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Protocols for Indigenous fire management partnerships

Final report

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Cover photographs

Front cover: Ranger conducts a controlled burn. *Photo: Glenn Campbell.*

Back cover: Low intensity fire in savanna. *Photo: Jaana Dielenberg.*

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Acronyms

DOE Department of the Environment

NESP National Environmental Science Programme

Abbreviations

IK Indigenous knowledge

TEK Traditional ecological knowledge

TO Traditional Owner

Executive summary

Indigenous people's knowledge of fire is an integral part of Indigenous governance systems. It has been crucial to their successful management of Australian landscapes for millennia, and it enables diverse, ongoing management efforts across the continent. This report focuses on (1) identifying lessons learned from incorporating Australian Indigenous fire knowledge into fire management practices, and (2) developing protocols that can guide the incorporation of Indigenous knowledge into fire management and carbon abatement planning nationally. The report is the final product of Project 5.2 of the National Environment Science Program (NESP), Northern Australia Environmental Resources Hub.

The research team conducted a literature review and a series of activities to investigate the perspectives of fire program practitioners, partners, stakeholders and resource providers. These activities included individual and small-group interviews, focus groups, regional workshops and a national fire forum. The outcomes of these activities are reported in a series of documents, including this technical report, a summary report from the national fire forum (Appendix 1) and reports on fire program activities in each of the northern jurisdictions (Appendices 2–4).

This report summarises the relevant literature, highlighting some of the key aspects of Indigenous people's relationship with fire, along with the implications of this relationship for wider Australian landscapes and biota, both past and present. It notes that Australia's Indigenous people have a long tradition of systematically and purposefully using fire to manage the landscape, and that the positive impact of Indigenous landscape burning can be seen in the defining features and health of Australia's terrestrial biodiversity and cultural-ecosystems. The review distills key lessons learned from the incorporation and translation of Indigenous knowledge into a range of fire management activities and programs and charts the key methods, processes and protocols for incorporating Indigenous knowledge into environmental management, including fire management.

The project used a systems approach to document Indigenous fire knowledge and Indigenous holistic perspectives. This work confirmed that healthy country is sustained by burning practices that respect sacred sites, stories, cultural protocols and different types of country, such as rainforest and savanna. Indigenous people's health and well-being is the starting point for effective fire management, as people need to be healthy enough to work and to walk on country—the best mechanism for fire knowledge sharing and learning. Cultural and customary institutions also need to be strong to pass on fire knowledge and ways of knowing, and to protect intellectual and cultural rights. Resources such as rangers, vehicles and seasonal indicators are also needed in order to manage fire well. Partnerships that support Traditional Owners across all these aspects of Indigenous fire knowledge produce multiple additional benefits, including carbon economies and social connections between youth and elders.

Protocols for Indigenous fire management partnerships derived from these principles include the following:

- Indigenous fire management projects and enterprise can be rekindled predominantly on the lands for which the project owners have some customary responsibility and often other legal rights.
- Fire management partnerships must recognise and support Indigenous fire knowledge and fire management as part of local Indigenous governance systems.
- Broad support for Indigenous fire management and enterprise development relies on applying the best methods for learning, sharing and passing on fire knowledge.
- Place-based partnership approaches are needed to design and deliver Indigenous fire management programs across Australia.
- Partnerships established to support Indigenous fire knowledge in contemporary land-management activities need to work with contemporary institutional and governance arrangements.
- Indigenous fire management programs and partnerships can and should deliver environmental, social, cultural and economic benefits for Indigenous people.

The importance of an open policy and regulatory space for Indigenous innovation was observed. The project also identified key challenges and opportunities for fire programs, as well as key areas for future research into Indigenous fire knowledge and its incorporation into on-country fire enterprises and fire programs.

Introduction

Fire is a powerful and enduring force that has a profound influence on Australian landscapes. In regions across Australia, Indigenous communities are now applying, adapting and rejuvenating Indigenous fire knowledge and landscape-burning regimes through a range of land-management activities and partnerships. This has produced a diversity of Indigenous fire management enterprises, each of which combines and adapts the material, cultural, ecological and economic significance of fire for Indigenous people in different ways.

In many parts of Australia, there is strong evidence to suggest that Indigenous people are well placed to develop rewarding livelihoods and enterprises through payment for environmental service (PES) schemes and collaborative management agreements that involve Indigenous landscape-burning work. Indeed, Indigenous people are already securing income, jobs and training, as well as cultivating new knowledge needed to burn contemporary landscapes, through a range of conservation, carbon offset and natural resource management (NRM) agreements. Accounts from Indigenous people highlight the Indigenous values and benefits achieved through landscape-burning activities, provided fire knowledge sharing and land-management practices are supported by Indigenous governance frameworks and land ethics. As these Indigenous landscape-burning partnerships and activities are mature, it is timely to reflect upon the range of cross-cultural, social, institutional and environmental factors that need to be considered in order to develop and sustain Indigenous community, public program and private investor support for efforts to prescribe landscape-burning efforts.

This is the final report of an eight-month review that has sought to understand and evaluate the scope and application of Indigenous fire knowledge in contemporary Northern Australian fire projects. This work was conducted to inform the development of agreed protocols to guide the incorporation of Indigenous knowledge into fire management and carbon abatement programs nationally. It is hoped that these protocols help Indigenous and non-Indigenous partners to develop locally appropriate landscape-burning regimes that meet Traditional Owner (TO) and local management objectives and identify opportunities for improvement.

The research team on this project included Cathy Robinson (CSIRO, project leader), Ro Hill and Marcus Barber (CSIRO), Emily Gerrard (Allens) and Glenn James (North Australian Indigenous Land and Sea Management Alliance Ltd, hereafter referred to as NAILSMA). Information from interviews and workshops involving Traditional Owners, non-governmental organisations (NGOs), scientists and government agencies has been combined with findings from a literature review to document the successes and challenges associated with (1) sharing Indigenous knowledge systems with western science; (2) translating Indigenous knowledge and the historical purposes of Indigenous fire into contemporary fire management activities; (3) reporting on the different perspectives, experiences and lessons learned from the incorporation and translation of Indigenous knowledge into contemporary fire management; and (4) identifying institutional, social, cultural and other factors that enable or constrain the incorporation of Indigenous knowledge into prescribed fire management goals and activities.

Chapter One outlines the research approach and project steering arrangements that were deployed to develop Indigenous fire management partnership protocols. Chapter Two draws on a literature review and case-study analysis to understand the practicalities of incorporating foundational Indigenous fire knowledge into contemporary fire management across Northern

Australia (Appendix 1–5). Chapter Three discusses the challenges and opportunities associated with using Indigenous fire knowledge to guide contemporary fire partnerships and programs and distills key lessons learned. Chapter Four outlines Indigenous partnership protocols derived from an analysis of interviews, workshop discussions and the available literature. The review concludes by summarising key messages identified through regional and national forums and suggesting important areas where science–Indigenous partnerships could design useful research in this domain.

Chapter 1. Research approach and methods

This project was undertaken by a research team from the CSIRO, NAILSMA and Allens, guided by a Steering Committee whose members:

- Had experience and expertise in Indigenous fire management projects and partnerships in Northern Australia
- Were affiliated with key agencies and organisations involved in Indigenous fire management activities
- Collectively represented a broad range of Indigenous fire management contexts and project activities across Australia
- Were willing and able to participate in two phone meetings (at the start and end of the project), and to guide and review key outputs from this project.

The Steering Committee for this project included:

- Michael Ross, Cape York Land Council
- Joe Morrison / Jen Redway, Northern Land Council
- Richard Geddes / Rhys Swain, Kimberley Land Council
- Nerissa Walton/Richard Geddes, Indigenous Land Corporation
- Ricky Archer Djelk Rangers, Bawinanga Aboriginal Corporation
- Otto Campion, Gurruwilling Rangers
- Tom Vigilante, Bush Heritage
- Mitch Jeffrey, Indigenous NRM, Department of Environment
- Tina Bain/Erika Schwarze, Environment Management and Policy, Department of the Prime Minister and Cabinet

The Steering Committee guided research activities and provided the following advice:

- Hold regional workshops in Western Australia, the Northern Territory and Queensland, and facilitate a larger national forum that allows Indigenous fire experts and practitioners to learn from each other's experience in fire partnerships and management
- Encourage as many Indigenous participants to attend the fire workshops as possible, emphasising support in partnership with participating agencies
- Organise workshops and national forums during the wet season when rangers are not busy with landscape-burning activities.

The protocols for Indigenous fire management partnerships that are outlined in Chapter Four are based on a literature review and a qualitative multiple-case-study approach that focused on Northern Australia but incorporated relevant information from elsewhere. The project and case-study research approach was approved by the CSIRO Social Science Human Research

Ethics Committee (REF: 037/15). The research team relied on advice from Steering Committee members to select and subsequently interview key people who could reflect on practical and policy efforts to translate Indigenous knowledge and the historical purposes of Indigenous fire into contemporary fire management activities. Research team members conducted 27 formal interviews with Indigenous fire experts and practitioners, five interviews with Indigenous fire management partners and four group meetings that involved 12 government staff involved in supporting Indigenous fire management programs.

Regional workshops took place across Northern Australia, and key issues and lessons were reported back to workshop participants (Appendix 2–4). Key findings from these workshops were presented at a national forum held in February 2016, and they were then combined with perspectives offered by national forum participants to generate the protocols presented in this report. A report on the national Indigenous fire knowledge and fire management forum was co-authored by the research team and forum participants (Appendix 1).

A review of publicly available literature on Indigenous fire knowledge and fire management was conducted, with a focus on:

- The importance of fire to Indigenous people
- The contributions of Indigenous people and a range of scientific studies to our collective understanding of the relationship between Indigenous people, fire and the Australian landscape
- Approaches to characterising Indigenous knowledge and fire
- Legal and policy developments that have led to the incorporation of Indigenous knowledge into a range of land-management partnerships, including
 - Conservation agreements
 - Carbon abatement projects
- Challenges to Indigenous involvement in contemporary fire management programs and institutions
- Key research priorities for Indigenous fire management and partnerships.

It is important to acknowledge that this literature review primarily compiled sources of information from non-Indigenous authors who have observed, researched or worked with Indigenous people. Creating written records is typically a non-Indigenous form of knowledge transmission, and non-Indigenous observations and records of Indigenous people's behaviours, actions, comments and traditions reflect the western paradigm of non-Indigenous authors.

The following chapter reviews material from the literature, interviews and workshop discussions to consider Indigenous people's relationship with fire, Indigenous fire knowledge and practices, and the value of a systems approach to understanding Indigenous fire knowledge.

Chapter 2. Understanding Indigenous fire knowledge and landscape-burning practices

Fire has influenced the way Australian Indigenous people live on, with and through their land for millennia. Indigenous elders are aware of this significance, and this has underpinned their advocacy on behalf of Indigenous fire knowledge and associated fire management practices. In considering the general importance of fire to Indigenous people, senior Olkola elder Michael Ross emphasised its multiple everyday uses:

Fire is one of the things that Indigenous people have got all the time. They use it for cooking, they use it for camping—warmth—and they also use it for hunting. Growing up with those old people in that area I've seen it, that fire is very important to us (Michael Ross, project interview, November 27, 2015).

This material significance is complemented by a cultural and symbolic significance that is passed on from generation to generation. Senior West Arnhem Land custodian Dean Yibarbuk (1998, p. 5) explains how this occurs:

... 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.

Indigenous people's material and cultural understanding of the importance of fire, coupled with their knowledge and understanding of their local environment, enables them to undertake burning in a way that achieves desired ecological outcomes at the landscape management scale. Senior Olkola Lex Ross explains:

Fire creates new life. That's how they start it off. They burn, then new grasses grow, then the animals came on. It was part of the daily routine—you burn grass, you get new shoots coming up, you get wallabies and kangaroos coming on, and emus and that feeding. And that's how they survived, that was the main reason for fire. People have been doing that for centuries (Lex Ross, project interview, November 27, 2015).

In regions across Australia, Indigenous communities are now applying, adapting and rejuvenating Indigenous fire knowledge and landscape-burning regimes through a range of land-management activities and partnerships, and for manifold outcomes. As Otto Campion explains:

Our knowledge, our burning, our culture informs how to burn. Carbon work, environment work, ranger work, research work ... Our law, our knowledge, our people underpin these partnerships so we can learn together to manage fire today ... Partnerships with scientists, business, government [are all] part of looking after our country, looking after our children, looking after our law (Otto Campion, project interview, November 23, 2015).

The knowledge imparted through these activities and partnerships is localised and diverse, reflecting the array of ecosystems and Indigenous livelihood and economic systems that exist across Australia (Garde et al., 2009; Yibarbuk 1998). This knowledge is also dynamic,

influenced by recent innovations, as well as a long history of trans-continental contact, the more recent processes of colonisation and the post-colonial assertion of rights (Barber et al., 2014; Rose 2000).

