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**Abstract**

This paper draws on research conducted with Aboriginal land managers across Northern Australia to show how and why payments for ecosystem service (PES) schemes should be framed around Indigenous rights to and relationships with their traditional estates. PES schemes offer opportunities to recognise and support Aboriginal communities' land and sea management knowledge and practices, and there is strong evidence that Indigenous communities are seeking to engage with such schemes. We focus on Aboriginal savanna landscape management, particularly traditional burning practices, to extend the ecosystem services framework to recognise Indigenous values and interactions with their lands as a critical service for Indigenous well-being. Drawing on case-study analysis of PES projects negotiated to support Aboriginal fire management programs across Northern Australia, we show how cultural ecosystem services can be applied to represent the active, dynamic and often interdependent relationships inherent in Indigenous human–environment relationships.

Key words: Northern Australia, carbon offset schemes, Aboriginal landscape burning, cultural ecosystem services, human rights

**Highlights**

- Indigenous people's relationships to their traditional estates, and the practices involved in their care, can inform the design of payment for ecosystem service (PES) agreements.
- We expand understandings and applications of cultural ecosystem services to show how this can build synergies between PES frameworks and the priorities of Indigenous groups.
- Indigenous savanna landscape burning is used as an illustrative example to demonstrate how this framing can be applied to designing and assessing Indigenous benefits from PES agreements.

**1. Introduction**

Sustainable development has been defined as a quest to deliver ecosystem services while enhancing human well-being (MEA, 2005). Recognising that well-being is determined by more than economic benefits (Costanza et al., 2012), conservation and sustainable development policy agendas are being reshaped to acknowledge and safeguard the cultural and social benefits that environments provide (Diaz et al. 2015), and to enhance local community rights and decision-making authority in environmental management (Daniel et al., 2012; Robinson et al., 2014a). The direct links between cultural and natural services identified by Indigenous people globally—coupled with recognition of the human rights implications of damaging those links—have highlighted the importance of ensuring that

sustainable development efforts acknowledge and protect Indigenous peoples' rights and authority, and reflect their values and priorities (Diaz et al., 2015).<sup>1</sup>

However, effectively incorporating Indigenous peoples' rights and benefits into sustainable development goals and programs remains a critical planning and management challenge (UNEP, 2014). Indigenous livelihoods often depend on the direct use of local environments, and protecting the capacity of lands to maintain outputs of biophysical services is therefore a necessary commitment. In addition, less tangible but nonetheless critical aspects of well-being depend on meeting customary obligations to care for lands and resources using traditional methods. One's ability to discharge these obligations is obviously affected by conditions of access to lands and possession of decision-making powers (rights) (e.g. Poe et al., 2014; Satz et al., 2013; Stevens, 2014; Jackson and Palmer, 2014; Bark et al., 2015). Respecting human rights while responding to the needs of ecosystems requires ecosystem management tools capable of protecting such relationships.

Financial incentives for land owners and managers to maintain biophysical services from well-managed ecosystems have become powerful tools internationally. Payment for ecosystem services (PES) schemes, defined by Tacconi (2012, 29) as 'transparent system(s) for the additional provision of environmental services through conditional payments to voluntary providers,' have become a key feature of natural resource management markets and programs (Costanza et al., 2014). Although these schemes are considered one of the most effective means of securing ecosystem services on a global scale, they may not reliably offer 'win-win' solutions for global buyers and local suppliers (Howe et al., 2014; Muradian et al., 2013). Demonstrating that cultural services are not damaged when the delivery of biophysical environmental services is driven by strong financial incentives remains a key challenge (e.g. Fitzsimons et al., 2012; Russell-Smith et al., 2009).

In a number of locations, Indigenous communities are using payment for ecosystem service (PES) agreements to negotiate support for their environmental management activities and livelihoods. A relatively narrow range of provisioning services (*sensu* MEA 2005) has been

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<sup>1</sup> [1](#) In this paper, the term 'Indigenous' is used to describe people who have specific rights based on their historical and cultural ties to a particular territory. The term 'Aboriginal' refers to the Indigenous people of Northern Australia.

targeted. Maintaining or improving water availability and quality, protecting or restoring forests and woodlands to restore other ecological functions and store carbon, and enhancing biodiversity conservation are common objectives (e.g. Whitehead et al., 2009). Where cultural services are addressed, they may relate to visual amenity or recreational values (Daniel et al., 2012).

A growing number of studies focus on the extent to which such schemes align with the needs and aspirations of providers. Recurring questions include: what factors influence participation (Bark et al., 2015); do PES schemes infringe the political and other autonomy of local people (Jackson and Palmer, 2014); do net benefits actually reach participants (e.g. Kacsan et al., 2013); are benefits accessed equitably (McDermott et al., 2012); are other livelihoods displaced (Richie 2009); and does participation strengthen or weaken Indigenous cultural heritage (Petty et al., 2015)?

