
Evaluation of policy options to support carbon farming in the Western Australian Rangelands

Carbon and Rangelands
Policy Working Group

Prepared for the Partnership for the Outback February 2017

Revision 2 with addenda

Report

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**Prepared for the Partnership for the Outback
by the Carbon and Rangeland Policy Working Group**

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Carbon and Rangeland Policy Working Group

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1 Executive summary

This report considers options for the management of carbon as an economic good by government in the WA rangelands and recommends options for implementation. Management of rangeland for carbon sequestration is well aligned with the objectives of the Rangeland Reform Agenda.

On the evidence to date, it appears there is the opportunity for measureable amounts of carbon to be sequestered in the WA rangelands through deliberate management of domestic and native herbivory and other methods of landscape restoration. What is missing is an approved method applicable to the WA rangelands.

The assessments in this report assume that an audit method can be developed that will ensure the validity and reliability of measurements of carbon sequestered over the 25 year period of permanence required under the Emissions Reduction Fund (ERF).

The management approach to achieve carbon sequestration will be manipulation of grazing pressure (including domestic, feral and native animals). This may involve destocking areas of land where carbon sequestration has the highest potential (degraded areas of specific land systems) and re-fencing of properties to delineate these target areas from grazed lands. An alternative approach will be to manage grazing pressure to generate livestock income while at the same time increasing carbon stores. Where grazing values are low over a whole Pastoral Lease, a simpler and more cost effective approach may be to destock completely and control feral and native herbivores. All of these approaches are approved under the ERF, although a specific method is yet to be approved for the WA rangeland environment.

In one desk top study, it was assumed that commercial levels of sequestration was achievable on 22 per cent of the Murchison River Catchment, with an average of 30 t/ha CO₂-e sequestered in vegetation at equilibrium, for a total of 58 million tonnes. Lesser amounts can be sequestered on other land types. Assuming this sequestration occurs linearly over 25 years, we have estimated that carbon accumulates at 0.21 t CO₂-e/ha/year over the whole area of an average Pastoral Lease in the catchment.

Over 25 years – being the life of an ERF project – this equates to some 140 million tonnes of CO₂-e sequestered in vegetation across the southern rangelands if half of the pastoral leasehold area pursues carbon sequestration on land suitable for that purpose.

Profitability

The last auction price in April 2016 of CO₂-e under the ERF was \$10.23 per tonne, and we have used this in determining the economics of carbon management. Using a discounted cash-flow budget analysis over 25 years, net annual returns were estimated on existing pastoral leasehold lands at \$1.29 per hectare per year, or some \$194,000 annually for an example property of 150,000 hectares. Over the 25-year period the net present value of returns is estimated at \$10.05 per hectare. With a 50 per cent adoption rate across the pastoral leasehold lands in the southern rangelands net income into the region would be in the order of \$34.3 million annually. On Unallocated Crown Land (UCL) annual returns are expected to be lower at \$0.26 per hectare per year.

Net returns to the ‘carbon farmer’ are much more reliant on the price they receive for carbon and the rate at which it might be sequestered. If a mean sequestration rate of 0.15 tonnes CO₂-e per hectare per year can be achieved at a price of at least \$5 per

tonne, then even with a 15 per cent royalty payment to government for access to the carbon, returns to the carbon farmer compare well with grazing alternatives. It has been suggested that the price of CO₂-e is likely to increase in coming years, which will improve the economics of carbon management across the WA rangelands.

Potential royalties

If 50 per cent of southern rangelands pastoral leasehold land undertook carbon sequestration then royalty payments to government for access to the carbon are estimated at \$4.16 million per year for a rate of 7.5 per cent, from gross revenues of \$55.5m. Royalties from non-pastoral areas might be some \$2.56 million annually given the same level of adoption, from gross revenues of \$34.1 million.

Policy Options – Government retains carbon rights

Option 1. Entitled interests manage the Crown's carbon with benefits flowing to both parties – applicable across all rangelands.

Government retains the rights to the carbon on all public lands, and enters into commercial agreements with entitled interests (leaseholders, local government, WA conservation commission, registered and determined native title holders, and UCL) for the management of the 'Crown's carbon'. This may also include support for pastoral leaseholders in converting Pastoral Leases to Rangeland Leases. The government would register a project to obtain Australian Carbon Credit Units (ACCUs) through the ERF. In NSW, government agencies are project managers of carbon sequestration on conservation reserves. The government would need to negotiate an Indigenous Land Use Agreement (ILUA) with holders of native title tenure over areas of land to be managed for sequestration.

Policy Options – Government transfers carbon rights to third parties

Option 2. Government calls open tenders for third parties to facilitate carbon management by entitled interests – applicable across all rangelands.

Government calls open tenders for third parties to facilitate carbon management by entitled interests (leaseholders, local government, WA conservation commission, registered and determined native title holders, and UCL) for the management of the 'Crown's carbon'. As part of this process, the entitled interests would need to have legal access to the carbon. The successful tenderer would pay a royalty to the government for access to the carbon, with the royalty being a percentage of the agreed value of the ACCUs generated.

Policy options – Government transfers carbon rights to pastoral leaseholders

Option 3. Government to invite existing pastoral leaseholders to access the carbon rights on their own Pastoral Leases.

Upon request from the pastoral lessee, the right to access carbon on the lease would be attached to the existing Pastoral Lease. Under this option, government could support the negotiation of ILUAs as required to allow the 'carbon lessee' access to the carbon. Conversion to Rangeland Lease for carbon would occur where the scale of the operation deemed it necessary. The leaseholder would pay a royalty to the government for access to the carbon, with the royalty being a percentage of the agreed value of the ACCUs generated.

Option 4. Government legislates to transfer the rights to carbon to all Pastoral Leases free-of-encumbrances.

Government would attach the right to access carbon on all Pastoral Leases (note - this option is similar to that exercised in Queensland). Under this option, government supports the negotiation of ILUAs as required to allow the rights to carbon to be attached to the Pastoral Leases. Those lessees intending to 'farm carbon' would be encouraged to convert their leases to Rangeland Leases for carbon. Given that the rights to carbon have been transferred to each lease free of encumbrances, the government would not receive any royalty for the ACCUs sold by the lessee.

Option performance against criteria

There are at least three key points of difference between the four Carbon Management Policy options. They are:

- **Level of government involvement in management.** Option 1 implies direct government involvement in setting management contracts and paying for management for carbon-based outcomes. Government would receive revenues but also more exposure to carbon management outcomes. Revenues can be directed to other programs and or land management priorities. Government has strong control to target priority areas with differential contract terms. This could be used to achieve conservation, indigenous employment or stewardship objectives.
- **Capacity to raise government revenue** Options 1-3 generate revenue either directly from management of sequestration projects or indirectly from royalty payments. Option 4 provides no government revenues that might be leveraged for additional land management or social programs. Additional revenues to government are captured by current leaseholders, which may or may not be directed to investment back into the rangelands, dependent on the management objectives of the leaseholders.
- **Capacity to influence land management and to leverage outcomes to priority areas and environmental or social programs.** Option 1 provides government with direct influence on the setting of management contracts and receipt of potential revenues. Management might be set to undertake activities beyond those for carbon management – such as conservation priorities, and pest and weed control. Options 2 and 3 may still provide some direction or caveats for other land management outcomes but with less direct oversight. Royalties can still be directed to other priority land management activities. Option 4 provides the least leverage for outcomes beyond land management for carbon sequestration.

Possible adoption pathway

The preferred adoption pathway is likely to differ according to current land tenure. Existing Pastoral Leases will have differing advantages and requirements to UCL and the existing conservation estate. Native title status will also have varying implications across tenures.

Option 4 is considered to be least preferred, as it does not provide for any incomes to government or royalty payment. It is considered vital for a share of any new revenues to government from carbon to be used for stewardship, conservation and community development initiatives in rangeland areas.

Pastoral Leases

Priority might be given to enable sequestration to occur on areas covered by existing Pastoral Leases, as this is where management capability is present, the greatest rates of sequestration are possible and correspondingly the highest potential for government revenues or royalty payments. These areas are also likely to be where the greatest improvement in resource condition and conservation outcomes can be made.

All four options are available for use on Pastoral Leases. Initially the most acceptable option to pastoral leaseholders and government is Option 3. This option could be offered first and then if it is not accepted by a pastoral leaseholder the other option that could be put forward is Option 1, which may not be so onerous on an individual leaseholder. Option 4 provides no return to government from the management of carbon. Transfer of a public asset without any payment by the beneficiary is regarded as poor public policy.

After testing the market on existing Pastoral Lease areas, consideration could then be given to options across other land tenures.

UCL

Much of the UCL in the rangelands is held as determined exclusive native title. Although the prospects for carbon sequestration in most of this land are likely to be low on a per hectare basis, the large areas, and the possible potential offered by a change in burning regimes and removal of large feral herbivores suggest that managing to obtain ACCUs may be worthwhile. Option 1 is a suitable approach on land held as exclusive native title. In this situation, the native title holders could manage the Crown's carbon in return for payment. An ILUA would still be required before an ERF project could be registered.

In areas where UCL is not subject to native title, government could be the proponent and would manage its own carbon (Option 1). It could contract third parties to undertake on-ground carbon management activities.

The Conservation Estate

In NSW, the responsible government agency is managing projects registered under the ERF on land in the conservation estate. This approach can be adopted in WA. This is equivalent to implementing Option 1, except that the land in question is also held by the government.