Like many other aspects of Indigenous natural resource rights and responsibilities, however, European settler colonisers dismissed the importance and viability of Indigenous fire management practices, in part because of colonial assumptions about property ownership (Langton 1998). The Australian continent was depicted as unowned—‘empty’ of property rights and in an ecologically ‘natural’ state (later described using the terms ‘terra nullius’ in a legal context and ‘wilderness,’ respectively). The importance of the relationship between Indigenous people and fire was not evident to the settler colonial society, nor was it recognised by its social, legal and economic structures and institutions (Robinson et al., 1995). Instead, misleading narratives about the ‘disappearance’ of Indigenous fire practices were deployed, despite the fact that Indigenous people have continued to occupy their traditional lands since European occupation, and have continued to adapt their fire management practices to changing economic and social circumstances (Hill et al., 2000).

Langton (1998) highlights how misrepresentations, tropes and asymmetric power relationships have impeded effective application of Indigenous fire knowledge for decades—knowledge that has now been recognised as vital to solving global problems of excessive greenhouse gas emissions and biodiversity loss in tropical savannas (Russell-Smith et al., 2013). Since the 1960s, the potential of these Indigenous fire practices to significantly influence Australian landscapes has been recognised, as well as the ways in which these practices have evolved since European occupation. This has led to a rapidly growing body of scientific literature on the topic (Bowman, 1998; Jones, 1994). As Bowman (1998) notes, this literature was originally characterised by an absence of Indigenous people’s own views about fire. Fortunately, recent publications have begun to redress this omission, and in keeping with these efforts we have begun our review by privileging some of these Indigenous voices.

Indigenous people’s views and perspectives on fire knowledge management

Indigenous fire knowledge is the intellectual property of Indigenous people (Riley 2004). From the perspective of Indigenous people, knowledge about landscape burning is not only about where, when and how to burn; it is also about ensuring that those who light fires are acting under the appropriate authority of the people of that country—that is, people who have the residential and kinship ties that underpin customary connections. As Bobby Yerry, a Traditional Owner in the Wet Tropics region of Queensland, explains:

Kuku-Yalanji people, we can’t go ahead and just light a fire, we got to wait for the right people ... I’m a boss for my country, if you’re coming into country and lighting a fire, I’ll kill you, no muck around, spear, I’ll kill you (Bobby Yerry, quoted in Hill et al., 2004, p. 27).

For Indigenous people, this is often the single most critical element of fire management, but it is usually the element that receives the least amount of consideration from non-Indigenous fire managers.

Dean Yibarbuk, a respected Indigenous fire ecologist from Arnhem Land, has also emphasised the importance of who does the burning: ‘People are saying that the right people should be on their country looking after it to protect it from wild fires’ (Dean Yibarbuk, quoted in Bowman et al., 1998, p. 1). Yibarbuk (2009) also recognises the holistic nature of Indigenous people’s systems of managing fire, which include: responsibility for fire and fire knowledge; links with traditional stories about animals, birds and reptiles and how they have gone through processes of change; knowledge of seasonal movements that affect fire (Bangerreng, Yekke, Wurrkeng, Gurrung, Gunumeleng and Gujewek); knowledge of how to read the season through the flowering of plants and the movements of animals; knowledge about the roles of spiritual beings in the country; and a responsibility to fix the damage that is being done to the climate by greenhouse gases.

Kuku-Yalanji Indigenous people report that their system of fire management has six critical components: (1) political and legal aspects—elders are sources of authority, and customary law determines who has the right to light fires on particular traditional territories; (2) economic considerations—fires are lit to obtain food (for example, when hunting for wallabies), and to obtain money as part of cultural tourism activities; (3) technology of management—fires are lit when grass is at the right stage of curing, assessed by crumbling it in your hand, or when a particular flower appears, indicating that it is the right time to burn rainforest margins for a yam crop; (4) social considerations—fires are lit together with groups of Kuku-Yalanji people, to support sharing and passing on knowledge; (5) spiritual beliefs—fires come from the Ngujukura, the dreaming, and the activities of the ancestral beings who are still in the landscape today in sacred places and other sites; and (6) knowledge of fire—passed on through Kuku-Yalanji traditions and practices, including language, song, dance, art, smoking ceremonies and other cultural activities. Kuku-Yalanji people employ fire management to keep their culture and people strong in the landscape (Hill et al., 1999).

The Fire Management Plan created by the Kuku-Thaypan people from Cape York Peninsula (Standley and Felderhof, 2011) captures both the importance of respecting customary law in burning practices and the holistic approach to fire management. The plan states that ‘fire is a very sacred tool that was given to the people from their ancestors and carries with it laws governing its use and application’ (p. 11). It also recognises nine elements of their fire system, organised into three groups: lore, people, country (knowing how to do landscape burning); law, plants and animals (knowing what burning does); and people, biodiversity and monitoring (knowing what it is). As ‘Old Man Dr Tommy George,’ who received his honorary doctorate from James Cook University in 2005, explains:

This land is Mulong country, spirit country, the old ways here. I’ve been around this land for a long time, the Aboriginal people we look after this land, the old ways, long time ways ... The old way is still strong, we’re with the land, our young ones they know how to burning—me and my brother [the late Dr. George Musgrave] taught them (quoted in Cape York Elders & Community Leaders, 2013, p. 14).

This holistic approach to fire knowledge emphasises the importance of linkages between diverse components including people, law, spiritual significance and knowledge of plants, animals and country. It also stands in marked contrast to the body of literature on Indigenous fire that preceded the entry of Indigenous voices and perspectives (Langton, 1998). The following sections summarise this literature, organised in terms of disciplinary contributions, in order to provide an approximate timeline of overall research awareness about the role

Indigenous burning regimes have played in maintaining Australia's landscapes. The chapter concludes with discussion of how Indigenous fire knowledge can be characterised as part of a human–environment system, drawing on recent advances in systems thinking (Fischer et al., 2015; Gavin et al., 2015).

Historical analyses of Indigenous fires in the recent past

In 1969, archaeologist Rhys Jones proposed what has become known as the 'fire-stick farming' hypothesis—namely, that Australian Indigenous vegetation fires have always been a deliberate resource-management strategy (Jones, 1969).¹ This 1969 paper was critical in raising scientific awareness of Indigenous fire regimes. In the following decades, a number of disciplines began to focus on the question of Indigenous fire practices, including anthropology, archaeology, ecology, history and palynology.

Jones' (1994) account of his early work drew particular attention to the journals of George Augustus Robinson, written in 1829 and 1832. Comparison between Robinson's descriptions of Western Tasmania and the contemporary landscape highlighted how much the flora of the region had changed, which encouraged thinking about the impact of past Indigenous actions on the landscape. Observations in other historical sources encouraged further scientific interest in this early period (Hallam, 2014). Perhaps the most well-known colonial observation comes from the explorer Thomas Mitchell, whose notes implied that Indigenous people were indeed shaping the landscape:

Fire, grass, kangaroos, and human inhabitants, seem all dependent on each other for existence in Australia, for any one of these being wanting, the others could no longer continue ... But for this simple process, the Australian woods had probably contained as thick a jungle as those of New Zealand or America, instead of the open forests in which the white men now find grass for their cattle (cited in Rose, 1996, p. 135).

The journal of Sir Joseph Banks (1770) is one of many historical documents written by early European explorers and settlers that specifically records Indigenous people's many uses for fire, including as a means of retribution against perceived misdeeds by Cook's crew while they repaired the Endeavour at what is now the site of Cooktown (Braithwaite, 1991; Gammage, 2011; Hill et al., 2011; Mitchell, 1848).

Although colonial historical sources continued to be recognised as relevant (e.g., Bowman, 1998; Head, 1989; Hill, 2003), they generally played a small role in scientific investigations in subsequent decades, and a comprehensive survey of the evidence available in historical sources has only been undertaken recently (Gammage, 2011). Gammage (2011, pp. 15–17) emphasises that colonial settlers repeatedly described Australian landscapes as having a 'park-like appearance,' and yet assumed this was natural, rather than a consequence of systems of Indigenous management and ownership. Gammage locates and collates numerous historical sources that describe Indigenous use of fire and/or attribute the state of the landscape to Indigenous action (and, at times, the removal of that action due to colonisation).

¹ Jones' perspective was particularly influenced by a 1965 conference paper by a botanist, Bill Jackson, who argued that the floristic diversity of Western Tasmania could only be the result of human forces acting on the frequency and intensity of fire, and by another paper at the same conference that highlighted the significance of agriculture in the human transformation of landscapes (Jones, 1994).

Responding to Jones' original formulation, his own review of the historical evidence and the specific question of whether Indigenous people were 'farmers', Gammage (2011, p. 320) notes:

People burnt, tilled, planted, transplanted, watered, irrigated, weeded, thinned, cropped, stored and traded. On present evidence not all groups did all these, and few Tasmanians may have, but many mainlanders did. What farm process did they miss? There was one difference. They were mobile. No livestock, no beast of burden, anchored them. They did not stay in their houses or by their crops. Sedentism has been used to disqualify Aborigines as farmers, but sedentism contrasts with mobility rather than hunter-gathering.

Gammage's account functions as both the largest historical synthesis to date, and as a polemic against previous writing that minimised Indigenous impacts on the landscape (Horton, 1982). Exploring the full nature of Gammage's extended argument and its implications is beyond the scope of the current review, but it is important to note its significance as a collation of widely dispersed and disparate historical sources relating to Indigenous alterations of the Australian landscape, particularly via the use of fire.

Although Gammage's book has received many positive reviews (e.g., Hallam, 2011; Taylor, 2012), Australian ecologists have been more critical (Sinclair, 2012). In particular, they have expressed concern about the potential impact of applying Gammage's version of Indigenous fire practices on Australian biota. They have also questioned the suggestion that reinstating Indigenous burning practices will prevent wildfires. For example, Leavesley (2012) writes:

When the climate and weather conditions were suitable, fires of great intensity, rate-of-spread and extent swept across the continent and in so doing, dominated the fire regimes prior to 1788 (p. e4).

Although a substantial body of evidence points to a significant decline in fire-sensitive vegetation since European occupation due to the increased frequency and intensity of fire events, there is also evidence of extreme wildfires in southern Australian forests prior to 1778 (Bowman, 1998; Wood et al., 2010).

Analysis of Indigenous fires in the Pleistocene

Following Jones' initial insight, later studies in archaeology and palynology focused attention on the initial impact of Indigenous people on the landscapes of Pleistocene Australia, including:

- Their roles in the extinction of Pleistocene megafauna and the contemporaneous contraction of rainforest (Rule et al., 2012; Sakaguchi et al., 2013)
- Changes to the summer monsoon (Wyrwoll and Notaro, 2014)
- The evolutionary and co-evolutionary diversification of the Australian biota (Bowman, 2003; Codding et al., 2014)
- Correlations between Indigenous occupation and fire regimes (Williams et al., 2015a; Williams et al., 2015b).

Recent analyses suggest interactions between human action and wider systemic changes driven by non-anthropogenic factors. For example, paleontological research has established that a major transition to increased fire frequency and the emergence of fire-prone vegetation

in Tasmania was driven by the onset of high frequency and amplitude El Niño Southern Oscillation variability after 5,000 years (calibrated) before present (cal BP) (Fletcher et al., 2015; Fletcher et al., 2014). Dendrochronological techniques have also established that infrequent catastrophic fires occurred in some ecosystems, such as the temperate forests of Tasmania, under Indigenous regimes prior to European occupation (Wood et al., 2010). In general, it is now understood that within the regional parameters established by climate and topography, Indigenous fire regimes played a determinative role in establishing and maintaining finer-scale landscape patterns (Bird et al., 2013a; Williams et al., 2015a).

Approximating Indigenous fire practices

In his original 1969 paper, Jones noted that if the aspiration was to conserve the Australian environment as it was before 1788, burning would need to be re-introduced ‘at regular intervals under controlled conditions.’ Ecologists responded to the science challenge this aspiration presented by attempting to: (1) develop a comprehensive understanding of the dynamics and evolution of the Australian biota, and the associated roles of fire; and (2) formulate appropriate strategies for fire management that reflected this understanding (Bowman, 1998; Cary et al., 2003). Ecological and fire-modelling studies have investigated questions about Indigenous fire regimes, particularly their potential influences on status and trends of ecosystems and their constituent biota (Bradstock et al., 2012), and their capacity to reduce the risk of fires through fuel reduction (Penman et al., 2011).

At Uluru, early efforts to implement a biodiversity-friendly fire regime that incorporated traditional practices resulted in ‘patch mosaic burning’—an approximation of the Indigenous fire-stick farming strategy (Saxon, 1984). This practice manipulates fire to create a mosaic of patches across the landscape (Parr and Andersen, 2006; Price, 2015; Trauernicht et al., 2015). Since then, approximations of Indigenous fire regimes have been implemented in several Northern Australian contexts, including Arnhem Land and the north Kimberley. These approximations have produced beneficial outcomes, including: protecting endangered tropical heathlands; providing long, unburnt habitat for small mammals (Murphy et al., 2015; Radford et al., 2015); and contributing to the abatement of greenhouse gases. These attempts to approximate Indigenous fire-stick farming through patch mosaic burning fueled renewed interest in incorporating traditional practices to strengthen fire reduction and lower fire risks (Gammage, 2011; Kohen, 1996).

Early dry season burning is another approximation of Indigenous fire-stick farming, and it is used in Northern Australia to reduce the frequency of high-intensity wildfires and thereby lower greenhouse gas emissions (Russell-Smith et al., 2013; Yates et al., 2008). Early season burning in the savannas is also an effective tool for increasing carbon retention. Recent arguments suggest that this practice could be extended into the lower rainfall zone (Whitehead et al., 2014).

Despite such successes, ecologists have emphasised that burning practices need to be carefully tailored to the specific features of the ecosystem they are intended to protect (Parr and Andersen, 2006). In particular, there is ongoing debate about how certain aspects of fire regimes—such as fire frequency, extent, intensity and seasonality—interact with critical ecosystems and biota (Andersen et al., 2012; Coddling et al., 2014; Cowley et al., 2014; Griffiths et al., 2015; Lawes et al., 2015; Yates et al., 2008).

It is also important to note that approximations of Indigenous fire practices ignore the holistic nature of Indigenous fire management. The key dimensions of fire management encompass customary law, economies, social relations, ecology and diverse technologies, such as seasonal indicators (Bright, 1995; Hill et al., 1999; Rose, 1995), as well as culturally embedded mediating and explanatory factors. These mediating factors include signals that are received from country when it is the right time for burning, such as the flowering of trees; the kinship relationships that determine who can light fires for country; the knowledge of cultural sites and cultural resources that influence the pathways of fire at a very fine scale across the landscape; and the economies that benefit from certain fire regimes, including tourism economies, which benefit from burning designed to protect assets such as picnic tables and camping grounds (Bright, 1995; Hill et al., 2004; Hill et al., 2008). For this reason, it is important to document and understand the wider context in which Indigenous fire management takes place.

Investigating the larger context of Indigenous uses, purposes and meanings of fire

Jones' (1969) account recognised that Indigenous burning practices have social as well as environmental purposes, including burning for 'fun', for signalling purposes, to clear the ground, to regenerate plant food and to extend human habitat (p. 226). More sophisticated accounts followed that encompassed both the purposes (Gould, 1971) and the meanings of fire (Rose, 1996). Rose's (1996) analysis of Indigenous fire demonstrates this diversity of meaning and purpose. The opening quotation of this analysis, for example, highlights the temporal cycle of fire, but also notes that fire is a response to the condition of the country—an activity that expresses an ongoing relationship:

'Burn grass' takes place after the wet season when the grass starts drying off. This takes place every year. The country tells you when and where to burn. To carry out this task you must know your country. You wouldn't, you just would not attempt to burn someone else's country. One of the reasons for burning is saving country. If we don't burn our country every year, we are not looking after our country (April Bright, in Rose, 1996, p. 63).

Out of context, such a quote might be taken to indicate that Indigenous people burn the entire landscape every year in order to 'save' it, but the earlier part of the quote—'the country tells you when and where to burn'—highlights that burning efforts target specific geographic locations within a landscape. Furthermore, some areas of particular spiritual and/or ecological significance are always kept unburnt, such as denser jungle in northern savannahs and mulga stands in desert areas. Noting the political and theoretical importance of Jones' 'fire-stick farming' terminology in the context of the concept of 'terra nullius,' Bird Rose (1996, pp. 64–67) goes on to provide an extensive list of Indigenous uses for fire: cooking; warmth; light; healing; toolmaking; cleaning up camping areas; curing native tobacco, ochres and medicines; warding off supernatural powers; ceremonies; warfare; signalling and communication; hunting and animal drives; and land management, using the frequency, intensity and timing of fires to germinate plants and create foraging areas for both humans and other animals. Using fire in this way requires knowledge of soils, land forms, surface and underground water, vegetation types, time of day and year, wind and associated meteorological conditions (Rose, 1996, p. 67).

Empirical data collections in Western Australia have further supported the existence of a series of connections between Indigenous foraging, fire and landscape (Bird et al., 2005; Bird et al., 2013b; Bliege Bird et al., 2008). For instance, Indigenous people use fire to increase hunting efficiency, particularly among women (Bird et al., 2005), and patch mosaic burning can be used to create ecological niche effects that positively affect populations of a key target species, effectively balancing the negative effects of predation in recently burned areas by hunters (Bird et al., 2013b). It has also been demonstrated that anthropogenic patterns differ from those caused by lightning (Bliege Bird et al., 2008).

Rose (1996) also notes that Indigenous landscape burning is not just about knowledge of ecological systems; it is also embedded in the cultural and legal systems of Indigenous people's traditional estates. She describes the spiritual, symbolic, moral and legal aspects of Indigenous people's use of fire, noting:

For Aboriginal people, these smokes and fires told them that everything was good—that people and country were doing the right thing. In addition to land management, fire and smoke are central to virtually every aspect of daily life, and to every life passage. Birth, initiations, dispute resolutions, and funerals all require fire and smoke. Rights to use fire in particular contexts are allocated among kin and defended in the same way that rights to songs, designs, and other forms of knowledge are defended (Rose, 1996, p. 69).

Despite the importance of fire, the ongoing effects of colonisation have made it impossible to maintain past fire regimes, which once acted as markers of a known Indigenous presence in the landscape. From an Indigenous perspective, the country itself can be understood as responding to this failure to burn the land. The Yanyuwa people, for example, believe that ancestral spirits 'closed up' unburned country with dense vegetation because 'the old people' were angered at such neglect (Bradley, 1995, cited in Rose, 1996, p.72). Even where the reinstatement of Indigenous fire regimes is possible, there are concerns among Indigenous people that fire may no longer act as a moral marker of appropriate conduct by appropriate people, in the way that it has done in the past.

Studies of Indigenous fire knowledge have in some contexts reframed Indigenous landscape burning as traditional ecological knowledge (TEK)—a phrase developed by mostly western-trained scientists focused on documenting the relationships, knowledge, practices and beliefs of Indigenous people and other ethnic minorities across the globe (Berkes, 2009). Research interest in TEK has developed alongside growing advocacy for Indigenous rights, and this work has contributed to broad acknowledgment that maintaining natural resources is significantly dependent on the diversity and sustainability of Indigenous social-ecological-cultural systems (Berkes, 2000, 2009, 2012; Danielson et al., 2005, 2014; Gomez-Baggethun et al., 2013; Poe et al. 2014).

Climate warming and Indigenous landscape burning

Understanding interactions between weather and fire is critical to the design and implementation of evidence-based fire management programs (Driscoll et al., 2010b). Indeed, contemporary fire management efforts are primarily driven by the virtual certainty that global warming will increase extreme fire weather and lengthen fire weather seasons, leading to heightened levels of risk (Bowman et al., 2009; Jolly et al., 2015).

Climate change projections for heightened fire risk have stimulated current interest in fuel-reduction burning to mitigate wildfire effects (Volkova et al., 2014). However, Australian studies have demonstrated that prescribed burning—including approximations of Indigenous practices, such as patch mosaic burning—has very different outcomes in different landscapes. For example, King et al.'s (2013) modelling of the impacts of simulated prescribed burning demonstrated that the burning was beneficial in arid landscapes, but not in moist landscapes (King et al., 2013). Further ecological and fire-modelling research is needed to better understand the effects of patch mosaic burning on fuel management, and to link management actions directly to asset protection and risks to biodiversity in specific ecosystems (Driscoll et al., 2010a).

Knowledge diversity, adaptation and transformation

Considerable Indigenous knowledge about fire management has been documented in broader accounts of Indigenous hunting and gathering (Altman, 1987; Bliege Bird et al., 2013; Chase and Sutton, 1981; Williams and Hunn, 1982); relationships to landscape (Baker, 1999; Horstman and Wightman, 2001; Rose, 2000); flora and fauna (Bradley et al., 2005; Roberts et al., 2011; Yunupingu et al., 1995); and seasonal variations (Clarke, 2009, 2011; Prober et al., 2011; Woodward, 2010; Woodward et al., 2012). These accounts emphasise that fire knowledge is just one aspect of a broader knowledge base and system that encompasses a range of biophysical, ecological and institutional relationships. This, in turn, is embedded within a broader cultural understanding of how people and landscape are intertwined.

Contemporary Indigenous knowledge and management techniques are also the outcome of a range of adaptations to this broad base of knowledge—adaptations that were sometimes forced by active colonisation, but which also arose indirectly through changes in the way that people lived with the land (Barber et al., 2014). In particular, industries such as pastoralism have had a major impact on Indigenous Australians' way of life (Curthoys, 1987, Hill et al. 2001). This, in turn, has influenced contemporary Indigenous people's understandings of fire, as well as the mechanisms through which they learn about fire (Barber et al., 2014, Hill et al. 2000).

More focused accounts of fire knowledge have emphasised the overall diversity of this knowledge (Huffman, 2013), as well as fire's explicit connections with hunting (Bird et al., 2005), identity (Bradley, 1995), resource management (Hill and Baird 2003), and adaptation to change (Hill et al., 2000; 2001). Recently, however, attention has focused on the effects of Indigenous fire knowledge and the associated landscape-management implications (McGregor et al., 2010; Russell-Smith et al., 2013). Gammage (2011, pp. 160–161), for example, has extrapolated and summarised a series of principles that he terms a 'learning curve,' based on Indigenous people's use of fire as a key management tool:

- The more fuel is reduced, the more easily fire is controlled and the more useful it is.
- Even hot fires leave unburnt patches, but the cooler the fire, the bigger the patches.
- Burnt and unburnt patches benefit animals by balancing burnt (feed) and unburnt (shelter) country.
- Patches form mosaics, which can be adjusted in size by varying fire intensity.

- Intensity can be regulated by fire frequency and timing.
- Frequency and timing are local. They depend on local flora and local moderators like rain, wind, temperature and aspect.
- The better people understand these variables, the more they can burn with purpose. They can move from limiting fuel to shaping country.
- This lets them selectively locate fire-tolerant and fire-sensitive plants, situate and shape mosaics and resources conveniently and predictably, and arrange them in sequence so one supplies what another does not.
- In this way, Australia becomes a single estate, varied in means but not ends.
- Maintaining the estate is enforced by universal law (Gammage, 2011, p. 162).

Gammage's extrapolation to the continental scale, represented here in the final two points, remains controversial. However, his account does summarise many of the critical variables that Indigenous fire knowledge of on-the-ground practices encompasses.

Understanding Indigenous fire knowledge—a systems approach

Recent advances in social–ecological linkages, people-centred environmental management and bio-cultural diversity have stimulated interest in the capacity of systems approaches to improve environmental understanding and management practices (Diaz et al., 2014; Gavin et al., 2015; Fischer et al., 2015). Holistic approaches to understanding Indigenous fire knowledge pay necessary attention to how the dynamic linkages between people and country are mediated and influenced by natural and human drivers of change, institutions and the resources available to manage fire. Figure 1 presents a highly simplified representation of how Indigenous fire management is embedded within a social-ecological system with six interacting parts.

Part A: Healthy People. Indigenous people's health and well-being has a major influence on how fire operates in the system because people need to be healthy to be able to work and walk on country to light fires. It also has an indirect influence, because people's ideas about health influence the types of institutions they establish (see Part B).

Part B: Fire institutions. Indigenous fire institutions are deeply influenced by the presence of ancestral beings in the landscape, which are the source of law about fire, and which result in patterns across the landscape of story places and tracks, including sites that must be protected from fire. However, these Indigenous institutions are now constrained by government institutions. For instance, private land tenures may restrict the rights of Indigenous people to access sites that they have a responsibility to protect. Government fire institutions include:

- A suite of national institutions, embodied in the Environment Protection and Biodiversity Conservation (EPBC) Act, the Emissions Reduction Scheme, the state/Northern Territory bushfire acts, etc.
- Property rights and access to land and intellectual resources

Partnerships between Indigenous people and private landholders can establish new institutions and ways of bringing people together to change the way fire works in the landscape, provided they can mobilise resources (see Part C).

Part C: Resources. Resources affect how fire works in the system. For example, they determine how far people can travel to undertake fire management, and whether they use cars or helicopters. Key resources include:

- Vehicles, safety equipment, GIS systems, computers, buildings
- Health facilities in community locations to support people on country
- Flowering trees that act as seasonal indicators of when to light fires, confidence to light fires, crumbling of grass to determine state of curing
- Metrics for emissions reduction, biodiversity and cultural assets.

These resources allow people to change how fire is working in the landscape (see Part D).

Part D: Drivers of change. These come from two sources:

- People can change how fires occur in the landscape by changing the location, season and extent of ignition.
- Nature can change how fires work in the landscape. For example, volcanoes may erupt or there may be an increased number of lightning storms.

Driving changes in fire regimes in turn drives changes to country (see Part E).

Part E: Healthy country. Country is healthy if fires burn in ways that are good for the plants, animals and people who live there. Rainforest plants and animals need different types of fire than savanna plants and animals, and sacred sites need fires that are lit with the right ceremonies, stories, people and languages. Healthy country with the right fires in turn delivers many benefits (see Part F).

Part F: Multiple benefits. Changing fires in the landscape can bring many benefits. It can:

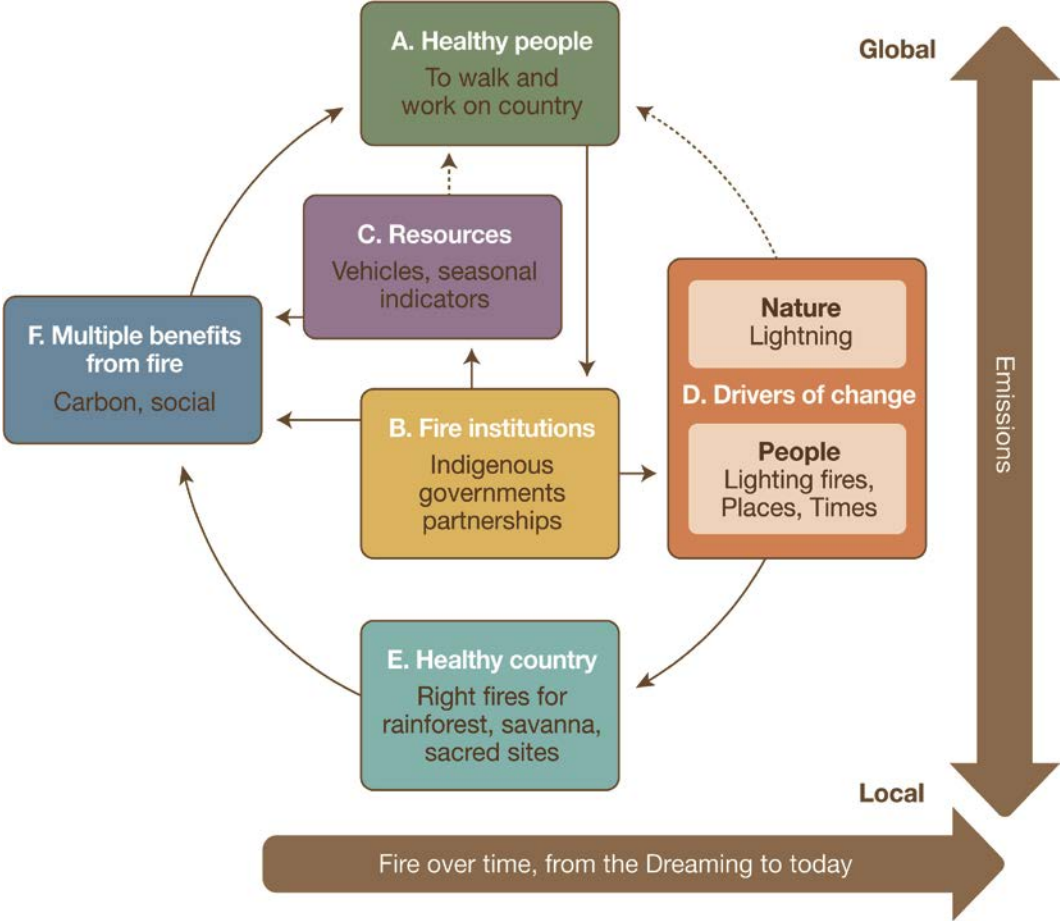
- Increase provisions, including fruit, flowers, seeds, animals for food and tools, art
- Regulate services, including climate regulation (emissions reduction, carbon sequestration) and pollination regulation (fire influences)
- Deliver cultural services, including education (signalling, storytelling), recreation (fire for fun) and employment.

However, these benefits are only delivered through the combined actions of all the other parts in this system: the institutions, the drivers of change, healthy country with the right sorts of fire, adequate resources and healthy people. The delivery of these benefits is also affected by changes over time. For example, local emissions affect global carbon and climate cycles. This is shown in the arrow at the bottom of Figure 1.

Considering fire through the system lens highlights the multiple interactions and influences that are required to deliver multiple benefits. Focusing on a single component of the system will not deliver the full range of potential benefits. Indeed, such a focus may negatively affect the health

of Indigenous people or undermine the Indigenous institutions that support their ability to light fires on country. Applying, adapting and rejuvenating Indigenous fire knowledge and landscape-burning regimes requires action in all the components of the system.

Figure 1. Indigenous fire knowledge within a social-ecological system



Chapter 3. Challenges and opportunities associated with using Indigenous fire knowledge to guide contemporary fire partnerships and programs

The regional workshops and national forum confirmed that Australian Indigenous communities are now applying, adapting and rejuvenating Indigenous fire knowledge and landscape-burning regimes, and many hope to incorporate this knowledge into contemporary fire programs. However, although fire management programs generate obvious benefits, such as carbon abatement, analyses of Indigenous fire management and carbon PES schemes have identified a range of ecological, economic, social and institutional challenges that can frustrate such efforts.

To add further complexity, the challenges and opportunities associated with Indigenous fire management projects vary across regions and between partnerships. In the Kimberley region, for example, workshop participants discussed the very different opportunities and challenges that exist for carbon and conservation fire programs in different communities (Appendix 2). In both the Northern Territory and Western Australia workshops, state-based legislative restrictions on burning that vary between tenures were cited as key challenges because they fragment the landscape and make it difficult to negotiate a collaborative burning program (Appendix 2 and 3).

Despite these challenges, however, on-country fire enterprise opportunities have enabled some Indigenous groups to develop well-designed and strategic approaches to fire. These approaches reflect considerable diversity, even at the local scale. Box 1 showcases how effective contemporary fire management within a single language group – the Olkola of Cape York - can utilize alternative structures, partners, and processes to meet management needs shaped by land tenure, institutional structures, and recent history. Key issues surrounding the incorporation of Indigenous knowledge into fire management activities and partnerships are summarised in reports from the regional workshops and the national forum (Appendix 1–4).

Based on the challenges and opportunities identified by workshop participants, the following sections identify key lessons for future fire management programs in five specific areas:

- Knowledge sharing
- The legal and policy context
- Savannah carbon fire programs
- Environmental fire programs
- Indigenous jobs, training and the community.

Box 1. Local diversity in fire management programs: Examples from Olkola country

Olkola people live in a range of locations across Cape York, including Kowanyama, Laura, Cooktown, Cairns and other north Queensland locations. The Kowanyama Aboriginal Council acquired one part of Olkola territory (the Oriners and Sefton pastoral leases) in the 1990s, and the long-established Kowanyama Aboriginal Land and Natural Resource Management Office (KALNRMO) has been managing these leases for cultural and ecological values since that time. In recent years, Olkola people gained ownership over a much larger portion of their traditional country through a government handback process. Five pastoral leases adjacent to and north of Oriners and Sefton are now owned and managed by Olkola people through the more recently established Olkola Aboriginal Corporation (OAC).

Both the KALNRMO and the OAC have established fire management programs that include carbon offsets. The Kowanyama offset program for Oriners and Sefton is facilitated by an external partner that directly participates in on-country burns, in collaboration with Olkola Traditional Owners and KALNRMO managers. The Kowanyama Aboriginal Council owns the pastoral leases, and the majority of the revenue accrues centrally. The offset revenue is a crucial resource for the ongoing management of Oriners and Sefton Stations. Olkola Traditional Owners and rangers undertake burning for the OAC program on adjacent Olkola land. The external partner does not participate in on-country activities, and its role is limited to remote assessments of the total offsets gained. Revenue accrues to the OAC and is currently the major source of operational funding for the corporation.

Both Olkola projects successfully accrued significant carbon offset funding in the 2015 fire season and are engaged in building ongoing governance, management and communication structures to manage fire in the future. Their different histories, roles and responsibilities reflect the potential for local diversity in fire programs.

Key lessons regarding knowledge sharing

In Australia, scientific and co-led Indigenous research has resulted in a more general understanding that within the regional parameters established by climate and topography, Indigenous fire regimes have played an interactive role in establishing and maintaining finer-scale landscape patterns. However, it is clear that popular approximations of Indigenous fire practices ignore the culturally embedded aspects of these practices that determine the right time for burning; the kinship relationships that determine who can light fires for country; and the knowledge of cultural sites and cultural resources that influence the pathways of fires at a very fine scale. There are also concerns that some of the Indigenous knowledge needed to burn country ‘the right way’ is being lost due to ‘not being on country,’ and that some communities may ‘lose [their] confidence to burn’ because of the need to accommodate ‘new rules for burning’ guided by programs and investors. For example, communities may be expected to burn for carbon, rather than ‘burning driven by what communities want’ (see Appendix 3).

Creating knowledge-sharing mechanisms that are co-designed with Traditional Owners and empower Indigenous decision-making for fire management was therefore highlighted as a key area of interest for Indigenous people involved in this review. For example, participants emphasised that walking the country together is still the best way to learn about Indigenous fire knowledge and benefit from other people’s experiences. In Indigenous communities, training in fire begins early and continues throughout people’s lives:

Fire walks were a natural thing in the past, nowadays we are fitting all those things in our work periods. [Fire walks] give me time to consider beginning of life, through ceremonies,

how it came together with neighbouring groups. I walk with my country-men and women ... Pick up by sharing with friend, participating in walks, all that. It is really sad that there is no more old people living with us ... We bring young people, teach knowledge to the kids... get out of the community, out in the bush. They can hear the tunes of the wild things, birds, animals. People on country can feel the spirits, can see the birds fly around (Dean Yibarbuk, Warddeken Land Management, national fire forum).

Strategic fire planning and operations have also matured significantly across Northern Australia. In the Northern Kimberly, for example, strategic burning is often based around clan estates or cultural sites which also determines the location of strategic blocks/firebreaks (see Appendix 2). Scientific and Indigenous knowledge have been used to inform on-ground programs to create a mosaic of burnt and unburnt areas by the time the wet season rains start (Appendix 1).

Peer-based learning was also emphasised as a key mechanism for Indigenous fire practitioners to learn from each other. For example, Cape York NRM has held four Cape-wide fire workshops for Indigenous fire practitioners during the past five years, emphasising peer-to-peer knowledge sharing and creating opportunities for the collaborative governance of regional fire regimes. These are highly valued by Indigenous fire practitioners and leaders across Australia. At the national fire forum organised as part of this project, participants reiterated the value of mechanisms such as workshops. John Clark from Kowanyama, for example, reflected on how these mechanisms can build a systems-based approach to incorporating Indigenous knowledge into fire management programs and partnerships: 'Forums like this you learn a lot ... [I]t is good to get together with rangers now here, would be better with elders as well, get the experience. Need more girls too, more female rangers, not only men have knowledge of fire, so have the ladies' (Appendix 1, p. 15).

Participants at the national forum and regional workshops (Appendix 1–4) also highlighted the following points:

Knowledge partnerships involve 'sharing knowledge' and 'respect' between elders, rangers, neighbours, scientists, representative organisations and fire management investors (e.g., Landcare, TNC, carbon market investors) in order to manage 'country today.'

Knowledge partners include scientists, neighbours and community groups.

Knowledge sharing is aided by 'getting practitioners together out on country to share lessons and experiences.' Knowledge-sharing methods include innovative techniques and applications that are built between Indigenous and non-Indigenous partners, such as:

- Videos recording elders and younger clan members demonstrating their knowledge and knowledge transmission whilst on country. Repetition of interactions in situ allows country to speak to the people and people to speak to country, and it is an important element of Indigenous fire knowledge. This knowledge-sharing method also facilitates grassroots Indigenous-identified action led by Indigenous people, directed by their elders.

- Efforts to co-monitor species and habitats to guide burning regimes and improve habitats for key species, such as the Gouldian Finch partnerships in the Northern Territory and the Kimberley.
- Fire decision-support and reporting tools to assist with fire planning, the coordination of activities and reporting efforts.
- Two-way measures of fire (largely informal) that enable partners to record the multiple benefits of right-way fire, including environmental, cultural and economic benefits.

Based on the literature review, individual and small-group interviews, focus groups, regional workshops and the national fire forum this review can distill four key lessons regarding fire knowledge sharing

1. **Indigenous peer-based knowledge sharing** on country, for example through “fire walks”, promotes and grows Indigenous knowledge which is highly valued by Indigenous fire practitioners and leaders across Australia, and critical to effective partnerships.
2. **Knowledge sharing between Indigenous and non-Indigenous fire experts and practitioners** are key to managing contemporary landscapes. These can be formal or informal and need to be co-designed with Traditional Owners and empower Indigenous decision-making to effectively support Indigenous fire management partnerships.
3. **Knowledge sharing relationships are key for collaborative and adaptive management.** They inform partnership negotiation, design, and the monitoring and evaluation of the multiple benefits, risks, opportunities and practices of Indigenous fire management projects and partnerships.
4. **Successful Indigenous fire knowledge practices and partnerships** are embedded in and influenced by knowledge about people, country and fire institutions. Systems thinking can help link Indigenous and non-Indigenous knowledge and facilitate knowledge partnerships.

Key lessons from the legal and policy context

Informed by both local political and legal activism and by wider international developments in sustainable cultural and ecological biodiversity (see Wiessner, 2011), a series of legal developments from the 1960s onwards commenced the recognition of the active role Indigenous people play in managing land and natural resources, including fire. Although the Gove land rights case was unsuccessful,² it laid important foundations in Australian jurisprudence and prompted recognition of Indigenous people’s systems of law and custom. While noting the existence of Yolngu ‘customary law,’ the court held that Australian governments were not bound to follow this pre-existing customary system.

² *Milirrpum and Others v Nabalco Pty. Ltd. and the Commonwealth of Australia* (1970) 17 FLR.

Following this case, the Woodward Inquiry (ALRC, 1974) examined the issues affecting recognition of Indigenous people's land interests alongside the interaction with other land uses and conservation management. Justice Woodward's recommendations led to the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth), which provided an important mechanism for Indigenous communities to gain control of land and associated natural resources. However such comprehensive statutory recognition was restricted to the Northern Territory.

In 1992, the Australian High Court recognised the prior existence of native title across the continent in the 'Mabo' decision,³ reversing more than two centuries of the settler colonial presumption that the land was empty of property rights prior to the arrival of the colonisers. Native title law subsequently developed through a series of legislative decisions and legal responses, creating a pathway for Indigenous recognition by settler colonial law that enabled limited rights in property and natural resources. This legal and political development also sparked a rapidly growing area of scholarship focused on various aspects of Indigenous native title and co-management regimes, including aspects of Indigenous fire practice, knowledge and management systems. Mabo finally rebutted the notion of 'terra nullius'—the legal fiction that underpinned a failure to recognise pre-existing Indigenous systems of law and custom in Australia. A patchwork of state, territory and federal recognition of Indigenous people's tenure interests across Australia has left Australian Indigenous people with varying degrees of protection for their traditional rights and interests. This patchwork system also sets different pathways for using traditional rights and interests as a basis for participating in land and water-management activities.

The protection of Indigenous groups' intellectual and cultural knowledge has been a focus of international policies and forums centred on sustainable development. Indigenous people in Australia have long asserted that existing systems for the protection of intellectual property rights do not provide adequate recognition or protection of their cultural products and expressions. Much work has been done, and cases litigated, with respect to Indigenous people's traditional knowledge and intellectual property in relation to the arts sector. (See, for example, the 'carpet cases'; *Milpurruru v. Indofurn Pty Ltd*, 1994, 130 ALR 659.) A range of international instruments, standards and targets have also been developed that acknowledge Indigenous and local people's knowledge as a key platform for managing and conserving biodiversity and ecosystems, including UNESCO efforts on the protection of 'folklore,' and the 1985 draft *sui generis* Model Provisions for National Laws for the Protection of Folklore Against Illicit Exploitation and Other Prejudicial Actions. Notably, Article 31 of the United Nations Declaration on the Rights of Indigenous Peoples states:

Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games, and visual and performing arts. They also have the right to maintain, control, protect, and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.

³ *Mabo v Queensland No. 2* (1992) 175 CLR.

Indigenous knowledge has also become a key feature of targets contained in the Convention on Biological Diversity (CBD):

By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels (Aichi Target 18; CBD, 2011).

This target reflects Article 8(j) of the CBD, which requires nation-state parties to:

Subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilisation of such knowledge innovations and practices.

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) goes some way towards implementing Article 8, recognising the concept of Indigenous people's traditional knowledge and providing a framework for certain benefit-sharing arrangements with respect to biological resources on Commonwealth land. A key justification for the need to protect traditional knowledge is the recognised value of the expertise and practices of Indigenous communities in terms of the development of sustainable economies. However, a review of the existing literature highlights that existing legal instruments and Anglo-Australian concepts of proprietary ownership are too blunt to recognise and protect the inherently complex systems of Indigenous knowledge and its 'ownership.'

Given this history of Indigenous–state interactions and assumptions, it is perhaps not surprising that cross-cultural approaches to fire co-management have been subject to tensions. Nonetheless, recent changes in legislation have allowed for limited and varied aspects of Indigenous fire knowledge and management to continue across Australia. However, Indigenous fire management partnerships may not always be expressions within a system of Indigenous law, and they are sometimes categorised as components within environmental, climate change and land rights legislation. Conversely, a number of Indigenous groups conceptualise fire projects as an expression of traditional cultural practice and responsibility, with an incidental commercial benefit that enables activities to be subsidised through the sale of carbon or environmental benefits associated with traditional activities.

With the recognition of native title, new opportunities have arisen for Indigenous law to be recognised in terms of a coherent Indigenous system of tenure and knowledge. Lasting and holistic agreements arising from native title process are still in their early phases, but some criteria and frameworks for permanent and binding local and regional co-management agreements have been established across the continent. A key challenge that remains in relation to fire management partnerships relates to equitable benefit sharing. Indigenous Australians continue to call for unique law and policy to protect Indigenous Australians' traditional knowledge and cultural expressions (Janke, 2003).

Australia's High Court has found an inability under the *Native Title Act 1993* (Cth) to recognise a right to maintain, protect and prevent the misuse of cultural knowledge of common law native title holders (*Western Australia v. Ward*, 2002, 191 ALR 1). This decision adds to growing consensus that unique laws and policies (or protocols) are needed to more adequately address the recognition, protection and appropriate valuation of Indigenous people's ecological knowledge in Australia. The fact that significant areas are 'owned' or managed by Indigenous Australians further emphasises the need to re-evaluate the role of Indigenous people and their expertise in the management of Australian landscapes. According to various sources, this area ranges from 30% to 45%, depending on the degree to which shared management arrangements are considered (Hill et al., 2013).

There is potential for inconsistency in the treatment of Indigenous fire practices through the application of Australian legal instruments. For example, the unique Indigenous fire practices of rainforest Indigenous people in the Wet Tropics of Queensland World Heritage Area (WTWHA) were listed as nationally significant under the EPBC Act in 2012. This listing provides protection for these fire practices as a matter of national significance. At the same time, however, the state of Queensland negotiated Indigenous land use agreements over parts of the WTWHA that restrict Indigenous fire practices to weed control. This restriction is not consistent with the listing of these fire practices as protected under the EPBC Act (Hill et al., 2014).

There are opportunities to build on previous work and models, including in relation to protecting Indigenous people's cultural knowledge, and Australia's national environment law potentially provides a key lever in this regard. The objectives of the EPBC Act include recognising 'the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity and [promoting] the use of Indigenous people's knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge' (EPBC Act, Sections 3(1)(f) and 3(1)(g)). In order to achieve these and other objectives, the statute expressly promotes 'a partnership approach to environmental protection and biodiversity conservation through ... recognising and promoting indigenous peoples' role in, and knowledge of, the conservation and ecologically sustainable use of biodiversity' (EPBC Act, Section 3(2)(g)(iii)).

Ensuring traditional knowledge is better protected and valued in fire management partnerships will require a reconciliation of established proposals relating to the protection of Indigenous people's traditional knowledge and/or intellectual property (including lessons learned in the development of the Indigenous Art Code) with existing policy and statutory levers and foundations, such as those found in the EPBC Act. As highlighted in our workshops and literature review, State-based fire permits, tenure arrangements and diverse institutions for broad-scale fire mitigation, often impede Indigenous customary fire practices, historically operating at fine-scale in the landscape through extended family groups. Developing balanced, respectful and appropriate measures, protocols, laws and/or policies is crucial to creating solid fire management knowledge partnerships and knowledge-sharing methods.

Based on the literature review, individual and small-group interviews, focus groups, regional workshops and the national fire forum this review can distill three key lessons regarding the legal and policy context of Indigenous fire management activities and partnerships.

- 1. The protection of Indigenous groups' intellectual and cultural knowledge** has been a focus of some international and national policy forums and provides important levers for ensuring traditional knowledge is better protected and valued in fire management partnerships
- 2. A series of legal developments** and policy changes have enabled better recognition of the active role Indigenous people play in managing land and natural resources, including fire and the responsibilities land holders have to sustainable landscape burning practices.
- 3. There is inconsistent translation of legal and policy instruments** that support innovative Indigenous fire knowledge translation into programs and practices across the continent.

Key lessons from environmental fire management projects and partnerships

Indigenous people engage in environmental management with multiple stakeholders, including governments, scientists, producer groups, conservationists and others, through a range of partnerships and mechanisms. This includes fire projects, which form part of a broader portfolio of activities derived from investments focused on supporting Indigenous land-management projects throughout Australia.

In Northern Australia, fire is a critical feature of Indigenous Protected Areas (IPA) planning and Indigenous land-management activities (Hill et al., 2016). As the NESP 5.1 project investigating research priorities for IPA highlighted, better understanding is sought of aspects and features of these partnerships in order to support:

- The coordination of fire, feral animal and weed control across programs, tenures and groups
- Fire for protecting multiple cultural and natural values
- Partnerships across government, private companies and Indigenous groups that agree on prescribed burning programs and maintain cultural and environmental values (Hill et al., 2016).

Indigenous people engaged in joint-managed parks have encountered some unique opportunities to apply their fire knowledge, but have also found some aspects particularly challenging (Box 2). Understanding one another is often a key challenge. Non-Indigenous fire managers need to understand Indigenous fire management priorities, and vice versa. This may mean that partners have to accept burning at certain times and in certain places that they would not choose themselves. Respectful, collaborative and adaptive approaches to building landscape-burning governance and management regimes are critical to managing this challenge.

Box 2. Indigenous fire knowledge and management, and partnership issues in national parks

In some joint-managed national parks, fire management has enabled Indigenous people to exercise control over their fire knowledge, put it into practice and pass it on to the next generation. However, there are some challenges across Northern Australia, where:

- The burning practices of Indigenous and non-Indigenous people and park managers are affecting key species, habitats and values.
- Uncontrolled burns are creating distrust among fire managers, which is complicating efforts to negotiate future burning activities.
- Indigenous people are concerned that park staff are ignoring their fire knowledge, and that they are being excluded from fire decisions and activities on park estates.
- Local negotiations have been challenged by broader national and international obligations and pressures, which, according to one park staff member, have stopped 'local collaborative and adaptive regimes [being] trialed.'
- Indigenous people and park staff sometimes assign different priorities to the importance of burning. For example, if credits accrue to Indigenous carbon managers burning in a park, they may consider appropriate burning a high priority. For park staff, however, a range of other management or institutional objectives may result in less attention to burning.

'Fire can be thought of as a good signal of how well parks partnerships are going ... If burning regimes are not negotiated and going wild, you know that relationships need some work ... The trouble then is that wildfires erode the partnerships between TOs and park staff even further ... Burning together is key to building the trust, communication and good fire practice needed. Start small, evaluate together and bit by bit a good fire regime can be created' (Indigenous park staff, Northern Territory).

For more details, see Appendix 1–4.

There is also potential for the cross-scale interactions of institutions to impede the ability of Indigenous peoples to negotiate contrasting goals and motivations in fire management. For example, in Kakadu National Park, Petty et al. (2015b) have highlighted how the basic institution of land management *Gunmugugur*, (a patrilineal group comprising several family units), operates at a fine scale to mediate fires in the landscape for a variety of purposes throughout the year from when vegetation will first carry fires after the summer wet months, without an apparent bias towards early dry season burning. Program and policy in Kakadu have operated at a much broader scale, in response to a range of both Indigenous and non-Indigenous social and institutional factors, and have gradually homogenized the fire regimes so that most fires occur predominantly in the dry season, a much coarser outcome than delivered in the past through *Gunmugugu*. Traditional Owners have some distrust of and concern about this coarse outcome, and some advocate return to burning through walks on the ground (Petty et al. 2015a).

Co-management arrangements: Case studies in the Queensland World Heritage Area and Kakadu National Park

Co-management arrangements entered into by Indigenous people enable them to a greater or lesser extent, include customary lore and practice in the template for contemporary co-management dialogue with government management programs. These institutions also provide a mechanism for entering into wider agreements, such as World Heritage conservation agreements. Two important examples of this are the agreements operating in the Wet Tropics of Queensland World Heritage Area and in Kakadu National Park in Australia.

Wet Tropics of Queensland World Heritage Area (WTQWHA). In 2005, negotiation of a regional agreement between rainforest Indigenous people and the Australian and Queensland governments produced a framework for recognising and protecting the rights, interests, cultural values and practices of Indigenous people in the WTQWHA (WTRA, 2005). Rainforest Indigenous people, supported by government resources, led a process that culminated in nominating cultural values for national heritage listing (Hill et al., 2011). Among these, fire management practices were identified as a key technological innovation that enables rainforest occupation (ARC, 2007). Rainforest Indigenous people developed specific uses of fire to manage and alter their rainforest home, including the purposeful use of fire to alter vegetation communities and plant-specific techniques to control the lawyer vine. These practices are the expression of technical achievements that made it possible for Indigenous people to live year-round in the rainforest of the wet tropics, and they have now been listed as of national significance under the Environment Protection and Biodiversity Conservation Act (1999) as ‘official values’ of the WTQWHA⁴ under Criterion F.⁵

However, demonstrating the tensions associated with incorporating Indigenous fire knowledge, the fire management practices that are now specifically listed as a cultural value of national heritage significance are still actively suppressed in WTQWHA management. One particular set of barriers is associated with the institutional structures and management processes of national parks:

We have sections in the Wet Tropics area or in the rainforest that we’ve been burning off for thousands of years and when we want to go back and practice our traditional burning, National Parks always put a red tape around us burning ... how can we sort of negotiate with National Parks to keep traditional knowledge going? (Working Group comment, Warrama Summit, November 30, 2013)

As this highlights, arrangements made by national park management do not always fully support Indigenous fire practices under customary institutions (Hill et al., 2014).

There are also constraints associated with Indigenous land use agreements (ILUA). Although these are intended to facilitate the expression of native title aspirations and rights, they do not always function effectively with respect to fire management:

We’re getting nothing out of native title. They started discussing 500 blocks with us. Now we’ve got 185 with exclusive possession, only 19 freehold, but they turned around and put national parks with ILUA over it. And that ILUA stops us doing our traditional burning, burning only for weeds (Girringun sub-regional workshop, November 2013).

⁴ Information on the Wet Tropics Heritage Area can be found here: http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=place_name%3DWet%2520tropics%3Bstate%3DQLD%3Bkeyword_PD%3Don%3Bkeyword_SS%3Don%3Bkeyword_PH%3Don%3Blatitude_1dir%3DS%3Blongitude_1dir%3DE%3Blongitude_2dir%3DE%3Blatitude_2dir%3DS%3Bin_region%3Dpart;place_id=106008

⁵ Rainforest Indigenous people also developed a specialised and unique material culture to process toxic and other plants, including bicornual baskets made from lawyer vine, grooved grinding slabs, crushing stones, anvils pitted with small hollows, hammer stones and polished waisted stone axes called ooyurkas. Evidence of the diverse and complex range of techniques used to process these plants remains, including ground ovens to soften toxic nuts and certain streams that leach out the toxins. They use at least 14 toxic plants as food—an unusually large number in the Australian context. Most of these plants are distributed throughout the rainforest, and each tribal group uses toxic plants found within their own country. The technical achievements that allowed rainforest Indigenous people to utilise toxic plants are of outstanding heritage value to the nation.

In part, this issue reflects tension between objectives associated with conservation science and those understood to be critical from the perspective of Indigenous Traditional Owners:

There's a clash between scientist and TO burning ... we are not yet at the point of running fire management according to our customary law. It's not at that point yet, it's more a 'watered-down version' because we are doing it in partnership (Girringun sub-regional workshop, November 2013).

Kakadu National Park. Kakadu has long been heralded as the 'blueprint' for joint management arrangements that balance Indigenous land rights and conservation issues (Woenne-Green et al., 1994). As wildlife researcher Michael Ridpath noted, Indigenous knowledge of fire management was a key focus of early interest because:

Old men are still alive who must remember the regimes they once regularly employed. There is still time, though not much, for the unique information they possess to be recorded. Such data would be of great interest in itself and possibly even of some practical use as a guide to the maintenance of certain plant associations (Ridpath, 1979, p. 65).

However, when American anthropologist Henry Lewis studied fire relations between Traditional Owners and park rangers soon after the park was established in the late 1980s, he observed the difficulties of putting joint management into practice, as rangers and Traditional Owners struggled to reconcile different philosophies and approaches to fire. Lewis noted:

[Non-Indigenous] park personnel at Kakadu ... must, for most months of the year, come to terms with a situation involving the uses of fire by resident Aborigines and non-resident Aborigines on their way to and from Arnhem Land, as well as fires carrying over from nearby cattle stations, buffalo hunters, mine officials and employees, and the occasional tourist (Lewis, 1989, p. 945).

Two decades later, Petty et al. (2015 a and b) reported that there was still a strong perception that too much of Kakadu is being burned, much of it incorrectly. Tensions between Traditional Owners and park rangers over who should manage landscape burning also persisted. For instance, some linked the rapid and severe decline of native small mammals in Kakadu National Park (Woinarski et al., 2010) and damage to rock art sites to wildfires⁶ (Woinarski et al., 2011). In October 2015, tensions flared again when a fire lit to manage weeds burned through 14,000 hectares of the park. Only 31% of the park had been treated with a patchwork of low-impact fires (Price, 2015), and Northern Land Council CEO Joe Morrison called for more support for Traditional Owners to directly manage fire in Kakadu (Northern Land Council, 2015).

The Aboriginal Carbon Fund reports that it is currently brokering a fire-abatement carbon project in the Kakadu region (<http://aboriginalcarbonfund.com.au/blog/2016/5/19/summit-showcases-growing-aboriginal-carbon-industry>). This has raised some concerns among park rangers who will need to understand and co-manage another landscape-burning regime, and it may be difficult to negotiate with Kakadu park managers (see Appendix 1 and 3). Allowing sufficient resources and time to develop appropriate governance arrangements and ensuring

⁶ For example, see http://blogs.abc.net.au/nt/2012/07/kakadu-on-the-verge-of-extinction.html?site=darwin&program=darwin_drive

that the negotiations to address current concerns recognize and support appropriate linkages between local, national and international institutions will be critical to arriving at mutually-agreeable solution (Petty et al. 2015a and b).

As these Wet Tropics and Kakadu case studies highlight, conservation agreements are a key mechanism for formally recognising Indigenous fire knowledge and management. However, 'in principle' recognition does not always lead to successful incorporation of fire knowledge or the ongoing empowerment of Indigenous fire knowledge holders and fire managers. This potential for both recognition and suppression is also evident in carbon abatement programs (discussed below).

Based on the literature review, individual and small-group interviews, focus groups, regional workshops and the national fire forum this review can distill four key lessons regarding environmental fire management projects and partnerships

- 1. Effective projects and partnerships must be based on acknowledgement and respect for both extant Indigenous knowledge and skill, and the need to (re)build effective, practical and innovative knowledge from available knowledge systems.** Without respect for quality knowledge that addresses fire management concerns and interests the untutored burning practices of Indigenous and non-Indigenous people and park managers can lead to uncontrolled burns in protected areas, build mistrust between among fire managers, and adversely affect key species, habitats and values.
- 2. Conservation agreements provide a significant opportunity for practical recognition of Indigenous fire knowledge and management.** Even so tensions between Traditional Owners and park rangers can persist over fire knowledge credibility, use and priorities making management authority, planning and implementation contested.
- 3. Interactions between international, national and state /territory laws and policies can impede the operation and continuity of Indigenous customary institutions.** Conservation agreement-making needs to facilitate appropriate partnership relations that enhance Indigenous knowledge systems, capture environmental imperatives, and harness partnership values to operate at multiple scales.
- 4. Efforts to assist non-Indigenous fire managers to understand Indigenous fire management priorities, and vice versa are critical** for building collaborative and adaptive landscape burning regimes and should be appropriately and equitably resourced.

Key lessons from savanna carbon projects and partnerships

Across Australia and internationally, financial incentives that encourage landowners and managers to apply their knowledge in order to maintain biophysical services from well-managed ecosystems have become powerful tools. In particular, PES schemes—defined by Tacconi (2012, p. 29) as ‘transparent system(s) for the additional provision of environmental services through conditional payments to voluntary providers’—have become a key feature of Indigenous cultural and 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, many have highlighted that Indigenous rights and cultural services need to be considered when negotiating Indigenous benefits from PES schemes (Fitzsimons et al., 2012; Robinson et al., 2016b).

In Indigenous Australia, the largest and highest-profile example of the wider PES market is the carbon abatement sector. National law that established Australia's Emission Reduction Fund as part of a broader carbon farming scheme, created 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 enshrine set parameters for burning which can change the timing of the burning and reduce the total area burned, re-establishing fire regimes closer to traditional Indigenous practice than prevailing regimes dominated by wildfire. Indigenous communities and their organisations across Northern Australia have taken up opportunities to earn carbon credits through voluntary and Carbon Farming Initiative/Emissions Reduction Fund PES agreements with some enthusiasm. By the end of 2015, 10 projects working over several million hectares of mostly Indigenous held land were contracted to deliver credits to government that included penalties for under-delivery.

Legal and policy lessons vary depending on the state or territory in which fire projects are located, and the land tenures on which they are conducted. Across the top end, there are examples of fire projects on Aboriginal Land Rights Act land, Indigenous freehold land held by Indigenous Land Corporations, and native-title land, such as with the Kimberley savanna-burning carbon abatement projects. However, common challenges include understanding the legal requirements relevant to generating income from carbon projects, as well as challenges associated with governance, planning and contracting services needed to undertake projects. There is also considerable uncertainty around changing government policies on land and biodiversity management, funding arrangements and carbon project recognition at local, state/territory and federal levels.

Indigenous and non-Indigenous Australians conceptualise and use fire differently and have different cultural relationships with fire, and this should influence policy approaches and risk assessments in project partnerships. Ignoring these differences and adopting a 'one size fits all' and 'lowest cost carbon abatement' approach challenges the feasibility of projects, particularly requirements around insurance, audits and fire reports. International carbon credit mechanisms have adapted to cater for the realities of small-scale projects, varying reporting and other obligations [see for example the simplified modalities and procedures for small-scale clean development mechanism project activities]. The Australian legal and policy realm could take similar steps to create more tailored processes to widen the pathways for Indigenous participation in emerging conservation economies. Creating long-term sustainability in this space requires partnerships to deliver multiple benefits to local Indigenous communities, states/territories and the broader Australian public. Appropriately recognising, valuing and protecting Indigenous people's traditional expertise, customary connection and rights to land is a key pillar in strengthening this space. However, it remains a key challenge in fire management partnerships, along with the development of 'co-benefit' investment and industry sector support.

The carbon abatement method and Indigenous knowledge incorporation

The savanna fire management carbon abatement Methodology was developed through Indigenous partnerships with the science and policy community to enable the engagement of Indigenous fire managers in Australia's carbon economy.⁷ The carbon economy was designed to help Australia meet its commitments to reduce greenhouse gases under the Kyoto Protocol (United Nations Framework Convention on Climate Change, 1997). Following the introduction of a carbon pricing scheme and legislative framework for generating and trading Australian Carbon Credit Units (ACCUs), the Australian government has established its Emissions Reduction Fund to enable the Government to purchase ACCUs from a variety of projects (beyond the land sector). The Emission Reduction Fund is a reverse auction mechanism aimed to maximise its acquisition of ACCUs at the lowest cost to try and meet its Kyoto obligations by 2020. The Australian government has approved the savanna-burning emissions abatement Methodology for areas in the north of Australia with above 600mm annual rainfall. Savanna fire managers currently use the Abatement Methodology to abate CO₂ 'equivalent' greenhouse gas emissions (Australian Government, 2012a) and will, with the development of complementary Sequestration Methodologies within 18-24 months allow project owners to account for carbon storage in savanna biomass also, based on the same fire management regimes.

The savanna-burning methodology is based on Indigenous burning knowledge and practices, and it was designed to maximise Indigenous engagement and value within contemporary contexts, where people's daily occupation of all their traditional territory is no longer possible. Those involved in developing the savanna-burning methodology focused on the relationship between Indigenous people and fire, including both the changes in fire regimes that have occurred since Indigenous occupancy (Russell-Smith et al., 2003), and the impact of changing fire regimes over the past 200 years of colonisation (Bowman, 1998; Bradshaw et al., 2013). The practical aim of the methodology is to engage Indigenous land managers in a carbon economy that aligns with the interests and seasonal practices of Indigenous fire managers, and that provides economic opportunity for Indigenous people to independently fund the proper management of their customary lands.

The West Arnhem Land Fire Abatement (WALFA) project is one example of a successful abatement program incorporating Indigenous knowledge. This project manages 28,000 square kilometres of the western Arnhem Land escarpment as an Indigenous carbon offset agreement with Conoco-Phillips's liquefied natural gas plant in Darwin. Key elements of the WALFA project that are relevant to Indigenous fire technologies include the following:

- Senior Indigenous landowners drove the establishment of the initiative, including initiating conversations with scientists about changing the fire regimes
- Elders identified 'burn-early' as the key change required, with key concerns about damage to cultural sites and other undesirable changes.
- Indigenous rangers use helicopters for aerial ignition across extensive areas of land
- Senior custodians and rangers work together to plan the aerial ignitions beforehand (Russell-Smith et al., 2013)

⁷ The Emissions Abatement through Savanna Fire Management Methodology continues to be refined.

- Traditional Owners have formed business entities to manage the commercial abatement contracts (Conoco and ERF), the benefits of which they undertake a plethora of activities to fulfil their more holistic interests in caring for their country.

Having prioritised ‘early burning’, the first six years of the project witnessed a shift from a late dry season wildfire regime (August–November) to an early dry season fire regime (April–July), as well as a slight reduction in the area burnt annually (Price et al., 2012). While this outcome met the prime concerns of the senior Indigenous land owners very successfully, it also triggered further discussions about promoting opportunities for other dimensions of Indigenous fire knowledge and practices to be promoted, and strengthened. Marum (2014) identified that lack of skills in Indigenous language by most within the WALFA fire abatement network had limited effective communication within the on-ground cross-cultural context. This deficit together with lack of effective locally-tailored training had resulted in ongoing dependency relationships that impeded engagement of Indigenous knowledge across institutional and governance aspects.

It should be noted, however, that the WALFA project has a different history and land tenure basis than other Indigenous carbon abatement projects across northern parts of Australia. The North Kimberley Fire Abatement Project (NKFAP), for example, utilises native title interests as a basis for generating carbon credits, and at the time of this review, it was the only carbon abatement project registered under the Carbon Farming Initiative (CFI) using native title rights and interests. The NKFAP is an ‘emissions avoidance’ CFI project, which uses established savanna fire management methods to generate carbon credits. The savanna-burning emissions abatement methodologies are tenure blind and relate to fire management, not to carbon rights like the later sequestration methodologies. Qantas’ involvement with the NKFAP was highlighted in the Kimberley workshops as a very successful fire project transaction. (Appendix 2). Income from the sale of carbon credits by NKFAP participants has provided revenue for a combination of aerial ignition and fire renewal and revival in the landscape through on-ground activities, including “fire walks” that engaged senior custodians and Rangers together in locating and protecting cultural sites. There is concern amongst Indigenous people in the Kimberley that the current carbon price under the ERF is insufficient to support comprehensive benefits delivered by the application of Indigenous fire knowledge. The role of supplementary partnerships may therefore become increasingly important.

Benefits and co-benefits

To a large extent, enthusiasm for carbon abatement projects stems from the benefits and co-benefits they can deliver to Indigenous communities (Robinson et al., 2016a, 2016b). These projects enable a voluntary transfer of incentives to Indigenous communities providing ecosystem services, and voluntary participation has provided a valuable pathway for supporting wider Indigenous on-country enterprises (Whitehead et al. 2009). NGOs and corporations have recognised such projects as key mechanisms for meeting offset standards and their co-benefit requirements, and have engaged in PES partnerships with local Indigenous communities to deliver carbon offset projects (Robinson et al., 2016a, 2016b).

The benefits of these schemes are well recognised within Indigenous communities. As the then Balangarra Aboriginal Chair Cissy Gore-Birch-Gault explained, the carbon project and partnership ‘is empowering our community to develop a sustainable future, built on traditional knowledge and connection to country. It has created jobs and is driving positive social change

in our communities' (KLC Media Release, 2014). Analysing the WALFA project, the Aboriginal and Torres Strait Islander Social Justice Commissioner (ATSISJC, 2008) noted that it:

- Enabled collaboration between the five participating ranger groups and the coordinating body—the Northern Land Council
- Was co-funded by the Australian Government's Community Development Employment Project and the Natural Heritage Trust, as well as Conoco-Phillips, reflecting support from public and private sector interests
- Supported local-scale, on-ground burning by rangers in vehicles and on foot, as well as aerial burns
- Made payments directly to rangers' bank accounts, enhancing economic independence
- Enabled people to get back on country with their families as part of the ranger program, providing opportunities for elders to pass on knowledge of language, place names and stories and teach painting to youth while on country
- Generated well-being benefits, such as increased self- and cultural esteem for the rangers, who in turn could act as positive role models in the community
- Facilitated the development of social capital through opportunities to meet with other rangers, Northern Land Council staff, scientists, government and corporate staff associated with WALFA
- Provided opportunities for rangers to engage with the 'dominant paradigm' of settler colonial society in a way that celebrates and engages with their roots (ATSISJC, 2008).

Based on the benefits derived thus far, NAILSMA and a number of partners have proposed an extension of the WALFA project approach in other areas to include additional components of Indigenous fire systems (Fitzsimons et al., 2012). This includes:

- Whole-of-country planning to capture a diversity of values and income potential, including carbon farming where appropriate
- Governance arrangements that reflect local contexts and customary institutions
- A greater focus on social and cultural aspects, in addition to environmental and economic concerns
- Participatory mapping of key biodiversity assets, cultural relationships, boundaries, sites and layers of landscape meaning to underpin measurement of biodiversity and cultural outcomes based on both science and Indigenous knowledge
- Use of effective participatory tools, such photos and voice and video recording
- Development of social, cultural and biodiversity 'credits' for potential sale in PES markets (Fitzsimons et al., 2012).

The ability to apply local fire knowledge is a crucial ongoing aspiration for successful Indigenous carbon abatement, conservation and other PES programs (Table 1), primarily because of the substantial array of benefits that can be delivered by such engagement. However, different benefits from carbon-offset projects are often hard to balance. For example, issues can arise when the institutionalisation of Indigenous fire management leads to a pattern of simplification and diminution of local knowledge and practices (cf. Petty et al., 2015). The

costs of carbon abatement projects can be greatly increased when invasive fire-prone weeds transform landscapes, and the presence of weeds like gamba grass (*Andropogon gayanus*) pose a financial risk that highlight the need for flexibility in program goals and incentives (Adams and Setterfield 2013).

Table 1. Indigenous community motivations to participate in carbon-offset project opportunities in Australia.

Indigenous organisations with access to higher levels of land rights, resources and relevant expertise	Indigenous organisations with access to lower levels of land rights, resources and relevant expertise
Safeguard local landscapes and livelihoods benefits	
<p>Build community well-being and strengthen cultural resilience through increased involvement in decision-making and management of commercial activities on Indigenous land</p> <p>Payment for ecosystem services that restore connections to Indigenous country, preserve and develop Indigenous knowledge, and improve landscape health</p>	<p>Connect community members with potential training and employment opportunities offered by carbon offset activities</p>
Develop partnerships that enable local communities to provide informed consent and maintain decision-making authority	
<p>Build community capacity, with a focus on developing legal and administrative structures and sourcing and collating specialist knowledge related to legislation and carbon rights</p>	<p>Build community capacity, with a focus on community engagement to ensure carbon project opportunities build on existing education, consultation and training structures and initiatives</p>
Deliver sustainable development benefits to the region and broader Australia	
<p>Manage or restore habitats or species that sustain Indigenous social-cultural-ecological systems</p> <p>Address concerns about climate change impacts on Indigenous communities, territories and broader Australia</p>	<p>Access and co-manage areas in order to build relationships with neighbouring land owners and help restore agreed priority habitats and species</p> <p>Address concerns about climate change impacts on Indigenous communities, territories and broader Australia</p>

Source: Robinson et al., 2016b

Opportunities for engaging in PES projects through fire management are best supported through cooperative relationships between neighbouring, regional and trans-regional Indigenous land owners/managers. Issues surrounding the integration of local/regional Indigenous knowledge systems and enterprises into service delivery and fire management institutions also highlight that Indigenous fire knowledge is not isolated from other elements of organisation, decision-making and innovation that Indigenous land managers bring to PES agreements and delivery (see Box 3).

Box 3. Summary of key challenges facing Indigenous carbon projects and partnerships, identified in interviews and regional and national forums

High costs and marginal returns from carbon markets

Carbon enterprises are varied and uncertain. There was some interest in keeping carbon projects ‘run by the community and not through a broker,’ and some suggested that a ‘structure and pathway for an Indigenous carbon industry is needed.’ Concerns were voiced that communities are sometimes engaging in carbon markets ‘without doing [a] proper budget that accounts for all the costs in keeping savanna burning projects viable.’ Viable projects from Indigenous perspectives support strengthening of all aspects of the fire knowledge system (including institutions and social connections), not just carbon abatement. Participants also noted that there is limited access to voluntary market and international standards, as well as an over-dependence on carbon commodity.

Land tenure arrangements and permit arrangements

Accessing roads on neighbouring pastoral leases, fire permits and licenses, and negotiating fire programs across multiple tenures with multiple partners and different objectives were all reported as creating fragmented landscape-burning programs. Cooperation is key "... We are building a regional approach to building fire management responsibility but it takes time and resources. Trust needs to be built and fire management mistakes have been made but we are building our partnerships from year after year." (Appendix 1). National and state legislation and laws need to adapt to allow space and support opportunities emerging in this PES economy, which provides important opportunities for implementation of outcomes from recognition of native title rights and interests.

Flexibility in savanna-burning abatement methodologies to accommodate climate, geographic and biophysical factors

The 1 August cut-off for savanna burning prescribed by the abatement method is problematic in many regions and does not accommodate different wet and dry seasons. Standards need to fit regional contexts, but ‘protocols are the same everywhere – encourage early burning to stop fighting fires late.’ For some regions and in some years, ‘August 1 is too early.’ There was also concern that ‘Indigenous groups are being given incentives to burn the country to the ground.’ Flexibility is also a key requirement to manage risks from invasive fire-prone weeds (such as gamba grass) which can have financial or project feasibility implications.

Maintaining levels of requisite resources in Indigenous communities

Indigenous and non-Indigenous fire practitioners report growing Indigenous community capacity to manage fire. The resources and capacity of ranger groups have grown, and fire management activities are generating income, getting people back on country and supporting more traditional burning. In many cases, it has taken decades to reach this capacity, but committed and well-resourced communities can achieve it. However, securing long-term resources for good fire management is difficult, including resources for training and employing fire officers, opportunities to share knowledge about good fire management practices with neighbouring groups, and scientific and technical expertise to manage fire so that it can achieve multiple benefits.

Recognition of Indigenous fire knowledge broadly and not just as “early dry season burning”

‘Savanna-burning carbon methodology is based on Indigenous fire knowledge (IFK) and practice.’ It is critical that Indigenous knowledge designs and drives the process. ‘This is not just about only using [IFK] – we need to take on other knowledge, but we can’t lose control of where, why and how we burn.’ ‘The balance between science and TK [traditional knowledge] is not where we want it to be.’ Burning for carbon was reported as ‘intense’ and ‘too frequent,’ and it was reported that it encourages Indigenous groups ‘to burn large tracts of country rather than smaller patch burning.’ There is a concern that communities will ‘rely on carbon to fund on-country enterprises ... and we know this market is uncertain.’

For more details, see Appendix 1, 2, 3, and 4.

Based on the literature review, individual and small-group interviews, focus groups, regional workshops and the national fire forum this review can distill three key lessons regarding savanna carbon projects and partnerships

- 1. Savanna carbon projects and partnerships collaboratively negotiated between Traditional Owners and other key partners can offer innovative on-country enterprises** that provide economic, social, environmental and cultural benefits for Indigenous communities and broader Australia.
- 2. There is growing Indigenous community capacity to manage carbon abatement projects.** This knowledge and capacity needs support so that prospective Indigenous land managers gain confidence to secure relevant agreements for savanna carbon projects, understand the legal requirements relevant to generating income from carbon projects and deal with the governance, planning and contracting services needed to negotiate and sustain agreed benefits from carbon abatement activities and contracts.
- 3. Flexibility in savanna-burning abatement methodologies** (to account for diverse local climate, geographic and biophysical factors) **and flexibility in the design of savanna carbon abatement partnerships** could enable Indigenous communities to undertake landscape burning across Northern Australia.

Key lessons for Indigenous jobs, training and the community

Fire activities create jobs for local Indigenous people that involve work valued by Traditional Owners and rangers. However, it is difficult to secure long-term resources for good fire management, and this was raised as a key issue at the regional workshops and national fire forum (Appendix 1–4). Necessary resources include resources for training and employing fire officers, opportunities to share knowledge about good fire management practices with neighbouring groups, and scientific and technical expertise to manage fire for different purposes.

Communities with very active fire programs report that a lot of community resources are needed to maintain fire projects and partnerships. As one participant noted, fire projects can ‘take up all our time, leaving us with less time to do other work that is important for the community.’ Concerns about elders’ health were also voiced: ‘We can’t put them on the fire line, but we need to keep them informed so they can guide us to burn the proper way.’ Some also mentioned the growing dangers associated with the work: ‘We could get a ranger killed trying to fight a fire to meet the mitigation. We never used to fight the fires, now we are spending all this money fighting them, turning the ranger group into a fire brigade.’

Nonetheless, a number of fire PES schemes and government programs have emerged, resulting in growing Indigenous community capacity to manage fire. The resources and capacity of ranger groups have also grown. As one Indigenous fire ranger at the Northern Territory forum explained: ‘We have turned unmanaged fire into managed fire.’ Fire management activities are generating income, getting people back on country and supporting

more traditional burning. In many cases, it has taken decades to reach this capacity, but the successes demonstrate that committed and well-resourced communities can achieve this goal.

However, there is concern that landscape-burning regimes may focus on efficient pathways rather than the multiple benefits locally driven fire regimes can and do provide. As one forum participant put it: 'Fire using helicopters may be efficient, but it is also important [for] Aboriginal people [to] get out on country so we can adapt our fire management practices based on how country is responding to our burning.' Engagement is ongoing to ensure that 'fire is done the proper way, and [that] the community backs the rangers in their burning efforts,' but 'sometimes the dollars are going against the TOs' needs – dollars in the bank are the co-benefit, caring for country and passing on knowledge are the main game' (Appendix 3). There are also concerns that carbon projects will encourage groups to bring in contractors 'who don't know country,' and that these contractors will 'get the skills we should be building in our community,' as well as the technical expertise needed to broker carbon markets and ensure compliance with methodologies.

Based on the literature review, individual and small-group interviews, focus groups, regional workshops and the national fire forum this review can distill three key lessons regarding for Indigenous jobs, training and the community

- 1. Indigenous fire management sits within the holistic responsibilities for 'caring for country'.** The creation of employment within this context is about work that is meaningful and has strong synergies with the religious, economic, social and cultural values sought by Indigenous people in their country.
- 2. Indigenous land and sea managers with active fire programs report that a lot of community resources go in to maintaining fire projects and partnerships to achieve locally desired outcomes.** Though there are often stresses on local resources, it is acknowledged that practical partnerships are important to enable fire activities to continue.
- 3. Re-introducing effective fire management, building the skills, gaining the confidence and business acumen and developing practical partnerships is a long term task.** Important precedents have shown that fire management enterprise can be viable. With the evolution of support services and institutions the pathways to engagement in this burgeoning economy appear to be getting easier, but adequate resourcing remains a key uncertainty for interested Indigenous groups and their partners.

Chapter 4. Protocols for Indigenous fire management partnerships

Considerable diversity exists in the history, structure and operation of contemporary Indigenous fire programs, even at the local level. This diversity requires a flexible approach to program management, and an awareness of how issues such as contemporary tenure boundaries intersect with customary ownership. It is also important to understand how different models of external partnership can shape on-the-ground fire management activity and relationships between fire neighbours. The diversity in Indigenous fire programs also necessitates regular opportunities for wider learning to ensure the continued emergence and dissemination of best practices. Regional organisations such as natural resource management (NRM) agencies and IPA boards can play a particularly important role in facilitating communication, coordination and inter-program governance arrangements.

Indigenous landscape burning regimes can connect Indigenous people and country. Yet Indigenous people who participated in this review expressed concerns that current fire projects do not always engage with them effectively, and that some regions are still being burnt inappropriately, damaging flower and fruit resources for animals and leading to declines in culturally important plants and animals. In terms of economic benefits, carbon markets and associated PES schemes are commercial and policy driven schemes to enable the Government to meet international greenhouse gas emissions reduction targets and to create private sector financial incentives that will sustain reduction activities over time.

Non-carbon benefits are similarly of interest to voluntary market investors and others with an institutional interest in a variety of environmental, social and cultural diversity outcomes. Entry into these markets can empower Indigenous landholders and managers to achieve manifold goals and generate associated co-benefits through the development of carbon sequestration and abatement projects (Howe et al., 2014). In practice, however, designing carbon offset programs and policies that achieve both carbon and associated co-benefits has proved challenging (Gerrard, 2012; Reed, 2011; Robinson et al., 2016a). Efforts have been frustrated both by a lack of understanding about the parameters within which benefits for Indigenous communities can be sought, and by the realisation that there may be fewer opportunities than anticipated to realise a full suite of carbon and Indigenous co-benefits (Robinson et al., 2014).

With respect to the relative influence of ‘western’ knowledge systems in the context of institutional support and prescription of Indigenous fire management, the (re) definition of applicable Indigenous knowledge can lead to the simplification and diminution of local knowledge and practices, with undesirable ecological and social consequences (Petty et al., 2015). In part, this is because large-scale institutions developed to ‘support’ Indigenous fire management are simpler and more rigid than the smaller-scale institutions needed for effective local implementation. In addition, failure to understand how fire is embedded within a social-ecological system with dynamic interactions between institutions, people, country, drivers of change and resources can lead to an ineffective focus on only one part of the system, which may undermine other vital components (Figure 1).

Indeed, researchers have recently argued that large-scale fire management partnerships can result in a form of ‘bureaucratic participation’ that ultimately extends nation-state power and

neo-liberal principles, rather than empowering Indigenous fire management institutions (Fache, 2014; Fache and Moizo, 2015). There are concerns that this could lead to too much burning, burning at the wrong time of year, and burning by people without the appropriate cultural authority (see National Forum Report, Appendix 1). Yet perspectives shared at regional workshops and at the national forum highlight that progress is being made as networks of Indigenous actors at the local, regional and national level have worked within these bureaucratic structures to advance and empower Indigenous priorities and knowledge systems. Arguments among rangers, senior custodians and other Indigenous people also indicate an ongoing and vital interest in fires in the landscape and a healthy human response to dynamism and rapid environmental change.

Addressing these challenges requires an Indigenous focus on fire knowledge, as well as indicators within a system of Indigenous-based adaptive governance that take into account how economic and social factors intersect with ecological requirements and ongoing environmental and social change. However, efforts to achieve this can be frustrated by cross-cultural barriers, reflecting differences in worldviews and in key values; institutional barriers, reflecting constraints in how programs are conceptualised, administered and adapted; and logistical and operational barriers, reflecting limits to proper planning and the resources available to complete the work. These barriers are difficult to negotiate, which highlights the importance of developing protocols that can guide efforts to incorporate Indigenous knowledge into fire programs and partnerships.

From a legal and policy context, a ‘protocol’ can mean many things—from a global binding instrument such as the Kyoto Protocol to bilateral, interpersonal or other arrangements, a balanced engagement process, or simply a means to achieve a common end. In the Native Title context, many Indigenous groups are familiar with the development of a ‘negotiation protocol,’ which is intended to set the expectations and parameters of a negotiation between parties. Protocols also appear in standards established to ensure that PES schemes at least do no harm if not improve local Indigenous communities (eg REDD+) and for evaluation of land-management activities against agreed performance criteria. For example, there are premium standards that require carbon offset projects to undergo third-party methodology and project-design validation to establish a premium price for higher sustainable development benefits (reviewed in Robinson et al., 2011).

In the context of Indigenous fire knowledge, protocols can guide the criteria, indicators and metrics used firstly by Indigenous project owners to keep track of and make management decisions about the impacts (positive and negative) of their fire management project/business on core values and aspirations, and with partners to jointly evaluate effectiveness, mitigate threats and deliver multiple negotiated benefits. They can also be used by Indigenous land holders or their representatives to guide partners in efforts to engage with them and to help determine whether fire management can offer a desired mix of benefits that align with Indigenous and policy/corporate goals. Identifying and testing the criteria against which Indigenous fire management partnerships may be designed and assessed brings us (collectively) one step closer to supporting Indigenous engagement in fire management enterprises and programs across Australia.

Participants at the national fire forum agreed that protocols should be local and ‘driven by local communities,’ because ‘each community is different, so is each fire strategy.’ As such, they

initially queried the purpose of national protocols, rather than protocols specifically designed to suit local on-the-ground activities and partnerships (see Appendix 3).⁸ However, general consensus emerged that generic protocols could be useful for

- (1) highlighting why fire partners need to understand Indigenous fire management priorities, and
- (2) explaining how partners can ensure fire activities are appropriate, legal, safe and effectively communicated to the community.

Drawing on this feedback, broader discussions in regional workshops and a national forum, and a growing body of literature examining Indigenous fire-managing activities and agreements from a range of perspectives (see Appendices), six key protocols were developed to guide Indigenous fire management partnerships. These protocols are detailed below.

Recognition of traditional and legal rights and interests

Indigenous fire management projects and enterprise can be rekindled predominantly on the lands for which the project owners have some customary responsibility and often other legal rights.

This is highly significant in terms of the values Indigenous managers are aspiring to enhance and in terms of the nature of partnerships they seek. Much of the impetus for Indigenous land management is to substantiate and manifest local identity, connection, responsibility and control of well-being outcomes. These are core benefits sought through caring for customary lands and increasingly enabled by synergistic business activities (e.g fire management). Any diminution of those rights and aspirations through inappropriate engagement and operational relationships with customary land owners will disempower and discourage Indigenous groups from participating in fire programs and collaborative partnerships. For many Indigenous groups the processes of securing rights and interests in land (eg through Native Title) are incomplete. Recognition and respect for this is very important when considering fire program and enterprise partnerships.

Knowledge recognition

Fire management partnerships must recognise and support Indigenous fire knowledge and fire management as part of local Indigenous systems in which custodial and other institutional forms of governance are central.

Australia's Indigenous people have a long tradition of working collectively, systematically and purposefully to use fire to manage the landscape. Their complex and nuanced systems of knowledge are the product of reciprocal relationships with specific custodial lands over millennia, and now including adapted contemporary knowledge systems (e.g science). Local knowledge remains the intellectual property of discrete Indigenous groups. Fire is embedded in and involves knowledge about dynamic interactions between institutions, people, country,

⁸ This echoes the findings of the work done to examine if and how national carbon co-benefit protocols could or should be established.

drivers of change, resources and benefits delivered (Figure 1). Fire is crucial to the way that Indigenous people live on, with and through their land, and determining its timing and its location is an important signifier of Indigenous people's rights to be on, care for and govern their country.

Learning and sharing knowledge

Partners that wish to support Indigenous fire management activities and enterprises need to pursue the best methods for learning, sharing and passing on relevant knowledge. Although other tools are needed to manage large areas, (Indigenous and non-Indigenous people) walking the country together is the best way to learn about local Indigenous fire knowledge.

Effective and appropriate landscape-burning regimes are based on high-quality information, often facilitated through collaborative knowledge-sharing. Indigenous communities need to be empowered to build collaborative knowledge by first developing a strong foundation that respects local knowledge systems. Indigenous fire managers are keen users of modern science and technology and are often wanting appropriate training to fill the gaps and improve their to management and operational judgements about burning. Information from Indigenous communities shared by Indigenous fire experts, combined with information obtained from scientists, can guide this effort.

Partnerships

Place-based partnership approaches are needed to design and deliver Indigenous fire management programs across Australia.

Legal and policy developments often respond to Indigenous initiatives and leadership in a narrow manner. Over time there has been growing recognition that Indigenous rights and knowledge are critical to successfully managing biodiversity, Indigenous livelihoods and on-country enterprises. Indigenous communities are now assisting the evolution of legal and policy frameworks by applying, adapting and rejuvenating Indigenous fire knowledge to guide a range of landscape-burning regimes, including conservation and carbon abatement programs and agreements. Practical efforts to support local Indigenous fire knowledge, practices, priorities and techniques have demonstrated that whilst achieving enterprise governance at landscape scale can be challenging, enabling customary structures to underpin collaboration and inform project partnerships is needed for adaptive long term success in landscape burning enterprises.

Governance

Partnerships that are established to support Indigenous fire knowledge and management activities need to work within contemporary institutional and governance arrangements.

Indigenous fire management is influenced by an array of governance arrangements, including Indigenous customary governance regimes; co-managed or agency-driven government fire institutions and programs; and market-driven fire agreements. The rules and purposes of each

fire governance regime influence the burning regimes and the management issues facing Indigenous fire management partners. Contemporary Indigenous fire management enterprises are often challenged by appropriate knowledge to burn contemporary landscapes, high dependence on external partners, service providers and shifting policy and regulations. Effective linkages across from fine-scale local through to global institutions are crucial for good governance.

Benefits

Indigenous fire management programs and enterprise partnerships can and should deliver environmental, social, cultural and economic benefits for Indigenous people.

The ability to apply local fire knowledge is a crucial and ongoing aspiration for successful Indigenous carbon abatement, conservation and other PES programs, primarily because of the substantial array of benefits delivered by such engagement. It is important to recognise, support and record the multiple environmental, economic and health benefits from Indigenous fire management activities and partnerships, but these benefits are often hard to balance and achieve. There are also concerns that the institutionalisation of Indigenous fire management leads to the simplification and diminution of local knowledge and practices.

Further work will be needed to translate these Indigenous fire management partnership protocols into practice. The process will need to address tensions between customary land owner/manager holistic values and aspirations, the need to provide certainty and clarity to industry and the broader Australian public, and the need to maintain the lowest possible transaction costs for all parties involved.

Conclusions

Indigenous people have a long tradition of systematically and purposefully using fire to manage the landscape, and the positive impact of Indigenous landscape burning can be seen in the defining features and health of Australia's terrestrial biodiversity and ecosystems. There is also strong evidence that Indigenous communities across the country are seeking to engage with fire management projects, and it is timely to consider what lessons can be learned from projects that have already incorporated Indigenous knowledge.

With this in mind, this review has distilled **key lessons** learned from existing Indigenous fire management partnerships and activities across Northern Australia, highlighting the critical issues associated with incorporating Indigenous knowledge into fire management programs and activities (see Chapter 3). