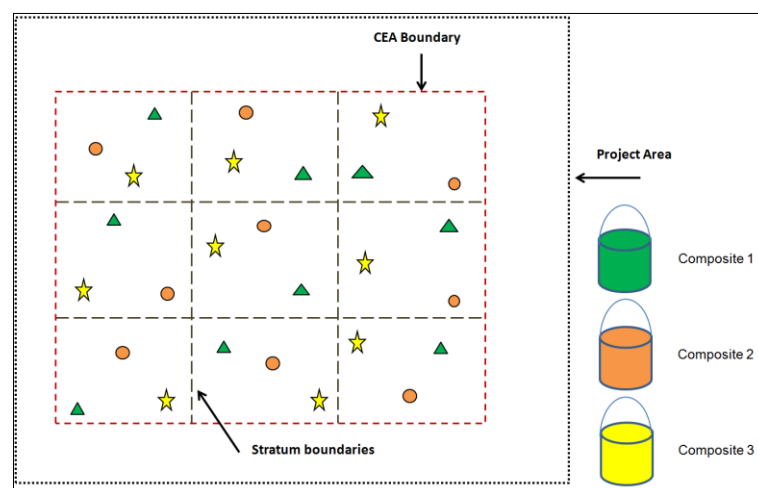


Figure 41. Example sampling regime for a Carbon Assessment Area (CAE) showing nine strata, each with three sample locations

Source: Department of the Environment (2014)⁴⁹¹

The number of composite samples that must be taken is dictated by the level of change that needs to be detected (Figure 42). The literature describing the effects of changing management practices on soil carbon reported changes between a reduction of 0.09 t/ha/year and an increase of 0.71 t/ha/year, with grazing exclusion producing changes of between -0.09 and +0.35 t/ha/year^{477,478}. Over the maximum reporting interval of five years, these changes would amount to between -0.45

^a Reports must be submitted no more than five years apart

and +1.75 t/ha. Examination of Figure 42 indicates that changes of this order of magnitude would require at least ten composite samples to be taken over ten strata. This is effectively 100 samples combined into 10 composites. Such extensive sampling may be prohibitive, but if sampling is not adequate, then any changes that do occur in soil carbon will not be detectable.

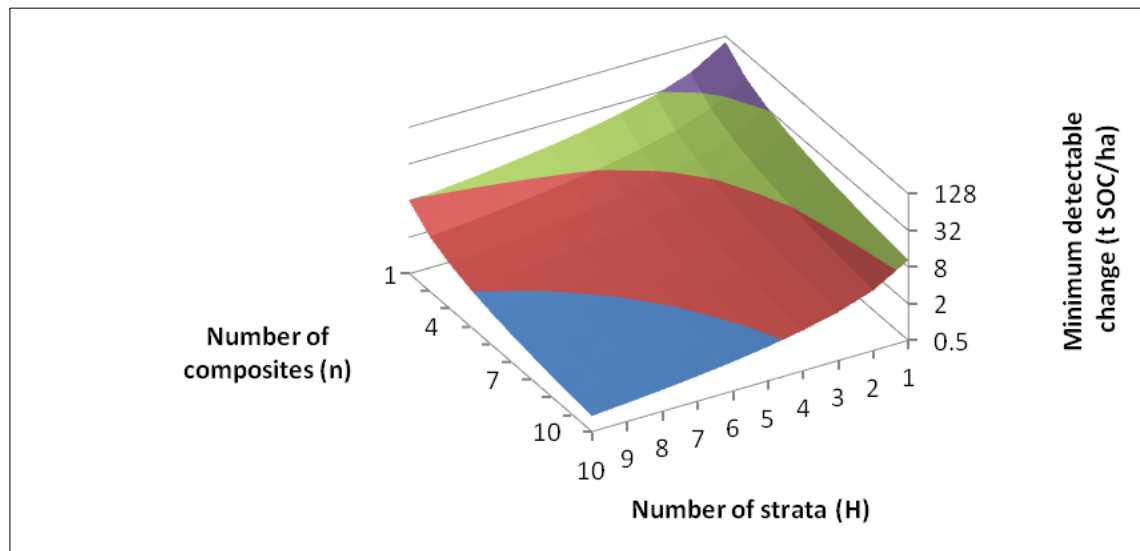


Figure 42. Relationship between the number of composite soil samples and sampling strata and the magnitude of changes in soil organic carbon (SOC) that can be detected

Source: Department of the Environment (2014)⁴⁹¹

Uptake of the soil carbon methodology will also depend on the expected level of return. At the current price of ca \$15/t, landholders achieving soil carbon improvements the top end of the reported range (an increase of 1.75 t/ha over five years) would receive an income of ca \$26/ha (\$2,600/km²) once every five years. At the lower end of the range (a decrease of 0.45 t/ha), the landholder would be required to pay ca \$7/ha (\$700/km²) every five years. These amounts do not include the deductions that must be made for emissions generated in the project from livestock production, tillage and any application of lime or other fertilisers. These compulsory deductions would reduce the income that could be derived in the most optimistic scenario and increase the debt in the most pessimistic one. Moreover, if the landholder is locked into a contract with the CER that requires a certain level of emission reduction, when soil carbon decreases rather than increases, they will be obliged to buy credits from another provider to cover the difference between what was promised and what was delivered. It is likely that any such purchase will be at an inflated price.

That said, by September 2015, there were 10 ERF approved projects using the soil carbon method, two of which include some land in the Monsoonal North (see Table 18). It is hoped that these

projects are successful and can identify management practices that permanently sequester carbon in the soil profile in the monsoonal tropics.

Water

Management of water in the conservation economy involves ensuring water extraction leaves enough water in the system for other current and future uses, and that water quantity and quality are maintained at levels needed to support biological systems, agriculture, fisheries and other human needs^{301,302,492}. This includes ensuring water supply for food security⁴⁹³. Dominance of agriculture in water-use has led to over-allocation in much of the continent⁴⁹⁴⁻⁴⁹⁶. Therefore, poor water allocation can be an impediment to the conservation economy. Attempts have therefore been made to assess the sustainable yields that can be achieved from northern rivers without adverse environmental impacts⁴⁹⁷. Some river systems in northern Australia (Burdekin, Mitchell, Daly, Ord) have been subject to intensive agricultural development, and others are the current focus of development pressure (e.g. Gilbert, Flinders). While sustainable development is seen as acceptable—and even desirable—in many northern catchments (particularly to address Indigenous disadvantage), development of some catchments (e.g. Gregory) has less support^{302,498}.

Water and river system management arrangements relevant to the Monsoonal North have included the National Water Initiative (NWI – a nation-wide intergovernmental agreement to reform water management)⁴⁹⁹ and Queensland’s Wild Rivers legislation^{218,500-503}. Both were designed to use consultative approaches to improve water and river management, but have received substantial criticism for failing in this regard. Wild Rivers legislation, which also provided employment for Indigenous rangers, was repealed with a change in government following much community debate^{91,503}. The fate of the NWI remains to be seen after its recent transfer from the Australian Department of the Environment to the Department of Agriculture and Water Resources.

The aim of the NWI is to develop mechanisms to ensure equitable water allocation, including through regulation, planning and water markets^{498,504}. The NWI recognises Native Title rights of Indigenous people to access water, and commits to providing specific allocations to meet their needs⁵⁰⁴. However, Indigenous needs are still given scant regard through much of the continent and, even where they are allocated, the amounts provided are not necessarily commensurate with the needs of Indigenous people⁵⁰⁵. Under the *Water Act 2000* (Qld), the Water Resource (Gulf) Plan 2007 provides for the economic aspirations of Indigenous communities, environmental flows, and the security of commercial fishing enterprises.

Water trading is one mechanism that can be used to facilitate fair and sensible allocation of water⁴⁹⁸. However, there has been very little water trading in northern Australia, and concern that poorly regulated water trading could further disadvantage Indigenous people and small agricultural operators by enabling large, wealthy producers to monopolise the market^{498,506}. This is one of the concerns of small producers in the Gilbert catchment, should Integrated Food and Energy Developments' plans to convert 50,000 hectares of grazing land into irrigated cropping land proceed^a. Nevertheless, there is widespread support for the establishment of water markets in northern Australia as long as sustainability; environmental protection; social justice and equity; and economic development issues are addressed⁴⁹⁸. Thus, while full realisation of a conservation economy in the Monsoonal North awaits appropriate water allocation mechanisms, considerable effort is being invested in their development, especially in ensuring they achieve equitable outcomes.