In part, this work tracks growing recognition of the importance of the ‘human dimension’ of global environmental change research, which investigates the political and cultural complexity of apparently universal concepts and protocols concerning the state of the planet and its future (Diaz et al., 2015). At the heart of this work is an acknowledgement that different socio-geographies define and value ecosystems in divergent ways (Corbera and Pascual, 2012; Zander and Garnett, 2011), and that these definitions and evaluations are influenced by dynamic political and social values and commitments (Costanza et al., 2014).

In this paper, we report perspectives from existing and potential Indigenous participants in PES schemes in Australia. We then adapt Chan et. al’s (2012) cultural ecosystem service framework to conceptualise and categorise Indigenous benefits that can be negotiated from PES agreements. We begin by considering the intersection of ecosystem services with the practices and ethics associated with Indigenous–environment relationships, before focusing on programs for abatement of greenhouse gas emissions through fire management projects in Northern Australia. We regard such projects as particularly relevant to the important questions raised above because they operate over very large areas and involve multiple clans collectively managing an activity (fire use) that is integral to Aboriginal culture and

requires the participation of many individuals. Consequently, performance in reducing emissions depends on high levels of collaboration among Indigenous groups and support from the wider community.

### ***1.1 Caring for Country and PES Fire Agreements in Northern Australia***

Australia's Aboriginal people have a long tradition of systematically and purposefully using fire to manage the landscape. The effects of Aboriginal landscape burning can be seen in the defining features and health of Australia's terrestrial biodiversity and ecosystems (Bowman, 1998). Bowman (1998) and Rose (1986) highlight explicit links between ecological structures and functions and the Aboriginal values and benefits achieved through landscape burning, applying practices supported by Aboriginal legal frameworks and land ethics. As Senior Aboriginal Elder Dean Yibarbuk explains, the well-being of Indigenous people is intimately linked to use and non-use values associated with landscape burning:

“... as they grow, young people learn that fire is more than just something for cooking and hunting—that it has deeper meaning in our culture. As they attend ceremonies with their parents they see and learn to respect the sacred fires that are central physical parts of the most sacred of ceremonies. Importantly these fires sit between the ceremony grounds where children and women stay and the more spiritually dangerous ceremony grounds where only senior initiated men go” (Yibarbuk, 1998, 2).

National law for a Carbon Farming Initiative (CFI) has established methods for reducing volumes of greenhouse gases (nitrous oxide and methane) released in the burning of grassy fuels, leaf litter and fine woody fuels. While the legally accepted methods acknowledge the role of fire in maintaining savanna systems, they seek to change the timing of the burning and reducing the total area burned, re-establishing fire regimes closer to traditional practice than prevailing regimes dominated by wildfire (Russell-Smith et al., 2009). Aboriginal communities and their organisations have taken up opportunities to earn carbon credits with some enthusiasm. By the end of 2015, ten projects working over several million hectares of mostly Indigenous land had sought to deliver credits to government under formal contracts that include substantial penalties for under-delivery.

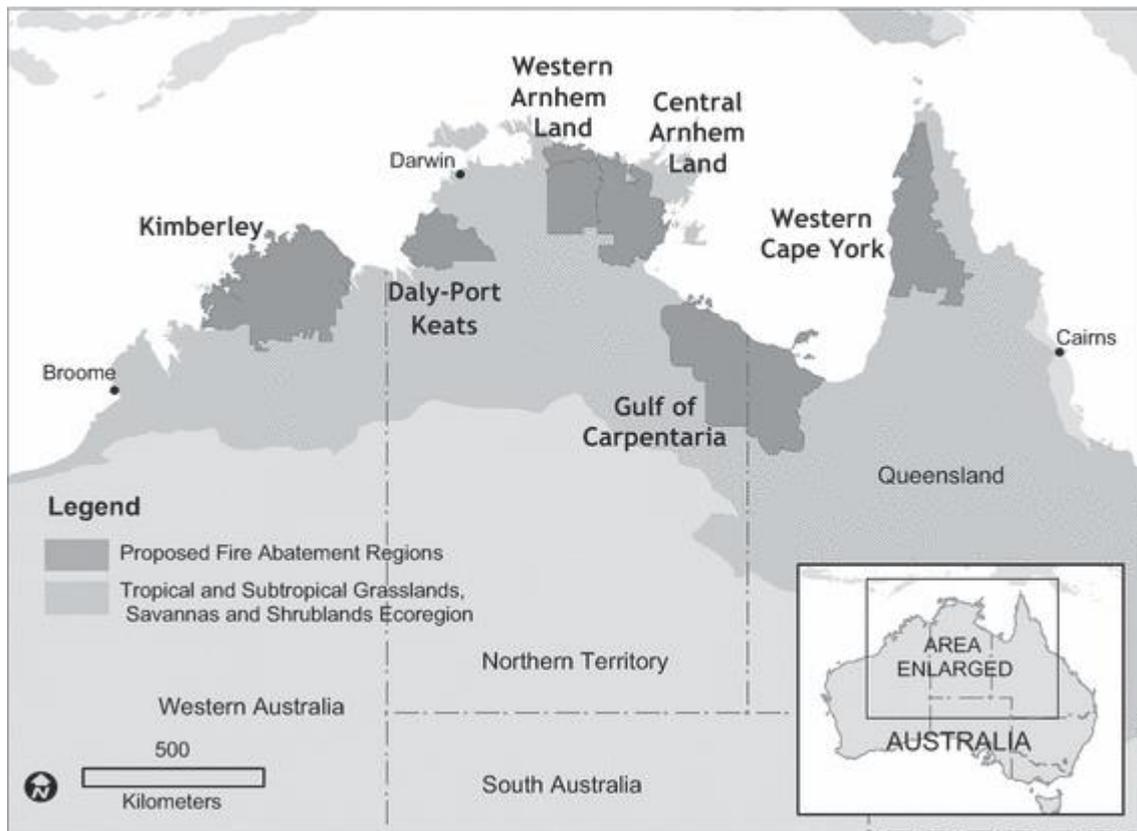
Aboriginal customary land owners share an ontological connection to familial land estates and a commitment to care for their 'country.' 'Caring for country' is a phrase that describes a range of Aboriginal land and sea management practices, ancestral connection and obligations to country and culture-based enterprises that sustain landscape and community values important to Aboriginal people (Yibarbuk, 1998). The Indigenous land ethic that underpins these activities challenges the dominant ecosystem service paradigm because it is driven by the notion of reciprocal relationships between people and country (Garnett et al., 2009)—in essence, the notion that 'if you look after country, the country will look after you' (Griffiths and Kinnane, 2010). As Altman et al. (2007, 27) explain, 'caring for country' amounts to 'more than the physical management of geographical areas—it encompasses looking after all of the values, places, resources, stories and cultural obligations associated with that area, as well as associated processes of spiritual revival, connecting with ancestors, food provision and maintaining kin relations.'