Developing a stewardship fund

Numerous documents have highlighted the threats to biodiversity in the rangelands (e.g. Carwardine *et al.* 2015, EPA 2004, and Government of WA 2011), and there is a recognition that not all conservation objectives can be met within the state's conservation estate (Brandis 2008). Achievement of stated objectives for conservation management in the rangelands will require specific management approaches across all tenures.

Priorities include protection of particular biodiversity assets such as rain forest remnants in the Kimberley, perennial and seasonal wetlands across the rangelands which act as refugia for biodiversity, and other unique habitats. The threats include feral cats, excessive grazing pressure by domestic and feral animals, weed ingress and inappropriate fire regimes.

Additionally, sustainable management of pastoral lands has long been recognised as a market-driven challenge which has resulted in a long-term decline in productivity, profitability, and rangeland condition across many parts of WA's rangelands. Neutralising

this active market disincentive to manage for long term productivity and sustainability with an active incentive to do the opposite is increasingly the subject of investigation and trial.

The funds raised by government through direct (Option 1) and indirect (Options 2 and 3) carbon management can be directed towards stewardship programs where tenure holders in the rangelands can be contracted to manage assets and threats on behalf of government, and to manage pastoral businesses more sustainably. Stewardship programs for the rangelands have been recommended (see URS 2013) and are underway in some situations. For example, a program in NSW is funding landholders to maintain prescribed levels of groundcover on pastoral lands in return for payment (see URS 2015).

As well as achieving improved rangeland condition and protection of biodiversity, stewardship programs will enhance employment in the rangelands, and develop on-ground skills in land management.

2 Introduction

In August 2016, the public communique issued from the *Outback Carbon Farming Conference* held in Perth, Western Australia, stated that a key obstacle preventing the emergence of a commercial carbon sequestration industry in the state's rangelands was the 'absence of policy to activate carbon rights in the WA rangelands' (see https://d3n8a8pro7vhmx.cloudfront.net/modernoutback/pages/523/attachments/original/1472189269/Summary_Document_V4.pdf?1472189269, accessed 1 November 2016).

This report considers options for the management of carbon rights as an economic good by government in the WA rangelands and recommends options for implementation. The Report has been commissioned by the Partnership for the Outback.

2.1 The requirement

To prepare a report that:

- provides an overview of the carbon sequestration industry in WA;
- provides an overview of how other Australian states manage carbon rights in the rangelands;
- evaluates the four carbon rights options detailed in the URS Australia (2013) report '*Sustainable land use and economic development opportunities in the Western Australian Rangelands*' for their ability to meet accepted standards of good public policy and the goals of the WA Government's Rangelands Reform Program;
- provides guidance on which option would be most suitable for each of the main forms of tenure in the rangelands;
- models the economic benefits that would flow from the recommended option/s to the government and non-government sectors; and
- identifies potential policy implications of the chosen option/s, or questions for further research.

2.2 Evaluation method

2.2.1 Assumptions

Some global assumptions have been made in preparing this report.

- We assume that the starting point is that the Crown owns the carbon in the rangelands. This puts carbon on the same footing as water, minerals and vegetation, which are also owned by the Crown and governed by separate legislation. These acts also cover how these resources can be exploited by third parties (as in the *Mining Act 1978* providing the means whereby the government administers access to the state's minerals).
- It is further assumed that there is, or can be, a legal basis for the WA Government to receive and regulate royalty payments from the sale of ACCUs derived from carbon sequestered on crown land.
- We have assumed that royalty payments are rated as a proportion of gross revenues, with no adjustment to lease rental rates. The Valuer General may adjust lease rentals to reflect fees already collected in the form of royalty payments.

- The assessment of the potential for carbon is confined in this report to the Gascoyne, Murchison, Goldfields and Nullarbor regions, as defined by the Department of Lands. These are usually termed the 'southern rangelands'. The rationale is that it is only in the Murchison River catchment that a comprehensive desktop assessment has been published of the capacity to sequester carbon at a region-wide scale (see Outback Ecology 2012). The other regions in the southern rangelands (Gascoyne, Goldfields and Nullarbor) are sufficiently similar in structure and function to the Murchison for that assessment to apply to them.
- There is as yet no accepted and approved method for determining the amount of carbon sequestered in WA's semi-arid pastoral land by managing for rangeland improvement. The assessments in this report assume that a method can be developed and accepted by the Commonwealth government.
- The corollary is that an baseline and audit method can be developed that will ensure the validity and reliability of measurements of carbon sequestered over the 25 year period of permanence required under the Emissions Reduction Fund.
- The management approach to achieve carbon sequestration will mainly be manipulation of grazing pressure (including domestic, feral and native animals). This may involve destocking areas of land where carbon sequestration has the highest potential (degraded areas of a lease) and re-fencing of properties to delineate these target areas from grazed lands. Where grazing values are low a simpler and more cost effective approach may be to destock across a lease.
- More complicated approaches on areas with potential for carbon sequestration may involve short duration grazing systems, lengthy periods of rest, and control of feral and native herbivores. It would seem these are being applied in a few projects in NSW and Queensland, and there is evidence that the approach is viable in WA (see Alchin *et al.* 2010). Further research is underway in developing a better understanding of the relationship between land type, grazing management and carbon sequestration. Finally, there are engineering techniques available for the restoration of landscape function in instances of severe erosion.
- There is also an assumption that managing to increase carbon at landscape scale will lead to a general improvement in range condition and local biodiversity. Over time, and depending on the relative profitability between the carbon and livestock markets, improved rangeland condition may provide a sounder basis for future grazing enterprises in the rangelands.

2.2.2 Review of carbon management in other jurisdictions

A review of current activity in abatement and sequestration across all jurisdictions was undertaken with reference to the register of projects approved under the Emissions Reduction Fund (see <http://www.cleanenergyregulator.gov.au/ERF/About-the-Emissions-Reduction-Fund/The-role-of-the-Clean-Energy-Regulator>, accessed 20 October 2016).

2.2.3 Assessing the capacity to sequester carbon in the WA rangelands

Existing reports on the potential for carbon sequestration in the rangelands were used to estimate the amount of carbon that can be sequestered and what land types are likely to be preferred (see Alchin *et al.* 2010, Outback Ecology 2012). These data are limited to

only a few locations in the rangelands, requiring sensitivity analysis to be undertaken using varying levels of CO₂-e sequestered per hectare.

2.2.4 Review of options in 2013 URS Report

The four options for carbon management presented in the 2013 URS Australia report '*Sustainable land use and economic development opportunities in the Western Australian Rangelands*' were revised. The original Options 1 and 2, which related to carbon management only on pastoral leasehold, have been extended to include unallocated crown land (UCL), other rangeland tenures (e.g. determined exclusive native title) and the Pastoral Leases acquired by the WA Government in the Gascoyne and Murchison regions. Options 3 and 4 refer to carbon management only on pastoral leasehold land. The criteria used to assess these four options have also been altered and expanded.

2.2.5 Economic assessments of carbon sequestration

The results of recent auctions conducted by the Clean Energy Regulator for the ERF were reviewed to obtain per tonne prices for CO₂-e. Further assumptions were made for costs to proponents in establishing a sequestration project under the ERF and/or a Rangelands Lease, and the management requirements and constraints. Given varying prices for CO₂-e, and the need to estimate costs in establishing a project, sensitivity analysis was conducted.

2.2.6 Selecting preferred option(s) for government

The review of the four options against a number of performance criteria, rangeland reform objectives, and policy implications, was used in recommending preferred options/ staging of options to government (see Section 6).

3 Background

3.1 Carbon management in the Australian rangelands

In August 2011, the Federal Parliament passed the *Carbon Credits (Carbon Farming Initiative) Act 2011* (CFI Act). The Carbon Farming Initiative (CFI) is a voluntary government offsets scheme that aims to provide financial incentives for landholders and other service providers to develop projects that will reduce greenhouse gas emissions (emissions abatement) or sequester carbon. Participants in the Emissions Reduction Fund (ERF) process can be issued with 'carbon credits', officially known as Australian Carbon Credit Units (ACCUs) for the resulting emissions reductions, with one tonne of CO₂-e avoided or sequestered equivalent to one ACCU.

To be eligible to earn ACCUs, activities must be on the positive list, which identifies activities that are deemed to go beyond common practice in the relevant industry or environment and covered by an approved method.

A proponent needs to have a project accepted by the Clean Energy Regulator (CER) at auction, with the contract specifying the scope, method, amount of CO₂-e to be sequestered and the price per tonne to be paid per ACCU. Payment occurs as ACCUs are delivered, over a period of 25 years. The national legislation requires that proponents must have the approval of anyone who has a legal interest in the land, before a sequestration project can be registered. This will include landholders, banks/financiers, the Crown, business partners /owners and determined native title holders represented by recognised native title body corporates.

In the semi-arid WA rangelands, deliberate management to improve range condition (and hence increase carbon stores) will likely be the only feasible means of sequestering carbon and this approach is consistent with the CFI Positive List.

3.2 Experiences in other rangeland jurisdictions

3.2.1 Access to carbon

Table 1 presents a simple comparison of carbon ownership, access to the carbon and how benefits are distributed from carbon management, across all rangeland jurisdictions in Australia. Further details for each jurisdiction are presented in following sections.