Maintaining water quality in order to support aquatic diversity and productivity involves managing riparian vegetation cover and weeds and controlling pest animals and grazing pressure^{302,507-509}. Opportunities for deriving income from such management are addressed elsewhere in this report. People surveyed in Sydney stated a willingness to pay \$161 each for maintaining Daly River waterholes in good condition for the use of Aboriginal people, \$120 for high quality recreational fishing and \$91 for biodiversity values⁵¹⁰. When extrapolated to Sydney's total population, a potential investment of \$81 m was identified as being available for water conservation in the Daly catchment. However, there is no mechanism in place for this money to be collected and transferred to river managers.

Non-government organisations

Historically, Australian NGOs had a history of supporting the addition of land to a state-based national reserve system⁵¹¹. In the 1990s, many moved into purchasing private conservation reserves^{36,65,512,513}. These actions often had the effect of disenfranchising Indigenous Australians^{251,500,514}. However, this is no longer the case for the major NGOs supporting conservation in northern Australia (Table 22)⁵¹⁵. In line with the priorities identified earlier in this report, many conservation NGOs now operate through partnership arrangements and provide financial and logistic support to Indigenous organisations wanting to undertake cultural and environmental management on their lands through. In the Monsoonal North, conservation NGOs are most active in the Kimberley and Top End. There is very little NGO activity in the Queensland

^a <http://www.abc.net.au/4935806>

sections of the Monsoonal North, although several groups do operate and invest on Cape York Peninsula.

Australian Wildlife Conservancy (AWC) is the only conservation NGO that currently operates privately-run protected areas in the Monsoonal North. It has several reserves in the Kimberley, Top End, Gulf Savanna and Northern Gulf (Figure 43), and employs Indigenous rangers under short term contracts for activities such as fire and weed management and biodiversity surveys. Two AWC reserves, Seven Emu and Tableland, are subleased from Indigenous leaseholders. The Tableland's sublease is in return for sublease payments, employment and assistance with managing the pastoral operations. Australian Wildlife Conservancy also coordinates multi-tenure fire management in the central Kimberley and upper Mitchell River catchment in the Northern Gulf, and cross-tenure weed management projects in the upper Calvert River catchment in the Gulf-Savanna and on properties adjoining Wongalara in the Top End.

Table 22. Conservation economy activities of non-government organisations in the Monsoonal North

NGO	Activity	Partners	Source
Multiple regions			
WWF	Financial assistance for marine debris removal	GhostNets Australia	516
WWF	Promotes sustainable fisheries	Marine Stewardship Council	517
Kimberley			
Australian Conservation Foundation	Financial assistance for cultural and natural resource management by Traditional Owners	Kimberley Land Council	518
Australian Wildlife Conservancy	Reserve purchase and lease, employment of Indigenous rangers, collaborative fire management for carbon credits	Neighbouring landholders	519
Bush Heritage Australia	Financial assistance for IPA planning and management	Wunambal Gaambera Traditional Owners	520
Bush Heritage Australia, Environs Kimberley & Rangelands NRM	Financial assistance for IPA planning and management	Bunuba Dawangarri Aboriginal Corporation	521
The Nature Conservancy	Financial assistance for IPA management planning	Kimberley Land Council	522
The Nature Conservancy & Pew Charitable Trusts	Financial assistance to establish Karajarri IPA	Kimberley Land Council	523
WWF	Indigenous partnerships for protection of cultural and natural values	Unavailable	524
Top End			
Australian Wildlife Conservancy	Reserve purchase, employment of Indigenous rangers, collaborative weed management	Neighbouring landholders	519
Bush Heritage Australia	Financial assistance for IPA planning and management	Warddeken Land Management Limited	525
The Nature Conservancy & Pew Charitable Trusts	Financial assistance to purchase and Fish River for cultural and natural resource management and fire management for carbon credits	Indigenous Land Council	526
The Nature Conservancy & Pew Charitable Trusts	Financial assistance to establish Warddeken and Djelk IPAs	Traditional Owners	527
Gulf Savanna			
Australian Wildlife Conservancy	Reserve purchase, employment of Indigenous rangers, collaborative weed management	Neighbouring landholders	519
Northern Gulf			
Australian Wildlife Conservancy	Reserve purchase and lease, employment of Indigenous rangers, collaborative fire management	Neighbouring landholders	519

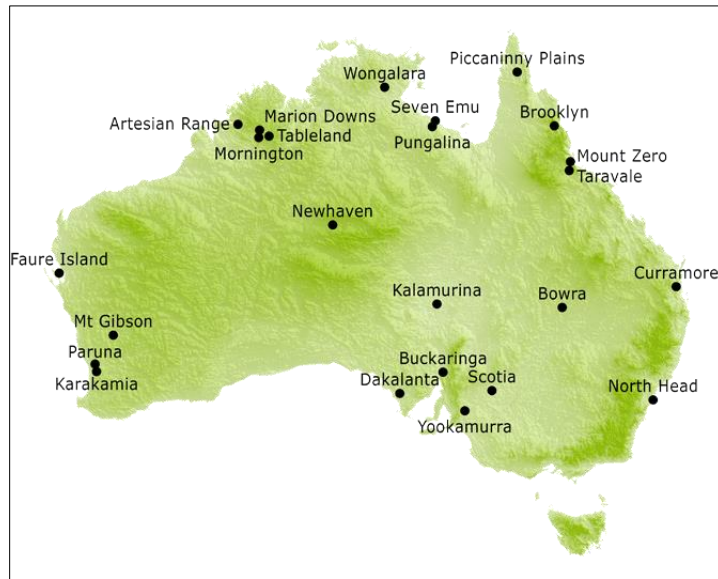


Figure 43 Australian Wildlife Conservancy sanctuaries

Source: Australian Wildlife Conservancy⁵²⁸

Bush Heritage Australia (BHA) has identified priority areas in the Monsoonal North region (Figure 44). While BHA owns properties elsewhere in Australia, its approach to conservation in northern Australia is to establish partnerships with Indigenous organisations in the Kimberley and Top End. This involves supporting Traditional Owner groups to develop and implement healthy country plans. While there are priority landscapes in the Queensland sections of the Monsoonal North, no partnerships have yet been developed there.

The South Endeavour foundation has reserves in the Wet Tropics and on Cape York Peninsula, but none currently in the Monsoonal North⁵²⁹. The Wildlife Land Trust⁵³⁰ provides non-financial support for wildlife sanctuaries on private land, but currently lists no sanctuaries in the Monsoonal North.

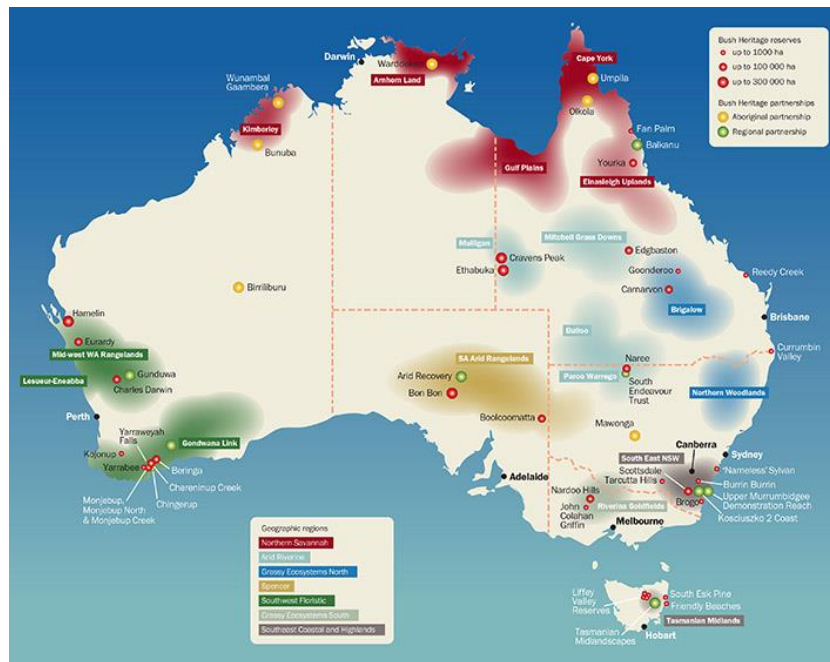


Figure 44 Priority landscapes, reserves and partnerships of Bush Heritage Australia

Source: Bush Heritage Australia⁵³¹

Other conservation organisations active in the region undertake projects involving Traditional Owners and other landholders, but generally with funds provided by government or one of the organisations listed in Table 22. Birdlife Australia undertakes several projects in the area involving many volunteer birdwatchers, but does not currently fund landholder programs in the north⁵³². Numerous conservation NGOs are also involved in lobbying, such as for GBR protection or threatened species management or against coal mining. Others engage in environmental planning and prioritisation with NRM organisations and other stakeholders. WWF advocates for Great Barrier Reef water quality improvement; provides financial assistance for the removal of marine debris; and promotes eco-labelling. While these activities are important drivers of the conservation economy, they are not discussed in this report, as they do not provide market opportunities for natural resource management.