Indigenous communities are pragmatic in their efforts to create what Morphy and Morphy (2013) describe as an 'intercultural space' with PES partners, provided such partnerships maintain Indigenous peoples' autonomy over the ways in which human–ecosystem interactions and benefits are understood and valued. Mechanisms such as participatory approaches to evaluating Indigenous benefits from PES agreements (e.g. Izurieta et al., 2011; Stacey et al., 2013) and the development of a 'recognition space' (Taylor, 2008) between Aboriginal and program reporting frameworks (which creates indicators particularly for Aboriginal people) have been highlighted as possible ways to address some of these issues. Yet these mechanisms can struggle to overcome the fundamental challenges associated with aligning the aspirations of local Indigenous communities and land managers with commercial purposes and providing valuation categories that are meaningful to Indigenous people (Diaz et al., 2015). As a result, PES frameworks can remain focused on addressing undesirable global environmental change without considering the issues that are significant to local communities and contexts (Veland et al., 2013) and that motivate those communities to participate in delivering global-scale environmental targets.

The skilled and coordinated use of fire according to locally specific norms makes essential contributions to meeting those obligations (Yibarbuk et al., 2002). Deployment of such an activity—of profound significance for maintaining tangible and intangible Indigenous cultural heritage—to meet other external goals raises important questions about the risks of infringing rights to use landscapes for other livelihoods or other customary purposes and compromising Indigenous cultural services (Petty et al., 2015). We approach the study from the perspective that those deploying financial incentives to change land management should understand what they are seeking to influence and appreciate the wider implications of promoting change.

## **2. Methods – the Northern Australian Fire Management Case Study**

To investigate how Aboriginal people valued the practices and outcomes of savanna landscape burning, the research team applied a qualitative multiple-case-study approach (Gerring, 2007). This approach was applied to guide questions for local Aboriginal communities that enquired about the motivations, practices and desired outcomes associated with landscape burning. Perspectives about were drawn from workshops held with local communities across Northern Australia who are actively participating in, or are interested in participating in, fire management projects that can generate carbon credits through reducing greenhouse gas (GHG) emissions (James, 2012; NAILSMA, 2013b). Key points raised during these discussions were then analysed by the research team, focusing on how local Aboriginal values can guide practical measures of land management success at the local level, and how Aboriginal communities could inform the design and evaluation of savanna fire carbon offset projects specifically, and land management enterprise more broadly (Figure 1). These categories were checked and approved by Elders in each case-study community.



**Figure 1.** Proposed fire abatement regions

Source: Fitzsimons et al., 2012

Three workshops were held with Traditional Owners and Aboriginal land managers in Western Cape York, the Gulf of Carpentaria and Central Arnhem Land. Workshops attracted 30–40 people who were already involved in developing fire management projects (at various stages), or had seniority and knowledge of the country in the focal area. Participants were self-nominated or identified through the local land management group and consented to participate. Questions were posed at the workshop to elicit the type of benefits sought by Indigenous people motivated to engage in PES schemes and the mechanisms by which these benefits could be negotiated from workshop participants. The demographic in each location included 10–20 men and women and a cross-section of Aboriginal rangers and non-ranger customary landowners (with some overlap).

Indigenous organisations involved in delivering carbon offset projects across Northern Australia were also contacted and representatives were interviewed by telephone (see Robinson et al., 2014a). A semi-structured interview was also conducted, which included the following question: What benefits are desired from the local Aboriginal community participating, or interested in engaging, in a carbon PES scheme? Of the 28 Indigenous

organisations identified across Northern Australia, 79 percent participated in the survey. Interviews were conducted by telephone and lasted between 30 and 60 minutes.

The authors recognise that while interviews and workshops are a valuable source of information, they are verbal reports and as such are subject to a number of potential problems, including poor or inaccurate articulation of information. This issue was managed in three ways. Firstly, participants were provided with oral and written information about the workshop or survey, as well as a list of questions, prior to the event. They were also given at least a week between initial contact and the interview or workshop to reflect on their experiences before engaging with the researchers. Secondly, the research team collected as much information as possible about the respondents' involvement in and responses to carbon offset activities so that interviewers could assist the respondent in recalling information at the time of the interview. Finally, the researchers facilitating the workshops or conducting the interviews made it clear to participants that results would be formulated from many interviews and interactions, limiting the opportunity for any one individual to bias results.

Quotes from workshops and interviews with Aboriginal fire managers and Elders were entered into NVivo software for analysis to determine the desired benefits from participating in fire management activities, and how causality between these desired benefits and Aboriginal people's participation in fire management PES schemes might be assessed. This software allows relevant sections of text to be retrieved through a process of coding (Saldana, 2009), which involves carefully reading, describing textual data and categorising data using a descriptive word. This identified higher-order groupings of benefits desired by Indigenous communities.

The coding process related categories identified in Chan et al.'s (2012) cultural ecosystem service framework to the aspirations and priorities of the Indigenous people surveyed. The cultural services offered by the ecosystems services framework have been defined to include 'non-material benefits' such as 'cultural diversity, spiritual and religious values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, recreation and ecotourism' (MEA, 2005). An expanded understanding and application of

cultural ecosystem services can provide a more holistic approach to PES schemes, allowing them to accommodate Indigenous understanding of nature–society interrelationships (cf. Jackson and Palmer, 2015).

### 3. Results and Discussion

In both components of the study, structured interactions with Indigenous participants focused on what Indigenous communities gained or hoped to gain by participating in a carbon PES scheme. Despite recognising that fire projects may produce tradeable GHG emissions reductions, biodiversity and other biophysical outcomes, Aboriginal workshop participants invariably noted that their principal aim was improving the well-being of local Indigenous people. Keeping country and resources in good condition provides essential support for that fundamental goal, but enhanced well-being also depends critically on the detail of the processes and practices used to promote the biophysical health of landscapes.

PES scheme processes and practices were explored through an array of related questions covered in each workshop, which varied in detail among respondents based on their prior responses. A representative sample of questions put in the practitioner-oriented component of the study is shown in Table 1. These questions are grouped into a small number of *post hoc* categories that indicate emphases determined and approved by workshop participants.

**Table 1.** Questions exploring the type of benefits sought by Indigenous people motivated to engage in PES schemes (NAILSMA 2013b)

Category of value	Key questions explored in the workshops
Connection	Is the PES scheme helping to (re)build and/or enhance Indigenous peoples' connection to ancestral country, to local history, to familial networks, to neighbouring and other land management groups, and to the broader Australian society and economy? Does the PES activity help Indigenous land managers connect with a strong sense of the future?
Identity	Is the PES activity enhancing the above? Is it enhancing the authority to make decisions about country according to custodial responsibility? Are these decisions better recognised in local and western governance arrangements? Is PES enhancing the local cultural identity of the Indigenous group and community?
Knowledge and skills	Is the PES activity promoting and actively enhancing local and traditional knowledge transfer/acquisition? Is it enabling the up-skilling of local people to improve independence from outside expertise and control? Is access to and skills in orthodox science increasing peoples' ability to argue for protection of connections inherent in Aboriginal cosmology?

Power and empowerment	Is the PES activity enhancing personal confidence, local influence over local livelihoods, local and broader governance arrangements, and stronger interactions with the state and other interests, including partnerships? Is the PES activity supporting and enhancing customary and legal rights?
Regional context	Is the PES activity in sync with local knowledge and practice around seasonal change? Is the approach to PES planning and activity informing practical responses to climate change, including effects on seasonal signals and hence customary patterns of activity?

Important issues emphasised in interactions around these questions and relating to these categories include:

*Connection:* Relates to the relationships Indigenous people have with each other and with lands, waters and living things. These connections are expressed through family, kinship, skin system, other Indigenous law and commitment to specific homelands. No site will lack well-recognised cultural links with other sites, and those linkages may extend over long distances. Failure to meet obligations in one area will affect neighbouring and sometimes distant sites and people.

*Identity:* Equates with Indigenous peoples' authority and obligation to country. A person who is recognised as holding a cultural legacy from their country accepts obligations and is assigned authority. They are the right people to negotiate with and carry out the wishes of traditional owners. 'Caring for country' includes the reinvigoration of place-specific local names and language. It re-engages people with their histories, lineages and sense of place, helping to strengthen personal and group confidence and pride. Elders who participated in workshop discussions talked about periodic patch burning that occurred during travel to neighbouring communities for ceremonial reasons and to alert the ceremony hosts of their passage. Fire was described as an extension of the land manager's body, protecting values of country and reaffirming complex social life roles and responsibilities in the one application.

*Knowledge and skills:* Indigenous groups emphasised the obligation to transfer detailed socio-ecological knowledge to younger generations, especially through direct experience on country. In contemporary land management, a number of knowledge forms are sought and applied by Indigenous people. Local and traditional knowledge systems are pivotal but not exclusive; technical, scientific and western governance knowledge is increasingly sought to bolster capacity and reduce dependencies on external advisers.

*Power and empowerment:* Power has a number of facets in the local community context: personal, spiritual, social, economic and political. Respect is essential in any genuine partnership, with both parties understanding and accepting their respective obligations and entitlements and possessing the means and confidence to deliver and receive them. A measure of local empowerment is a pre-requisite for entering partnerships in the first place, but this would be reinforced and increased through positive experiences. Such positive feedbacks are necessary to build individual agency, social cohesion and, ultimately, enhanced community well-being. Improving the ability to reconcile customary law and practice with effective and productive partnerships will underpin better planning and more robust institutions for good decision-making.

*Regional context:* The physical, metaphysical, social and economic activities that make up and inform Indigenous land management are tuned to regional context. Much Indigenous

knowledge is built around seasonality, related understanding of social and ecological cycles, and the importance of their relationships to sound land, water and resource management. Responding to seasonality is such a fundamental component of Indigenous knowledge and practice that it warrants separate treatment.

In the component of the study that involved greater representation of staff from Indigenous organisations involved in or seeking involvement in carbon-focused PES schemes, discussions covered issues similar to those raised by local people directly engaged in fire use on project sites, but added formal institutional perspectives related to carbon PES agreements. A post hoc categorisation of the benefits sought from engagement in PES by this group draws on Chan et al.'s (2012) cultural ecosystem service framework and is presented in Table 2.

**Table 2.** Categorisations of benefits sought from engagement in PES deploying Aboriginal landscape burning. Categorisation is adapted from Chan et al. (2012). Quoted statements are from telephone interviews. Narratives and concerns often relate to more than one benefit category.

Benefit category	Indigenous narrative	Detail of benefits sought	Concerns
Human rights	'We perform roles and meet responsibilities to "care for country."' 'People and country take care of each other.' 'Elders need to be able to make good decisions.'	Maintenance of bio-cultural diversity associated with people–country interactions. Formal laws and related governance systems support application of Indigenous knowledge and authority.	Ecological, social and spiritual responsibilities and relationships of care are damaged or fragmented. Limitations on access to information and rights to participate in decision-making.
Material	'Healthy country – healthy people.' 'Bush foods ... need fire to be healthy.' 'Less smoke leads to less sickness in the community.'	Ecosystem functions and processes flourish with proper use of fire to foster human health. Negative effects of poor fire management are reduced.	Non-Aboriginal landscape burning continues to have a negative impact on wildlife species that are 'important for country,' 'culture' (e.g. totemic animals), 'food' and biodiversity.
Aesthetic	Country is 'cleaned up,' plants show 'green growth,' 'scrub cleared.' 'Country shows we are here.'	Landscapes reflect the positive effects of informed human presence.	Obstacles to local Indigenous people interacting with their landscapes, sometimes through competing aesthetic values relating to human absence.
Place / heritage	'Proper fire stops wildfire damaging sacred sites.'	May include monitoring places that need to be protected, sustained or restored through fire management practices.	Weak servicing of outstations and roads to 'travel through country.'
Activity and access	Well-burnt country provides 'us access to good [hunting and fishing] sites.'	Aboriginal people feel free to apply Aboriginal law to fire burning goals and decision-making.	Empowerment of Aboriginal fire management knowledge, decision-

Benefit category	Indigenous narrative	Detail of benefits sought	Concerns
	We perform roles and responsibilities to 'care for,' 'look after, share what we learnt from being out on country with Elders and kids,' 'get tucker,' 'show our knowledge about this place,' 'work with partners (scientists, government agencies) to manage this area.' Part of 'good' work ... to see 'dads, grandparents, everyone!' have a role.	Partnerships achieve effective fire planning and management. Partners apply Aboriginal values or approaches to landscape burning.	making authority and participation is not maintained throughout PES agreement.
Spiritual	'Fire the proper way, traditional way,' shows 'law is strong,' provides confidence for younger generation 'to help take over responsibilities.' Aboriginal fire rangers are 'happy,' 'proud' to do this work, while 'old people' report feeling 'relieved,' 'engaged' to be part of deciding where and why to burn.	Restoration of Aboriginal landscape burning supports ceremony and other obligations to ancestors. Sacred sites are better protected.	Shifting capacity of Aboriginal communities to sustain and/or restore cultural laws, rituals, ceremonies and protocols.
Inspiration	Rangers are motivated to 'learn,' 'work' and 'train' so they can go out on fire management activities. People feel 'at home,' 'happy,' 'safe,' 'ready to hunt!' in properly burnt landscapes.	Motivation to seek employment and training opportunities is reinforced by customary activities. Kids want to 'stay at school,' 'learn about the environment' because they want to care for country.	Adequacy of resources to sustain and grow Indigenous participation in fire management and decision-making.
Knowledge	Support for Aboriginal burning activities has led to communities being 'a lot more active on country.'  'We ... share what we learnt from being out on country with Elders and kids.'	Aboriginal knowledge guides fire management decisions. Enhanced opportunity for Aboriginal rangers and Elders to 'see country' and share knowledge about other areas of concern, how landscape responds to fire ('we saw trees are healthy from last burn') and where, why and how other areas need to be burnt. Engagement in on-country PES promotes knowledge of country.	Loss of knowledge and authority may compromise performance. Available (Indigenous and scientific) knowledge may be uncertain and/or difficult to reconcile, and may require collaborative efforts to share, learn and co-produce new knowledge suited to local contexts.
Existence / bequest	'Look(ing) after country ... [with fire] is for the next generation — our kids, grandkids ... kids and grandkids of kangaroo.' 'Part of our role as Australians — to look after mob, our country and help with climate change.'	Involvement of younger generations in fire management. Better knowledge transmission to young people. Contributions to larger scale Aboriginal management benefits (e.g. reduced greenhouse gas emissions).	None identified.

Benefit category	Indigenous narrative	Detail of benefits sought	Concerns
Social capital and cohesion	‘Rangers are happy when we are out burning the bush.’ ‘We all get involved—teachers, rangers, parents, elders ... all have a part to play’ [in fire management knowledge sharing, teaching and on-ground practice].	Activities enhance the ability to access, use or relate to country as desired and/or provide positive health and well-being benefits.	Other complex social, economic, and political factors that can affect Indigenous participation and benefits from savanna fire-burning activities.
Identity	‘Right people, right place ... right fire.’ ‘I help look after fire—fire burnt the traditional way.’ ‘Our country needs fire and our mob’s job is to burn it the right way.’ Maintain an Aboriginal ‘cultural signature’ through fire use.	Maintenance or restoration of ‘sense of belonging’ when involved in burning and decisions that ‘drive ... interest in building strong futures.’ Aboriginal landscape burning reinforces ‘cultural authority and supports cultural maintenance.’	None identified.
Employment	‘Everyone wants to do fire management work!’ Part of ‘good’ work for rangers and makes ‘kids, wife and family happy’ to see ‘dads, grandparents, everyone!’ have a role, ‘be proud,’ ‘get meaningful work.’	Social safeguards attract premium prices for units from Aboriginal carbon projects. Locally negotiated standards, as well as assessment of efforts to facilitate greater willingness of non-Indigenous interests (e.g. conservation NGOs) to invest in Aboriginal landscape burning projects.	Fluctuating demand for products of Indigenous PES schemes, including carbon offset schemes.

The most cursory examination of these overtly *post hoc* (Table 1) or *a priori* categorisations (Table 2) reiterates the often-acknowledged difficulties associated with organising or simplifying complex human–landscape relationships for presentation to external parties who seek to influence land management practice. Interviews and workshop discussions summarised in Table 1 demonstrate that for Aboriginal people in Northern Australia, fire practices and the country that is burned are integral components of their identity. Sites, places and regions that are burned are embedded in ‘country,’ where spirit beings have moulded the morphology of the landscape, their pathways dividing and ordering relationships between people, groups, totems, country and living resources. Based on these connections, Traditional Owner Elders and rangers manage their territories through a mosaic of discrete property and managerial group rights and shared regional, cultural and economic exchange relationships. With this cultural–legal framework as a backdrop, Aboriginal fire-burning aspirations, roles and activities are guided by the ways in which Elders assess the health of their country, value different types of burning practices, and assess the outcomes of burning activities. These responsibilities and values serve as the primary motivators for Indigenous communities to engage in fire-based PES schemes.

From this perspective, Aboriginal landscape burning can be conceptualised as an ecosystem service practice entrenched in local cultures and regional landscapes, aptly described by

Aboriginal participants at the Mapoon workshop as ‘right country, right people, right time, right fire’ (NAILSMA, 2013b, 9). Aboriginal accounts described how the ethics and origins of ‘country’ are in ‘dreaming,’ which provides the foundations to negotiate the relationship between one place and another, and one species and another. These perspectives offer new ways of considering the range of well-being services provided by Indigenous people caring for country and resonate with experiences of other Indigenous social–ecological systems (Kaczan et al., 2013; McDermott et al., 2012).

Table 2 translates ecosystem services and well-being as a dualistic and holistic relationship. One cannot speak about human rights without also speaking about ecological rights, or as one Aboriginal interviewee put it: ‘people and country take care of each other’ (‘Human and ecological rights,’ Table 2). Access to country, decision-making authority and maintenance of knowledge are critical to PES agreements because the Aboriginal right to care for, and be cared by, country is a fundamental and foundational right, and because, in ecosystem services terms, Aboriginal peoples’ access to, decisions over and interactions with their traditional estates generate key ecosystem processes that lead to services that mutually benefit humans and nature. For example, workshop participants involved in the Central Arnhem Land workshop described how the top of yams dug up in the early dry season by Aboriginal women are often replanted before the area is later burnt, which encourages yams (an important source of bush food) to re-sprout in the following wet season (see ‘Material service,’ Table 2).

Having access to visit and harvest these places helps Aboriginal people to monitor whether their country has been ‘burnt properly.’ Under a traditional ecosystem service paradigm, this could be described as an aesthetic service provided by appropriately burnt landscape (‘Aesthetic service,’ Table 2) but, as one survey respondent explained, a place ‘cleaned up’ by fire ‘provides us with the evidence that we are here and how burning is a shared benefit for us and our country.’

Some places (such as sacred sites, rock art sites and waterholes) were identified as needing special burning attention as part of a broader effort to ensure that people and country can take care of each other (see ‘Place/heritage service,’ Table 2). Promoting the well-being of humans, plants and animals requires the appropriate rituals, including burning, to be performed by the correct people who are connected to the ‘dreaming’ of that species or country. Fire planning and management strategies have been put in place by Aboriginal communities in some regions of Northern Australia that include ‘bush food,’ ‘historical,’ ‘lore and culture,’ ‘story,’ ‘visitor,’ ‘strong and active culture,’ and ‘bush country’ places (cf. Griffiths and Kinnane, 2010). All highlight the key characteristics of interspecies connections and responsibility that are embedded in caring for country efforts, and which relate to specific animals, specific people and the specific relationships embedded in their specific country.

Traditional use of fire enables Aboriginal people to access important land and water resources that are highly valued as part of broader community claims to land, water and religious/cultural rights. Indeed, fire was repeatedly described as a manifestation of those rights and an 'expression of culture.' As one senior ranger stated, '[Fire] is part of life for Aboriginal people,' yet complex colonial processes have resulted in the broad-scale removal, disenfranchisement or enticement of Aboriginal people from their customary lands (cf. Ritchie, 2009; Cooke 2009), leaving vast landscapes vulnerable to destructive unmanaged (wild) fire and without fine-scale care for their subtle biophysical and socio-cultural values. Some areas, for example, were reported to have remained unburned for years, causing wildfires to threaten important bush food and historical and cultural places (cf. Yibarbuk, 1998). If reframed as an ecosystem service issue, Aboriginal peoples' lack of access to their country and denial of opportunity to burn the landscape represents a location-specific constraint on goods and services that would otherwise benefit local, national and international societies (see 'Activity and access service,' Table 2). It also represents an opportunity in a modern 'culture based economy' (Amstrong et al., 2006).

'Fire the proper way' was discussed as a tangible way of expressing that land is part of the spiritual identity of Aboriginal people, their Elders and their future generations, and that the law and connections holding these relationships and responsibilities together are strong (see, 'Spiritual service,' Table 2). Some Aboriginal ranger groups across Northern Australia are now involved in on-ground burning, "foot-walk" burning and aerial control burning, and rangers described the inspiration of work on fire projects and interacting with savanna landscapes that had been properly burnt (see 'Inspiration service,' Table 2). The practice of burning was seen as reliant on Aboriginal systems of knowledge about their environment, but also as an activity that helped build Aboriginal knowledge systems about the landscape that had been burnt. Participants in the study highlighted that rangers plan fire annually and, where Traditional Owners are living on country, are able to work with them to manage fire. Where the Traditional Owners are not living on country, the rangers discuss burning plans with them and seek their permission to go ahead. Managing fire, then, reinforces cultural authority and supports cultural maintenance, which in turn reinforces the commitment to deliver obligations to country (see 'Knowledge service,' Table 2).

Partnerships with scientists, government agencies and other land managers were seen as critical to the knowledge benefits of country that had been well managed by fire. These partnerships were deemed useful because they provide additional perspectives on how country should be 'looked after,' help assess the biodiversity, carbon and other environmental responses from environments that had been burnt, and work towards a landscape that 'supports our vision' for these remote lands and communities. Together, contemporary 'actionable' fire management knowledge systems were being built that restored and reinforced confidence to make decisions about where, why and how other areas should be burnt.

A consistent and fundamental feature of fire-burning activities is the desire to support the intergenerational transfer of knowledge and leave country in a 'healthy state' for 'our young people' and the other living species that share their land (see 'Existence / bequest service,' Table 2). As one interviewee explained, it is part of Aboriginal peoples' role 'as people on this earth' to share responsibility for managing the impacts of climate change. This supports an argument made by others that Aboriginal landscape burning is not only important for 'humanising' the landscape (Head, 1994) but is also an important strategy for achieving sound ecosystem management of Northern Australia (Yibarbuk et al., 2001). Aboriginal workshop participants went even further, discussing how fire had the potential to shape Australian intercultural relations and environmental culture (see 'Social capital and cohesion service,' Table 2). Workshop discussions and interviews described rangers who were 'happy' when out 'burning the bush,' and how the entire community—'teachers, rangers, parents, Elders'—all played a role in guiding Aboriginal landscape burning decisions and appropriate Aboriginal fire management practices (cf. Hunt et al., 2009). Such statements were part of discussions that explored new and open-ended ways of evaluating how country, community and partners could, as one interviewee explained, 'let country tell you when, how, why and where to burn' (cf. Garde et al., 2009).

Facilitating Aboriginal landscape burning can also be conceptualised as inherent to Aboriginal people's identity. Elders who participated in workshop discussions talked about periodic patch burning that occurred during travel to neighbouring communities for ceremonial reasons and to alert the ceremony hosts of their passage. Fire was described as an extension of the land manager's body, protecting values of country and reaffirming complex social life roles and responsibilities in the one application (see 'Identity service,' Table 2).

Burning also provides opportunities for valuable work that improves physical health and builds social cohesion (see 'Employment service,' Table 2). Many rangers have acquired qualifications through mainstream regulatory systems, including operation of incendiary devices from helicopters to improve access to remote areas. These 'new technology' efforts are pursued alongside customary activities (such as the harvest of plants and animals) and are valued by Aboriginal people because they develop and maintain knowledge and skills, embody connection with country, and underpin Aboriginal engagement in the hybrid economy of many remote regions (Altman and Whitehead, 2003).

Aboriginal people across Northern Australia are therefore clear that their primary target is the improved well-being of local Indigenous people and country which echoes motivations from other Indigenous communities around the world engaged in PES agreements who emphasise the need to support their rights and interests (Muradian et al., 2013). Offset agreements that enable Indigenous people to engage in 'caring for country' activities are deemed to be a key mechanism for achieving this goal, but these opportunities must reflect

the local context of social, economic and cultural landscape burning practices, relationships, interests and aspirations. The degree of actual and perceived Indigenous ownership and control is therefore an important metric against which Indigenous people evaluate the success of PES schemes negotiated as part of these carbon offset projects. They will do this most effectively if the potential for strong interaction between protection of rights and deployment of financial incentives to deliver environmental benefits is explicit in PES arrangements.

#### **4. Conclusions**

Global environmental change researchers are now being called on to provide 'realistic, context specific pathways to a sustainable future' (DeFries et al., 2012), and initiatives such as Planet under Pressure and the Intergovernmental Platform on Biodiversity and Ecosystem Services have initiated debate not only about the global environmental problems that should be prioritised, but also about the values that should be incorporated into any potential solutions. Ensuing discussions around climate change, in particular, have highlighted a growing conviction that Indigenous benefits associated with carbon offset projects must a) be promoted in ways that acknowledge and protect Indigenous participation and ownership, and b) reflect the priorities of local Indigenous people. This places greater onus on global environmental change offset partners to take a solutions-orientated approach that values and incorporates the contributions of Indigenous peoples (past, present and future) to sustainable development. This paper responds to this important shift in climate change policy by demonstrating how (and why) PES schemes can be reframed to include broader recognition of Indigenous relationships to their traditional estates and the priorities of local Indigenous groups.

This research highlights the key issues that can inform efforts to negotiate the protection of rights and deployment of financial incentives that can ensure Indigenous PES arrangements provide desired co-benefits to local communities (Saunders et al., 2002; Robinson et al., 2016). Indigenous PES agreements need to pay heed to the very active relationship Indigenous peoples have with nature and with a suite of subsequent cultural ecosystem services instead of considering nature a 'service provider' and ignoring the important ways in which humans contribute to socio-ecological processes and functions. Rather than focusing on how ecosystem services can be valued, commoditised or measured, Indigenous PES payment negotiations could instead focus on the reflexive and active human–environment relationships that 'service' one another. While this may mean that some PES scheme benefits are not codifiable or of interest to offset investors, these benefits nonetheless need to be supported because they are critical to sustaining the current and future well-being of Indigenous cultures and country and the shared responsibility to sustain our environment. Framing Indigenous PES schemes negotiations around these benefits can

open up pathways to help design and deliver successful mitigation strategies that also offer an important opportunity for Indigenous people to provide (and be paid for) environmental services aligned with Indigenous customary and contemporary obligations to their traditional estates.

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