Table 1: Access to carbon from abatement and sequestration projects

Jurisdiction	Who owns the carbon	Access to carbon from emissions abatement	Benefits from sale of emissions abatement credits	Access to carbon from sequestration	Benefits from sale of ACCUs
NSW	Crown	Not available	nil	WLD** leaseholders via forestry right	Leaseholder only
Northern Territory	Crown	Leaseholders and NT* holders (in high rainfall areas)	Leaseholders and NT holders	unclear	unclear
Queensland	Crown	Leaseholders and NT holders (in high rainfall areas)	Leaseholders and NT holders	Leaseholders via legislation	Leaseholder only
South Australia	Crown	Not available	nil	unclear	unclear
WA	Crown	Leaseholders and NT holders (in high rainfall areas)	Leaseholders and NT holders	To be decided	To be decided

Sources: Hepburn (2009), Hansen (2015), Eckert and McKellar (2008),

http://www.crownland.nsw.gov.au/_data/assets/pdf_file/0008/650609/P0706032_native_title_faq_v3.pdf,

accessed 20 October 2016. * native title ** Western Lands Division

3.2.2 Involvement in the Emissions Reduction Fund (ERF)

Table 2 shows the number of projects registered by the Clean Energy Regulator under the ERF¹. These numbers need to be interpreted with some caution. Some of these projects occur in more than one jurisdiction, and some properties have more than one project. Further, given that there is no defined boundary between ‘rangelands’ and other agricultural lands in NSW and Queensland, assigning projects to one or the other category may contain errors.

Table 2: ERF emissions abatement and sequestration projects in the rangelands

Jurisdiction	GHG emissions Abatement projects	Revegetation projects to sequester C	Avoidance of clearing vegetation to preserve existing C	Improving soil C through grazing management	Total
WA	11	1	-	-	12
Northern Territory	24	-	-	1	25
Queensland	39	86	3	5	133
New South Wales	-	107	55	2	164
South Australia	-	-	-	1	1
Total	74	194	58	9	335

see <http://www.cleanenergyregulator.gov.au/ERF/project-and-contracts-registers/project-register>, accessed 19 October 2016).

Emissions abatement activity (early dry season savanna burning) is an important activity in northern Australia, while sequestration is largely occurring through ‘human induced revegetation on previously cleared land where regrowth has been suppressed for 10 years’ in NSW and Queensland. In NSW, landholders on the margins of rangeland and agricultural lands who have been given permits to clear for agricultural purposes are forfeiting the right to clear in return for ACCUs. This is termed ‘avoided reforestation’. A few projects are ‘sequestering carbon in soils in grazing systems’ – as termed by the ERF – by changing grazing systems. This is a method that may have applicability in WA.

3.2.3 Northern Territory (NT)

The rights to carbon

The Northern Territory has not passed any legislation recognising the proprietary status of carbon rights. Thus there is uncertainty about access to carbon sequestered through deliberate land management.

Emissions abatement

Emissions abatement is the only carbon management method operating in the NT. The method uses managed burning practices (late wet season/ early dry season burns) in the tall grass savanna woodlands to reduce the frequency of extensive destructive late dry season fires, which release considerably more greenhouse active gases. There are currently 24 abatement projects operating in the NT under the Emissions Reduction Fund.

¹ The following discussion relates only to the projects established under the ERF. There is no information presented relating to the voluntary, international market.

Carbon sequestration

There is only one carbon sequestration project in the Northern Territory on the Clean Energy Regulator's list of projects, and this project operating in Queensland and the NT. It is likely that this lack of activity in the NT is partly due to: uncertainty about obtaining access to soil and vegetative carbon; the comparative advantage of cattle grazing over much of the NT's good quality rangelands; and conversely the lack of land where carbon management would generate better returns than grazing.

3.2.4 Queensland

The rights to carbon

Queensland and NSW are the only jurisdictions that have clarified whether landholders on crown leasehold land can generate carbon credits from sequestration activities. This doesn't apply to avoided emissions. There are still potential marketing benefits available to landholders that could demonstrate carbon neutral production systems and this wouldn't require any legislative or policy decisions at the state level, but they would still need to meet national standards (John Gavin *pers. comm.* 2016).

Emissions abatement

As in the NT, emissions abatement through the judicious management of savanna burning is used as a means of reducing emissions from uncontrolled hot fires. The approved projects are mainly operating in the higher rainfall (> 600 mm) tropical woodlands on Cape York. Thirty-nine projects are described on the ERF's list of projects.

Carbon sequestration

In Queensland, pastoral lessees have been given the opportunity to own any increase in carbon on their lease. However, as per the national legislation, they need to secure the consent of any other entity holding a legal interest in the land, such as a determined native title holder, as represented by a registered native title body corporate (Department of Agriculture 2013).

Eighty-nine projects have been established for sequestration elsewhere in the Queensland rangelands. These projects mainly involve deliberate revegetation of land previously cleared of cropping or pasture establishment (86), and the protection of land from intended clearing, by the forfeiture of rights to clear provided at some previous time (3). Five projects are changing grazing systems to increase soil carbon.

3.2.5 New South Wales (NSW)

The rights to carbon

In NSW, a 'carbon sequestration right' and a 'forestry right' have the same meaning, with the result that where a forestry right granted by the government is traded, it is the equivalent of trading carbon. In 2002, the High Court found that native title had been extinguished over all the perpetual grazing leases in NSW (see http://www.crownland.nsw.gov.au/data/assets/pdf_file/0008/650609/P0706032_native_title_faq_v3.pdf, accessed 20 October 2016).

Emissions abatement

There are no emissions abatement projects in NSW.

Carbon sequestration

In NSW, 55 projects have been awarded for 'avoided deforestation' being where a right to clear has been given back to the government as a means of securing ACCUs for the CO₂-e not released (see Gavin 2016). A larger number of projects (107) will earn ACCUs by the managed revegetation of previously cleared land, located mainly in the eastern parts of the Western Land Division. It is worth noting some properties have both types of projects.

3.2.6 South Australia (SA)

The rights to carbon

The legislation in SA does not allow for 'carbon farming'. SA work current is limited to education and capacity building in readiness (and to support legislative change) for a time when harvesting and sequestration may be a profitable option. The challenge is that for pastoralists, the Crown would be the only party entitled to profits from carbon sequestration (Jodie Gregg-Smith, *pers. comm.* 2016).

Carbon sequestration

There is only one sequestration project on the register, being for increasing soil carbon through grazing management.

The SA Arid Lands (SAAL) Natural Resources Management (NRM) Board's Rangelands Carbon Project 'Climate change and carbon economy extension and outreach in the SA Arid Lands' aims to develop and deliver extension services for land managers in the SA Arid Lands who may benefit from emissions management. The Board is currently working with 14 landholders to participate in carbon farming feasibility studies. A 'business as usual' analysis is being undertaken of each pastoral business using a computer based pastoral management tool. This will be compared to a series of 'what if' scenarios to see what future benefits and income could be made from diversification into carbon farming, emission reduction or other activities. (see <http://www.naturalresources.sa.gov.au/aridlands/land/land-management/carbon-farming/20150204-regional-cfi-activity>, accessed 20 October 2016)

3.3 Carbon management in the WA rangelands

3.3.1 Ownership of carbon

The *Carbon Rights Act 2003 (WA)* requires the owner of pastoral leasehold land and UCL [the Crown] to consent to the creation of the carbon right if it is to be held by somebody other than the owner of the land. Therefore, under the Act a carbon right does not exist over Crown Land (including Pastoral Leases and UCL) until a carbon right is registered with the Registrar of Titles in an approved form and including the written consent of all parties that hold a registered interest in the relevant land; including the Minister for Lands.

3.3.2 Current approved projects in the rangelands

Current activity is minimal in the rangelands with 11 projects registered with the CER for emissions abatement in the Kimberley, and one project approved for sequestration through revegetation in the Eastern and North Eastern Goldfields.

3.3.3 Technical possibilities

The experience in other jurisdictions

Most activity is occurring in NSW and Queensland where the physical, governance and policy situations are quite different to those prevailing in other jurisdictions. In both states, government in effect is allowing pastoral leaseholders to obtain the benefits from any carbon sequestered. Methods have been established allowing for ACCUs to be earned through the deliberate revegetation of land that was cleared over 10 years ago in the NSW and Queensland rangelands. Broad-acre clearing of pastoral leasehold land for agriculture has not been permitted in WA, so this method is not applicable in the WA rangelands.

In NSW, ACCUs can also be earned by foregoing a right to clear – again not a situation that occurs in WA. A few projects seek to increase soil carbon through grazing management, which could be relevant in WA. Finally, emissions abatement projects relying on changes in savanna burning are currently confined to high rainfall areas such as occur in far north Queensland, the northern parts of the NT and north Kimberley.

It is worth noting that in NSW and Queensland, the percentage of landholders who have developed projects to earn ACCUs is small, and tends mainly to be those on the wetter margins of the rangelands where vegetative growth (and hence the potential to sequester carbon) is higher.

Determining the capacity to sequester

Several investigations have demonstrated that areas of the WA rangelands can be deliberately managed to sequester measurable quantities of soil and plant carbon (see Alchin *et al.* 2010; Dean *et al.* 2012; and Outback Ecology 2012). In western NSW, manipulating the management of grazing has been shown to influence the levels of soil and carbon in semi-arid woodlands (Waters *et al.* 2016). More recent research in WA is improving the knowledge of the validity and reliability of carbon measurement in the rangelands (Peter Russell, *pers. comm.*).

Effective carbon management can be undertaken in the WA rangelands on land systems with the following characteristics:

- high carbon storage potential (defined by a combination of comparatively deep fertile soils and / or high density of woody or non-woody vegetation);
- low carbon baseline (as in degraded land);
- low spatial variation in soils and vegetation; and
- resilience to disturbance and land that responds well to management intervention. (Outback Ecology 2012)

In one desk top study, it was assumed that commercial levels of sequestration was achievable on 22 per cent of the Murchison River Catchment, with an average of 30 t/ha CO₂-e sequestered in vegetative growth at equilibrium, for a total of 58 million tonnes.

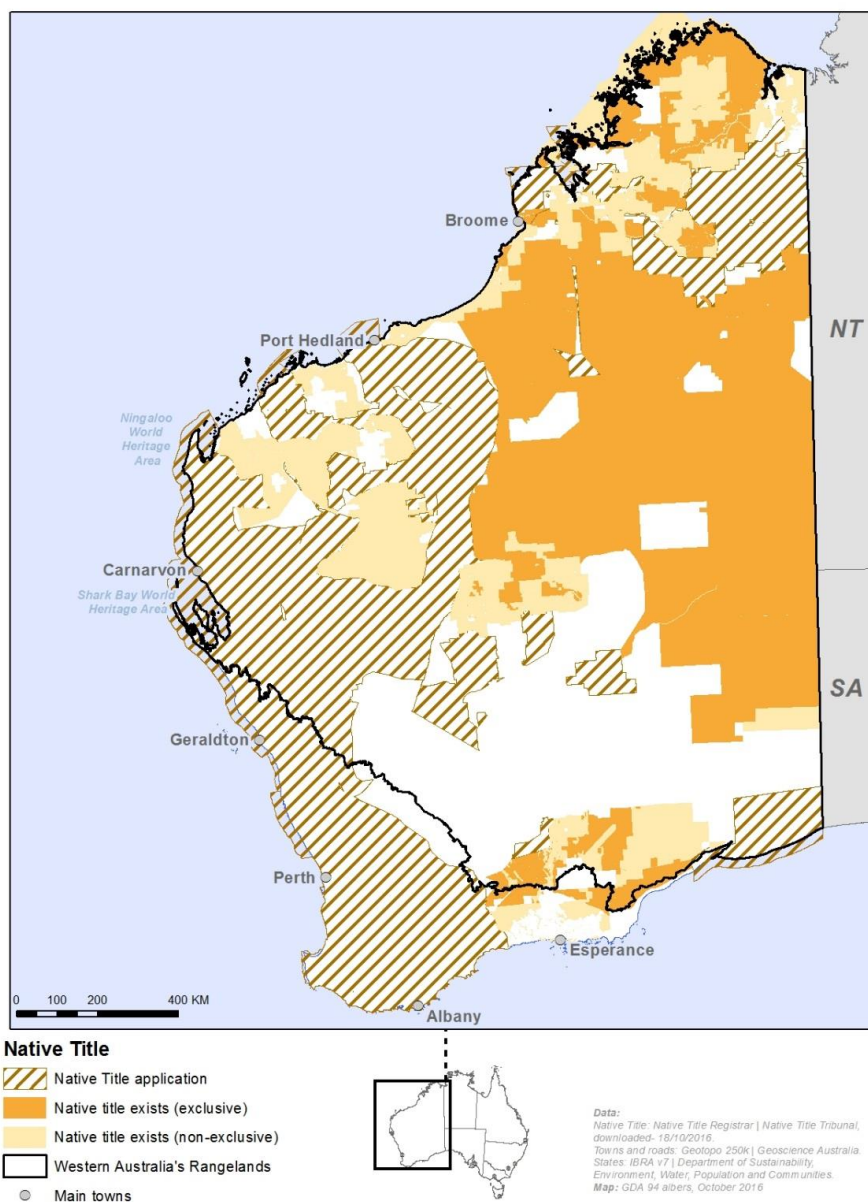
Lesser amounts can be sequestered on other land types. Assuming this sequestration occurs linearly over 25 years, we have estimated that carbon accumulates at 0.21 t CO₂-e/ha/year over the whole area of an average Pastoral Lease in the catchment.

In summary, there appears to be an opportunity for measureable amounts of carbon to be sequestered in the WA rangelands, mainly through deliberate management of domestic and native herbivory. What is still required is an approved method applicable to the WA rangelands.

3.3.4 Tenures of the rangeland available for carbon sequestration

The coverage of native title in WA is shown in the figure below. With the exception of the Eastern Goldfields, nearly all of the pastoral leasehold estate is covered by either registered native title claims, or determined non-exclusive title. Much of the UCL east of the pastoral leasehold areas is held as exclusive native title.

Native Title within Western Australia's Rangelands



As also shown in Table 3, most pastoral leasehold land is subject to native title, either as determined title (exclusive and non-exclusive) or as registered claims. In both cases, benefits obtained from access to rights for carbon may be regarded as a 'future act' under the *Native Title Act 1993*, which gives native title holders the right to negotiate with the proponents of these future acts. Obtaining the consent of entitled interests in the land where sequestration will occur is also a requirement for a project to be registered under the ERF.

Table 3: Pastoral leasehold and native title tenures in the WA rangelands

Tenure	No native title (ha)	Native title application (ha)	Native title exists (exclusive) (ha)	Native title exists (non-exclusive) (ha)	Grand Total (ha)
Pastoral-Indigenous	1,480,133	3,882,941	4,289,406	1,176,906	10,829,386
Pastoral-Mining	2,272,871	3,890,737	33	2,102,640	8,266,281
Pastoral-other	13,968,845	33,061,210	22,654	20,244,734	67,297,443
DPAW- former leasehold	1,755,796	3,515,738	2,353	770,327	6,044,214
Total Pastoral Leases	19,477,645	44,350,626	4,314,446	24,294,607	92,437,324
UCL	19,342,252	8,623,389	52,184,994	3,660,712	83,811,348
Remaining rangeland*	15,380,222	9,496,034	23,938,623	3,824,716	52,639,593
Grand total rangelands	54,200,119	62,470,049	80,438,063	31,780,035	228,888,265

* comprises Conservation Estate, Aboriginal reserve land, Defence land etc.

4 Evaluating the options

4.1 Providing access to carbon in the rangelands

In Section 2.2.1, the assumption is presented that ownership of carbon in the rangelands is retained by the Crown.

Under the Land Administration Amendment Bill 2016 (Rangeland Reform Bill), a Rangeland Lease can be established for a wide variety of uses, including obtaining access to the Crown's carbon. Establishing a Rangeland Lease will need to comply with the future act processes in the *Native Title Act 1993* (Cth) to be validly granted. In almost all cases, this is likely to require the lessee to enter into an ILUA with the relevant native title parties, where a Rangelands Lease and registered or determined native title co-exist (this includes much of the pastoral leasehold estate and the UCL with the exception of the Eastern and Northern Goldfields, and areas north of the Nullarbor Plain).

Rangeland Leases for carbon over defined areas can therefore be developed as a principal means of allowing third parties to manage carbon. Thus a Rangeland Lease for carbon can be analogous to a Pastoral Lease in that it covers a discrete piece of land, can co-exist with other tenures (except Pastoral Leases), has a defined life, involves payment to government for the lease, and prescribed rights and obligations for the holder of the lease. Three of the options consider this approach. Further assessment of options for how these leases will be allocated and administered by government and used by carbon leaseholders is considered in the following sections.

An alternative option has been evaluated where the government directly contracts existing persons with existing rights to land to manage the carbon on behalf of government.

4.2 Alignment of carbon sequestration with Rangelands Reform

Management of rangeland for carbon sequestration aligns well with the objectives of the Rangeland Reform Agenda, as presented in the Land Administration Amendment Bill 2016. If passed by the Parliament, this will allow for the establishment of Rangelands Leases within the WA rangelands.

Such a lease can be granted for any purpose that is 'principally consistent with the preservation and ongoing management of the rangelands as a natural resource'. Possible permitted uses under a Rangelands Lease include agriculture, tourism, Aboriginal economic development, conservation, environmental offsets and the capture of carbon credits, as well as pastoral purposes.

An existing pastoral leaseholder can apply for the conversion of all or part of an existing Pastoral Lease to a Rangelands Lease, with the uses of the land to be specified. One of those uses can be management of carbon which is in effect leased from the Crown. Where new uses are planned, these uses are regarded as future acts under native title legislation, and an ILUA would need to be negotiated with any registered native title claimant or determined native title holder.

Enabling third party and landholder access to carbon, as envisaged in Options 2, 3 and 4, will promote the take-up of Rangeland Leases for that purpose. This will result in an increased revenue stream for government via lease payments, and also via royalty

payments from the sale of ACCUs in Options 2 and 3. Management for increased carbon over a significant area of the rangeland will also contribute to the achievement of government objectives for improvement in the condition of the rangeland.

4.3 Carbon management policy options

The 2013 URS Australia report '*Sustainable land use and economic development opportunities in the Western Australian Rangelands*' suggested four options for carbon management in the rangelands. The four original policy options have been revised and expanded as they originally only dealt with the management of carbon on pastoral leasehold lands. As presented here, they now cover all land in the WA rangelands.

4.3.1 Government retains carbon rights

Option 1. Entitled interests manage the Crown's carbon with benefits flowing to both parties – applicable across all rangelands.

Government retains the rights to the carbon on all public lands, and enters into commercial agreements with entitled interests (leaseholders, local government, WA conservation commission, registered and determined native title holders, and UCL) for the management of the 'Crown's carbon'. This may also include support for pastoral leaseholders in converting Pastoral Leases to Rangeland Leases for carbon. The government would register a project to obtain ACCUs through the ERF. The government would need to negotiate an Indigenous Land Use Agreement (ILUA) with holders of native title tenure over areas of land to be managed for sequestration.

4.3.2 Government transfers carbon rights to third parties

Option 2. Government calls open tenders for third parties to facilitate carbon management by entitled interests – applicable across all rangelands.

Upon request from the pastoral lessee, the right to access carbon on the lease would be attached to the existing Pastoral Lease. Government calls open tenders for third parties to facilitate carbon management by entitled interests (leaseholders, local government, WA conservation commission, registered and determined native title holders, and UCL) for the management of the 'Crown's carbon'. As part of this process, the entitled interests would need to have legal access to the carbon. The successful tenderer would pay a royalty to the government for access to the carbon, with the royalty being a percentage of the agreed value of the ACCUs generated.

4.3.3 Government transfers carbon rights to pastoral leaseholders

Option 3. Government to invite existing pastoral leaseholders to access the carbon rights on their own Pastoral Leases.

Under this option, government could support the negotiation of ILUAs as required to allow the 'carbon lessee' access to the carbon. Conversion to Rangeland Lease for carbon would occur where the scale of the operation deemed it necessary. The leaseholder would pay a royalty to the government for access to the carbon, with the royalty being a percentage of the agreed value of the ACCUs generated.

Option 4. Government legislates to transfer the rights to carbon to all Pastoral Leases free-of-encumbrances.

Government would attach the right to access carbon on all Pastoral Leases (note - this option is similar to that exercised in Queensland). Under this option, government supports the negotiation of ILUAs as required to allow the rights to carbon to be attached to the pastoral leases. Those lessees intending to 'farm carbon' would be encouraged to convert their leases to Rangeland Leases for carbon. The government would not receive any royalty for the ACCUs sold by the lessee.

4.4 Comparing the policy options

The four options are compared across a range of criteria in Table 4.

4.5 Option performance against criteria

There are at least three key points of difference between the five carbon management options. They are:

- **Level of government involvement in management.** Option 1 implies direct government involvement in setting management contracts and paying for management for carbon based outcomes. Government would receive revenues but also more exposure to carbon management outcomes. Revenues can be directed to other programs and or land management priorities. Government has strong control to target priority areas with differential contract terms. This could be used to achieve conservation, indigenous employment or stewardship objectives.
- **Capacity to raise government revenue.** Options 1-3 generate revenue either directly from management of sequestration projects or indirectly from royalty payments. Option 4 provides no government revenues that might be leveraged for additional land management or social programs. Additional revenues to government are captured by current leaseholders, which may or may not be directed to investment back into the rangelands, dependent on the management objectives of the leaseholders.
- **Capacity to influence land management and to leverage outcomes to priority areas and environmental or social programs.** Option 1 provides government with direct influence on the setting of management contracts and receipt of potential revenues. Management might be set to undertake activities beyond those for carbon management – such as conservation priorities, and pest and weed control. Options 2 and 3 may still provide some direction or caveats for other land management outcomes but with less direct oversight. Royalties can still be directed to other priority land management activities. Option 4 provides the least leverage for outcomes beyond land management for carbon sequestration.

Table 4: Evaluation of policy options

Criteria	Tenure holder manages carbon for government, with government negotiating project with the CER	Third parties have access to carbon and negotiate project with the CER. Government will receive royalties from the value of sequestered C	Pastoral leaseholders have rights to carbon attached to the Pastoral Lease. Pastoral leaseholders will negotiate project with the CER. Government will receive royalties from Option 3, but not from Option 4	
	1. Entitled interests manage the Crown's carbon with benefits flowing to both parties – applicable across all rangelands	2. Govt calls open tenders for third parties to facilitate carbon mgt by entitled interests – applicable across all rangelands	3. Government invites pastoral leaseholders to have carbon rights attached to their own Pastoral Leases (PL) – Royalties are paid by leaseholders	4. Govt. legislates to transfer carbon rights to all Pastoral Leases free-of-encumbrances
Rights to Carbon	Crown	Any person who leases carbon rights	Existing pastoral leaseholders who lease carbon rights	All existing pastoral leaseholders
ERF proponent	Government	Successful tenderer	Pastoral leaseholders	Pastoral leaseholders
Benefits to Govt.	Sale of ACCUs	Royalties	Royalties	Nil
Costs to Govt.	Management fees Establishment of ILUAs	Transaction costs	Transaction costs	Transaction costs Loss of carbon revenue
Risks to Government	Cost of ILUAs	Too many parties involved in rangelands creating administrative difficulties	Current management issues may continue	Public concern about transfer of public assets without payment to government Current management issues may continue
Risks to Proponent	Poor quality of management by leaseholder Difficulty in estimating returns to carbon management	Difficulty in securing access to land Difficulty in securing sound management of carbon Difficulty in estimating returns to carbon management Difficulty and cost of securing ILUAs	Difficulty in estimating returns to carbon management Difficulty and cost of securing ILUAs	Difficulty in estimating returns to carbon management Difficulty and cost of securing ILUAs
Implications for native title	Government to negotiate an ILUA Low if successful tenderer is NT claimant to the land in question If current tenure holder transfers entitlement to Rangeland Lease, ILUA will be required	Otherwise a lease-by-lease ILUAs would need to be established	Lease-by-lease ILUAs would need to be established	Lease-by-lease ILUAs would need to be established
Fairness of access to carbon rights	Moderate – Government as owner of carbon is negotiating a management responsibility with entitled interest to land Similar to a stewardship payment.	High – right to tender for carbon is open to all parties, including current leaseholder and NT holders	Moderate – government can use tender process to recognise quality of previous pastoral management in setting the price for access to carbon	Low – All PL holders would be rewarded with a new property right, regardless of previous management. Would penalise good land managers
Transparency of transaction	Moderate	High	High	High

Criteria	Tenure holder manages carbon for government, with government negotiating project with the CER	Third parties have access to carbon and negotiate project with the CER. Government will receive royalties from the value of sequestered C	Pastoral leaseholders have rights to carbon attached to the Pastoral Lease. Pastoral leaseholders will negotiate project with the CER. Government will receive royalties from Option 3, but not from Option 4	
	1. Entitled interests manage the Crown's carbon with benefits flowing to both parties – applicable across all rangelands	2. Govt calls open tenders for third parties to facilitate carbon mgt by entitled interests – applicable across all rangelands	3. Government invites pastoral leaseholders to have carbon rights attached to their own Pastoral Leases (PL) – Royalties are paid by leaseholders	4. Govt. legislates to transfer carbon rights to all Pastoral Leases free-of-encumbrances
Certainty of securing carbon management outcomes	High – government is negating commercial contracts and can specify performance criteria. Potentially better monitoring	Moderate – government has less oversight and monitoring at end of contract period	Moderate – government has less oversight and monitoring at end of contract period	Moderate – government has less oversight and monitoring at end of contract period
Practicality of Administration	Moderate - Govt retains control of carbon, but is required to manage contracts on ongoing basis. Knowledge of carbon accounting and regulatory processes common across contracts	Low - management arrangements may fail, and sale of leases may be complex	High – all management and market risks are held by the pastoral (or rangeland) lessee	High. Easy to administer once rights to carbon transferred High. All management and market risks are held by the pastoral (or rangeland) lessee
Advantages to rangeland economic development	Straightforward, and Government holds risk. Could be beneficial on Indigenous land holdings and areas of determined exclusive NT Carbon revenues could be used for Stewardship and Indigenous Ranger programmes	Third party investment in carbon management On PL supports existing lessee's business On UCL creates revenue for NT holders Government receives royalty payment for leasing carbon right Royalty revenues could be used for Stewardship and Indigenous Ranger programs	On PL supports existing lessee's business Government receives royalty payment for leasing carbon right Royalty revenues could be used for Stewardship and Indigenous Ranger programs	On PL supports existing lessee's business
Disadvantages to rangeland development	Transaction and administrative costs to government in monitoring compliance with management agreement may be high No third party investment to initiate carbon management	Messy management arrangements may result in litigation and unnecessary costs	No third party investment to initiate carbon management activities unless leaseholder entered into joint venture with investor	No third party investment to initiate carbon management Government receives no payment for the carbon right and therefore has no additional income to invest in rangeland programs
Other considerations	Could implement a Land Management Plan as part of contract ILUA could involve profit sharing or employment opportunities in carbon management	Government could require a Land Management Plan before transferring carbon rights ILUA could involve profit sharing or employment opportunities in carbon management	Government could require a Land Management Plan before transferring carbon rights ILUA could involve profit sharing or employment opportunities in carbon management	Government could require a Land Management Plan before transferring carbon rights ILUA could involve profit sharing or employment opportunities in carbon management

5 Case Study Evaluations and Revenue Estimates

5.1 Budgeted Assumptions

Evaluations of potential returns to 'carbon farmers', and of indicative royalty payments to government from current Pastoral Leases, UCL and conservation reserves have been undertaken using the following base case assumptions.

- The results of recent auctions conducted by the Clean Energy Regulator, for the ERF, were reviewed to obtain per tonne prices for CO₂-e. The prices of CO₂-e have been:

April 2015	\$13.95/t CO ₂ -e
November 2015	\$12.25/t CO ₂ -e
April 2016	\$10.23/t CO ₂ -e

The last auction (April 2016) price of \$10.23 per tonne CO₂-e has been used as the base price in this analysis.

- A commercial discount rate of 10 per cent is used.
- Payments for sequestered carbon are annual based on annual sequestration rates.
- The budget period is 25 years and maximum sequestration is achieved at year 25.
- Sequestration rates are assumed to be linear and constant over the budget period.
- Sequestration rates (tonnes CO₂-e /ha/yr)

Good condition areas	0.05
Fair condition areas	0.25
Poor condition areas	0.5
Average across all land	0.213 ²

- Cost of ILUA negotiation process per ERF project (\$35,000).
- Payments from proponent to native title holders as part of ILUA (10% of gross earnings from sequestered carbon).
- Broker fee is 5 per cent of gross earnings from sequestered carbon.
- Royalty payment to government is assumed at 7.5 per cent of gross earnings from sequestered carbon as a base case, variation on this are analysed.
- Pilot inventory at \$0.30/ha, for areas greater than 10,000 ha.
- Mandatory baseline inventory at \$0.55/ha, for areas greater than 10,000 ha.
- Performance audits are undertaken at every five years at a total cost of \$20,000 for the example property.

² This compares to a figure of 0.26 t CO₂-e/ha across the whole of the Murchison River Catchment presented in Outback Ecology (2012). See Section 3.3.3.

5.2 Financial modelling of policy options and royalties

Cash-flow budgets were used to assess the potential viability for pastoral leaseholders accessing the carbon rights on their own leases (Option 3), and for third parties facilitating carbon management by entitled interests on UCL (Option 2). These budgets were then used to estimate aggregate royalty payments from various levels of adoption across existing pastoral leasehold lands and across UCL and the conservation estate.

It should be noted that these results are based on regular, uniform and steady annual sequestration rates and incomes. It excludes variation through the budget period associated with good and poor seasons, and any possible impacts of bushfire or such on short-term sequestration rates. Further analysis of these impacts might be useful for future assessments. This analysis also cannot make assessment of financial happenings post-year 25 should longer references for permanence be required.

5.2.1 Option 3 - Existing pastoral leaseholders lease the carbon rights on their own Pastoral Leases

This option expects that existing pastoral leaseholders will tender for access to the carbon rights on their existing lease. The budget for an existing southern rangeland Pastoral Lease assumed an area of 150,000 hectares and on-property costs included \$100,000 for initial property setup (e.g. new fencing, minor engineering works on areas of severe erosion) and thereafter \$50,000 annual management costs. Total upfront costs including property setup, ILUA, pilot and baseline inventory cost is \$1.75 per hectare. For simplicity of modelling, the property is assumed to be destocked and require some fencing, and management of watering points to control grazing pressure.

The proportion of good, fair and poor land was assumed as follows (sequestration rates on these classes as shown above):

Good condition areas	46%
Fair condition areas	32%
Poor condition areas	22%

Using a discounted cashflow budget analysis over 25 years, net annual returns were estimated at \$1.29 per hectare per year, or some \$194,000 annually for the example property. In comparison URS (2013) indicated, 'in nearly all years since 1991 (when the Wool Reserve Price Scheme collapsed), less than 50 per cent of Pastoral Businesses have been delivering a positive profit from grazing activities' (p. 58). No annual return data were available in that report for comparison.

Over the 25-year period the net present value (NPV) of returns is estimated at \$10.05 per hectare. As a comparison the URS (2013) report indicated, for Pastoral Leases in the southern rangelands, 'the offered prices vary between \$7.14 and \$14.10 per hectare, with the purchase including all stock, fixed infrastructure and normally mobile plant. For properties with little or no stock, the listed price is about \$4 per hectare' (p. 34).

Assuming a property with no stock and a value of \$4 per hectare, a purchase cost of \$600,000 was included in the budget. The NPV was still positive at \$6.41 per hectare over the 25 years.

With a 50 per cent adoption rate of this option across the southern rangelands, net income into the region would be in the order of \$34.3 million annually. The URS (2013) report provided data that showed that in 2010/11 the gross value of livestock products

from the southern rangelands was \$71m. Given a 50 per cent adoption rate for carbon farming much of the carbon sequestration might be undertaken on land outside of the areas which generate the majority of that pastoral production.

Sensitivity to CO₂-e price and sequestration rate

The sensitivity of these results was tested against variations in the price per tonne of CO₂-e and the mean sequestration rate across the property (see Table 5). Positive net returns are generated given mean sequestration rates above 0.1 tonnes of CO₂-e /ha/yr, and a price of \$7.50 per tonne of CO₂-e.

Table 5: Option 3 NPV Returns – sensitivity to sequestration & price (\$/ha)

		Mean annual sequestration (t CO ₂ -e/ha/yr)				
		0.05	0.1	0.15	0.213	0.25
Price (\$/t CO ₂ e)	\$2.50	-\$4.06	-\$3.18	-\$2.30	-\$1.19	-\$0.54
	\$5.00	-\$3.18	-\$1.42	\$0.34	\$2.56	\$3.86
	\$7.50	-\$2.30	\$0.34	\$2.98	\$6.30	\$8.25
	\$10.00	-\$1.42	\$2.10	\$5.62	\$10.05	\$12.65
	\$12.50	-\$0.54	\$3.86	\$8.25	\$13.79	\$17.05
	\$15.00	\$0.34	\$5.62	\$10.89	\$17.54	\$21.44

If the assumed parameters can be met, the analysis shows that financial returns are equivalent or better than those from grazing in the southern rangelands, and are robust across sensitivities to mean sequestration rates and the price of CO₂-e budgeted. However, it should be noted that these results are based on equal annual sequestration rates and incomes. It excludes variation through the budget period associated with good and poor seasons, and any possible impacts of bushfire or such on short-term sequestration rates. Further analysis of these impacts might be useful for future assessments. This analysis also cannot make assessment of financial happenings post year 25 should longer references for permanence be required.

Sensitivity of property returns to Royalty Rates – Option 3

Sensitivity analysis of the property scale results to rates of royalty payments and sequestration rates is shown in Table 6.

Table 6: Option 3 NPV Returns – sensitivity to sequestration & royalties (\$/ha)

		Mean annual sequestration (t CO ₂ -e/ha/yr)				
		0.05	0.1	0.15	0.213	0.25
Royalty rate (%gross income)	5.0%	-\$1.31	\$2.33	\$5.96	\$10.53	\$13.22
	7.5%	-\$1.42	\$2.10	\$5.62	\$10.05	\$12.65
	10.0%	-\$1.53	\$1.87	\$5.28	\$9.56	\$12.08
	15.0%	-\$1.76	\$1.42	\$4.59	\$8.60	\$10.95
	20.0%	-\$1.99	\$0.96	\$3.91	\$7.63	\$9.81
	25.0%	-\$2.21	\$0.51	\$3.23	\$6.66	\$8.68

These results suggest low sensitivity to royalty rates. Net returns to the carbon farmer are more reliant on the price they receive for CO₂-e and the rate in which it might be sequestered. If a mean sequestration rate of 0.1 tonnes CO₂-e per hectare per year can

be achieved at a price of at least \$10 per tonne, then even with a 20 per cent royalty payment returns compare well with grazing alternatives.

5.2.2 Option 2 - Third parties facilitate carbon management by entitled interests on UCL

The budget for the UCL example again assumes areas of 150,000 hectares but a different set of setup and management costs, and lower sequestration rates. On-property costs were assumed lower at \$25,000 for initial property setup as there will be no fencing to remove or undertake, and thereafter \$15,000 annual management costs.

Management costs per unit area are assumed to be much lower across these lands. Similarly the unit cost of an ILUA is reduced to \$15,000 as it is expected that each ILUA will cover much larger parcels of land, and determined exclusive native title holders will in effect be establishing an ILUA with their own interested parties. Total upfront costs including property setup, ILUA, pilot and baseline inventory cost is \$1.12 per hectare.

These areas are assumed to be in good condition with an average sequestration rate of 0.05 tonnes per hectare per year of CO₂-e as a result of improved fire management and removal of large feral herbivores.

Using a discounted cash-flow budget analysis over 25 years, net annual returns were estimated at \$0.26 per hectare per year (compared to \$1.29 from sequestration on pastoral leasehold lands), or some \$39,125 annually for the example area. Over the 25-year period, with inclusion of setup expenses the net present value of returns is estimated at \$1.28 per hectare.

With a 50 per cent adoption rate of this option across the non-pastoral lease area in the southern rangelands, net income into the region would be in the order of \$19.6 million annually.

The sensitivity of these results was tested against variations in the price per tonne of CO₂-e and the mean sequestration rate across the property (see Table 7). Positive net returns are generated given mean sequestration rates above 0.05 tonnes of CO₂-e /ha/yr, and a price higher than \$7.50/tonne of CO₂-e.

Table 7: Option 2 NPV Returns – sensitivity to sequestration & price (\$/ha)

		Mean Annual Sequestration (t CO ₂ -e/ha/yr)				
		0.03	0.04	0.05	0.075	0.1
Price (\$/t CO ₂ -e)	\$2.50	-\$1.71	-\$1.54	-\$1.36	-\$0.92	-\$0.48
	\$5.00	-\$1.19	-\$0.84	-\$0.48	\$0.40	\$1.28
	\$7.50	-\$0.66	-\$0.13	\$0.40	\$1.71	\$3.03
	\$10.00	-\$0.13	\$0.57	\$1.28	\$3.03	\$4.79
	\$12.50	\$0.40	\$1.28	\$2.15	\$4.35	\$6.55
	\$15.00	\$0.92	\$1.98	\$3.03	\$5.67	\$8.31

If the assumed parameters can be met, the analysis shows that positive financial returns are still possible across lands in good condition with much lower sequestration rates that might be achieved on current Pastoral Leases.

5.2.2.1 Sensitivity of property returns to royalty rates – Option 2

Sensitivity analysis of the property scale results to rates of royalty payments and sequestration rates is shown in Table 8. These suggest some sensitivity to royalty rates. Net returns to the carbon farmer are much more reliant on the price they receive for carbon and the rate in which it might be sequestered. If a mean sequestration rate of 0.05 tonnes CO₂-e per hectare per year can be achieved at a price of at least \$10 per tonne, then even with a 25 per cent royalty payment returns are still positive.

Table 8: Option 2 NPV Returns – sensitivity to sequestration & royalties (\$/ha)

Royalty Rate (%gross income)		Mean Annual Sequestration (t CO ₂ -e/ha/yr)				
		0.03	0.04	0.05	0.075	0.1
5.0%		-\$0.06	\$0.66	\$1.39	\$3.20	\$5.02
7.5%		-\$0.13	\$0.57	\$1.28	\$3.03	\$4.79
10.0%		-\$0.20	\$0.48	\$1.16	\$2.86	\$4.57
15.0%		-\$0.34	\$0.30	\$0.93	\$2.52	\$4.11
20.0%		-\$0.47	\$0.12	\$0.71	\$2.18	\$3.66
25.0%		-\$0.61	-\$0.06	\$0.48	\$1.84	\$3.20

5.3 Potential royalty payments

Potential royalty payments to government for allowing third party and pastoral leaseholder access to carbon were estimated across existing Pastoral Leases in the southern rangelands (i.e. excluding Pilbara and Kimberley regions), and for non-pastoral leasehold areas in the southern rangelands. It is worth noting that in 2012, across all southern rangeland pastoral areas, only 27 per cent of Pastoral Leases were being used solely for pastoral activities. In the Goldfields and Murchison it was much lower at 6 and 14 per cent respectively (URS 2013, p. 53).

Potential returns and royalty payments for the Pastoral Lease areas were calculated across the southern rangelands assuming sequestration rates and area distributions as per the case study example above. For non-pastoral leasehold areas sequestration was assumed at the good condition rate of 0.05 tonnes of CO₂-e per hectare per year on average across all areas. The value of carbon is assumed at \$10 per tonne of CO₂-e.

The sensitivity of potential royalty payments has been assessed against a range of adoption rates and the rates of royalty payment. These results are shown below for land within the pastoral leasehold estate (Table 9) and other rangeland (Table 10).

If 50 per cent of southern pastoral leasehold land was involved in carbon sequestration, royalty payments are estimated at \$4.16 million per year for a rate of 7.5 per cent, derived from gross revenues of \$55.5m. In 2010/11 the gross value of livestock products produced in the southern rangelands was some \$70 million (URS 2013 sourced from ABS).

Table 9: Potential royalty receipts – sequestration on Pastoral Leases (\$m/year)

Royalty Rate (%gross income)		Proportion of southern Pastoral Lease areas					
		10%	20%	30%	40%	50%	75%
5.0%		\$0.56	\$1.11	\$1.67	\$2.22	\$2.78	\$4.16
7.5%		\$0.83	\$1.67	\$2.50	\$3.33	\$4.16	\$6.25
10.0%		\$1.11	\$2.22	\$3.33	\$4.44	\$5.55	\$8.33
15.0%		\$1.67	\$3.33	\$5.00	\$6.66	\$8.33	\$12.49
20.0%		\$2.22	\$4.44	\$6.66	\$8.88	\$11.11	\$16.66
25.0%		\$2.78	\$5.55	\$8.33	\$11.11	\$13.88	\$20.82

Royalties from non-pastoral areas might be some \$2.56 million annually given the same level of adoption, from gross revenues of 34.1 million.

Table 10: Potential royalty receipts – sequestration on non-Pastoral Leases (\$m/yr)

Royalty Rate (%gross income)		Proportion of southern rangelands – non Pastoral Leases					
		10%	20%	30%	40%	50%	75%
5.0%		\$0.34	\$0.68	\$1.02	\$1.36	\$1.71	\$2.56
7.5%		\$0.51	\$1.02	\$1.54	\$2.05	\$2.56	\$3.84
10.0%		\$0.68	\$1.36	\$2.05	\$2.73	\$3.41	\$5.12
15.0%		\$1.02	\$2.05	\$3.07	\$4.09	\$5.12	\$7.68
20.0%		\$1.36	\$2.73	\$4.09	\$5.46	\$6.82	\$10.23
25.0%		\$1.71	\$3.41	\$5.12	\$6.82	\$8.53	\$12.79

Although optimistic, if between 50 per cent and 75 per cent adoption of carbon sequestration (by area) might raise between \$6.5 and \$10 million in total royalties per year across the southern rangelands.

These figures can be compared to recent data on the value of Pastoral Lease rentals, and estimates of the cost of administering the pastoral leasehold estate. As at 1 July 2012 the total Pastoral Lease rent was \$4.5 million (ex GST) (URS 2013, p21). This includes Kimberley and Pilbara leases. The total cost to government of administering the pastoral estate in 2012 was estimated at \$17.23 million (URS 2013, p24).

6 Conclusions

6.1 The importance of the assumptions

The material presented in this report is grounded in the assumption that measurable amounts of carbon can be sequestered at landscape scale, particularly in those areas of the rangelands that have altered vegetation and degraded soils. A further assumption is that a method for measuring carbon levels and auditing sequestration projects can be developed that is accepted under the ERF. Work on developing methods for WA rangelands is progressing.

6.2 Profitability

6.2.1 Option 3 - Existing pastoral leaseholders lease the carbon rights on their own Pastoral Leases

Using a discounted cashflow budget analysis over 25 years, net annual returns were estimated at \$1.29 per hectare per year, or some \$194,000 annually for the example property. Over the 25-year period the net present value of returns is estimated at \$10.05 per hectare. With a 50 per cent adoption rate of this option across the southern rangelands, net income into the region would be in the order of \$34.3 million annually.

The sensitivity of these results was tested against variations in the price per tonne of CO₂-e and the mean sequestration rate across the property. Positive net returns are generated given mean sequestration rates above 0.1 tonnes of CO₂-e /ha/yr, and a price higher than \$7.50 per tonne of CO₂-e.

If the assumed parameters can be met, the analysis shows that financial returns are equivalent or better than those from pastoralism in the southern rangelands, and are robust across sensitivities to mean sequestration rates and the value of carbon budgeted.

6.2.2 Sensitivity of property returns to Royalty Rates – Option 3

Net returns to the carbon farmer are much more reliant on the price they receive for carbon and the rate in which it might be sequestered. If a mean sequestration rate of 0.1 tonnes CO₂-e per hectare per year can be achieved at a price of at least \$10 per tonne, then even with a 20 per cent royalty payment returns compare well with grazing alternatives.

6.2.3 Option 2 - Third parties facilitate carbon management by entitled interests on UCL

Using a discounted cash-flow budget analysis over 25 years, net annual returns were estimated at \$0.26 per hectare per year (compared to \$1.29 off pastoral lands), or some \$39,125 annually for the example area. Over the 25-year period the net present value of returns is estimated at \$1.28 per hectare.

With a 50 per cent adoption rate of this option across the non-pastoral lease area in the southern rangelands, net income into the region would be in the order of \$19.6 million annually.

Positive net returns are generated given mean sequestration rates above 0.05 tonnes of CO₂-e /ha/yr, and a price higher than \$7.50/tonne of CO₂-e.

6.2.4 Sensitivity of property returns to royalty rates – Option 2

Net returns to the carbon farmer are much more reliant on the price they receive for carbon and the rate in which it might be sequestered. If a mean sequestration rate of 0.05 tonnes CO₂-e per hectare per year can be achieved at a price of at least \$10 per tonne, then even with a 25 per cent royalty payment returns are still positive.

6.3 Potential Royalties

If 50 per cent of southern rangelands pastoral leasehold areas undertook carbon sequestration then royalty payments are estimated at \$4.16 million per year for a rate of 7.5 per cent, from gross revenues of \$55.5m. Royalties from non-pastoral areas might be some \$2.56 million annually given the same level of adoption, from gross revenues of \$34.1 million.

6.4 The need for government support

Available advice is that managing rangeland for carbon will be regarded as a ‘future act’ under the *Native Title Act 1993*. Given that most of the rangelands are either covered by registered claims, or non-exclusive determined, or exclusive determined native title, ILUAs will need to be negotiated in most situations. Government support will be needed to assist all parties in reaching mutually beneficial agreements.

As noted earlier, there is no established and recognised methodology for measuring carbon in the WA rangelands, where management of grazing pressure is the only realistic option (c.f. with NSW and Queensland). Government needs to support current efforts directed at developing such a methodology.

Administration of the policy options outlined in this report will require resourcing, with the costs to be met from the royalties paid by those people who access the Crown’s carbon. Government will need to ensure that the administrative and regulatory resources are in place before implementing the policy options.

6.5 Possible Adoption Pathway

The preferred adoption pathway is likely to differ according to current land tenure. Existing Pastoral Leases will have differing advantages and requirements to UCL and the existing conservation estate. Native title will also have implication across tenures.

Option 4 provides no return to government from the management of carbon. Transfer of a public asset without any payment by the beneficiary is regarded as poor public policy. It is considered vital for a share of any new revenues from carbon to be used for stewardship, conservation and community development initiatives in rangeland areas.

6.5.1 Pastoral Leases

Priority might be given to enable sequestration to occur on areas covered by existing Pastoral Leases, as this is where management capability is present, the greatest rates of sequestration are possible and correspondingly the highest potential for government revenues or royalty payments. These areas are also likely to be where the greatest improvement in resource condition and conservation outcomes can be made.

Options 3 and 4 are available for use on Pastoral Leases. Initially the most acceptable option to pastoral leaseholders is Options 3. This option could be offered first and then if

it is not accepted by a leaseholder other options could be put forward that may not be so onerous on an individual leaseholder. – either Option 1 or Option 2.

After testing the market on existing Pastoral Lease areas, consideration could then be made for options across other land tenures.

6.5.2 UCL

As shown in Section 3.3.4, much of the UCL in the rangelands is held as determined exclusive native title. Although the prospects for carbon sequestration in most of this land are likely to be low on a per hectare basis, the large areas, and the possible potential offered by a change in burning regimes and removal of large feral herbivores suggest that managing to obtain ACCUs may be worthwhile. Option 1 is a suitable approach on land held as exclusive native title. In this situation, the native title holders could manage the Crown's carbon in return for payment. An ILUA would still be required before an ERF project could be registered.

In areas where UCL is not subject to native title, government would be the proponent and would manage its own carbon. It could contract third parties to undertake the required works.

6.5.3 The Conservation Estate

In NSW, the responsible government agency is managing projects registered under the ERF on the conservation estate. This approach can be adopted in WA. This is equivalent to implementing Option 1, except that the land in question is also held by the government.

6.6 Development of a stewardship fund

Numerous documents have highlighted the threats to biodiversity in the rangelands (e.g. Carwardine *et al.* 2015, EPA 2004, and Government of WA 2011), and there is a recognition that not all conservation objectives can be met within the state's conservation estate (Brandis 2008). Achievement of stated objectives for conservation management in the rangelands will require specific management approaches across all tenures. The priorities include protection of particular biodiversity assets such as rain forest remnants in the Kimberley, perennial and seasonal wetlands across the rangelands which act as refugia for biodiversity, and other unique habitats. The threats include feral cats, excessive grazing pressure by domestic, feral and native animals, weed ingress and inappropriate fire regimes.

Additionally, sustainable management of pastoral lands has long been recognised as a market-driven challenge which has resulted in a long-term decline in productivity, profitability, and rangeland condition across many parts of WA's rangelands. Neutralising this active market disincentive to manage for long term productivity and sustainability with an active incentive to do the opposite is increasingly the subject of investigation and trial.

The funds raised by government through direct (Option 1) and indirect (Options 2 and 3) carbon management can be directed towards stewardship programs where tenure holders in the rangelands can be contracted to manage assets and threats on behalf of government, and to manage pastoral businesses more sustainably. Stewardship programs for the rangelands have been recommended (see URS 2013) and are underway in some situations. For example, a program in NSW is funding landholders to

maintain prescribed levels of groundcover on pastoral lands in return for payment (see URS 2015).

As well as achieving improved rangeland condition and protection of biodiversity, stewardship programs will enhance employment in the rangelands, and develop on-ground skills in land management.

7 Addenda

Introduction

This report was released to the public in December 2016. It was subsequently reviewed In January 2017 by an officer of the Australian Department of Environment and Energy (DoEE). The review identified additional information and a number of errors of fact relating to the operation of the Emissions Reduction Fund (ERF) and how landholders in the Western Australian rangelands may be able to participate in the Scheme.

The sections where corrections need to be considered are presented below. Some additional financial analyses are also provided.

Addendum 1 – ERF permanence

In the Executive Summary (pg. 5), Section 2.2.1 (pg. 11), Section 5.1 (pg. 13) and Section 5.1 (pg. 25), the report states or makes assumptions on the basis that the life of an ERF project is 25 years or that the permanence period required under the scheme is 25 years.

DoEE clarification: *ERF sequestration projects may have permanence periods of either 25 years or 100 years, with the former incurring a 20 percent discount on the abatement awarded to adjust for the reduced permanence period. Project proponents may nominate the permanence period of their project, taking into account this discount and their long term management objectives for the project area.*

Under **Addendum 7** below, the financial analyses have been re-worked to indicate returns from a permanence period of 100 year, and **Addendum 8** indicates the results for 25 years with the 20 percent price discount.

Addendum 2 – Crediting period

Section 3.1, pg. 13 does not refer to the 'crediting period'.

DoEE clarification: *Projects are credited for a single defined 'crediting period'. The crediting period is the period of time over which a project can create Australian Carbon Credit Units (ACCUs). In general, emissions reduction projects have a crediting period of seven years and sequestration projects have a crediting period of 25 years.*

Addendum 3 – Contract period

Section 3.1, pg. 13 does not refer to the contract period for an ERF project.

DoEE addition: *Proponents can choose a standard contract duration, where multiple deliveries of Australian carbon credit units (ACCUs) will be made over a period of 7 years. Projects that have a crediting period of 10 years or more can apply for a contract period of up to 10 years. Short term contracts are also available, with specific requirements (refer to CER website³ for further details).*

³ <http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Step-2-Contracts-and-auctions/understanding-contracts/types-of-contracts>

Addendum 4 – Removal of the Positive List

The report states (Section 3.1, pg.13) that activities must be on the positive list.

DoEE correction: *This requirement was removed from the scheme in the transition from the CFI to the ERF. The positive list and this requirement no longer exist.*

Addendum 5 – ERF method development

In Section 2.2.1 (p.11) the report suggests that a method may be developed and “accepted by the Commonwealth Government”, while section 6 of the report (p.31) makes an assumption that “a method... can be developed that is accepted under the ERF” and states that ‘Work on developing methods for WA rangelands is progressing’.

DoEE clarification: *Unlike the former CFI in which methods could be proposed and developed externally, the Department of Environment and Energy (DoEE) is solely responsible for developing methods under the ERF. The Department engages external stakeholders and technical working groups as required to inform the process. Each year the Minister for the Environment and Energy determines the priorities for method development and considers the types of methods that will be developed for the ERF.*

The Department is not currently working on developing a method focused on carbon sequestration in rangelands.

Addendum 6 – Assumptions made in the financial analyses

In the Executive Summary and in Sections 3 (pg. 18) and 5 (pg.25), the report states that sequestration rates are assumed to be linear and constant over the budget period.

DoEE note: *While this simplifies the financial analyses, it is important to note that sequestration rates, specified in individual methodologies under the scheme, are typically nonlinear and change over time. This may have implications and flow-on effects for the financial analyses in the report.*

In the analysis in Section 5 (pg. 25), the assumption is made that that ‘payments for sequestered carbon are annual based on annual sequestration rates’.

DoEE note: *This may not be representative of the actual payment schedule for individual projects. Credits are issued within 29 days of submitting offsets reports, not necessarily annually.*

Addendum 7 – Additional financial analyses for a permanence period of 100 years.

In the Executive Summary and in Sections 5.2 and 5.3, the report states:

Using a discounted cash-flow budget analysis over 25 years, net annual returns were estimated on existing pastoral leasehold lands at \$1.29 per hectare per year, or some \$194,000 annually for an example southern rangelands property of 150,000 hectares. Over the 25-year period the net present value of returns is estimated at **\$10.05** per hectare. With a 50 percent adoption rate across the pastoral leasehold lands in the southern rangelands net income into the region would be in the order of \$34.3 million annually. On Unallocated Crown Land (UCL) annual returns are expected to be lower at \$0.26 per hectare per year.

The financial analysis was reworked to project the budget to 100 years by maintaining assumed audit and land management expenses over that period. Incomes are still received over the first 25 years. Under these conditions, the summary might now read as follows:

Using a discounted cash-flow budget analysis over 100 years, net annual returns were estimated on existing pastoral leasehold lands at \$1.29 per hectare per year, or some \$194,000 annually for an example property of 150,000 hectares. Over the 100-year period the net present value of returns is estimated at **\$9.72** per hectare.

Royalty payment estimates remain unchanged.

Addendum 8 – Reworked financial analyses for 25 year option.

DoEE correction: *ERF sequestration projects with a permanence periods of 25 years incur a 20 percent discount on the abatement awarded.*

The financial analysis was reworked to use a base price of \$8 per tonne CO₂-e rather than the original assumption of \$10. Allowing for this new information, the summary might now read as follows:

Using a discounted cash-flow budget analysis over 25 years, net annual returns were estimated on existing pastoral leasehold lands at \$0.96 per hectare per year, or some \$144,000 annually for an example property of 150,000 hectares. Over the 25-year period the net present value of returns is estimated at \$7.05 per hectare. With a 50 percent adoption rate across the pastoral leasehold lands in the southern rangelands net income into the region would be in the order of \$30.2 million annually. On Unallocated Crown Land (UCL) annual returns are expected to be \$0.18 per hectare per year.

To understand the viability implications of a reduced value of carbon it might be useful to use the sensitivity analyses undertaken in the report, which includes a price of \$7.50. These still show positive returns across expected sequestration rates.

Addendum 9 – Other corrections

In Section 3.2.2 (pg. 14) the term 'avoided reforestation' is used.

DoEE correction: *'avoided reforestation' should read 'avoided deforestation'.*

In the Executive Summary (pg. 5) the statement is made that 'Where grazing values are low over a whole Pastoral Lease, a simpler and more cost effective approach may be to destock completely and control feral and native herbivores. All of these approaches are approved under the ERF'.

DoEE correction: *Managing only feral and not native animals is an eligible activity to regenerate forest under the existing ERF 'human-induced regeneration' and 'native forest from managed regrowth' methods.*

8 References and further reading

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