It appears that no conservation NGO financially supports conservation on private or leasehold land in the Monsoonal North unless this land is owned or leased by that NGO. Emphasis on supporting Indigenous conservation efforts in the Monsoonal North reflects NGO priorities and investment patterns across Australia and worldwide (see [Prioritisation of conservation investment](#)).

Ecotourism

Cultural and nature-based tourism is a well-developed aspect of the conservation economy. It is applicable to both Indigenous communities and pastoral enterprises in the Monsoonal North, as well as to independent operators⁵³³⁻⁵³⁶. In total, tourism contributes between three and seven percent to the northern Australian economy⁵³⁷, but has had little growth since 1999. The market for cultural and nature-based tourism is only a small section of the market⁵³⁸. Fewer than 10% of visitors to Darwin in 2000-2002 participated in Aboriginal cultural activities or went on guided tours, and the percentage was even lower in 2010-12⁵³⁹. However, a higher proportion of visitors venturing away from major cities are interested in nature-based (particularly adventure-based) tourism, and there is potential to increase this small market⁵⁴⁰.

Ecotourism is a risky business. Both Indigenous and non-Indigenous micro-businesses in the Top End have a high failure rate⁵³⁴. Tourism operations are particularly vulnerable to global economic changes and bad weather⁵³⁸. Tourism can have both positive and negative impacts on Indigenous communities⁵⁴¹⁻⁵⁴⁴. In addition to the economic benefits of income and employment, benefits of well-designed tourism ventures include strengthening culture, increasing cultural coherence and increasing cross-cultural understanding. There is also the potential for tourists to contribute to communities through volunteerism, with some “grey nomads” being prepared to spend time in communities in capacity building projects⁵⁴⁵. Disadvantages of poorly designed tourism enterprises can include damage to cultural sites and inappropriate site visits, limited engagement between tourists and the Indigenous community, degradation of culture and exploitation. Unplanned tourism can also be a drain on the economy and cause environmental degradation⁵⁴⁶⁻⁵⁴⁸.

Growth of ecotourism to benefit regional economies will require appropriate policy settings, collaborative governance arrangements and tourism products based on consumer demand, along with significant investment in associated facilities^{66,538,549}. Appropriately managed tourism ventures can benefit from recognition through accreditation schemes, such as that run by Ecotourism Australia⁵⁵⁰.

Indigenous natural resource management

The livelihoods of Indigenous people before contact with Europeans were based on a form of conservation economy with the sustainable management of Australia's land and seas. Indigenous people in the Monsoonal North continue to have high levels of participation in a range of conservation economy activities^{1,551,552}. Many of these activities were described in previous sections of this report, including proclaiming and managing IPAs on their own land; working as rangers to undertake cultural mapping and Indigenous NRM; managing fires to abate GHG emissions; and operating tourism ventures. Indigenous people are also the principle suppliers of remote biosecurity surveillance and removal of ghost nets from the Gulf of Carpentaria. The relevance of these activities to indigenous communities are further explored below. Ecotourism is also a growing part of the Indigenous conservation economy, but will not be explored further in this section (see [Ecotourism](#)).

Indigenous cultural and natural resource management, hunting, fishing and other cultural activities have demonstrated health, cultural, economic and environmental benefits^{9,552,553}. Participation and related health benefits are highest among Indigenous people living in remote areas⁵⁵². However, the concentration of services in a few regional locations in the Northern Territory and Western Australia has been controversial, and does not appear to provide equitable access to resources to remote communities⁵⁵⁴. Maximising the benefits of conservation economy to Indigenous people will require a commitment to supporting remote communities, including through the local provision of infrastructure, services, employment and training⁵⁵².

Ranger programs and protected area management

Indigenous Protected Areas now constitute about one-third of Australia's National Reserve System (see [Indigenous Protected Areas](#)). Their creation has been facilitated by increasing recognition of the rights of Indigenous people to control, manage and use Protected Areas, whether these are under Indigenous or crown title^{7,555-557}. Funding provided in the declaration of these reserves and associated economic development has provided Indigenous employment and increased Indigenous participation in cultural practices and natural resource management^{5,25,558,559}.

Around Australia, there are over a hundred Indigenous land and sea management organisations operating and employing Indigenous rangers^{41,43,44,560-563}. Key activities performed by these groups include preserving traditional knowledge and sites; and undertaking cultural and natural resource management and monitoring on IPAs and other Indigenous-held land. They also undertake contract work on lands that may once have been part of their traditional estates. Mostly established under and supported by the Land Councils, these ranger groups have had varying levels of success, and have

often struggled to survive⁵⁶⁴. Even in the last year, lack of funding forced the Tiwi Land Council to disband its land ranger group⁵⁶⁵.

Initial Australian Government support for ranger activities was in the form of unemployment benefits that were “topped-up” if a ranger worked more than 15 hours a week⁵⁶⁶. In 2007, 90% of Indigenous people working in land and sea management were paid through such arrangements⁵⁶⁷. From 2008, the WOC program provided the first real wages for Indigenous rangers^{42-44,352,353}. However, WOC funding has not been available to everyone who had previously worked as an Indigenous ranger, so the total number of rangers employed initially declined⁵⁶⁶, but has continued to grow. Currently 1,612 rangers are employed through the WOC and IPA programs³⁵¹. Employment of Indigenous rangers was also bolstered in Queensland in 2006 with the establishment of the Wild River Rangers program under the *Wild Rivers Act 2005* (Qld). Thirty-five rangers were employed in this program by 2011, and 45 by 2012. In 2012, this program was replaced by the Indigenous Land and Sea Management Ranger program⁵⁰³, which currently employs 65 rangers²¹⁷, with the aim of increasing that number to 80⁴⁰¹. Each of these programs faces ongoing funding uncertainty associated with changing government policies. The Australian Government has continued to invest in the WOC program, with \$19.4 m awarded under IAS in 2014. While funding for some IPA development has been made under the IAS, IPAs no longer have a specific funding allocation (see [Australian Government funding programs](#)).

Neither the Western Australian nor Northern Territory Government have specific Indigenous ranger programs. However, Western Australian aims to employ Indigenous people in 7% of National Parks and Wildlife positions⁵⁶⁸, and 50 Indigenous rangers in the Kimberley³⁸¹. The Northern Territory’s target for Indigenous employment in the Parks and Wildlife Commission is 30% by 2024⁵⁶⁹. While Queensland does not appear to have an Indigenous employment target for its National Parks, it has a range of partnership arrangement for co-management of protected areas *Indigenous partnerships in management of protected areas* policy⁵⁷⁰.

In 2011, Indigenous people made up 7% of the workforce of the Australian Department of Sustainability, Environment, Water, Population and Communities, just over half (3.8%) being employed on an on-going basis⁵⁷¹. The Department’s aim was to increase the Indigenous percentage of ongoing-employees to 4.5% by June 2014 through changes to recruitment, training and workplace support. It is not clear if this objective was met, or retained with the change of government, or how many of these positions are in the Monsoonal North.

Indigenous carbon projects

Savanna Burning (emission abatement through early dry season burning) was pioneered on Indigenous lands in Arnhem Land through a collaboration between Indigenous elders and rangers and western scientists^{6,451,572,573}. Currently, at least one-third of Savanna Burning/Fire Management projects are being undertaken by Indigenous organisations⁵⁷⁴. These projects are responsible for close to three-quarters of the carbon credits generated from Savanna Burning so far. Income generated from Savanna Burning projects has contributed to employment and resourcing of many Indigenous rangers and land purchase³⁷. Incomes may be increased further as new methodologies are developed.

The Aboriginal Carbon Fund⁵⁷⁵ has assessed the opportunities for Indigenous people to earn income through other forms of carbon management (Table 23). The most promising for the Monsoonal North is Savanna Enrichment, which involves under-planting native vegetation with bush foods, such as Gubinge (*Terminalia ferdinandiana*) or Pindan Walnut (*Terminalia cunninghamii*). The planted trees will increase carbon stocks. This method should provide Kyoto-compliant carbon credits that can be sold either through the CER or on the voluntary market. Other opportunities they identified have less prospect of being approved by the CER, which only recognises forms of carbon storage and abatement that can be credited under the Kyoto Protocol.

Table 23. Assessment of potential emission reduction methods relevant to Indigenous land in the Monsoonal North

Source: Aboriginal Carbon Fund (2016)⁵⁷⁶

Method	Description	Assessment	Kyoto compliant
Savanna enrichment	Increasing carbon stocks with plantations of bush foods	Methodology under development	Yes
Blue carbon	Increasing carbon stocks in marine habitats such as mangroves or seagrass	Method approved overseas but requires research and development in Australia	No
Feral animal control	Reduces methane emissions by reducing the lifespan of animals	Method developed but rejected by Clean Energy Regulator	No
Rangeland management	Increasing carbon stocks by managing livestock, feral animals and fire	Method approved overseas but requires research and development in Australia	Unclear

Sustainable use of wildlife

Hunting and harvesting of wildlife is an important aspect of traditional Indigenous economies^{1,551,552,577}. The right to use wildlife for personal, domestic or non-commercial communal purposes is enshrined in Native Title legislation^a and permitted under legislation in all three jurisdictions across the Monsoonal North^b. Deriving income from commercial use of wildlife is also a

^a Native Title Act 1993 (Cth)

^b Conservation and Land Management Act 1984 (WA); Territory Parks and Wildlife Conservation Act (NT); Nature Conservation Act 1992 – Nature Conservation (Wildlife Management) Regulation 2006 (Qld)

high priority for some Indigenous people⁵⁷⁸, and activities such as harvesting crocodile eggs and mustering water buffalo have made a significant contribution to the income of some Indigenous communities for well over a decade^{579,580}. However, in all three jurisdictions, commercial use of wildlife is prohibited without specific approval. It also faces opposition from vocal conservation activists and the broader community⁵⁸¹⁻⁵⁸³. Commercial use of nationally or internationally threatened species is prohibited under the *EPBC Act*. Such species can only be commercially harvested or hunted if the Commonwealth Minister for the Environment approves a management plan for these activities. Crocodile management plans that included harvesting of eggs and safari hunting were submitted to the Commonwealth by the Northern Territory Government in 2005, 2009 and 2014⁵⁸⁴⁻⁵⁸⁶. On each occasion, the collection of eggs was approved, but safari hunting was prohibited^{584,a}.

Commercial use of feral animals faces less community opposition than does commercial use of native wildlife, and has fewer legislative barriers⁵⁷⁷. As well as delivering an environmental service, control of feral animals has the potential to provide income from the sale of meat, hides and horns^{588,589}.

Biosecurity surveillance

Indigenous people living along Australia's vast northern coastline are ideally placed to detect and monitor biosecurity threats (Figure 16)^{107,590,591}. Until 2006, Indigenous rangers in the Northern Territory undertook unpaid surveillance of fishing vessels⁵⁹². In May 2006, the Australian Quarantine Inspection Service (AQIS) allocated \$6.9 m over a four-year period to engage Indigenous community groups in monitoring bio-security risks from illegal foreign fishing vessels^{592,593}. Since 2010, about 40 Indigenous ranger groups have been funded to undertake biosecurity surveillance under contractual and fee-for-service arrangements through AQIS's Northern Australia Quarantine Strategy (NAQS)^{594,595}. These rangers assist in monitoring new weed occurrences; mapping host plants for foreign pest and diseases; trapping and examining feral pigs for diseases; managing sentinel herds; mapping bat colonies; monitoring marine debris; trapping mosquitoes for disease vector detection; and raising public awareness^{592,594,596}. On 8 July 2015, the Australian Ministers for Agriculture and Indigenous Affairs announced \$12.4 m to continue and extend this program as part of a \$200m commitment to improving Australia's biosecurity⁵⁹⁷.

Removal of marine debris

Removal of marine debris from the Gulf of Carpentaria has been coordinated by GhostNets Australia since 2004. Through much of this time, Indigenous rangers have been employed under fee-for-service arrangements. Most funding has come from the Australian Governments—either directly or through

^a No decision appears to have been made on proposed amendments submitted in 2012 ⁵⁸⁷

NRM organisations—but funding has been inconsistent^a. Support now also comes from industry (Blackmores) and WWF. At its peak in 2010, the program contributed to the employment of over 90 Indigenous rangers from 18 Indigenous communities⁵⁶². It currently supports three ranger groups in the Top End and four on Cape York Peninsula (Figure 45). GhostNets activities also contribute to the income of artists, who are increasingly sourcing marine debris from ranger groups to use in artworks^{594,598}.



Figure 45. Indigenous ranger groups engaged in ghost net removal

Source: Ghost Nets Australia <http://www.ghostnets.com.au/the-problem/where-does-the-rubbish-come-from/where-are-the-hotspots>

Pastoral industry

The most extensive land use in the Monsoonal North is grazing, undertaken on both Indigenous and non-Indigenous lands. Sustainable production on grazing lands, therefore, has great potential to contribute to environmental health of the region. There are also many opportunities for grazing enterprises to benefit financially from participating in the conservation economy. Improving herd and land management and reducing runoff and sediment loss can reap financial gain as well as provide environmental benefits. Reducing GHG emissions through land and herd management can also improve profitability of grazing enterprises. Financial support may also be gained for dedicated biodiversity conservation in priority areas. There are also several extension programs that will help

^a <http://www.abc.net.au/news/4708354>

pastoralists identify and adopt the best practices for their circumstances, and financial support may be available to underwrite the cost of this transition. Ecotourism is also a growing part of the pastoral conservation economy, but will not be explored further in this section (see [Ecotourism](#)).

Grazing land stewardship

Practices needed to protect and restore grazing lands in northern Australia are well understood, and include both land management and herd management (Table 24). Many of these practices also have biodiversity benefits. Stewardship payments recognise the public benefit of protecting and restoring the condition of agricultural land³³⁰⁻³³². Stewardship payment schemes are well-established across Europe the under the European Union Common Agricultural Policy^{129,599,600}. Many pastoral managers in northern Australia have indicated their willingness to enter into stewardship arrangements to manage weed, fire, pest animal and erosion issues for conservation outcomes^{46,48,134,436}.

Stewardship payments were first instituted in Australia in 1994 to subsidise management of salinity⁶⁰¹. From 2008 to 2012, the Australian Government provided stewardship payments for conservation management in threatened ecological communities for up to 15 years^{602-604,609}. An assessment was undertaken of 152 participating properties (including nine in Queensland) in Box Gum grassy woodland. Paddocks managed under stewardship arrangements were compared with paddocks on the same property that were still under the original management regime. Stewardship management was found to improve environmental condition, increase perennial grass cover, increase ground cover diversity, increase bird diversity and decrease weed cover⁶⁰⁵. The program also successfully engaged landholders who had no prior interest or experience with environmental programs; was viewed favourably by participants; and promoted an improved conservation ethic⁶⁰².

Table 24. Management to protect and improve grazing land condition, also listing biodiversity benefits

Sources: Hunt et al. (2014)⁶⁷; O'Reagain et al. (2011)^{126,606,607}; Burns et al. (2010)⁶⁰⁸; Holroyd and McGowan (2014) Crowley et al. (2013)⁶⁰⁹; McGowan et al. (2014)⁶¹⁰; Holroyd and McGowan (2014)⁶¹¹; Perkins et al. (2014)⁶¹²; Fisher and Kutt (2006)⁶¹³; Crowley and Hill (2011)⁶¹⁴

Method	Production benefits	Biodiversity benefits
Land management		
Maintain cover and diversity of native perennial grasses		
Use conservative and/or variable stocking rates, wet season spelling, rotational grazing and appropriate fire regimes	Improves pasture condition and livestock weight gain	Favours species needing protection of grass cover (e.g. geckos and spiders) or eat grasses and/or grass seed (e.g. finches)
Rest large areas of country		
Use wet season spelling, rotational grazing	Improves pasture condition and livestock weight gain	Allows regeneration of native plants species from tubers and seed. Improves breeding success for some native animals and reduces predation on others
Strategic infrastructure development		
Fence to allow pasture spelling and/or rotational grazing. Fence to land type to prevent over-grazing of preferred pasture grasses	Spreads grazing pressure and improves land condition	Permits stock exclusion from areas of high conservation value
Manage fire		
Use a mix of fire exclusion, early dry season burns for fire-breaks and to spread grazing pressure, and storm-burns to manage woody thickening	Reduces risk of wildfires. Can help to rest and regenerate pasture	Provides habitats for fire-sensitive plants (e.g. heath, rainforest). Maintains open grassland. Provides patches of unburnt habitat in which species, such as Red-backed Fairy-wrens, can persist
Control problem weeds and restrict further spread		
Focus on strategic control of weeds that transform whole ecosystems, such as prickly bushes that invade riparian areas	Increases quality of grazing lands	Provides habitat for a range of species, especially those dependent on habitats subject to complete transformation by weeds (e.g. Red Goshawk in riparian areas)
Control feral grazing animals		
Strategically bait, trap and shoot feral pigs, horses, donkeys, buffalo and cattle	Reduces total grazing pressure increasing pasture availability.	Improves habitat condition for a range of species. Reduces grazing pressure and erosion, improves water quality
Plan, assess and improve the management of your property		
Identify use and management of different parts of property. Address statutory obligations (e.g. vegetation management, water quality improvement)	Allows management to be adjusted with changing conditions. Ensures property is well run to maximise productivity	Allows biodiversity to be considered and protected in sympathy with production values
Herd management		
Adopt grazing practices that maximise production per animal rather than stock numbers		
Cull unproductive animals. Wean early. Improve weaner survival & growth. Segregate different classes of animals to manage nutrition	Maintains animals in good condition. Maximises reproductive rates. Improves genetics	Reduces grazing pressure
Adjust stocking rates in response to variation in climate		
Increase moderate stocking rate during good seasons and decrease during poor seasons	Maintains pasture quality and liveweight gain	Maintains grass cover and resilience

Stewardship payments to improve grazing management practices were similarly trialled for a two-year period in the Desert Uplands, Queensland, in 2006-7⁶¹⁵. While the auctioning system used in this scheme was considered a success, no assessment of environmental outcomes has been published.

Stewardship payments in the Desert Uplands trial averaged \$2/ha/year, which is the same as the estimated average cost of delivering a stewardship schemes in the Daly River catchment of the Northern Territory¹³⁴. Daly River managers said they would prefer to be paid or supplied with fencing and other materials necessary, rather than be granted increased land clearing rights, provided labour to do the work, or receive conservation certification.

Despite a willingness of pastoralists to participate, there are currently no active pastoral stewardship schemes operating in the Monsoonal North. Commonwealth funding that supported the original schemes has dried up, and no further investors have been identified. As discussed earlier, philanthropic organisations investing in environmental service delivery are focused on supporting Indigenous development and biodiversity conservation on Indigenous lands (see [Prioritisation of conservation investment](#)). One reason for the lack of interest in supporting stewardship on pastoral lands is likely to be the high perceived private benefit, as sustainable management of rangelands is the most profitable form of pastoral management^{606,616-619}. At present, the best option for receiving payments for improving grazing practices is through adjusting herd management to reduce methane emissions (as discussed earlier and elaborated on below).

Any organisation wishing to pursue stewardship programs would do well to follow the model of engagement and research behind the development of the Savanna Burning method, in which willing suppliers and potential purchasers were directly engaged in the development of the product, and at least 10 years of research was dedicated to identifying the benefits generated and developing monitoring and reporting mechanisms. The success of Savanna Burning has also depended on the development of a marketplace governed by the CER. By contrast, stewardship arrangements in the Monsoonal North currently lack a marketplace, willing buyers, a clearly defined product and methods for evaluating outcomes^{27,332,620,621}. Finally, given the uncertainty of funding, it is important that any future grazing land stewardship scheme ensures legacy outcomes for both providers and investors through an enduring change in management ethic or by financing transitional arrangements required to support long-term sustainable management.

Carbon options

The various options for pastoral enterprises to earn income from GHG emission reduction were assessed earlier (see [Carbon economy](#)), identifying fire management and herd management as the most viable. In addition, supplementing cattle diets with marine red algae^{455,456} or inclusion of *Leucaena* in the grazing system⁴⁵⁷ were also identified as having promise. Best practice herd management not only has the public benefits of reducing GHG emissions and improving land condition, but also improves the productivity and resilience of grazing enterprises. Given the high level

of private benefit, it falls well within the duty-of-care provisions, and therefore falls in an area that could be considered ripe for regulation (see Figure 31).

Biodiversity conservation

In most respects, biodiversity benefits from best practice grazing management⁶¹³, but other measures are required to manage land specifically for biodiversity conservation on all or part of a grazing property (Table 25). Because actions required are additional to those required for pastoral production, biodiversity conservation has a greater prospect of attract funding than does grazing land stewardship. Many pastoral landholders have already entered into conservation agreements for biodiversity conservation, including through establishment of nature refuges or conservation covenants^{50,622,623} (see [Biodiversity conservation](#)), or have expressed a willingness to participate in paid biodiversity conservation schemes^{46,48,622}.

As described earlier, state and Commonwealth funding has been the main source of funds for such efforts. While Commonwealth funds available for on-ground conservation in the Monsoonal North have been substantially reduced, covenanted conservation agreements are still available in Western Australia and soon to be revived in Queensland, and voluntary conservation agreements are available in the Northern Territory. In addition, offset payment schemes may provide funds to support long-term management of a specific threatened species or community in priority areas (such as those identified in Figure 11).

Table 25. Specific actions for biodiversity conservation on pastoral properties and impact on livestock production

Source: Fisher and Kutt (2006)⁶¹³; Crowley and Hill (2011)⁶¹⁴; James et al. (1999, 2000)^{239,624}; Johnson et al. (2007)⁶²⁵; O'Reagain et al. (2011)¹²⁶; Hunt et al. (2014)⁶⁷; Eldridge et al. (2002)⁶²⁶; Nimmo et al. (2014)⁶²⁷; Prowse et al. (2014)⁶²⁸

Method	Biodiversity benefits	Production impacts
Protect special areas by fencing out stock		
Fence areas with high biodiversity values, such as rocky ridges, wetlands, or water-remote areas	Favours of grazing-sensitive species. Improves wetland condition and water quality	Reduces area available for grazing, but may reduce mustering costs if areas are difficult to access
Retain and protect natural waterholes		
Fence off waterholes and major creek-lines and pipe water to troughs outside the fences	Improves wetland condition and water quality, provides sheltered drinking sites for birds and mammals	Reduces erosion and improves quality of drinking water. Can reduce risk of cattle becoming bogged
Reduce numbers of feral predators		
Strategically bait, trap and shoot cats. Manage wild dog populations (to control cat numbers)	Reduces predation pressure, particularly on small to medium-sized animals	Cats have minimal impact on livestock, but wild dog control is contentious
Retain some areas on the property (of each habitat) with little or no grazing pressure		
Ensure 5-10% of the property remains remote from water	Allows persistence of grazing-sensitive species	Reduces area available for grazing
Maintain structural and micro-habitat diversity		
Retain leaf litter, fallen logs, standing dead trees, large trees with hollows and termite mounds. Avoid extensive, intense fires and overgrazing	Provides shelter and feeding habitat for a range of species, such as ants (leaf litter), bandicoots (logs), owls (tree hollows), kingfishers (termite mounds)	Has minimal impact on native pasture systems, but is more difficult in sown pasture
Avoid clearing native vegetation		
Retain and leave buffers around vegetation with high conservation values, especially along watercourses. Clear no more than 30% of each land type on each property. Create mosaics of cleared and uncleared vegetation	Maintains habitat for a wide range of species	Sacrifice of potential pasture where clearing is permitted
Avoid using invasive introduced pasture plants		
Only plant exotic pasture species where they won't spread to high conservation value areas. Avoid transformer species (e.g. Gamba Grass and Para Grass)	Maintains habitat diversity, reduces fire hazard and associated the risk of tree loss	Potential sacrifice of grazing potential, offset by reduced fire hazard
Be biodiversity aware		
Find out which species live on your property, and which habitats they use. Observe how their needs and behaviours change through the seasons and years. Keep records of particular plants and animals and when plants are flowering. Track whether any species are increasing or declining. Watch out for new weeds and pests	Understanding the species and environments on the property improves capacity to know when a management decision will degrade habitats. Improves capacity to know when management or advice is required	A deep understanding of the property and how it functions may avert an issue that could affect livestock production

Water quality improvement

Grazing practices in the coastal draining catchments have the potential to affect GBR water quality. These catchments have been identified as producing some of the highest levels of sediment loss from

river bank loss, gully and hillslope erosion^{313,327,629-631}. Overgrazing of ground cover exposes soil to erosion, increasing runoff and sediment loss⁵². Loss of deep-rooted plants, including perennial grasses and shrub, has the greatest impact, as these plants stabilise the soil and effectively funnel rainfall into the soil profile^{632,633}. Therefore, cleared and overgrazed paddocks have high levels of soil loss. Highest levels of damaging fine-grained sediment entering the GBR come from the Bowen and Upper Burdekin sub-catchments, with gully and channel bed erosion responsible for most of this pollution^{508,631,634}.

The importance of grazing practices to increase ground cover to reduce sediment loss from paddocks is unquestioned^{52,635}. This will also reduce runoff that drives gully erosion. However, reducing the sediment reaching the reef will require re-establishment of deep rooted perennials to control gully erosion and restoration of riparian vegetation to stabilise sediment stored in the channel beds^{52,508,635}. Stabilisation of dirt tracks, roads and fence-lines is also essential^{52,635}.

Queensland's *Environmental Protection Act 1994* enables the Queensland Government to mandate certain practices on grazing lands in the coastal draining catchments of the Burdekin Dry Tropics¹⁵², including management to maintain certain levels of ground cover. While this legislation is still in place, it is not being actively enforced in the hope that industry self-regulation will successfully address grazing practices through Best Management Practices (BMP)⁶³⁶. A grazing BMP has been designed through collaboration between AgForce, the Fitzroy Basin Association and QDAF, with oversight from QEHP. This program focuses on the outcome of improving land condition through appropriate stocking regimes, rather than on the herd management practices that will enable grazing pressure to be reduced, and have been identified as improving profitability, land condition and GHG emissions (see [Carbon options](#)). Reef 2050 Long-Term Sustainability Plan includes the target of 90% of pastoralists in reef catchments operating under the Grazing BMP by 2018¹⁸⁴. By June 2015, 1,300 pastoralists were participating in the grazing BMP⁶³⁷, and by September 2015, 1,000 pastoralists had completed an Accelerated Grazing BMP course⁴⁰⁸. Queensland Government's GBR Water Science Taskforce is currently considering whether to reactivate the Reef Regulations or adopt other market-based approaches to achieving water quality targets⁶³⁸.

From 2008 to 2013, pastoralists in GBR catchments had access to Reef Rescue funds for activities such as property planning, pasture management to increase ground cover, low-pesticide weed management, fencing riparian areas and construction of off-stream watering points^{53,363}. The current Reef Trust program includes \$3 m to support pastoralists in the Burdekin and Fitzroy catchments improve erosion management through extension and mentoring programs³⁶⁴, and \$5.4 m to subsidise gully stabilisation (see [Great Barrier Reef water quality improvement](#))³⁶⁵.

Financial assistance

In Queensland, pastoralists wishing to improve the viability, environmental sustainability and climate resilience of their enterprises may be eligible for a sustainability loan (see [Sustainability loans](#)). Eligible activities include:

- Fencing to separate land types and exclude stock
- Prevention and reclamation of land degradation (e.g. erosion and salinisation)
- Pest plant and animal control
- Tree planting and biodiversity conservation
- Purchase of plant and machinery for land-care purposes
- Effluent and waste control and disposal
- Water quality protection
- Development of water supplies (dam construction, water points, irrigation systems).

Eligible activities to improve climate resilience include:

- Construction or improvement of storage facilities for fodder and other commodities
- Adoption of cropping or grazing best management practice to minimise climate change impact
- Improve and maintain water supplies and improve water use efficiency
- Alternative energy generation systems.

The loans can also cover business restructuring and purchase of livestock and machinery.

Sustainability Loans can be used to establish plantations for carbon sequestration. While no specific mention is made of using sustainability loans to cover the costs of establishing a herd management project under the ERF, some of the foundational activities (e.g. fencing and livestock replacement) are listed as eligible for support. An assessment of return on investment, included in the selection criteria, will be essential to ensure that taking out a sustainability loan does not result in an unsustainable debt burden.

An enterprise that is already financially over-extended is not eligible for a sustainability loan. However, those already burdened with crippling debt have the greatest difficulty in adopting sustainable practices as they feel pressured to increase stocking rates to meet debt repayments⁶³⁹. Many landholders in northern Australia are under financial stress resulting from static cattle prices; increasing costs; falling equity as a result of the collapse in land prices in 2008; and the resultant increased cost of servicing over-extended debt^{640,641}. The potential for debt reduction schemes (largely designed for promoting conservation and sustainable practice in developing countries) to assist debt-burdened pastoralists improve their environmental management is examined below.

Cancellation of a portion of national debt has been used to secure an increase in the area protected for biodiversity conservation in developing countries^{642,643}. Cancellation of portions of farm debt has also been used to secure on-farm conservation in the United States. Exploring the potential for such a scheme in northern Australia, Greiner and Lankester (2007)⁶³⁹ found a significant percentage of debt-burdened pastoralists were interested in converting a portion of their land from pastoral to conservation use in return for partial debt-cancellation. The payments landholders expected for participating in such a scheme (\$40-\$1,364/ha) were mostly higher than the cost of outright purchase of the land to be sacrificed (\$200/ha). Additional issues they identified included the difficulty of securing long-term conservation agreements; the cost and difficulty of enforcing management conditions on the sacrificed land; and the likelihood that the loss of areas for grazing would result in increased grazing pressure on the remainder of the property. Moreover, while a number of funding sources for the scheme were identified (government, banks, NGOs), no organisation is volunteering to invest in such a scheme. Rather, donors show a preference for investing in long-term biodiversity conservation linked to social justice in developing countries⁶⁴⁴.

Other potential financial instruments for assisting farmers out of debt include aggregation of debt across several enterprises, which reduces transaction costs and increases purchasing power⁶⁴⁵ and loan

guarantees^{161,646161,646161,646161,646161,646161,648161,649161,649161,650161,651161,650161,650161,642161,630161,622161,616161,617161,601161,583161,574161,564161,544161,544161,642,646}, in which a third party (such as a government or a conservation NGO) guarantees part of the loan required for the producer to transition to financial and environmental sustainability^{157,384}. Such arrangements may need to be conditional on a mandated commitment to practice improvement.

Market access and accreditation

Consumers are sometimes willing to pay extra for products that they perceive to be sustainably produced, especially if this means the product is better quality, more sustainable, or healthier than the standard fare^{647,648}. Demand for ecologically-produced food is growing in China and India^{64,649}. Producers benefit from eco-labelling and marketing only if it provides price premiums or market access and security. The challenge of a labelling system is traceability through the supply chain⁶⁵⁰. The Australian beef supply chain is complex, with little direct contact between producer and consumer (Figure 46).

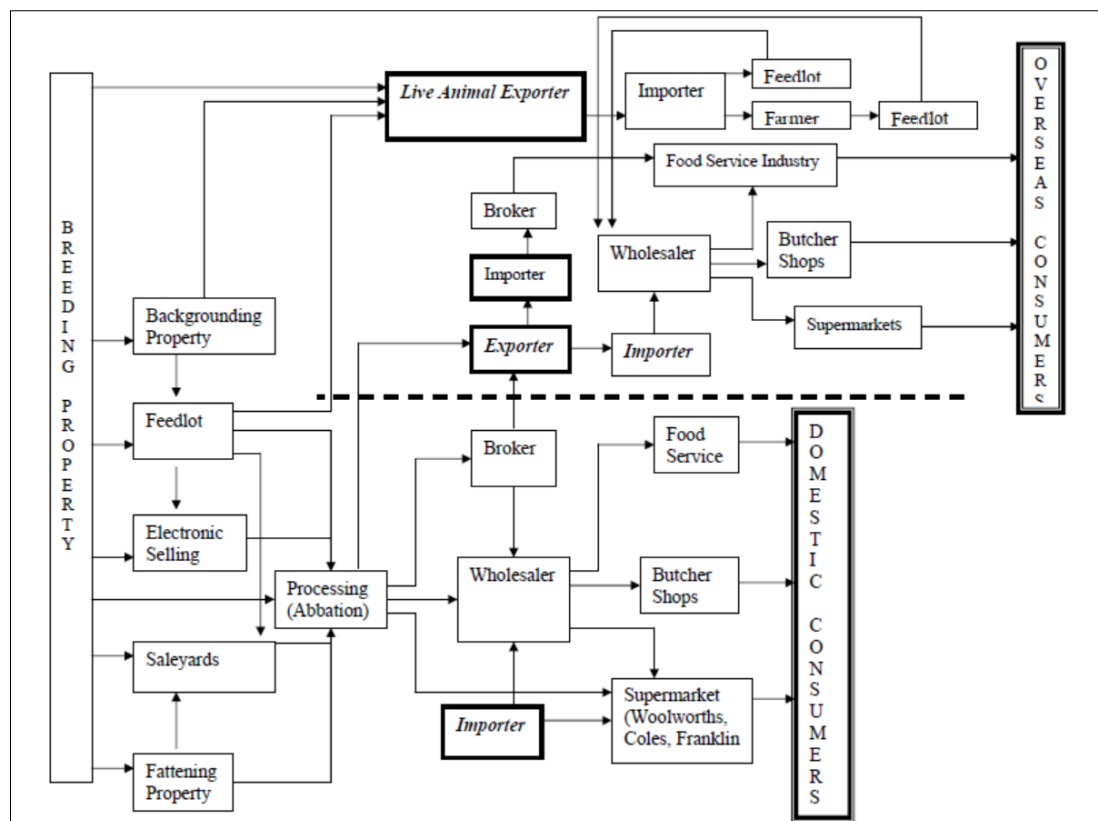


Figure 46. Australian beef supply chain

Source: Jie et al. (2007)⁶⁵¹

Northern beef is sold through three main pathways (Figure 47): saleyard auctions; over-the-hook sales to abattoirs; and paddock sales (principally supplying the live-export market). The most common method—saleyard auction—provides little opportunity for assessment of meat quality before sale or to attract a price premium for sustainably-produced cattle⁶⁵². There are a few Australian paddock-to-plate operations that deliver branded, high quality, sustainably produced beef at a premium price, but the market niche is currently small and the costs high⁶⁵².

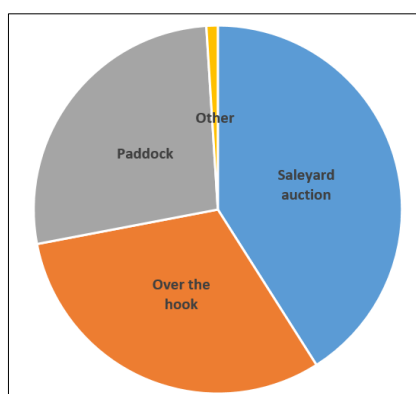


Figure 47. Method of sale of northern beef cattle in 2011-12 (b)

Source: Thompson and Martin (2014)⁶⁵³

The best way to ensure cattle attract a price premium through the general market is to ensure good body condition and meat quality⁶⁵². Meat Standards Australia grades meat quality at the abattoir based on various carcass characteristics. In 2013-14, producers of Meat Standards Australia (MSA)-graded beef received an average price premium of 29c/kg⁶⁵⁴. Certain criteria must be met before a carcass is eligible for MSA grading, including limited stress through mustering, handling and transport. Long distances mean many producers in the remote parts of northern Australia cannot meet these requirements⁶⁵⁵. Moreover, tropical breeds start with a lower meat quality than British breeds. Meat quality can be improved through good management, particularly by reducing stress and increasing growth rates through improved herd management⁶⁵⁶ (as described in [Improving herd genetics and management to reduce methane emissions](#)). Cattle produced in this way may attract a price premium of up to \$100 a head. Increased growth rates also mean that cattle can be sold at a heavier weight and at a younger age than they otherwise would, and so have access to a more profitable section of the market (Figure 48). This would not require specific labelling.

Another approach to ensuring beef producers receive recognition for sustainable production is through improving the reputation of the beef industry. At the enterprise scale, this will be achieved by high uptake of the Grazing BMP⁴⁰⁸. At the other end of the spectrum, Target100^a operates at the industry-wide scale to use education programs, and conventional and social media to showcase industry efforts to improve practices⁶⁵⁴. This includes promoting the achievements of the Grazing BMP program.

^a An initiative of Meat & Livestock Australia and industry representative bodies, including the Cattle Council of Australia, Australian Meat Industry Council, Australian Lot Feeders Association, Australian Meat Processing Corporation⁶⁵⁷

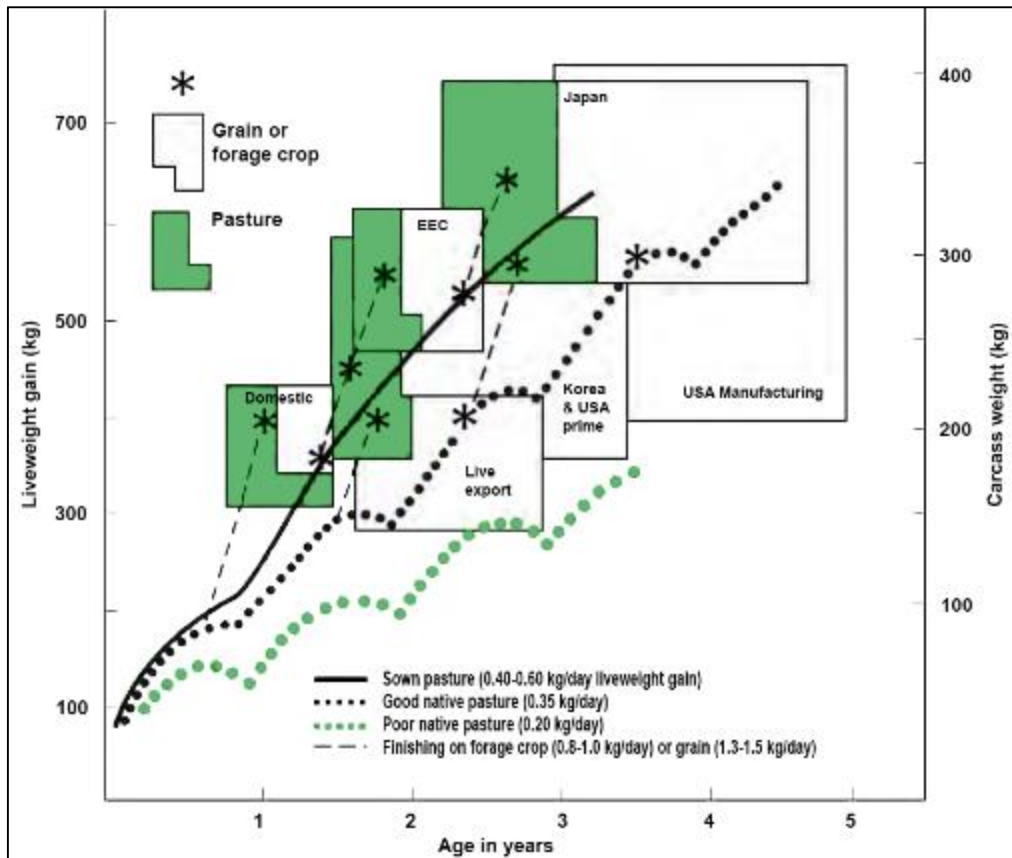


Figure 48. Market suitability of northern Australian cattle grown on different feed regimes

Source: Redrawn from Grice, Watson and Stone⁶⁵⁸ based on Gramshaw and Lloyd⁶⁵⁹ © The State of Queensland (through the Department of Agriculture and Fisheries) [2013]

In conclusion, opportunities for producers to benefit from eco-labelling schemes may be limited and expensive. However, producers who improve their herd management to improve environmental sustainability and reduce GHG emissions should reap the benefits through improved productivity, product pricing and market access, regardless of labelling. Access to MSA grading provides an additional price premium for sustainably-produced cattle, where transport arrangements permit animals to enter this market stream. Finally, industry-wide efforts to improve the environmental credentials of the beef industry will benefit individual producers through greater consumer confidence in their product.

Extension and adoption

Entering the conservation economy requires adjustment to pastoral operations to improve sustainability and profitability. Practices and systems for doing so are well understood and well documented, but extension services are essential to help pastoralists identify and adopt those that are appropriate for their enterprises. Well-researched pastoral extension tools in the Monsoonal

North include *Grazing Land Management*⁶⁶⁰, *Cash Cow*⁶¹⁰, *BreedPlan*⁶⁶¹, *Breedcow-Dynama*⁶⁶², *Profitprobe*⁶⁶³, *ŞavannaPlan-BeefŞense*⁶⁶⁴ and the *Grazing BMP*⁴⁰⁸. Many of these programs have been funded through strategic investments by Meat and Livestock Australia⁶⁶⁵. Government support for extension is essential if farmers are to improve their practices⁶⁶⁶, but state farm organisations and NRM groups also have a central role, as has been demonstrated in the development of the Grazing BMP. NRM groups also operate devolved grants to support adoption of specific technologies or land management practices.

Historically low uptake of best practice indicates that pastoralists either have a low motivation or face significant impediments^{667,668}. Pastoralists under financial pressure are often driven to overstocking or have difficulty making practice changes as they are spending time working off the property to make ends meet^{149,467,650,669-671}. However, promises of improved profitability alone are not sufficient to drive practice change. Addressing such issues requires assisting pastoralists improve their financial literacy and management of debt⁶⁴⁰. This includes helping pastoralists understand the profit drivers in their business, and to place more value on the amount of beef they produce than on the number of cattle they carry. This is the approach taken by *ŞavannaPlan-BeefŞense* and *Grazing BMP*.

Synthesis and conclusions

Drivers and framework

Community concern about deteriorating environmental conditions and the desire of Indigenous people to earn livelihoods from their traditional lands have been key drivers of markets for environmental service delivery in the Monsoonal North. Indigenous people are currently earning livelihoods from cultural and natural resource management, including wildlife conservation, fire management, GHG emission reduction and biosecurity surveillance. The pastoral industry is responding to consumer demands for ethically and sustainably produced beef by developing and implementing sustainable management practices. A whole theoretical framework has been constructed to help us understand and develop markets in which these products can be produced, valued, bought and sold. Collectively these markets are called the conservation economy.

The conservation economy is an economy that aims to conserve the value and utility of cultural and natural resources for future generations. It is underpinned by the recognition that humans depend on the ecosystem for material and spiritual well-being. Hence, management to protect, maintain and restore ecosystem services has economic value. The concepts of duty-of-care and beyond-reasonable-expectations are important for identifying which conservation management activities should be

mandated as part of expected practices, and which should attract payment. The public-private benefit ratio helps determine who should bear the cost of this management.

A conservation economy is not just a load of do-gooders prioritising cute and cuddly creatures over economic development, but is composed of real markets for real products, such as carbon, biosecurity and water. Not all commodities are easily valued, and some, such as biodiversity conservation, are difficult to itemise. However, once a price can be allocated to these commodities, people can derive income from their management; and natural and cultural values can be considered along with other commodities in decisions about land use and resource allocation.

For the conservation economy to progress from dependence on government and charitable sector grants to providing reliable and regular income requires a regulated marketplace. The market must have mechanisms to regulate what can be bought or sold, at what price, and who has the rights to production and sale. Especially for the least tangible commodities, monitoring will be required to verify that the product on sale is as purported. A regulated market place exists in Australia for carbon, is developing for water, but is only a concept for biodiversity. Maturation of the conservation economy in the Monsoonal North should see markets develop for a range of natural and cultural assets.

Conservation priorities

Priorities for investment in the conservation economy are driven at the international level by conventions to which Australia is a party, and to which Australian states and territories have also given their commitment. NRM groups and other recipients of NLP funds are also expected to contribute to these obligations. These international conventions emphasise sustainable development and social justice as well as biodiversity conservation, directing the investment of most governments to developing countries. This philosophy also informs the operation of NGOs both internationally and within Australia. Hence, coincidence of high conservation value lands with areas of Indigenous land make investment in Indigenous cultural and natural resource management a high priority for governments and conservation NGOs alike.

The highest priorities for conservation management in the Monsoonal North involve management to maintain environmental integrity, GHG emission abatement and sustainable pastoral production (Table 26). Biodiversity conservation offers most opportunities for Indigenous businesses and employment in the Kimberley and Top End. Fire management for carbon abatement is viable through much of the Monsoonal North, but has least potential in the Southern Gulf. Improvements to grazing management are a priority in the Southern Gulf and Burdekin Dry Tropics.

Questions remain about whether future water allocation systems will facilitate or impede the conservation economy; whether the rights of landholders in the Monsoonal North to clear native vegetation will be recognised in future ERF methodologies; and whether hopes for markets for grazing land stewardship can be realised.

Existing mechanisms and future prospects

Based on the above priorities, and instituting the concept of duty of care, the Australian and state and territory governments have legislated and regulated to improve biodiversity condition and water quality; reduce GHG emissions and the impact of production on environmental health; and offset adverse environmental effects of development. To support conservation that is well-beyond reasonable expectations, they have funded the establishment of protected areas on Indigenous and other non-state controlled land; the detection and control of exotic weeds, pest animals, diseases and pathogens. They have also assisted in the adoption of sustainable practices through extension programs and provide funding for structural re-adjustment.

Table 26. Priority areas for conservation economy activities in the Monsoonal North

Scheme	Kimberley	Top End	Gulf Savanna	Southern Gulf	Northern Gulf	Burdekin Dry Tropics
Indigenous business and employment						
Indigenous Protected Areas	+++	+++	++	++	++	+
Indigenous ranger programs	+++	+++	++	++	++	+
Biodiversity conservation						
Threatened species and communities	+	+	+	+	+	++
Managing biodiversity for climate change resilience	+++	+++	+	+	++	++
Weed and pest animal management	+++	+++	+++	+++	+++	+++
Marine debris removal	+	+++	+	+	++	+++
Biosecurity surveillance	++	+++	++	?	?	?
Carbon						
Avoided deforestation	?	?	-	-	?	?
Tree planting and regrowth	-	-	-	-	-	+
Fire management to abate GHG emissions	+++	+++	++	+	++	+
Herd management to methane GHG emissions	++	++	++	+++	++	+++
Herd management to improve profitability and grazing land condition	++	++	++	+++	++	+++
Improving soil carbon	-	-	-	-	-	-
Water						
Equitable water allocation	?	?	?	?	?	?
Maintaining riparian condition	++	+++	+	++	++	-
Improving GBR water quality	-	-	-	-	-	+++
Best practice management						
Water quality improvement	+	++	+	+	+	+++
Stewardship to improve grazing land condition	?	?	?	?	?	?

However, government funding has dwindled for NRM over the last decade and has done so disproportionately in the north. Allocations to NRM bodies are a fraction of what they were ten years ago and are linked to assisting the Australian Government meet its national and international obligations, rather than meeting regional priorities. Only investment in Indigenous cultural and natural resource management has been sustained, but even this is now subject to competitive tender against other Indigenous needs.

NGOs are increasing their presence in northern Australia, particularly working in partnership with Indigenous communities to support their cultural and natural resource management aspirations.

Indigenous communities have not only participated in the conservation economy, but have been a driving force in its development. There is still a long way to go before these opportunities benefit entire Indigenous communities, allowing them to break from reliance on the vagaries of government support. Payment for environmental service delivery through real markets (as is now possible through the ERF and fee-for-service biosecurity surveillance) is one pathway to providing livelihoods for

Indigenous people. However, even where conservation activities are the primary focus, other forms of economic development are likely to be required to provide the level of living standards enjoyed by the majority of Australians.

Pastoral industry bodies have supported the development and uptake of sustainable practice and diversification of pastoral enterprises into conservation and carbon management to improve industry resilience. Best practice herd management offers the best option for pastoralists to benefit from the conservation economy as it increases profitability, while allowing a decrease in grazing pressure. The ability to attract payment for emission reduction while doing so is an added benefit. Despite dedicated extension programs, uptake of sustainable practices by the pastoralists themselves has been patchy, and will need to improve this if more regulatory measures are not to be imposed. It is hoped that the Grazing BMP and other extension programs will be successful in achieving this aim. There is also potential for product branding to reward producers who adopt sustainable management by improving market share and prices. While great store has placed on the potential for stewardship schemes to provide incentive payments for improving sustainability of pastoral enterprises, few such schemes exist outside Europe and those established in Australia have been short-lived.

The principal opportunities for growth in the conservation economy in the Monsoonal North are therefore:

- Greenhouse gas abatement activities (e.g. Savanna Burning, methane emission reduction)
- Indigenous Land and Sea Management supported by governments and NGOs
- Protection of high priority biodiversity on private or leasehold land funded through development offsets, and (to a limited extent) through government-funded programs
- Taking advantage of the inherent financial benefits of herd management to improve animal performance and land condition.

Hence, the conservation economy is operating in northern Australia and is likely to grow, but it is also subject to variation with shifting government policy and consequent market opportunities. Growth is most likely to be driven by the international priorities of conservation of listed threatened species, protection of World Heritage values, establishment of a protected area estate and alleviation of poverty among Indigenous people and in the third world, adherence to sustainable development goals and mitigation of climate change. These priorities are likely to inform future investments by governments, NGOs and private donors.

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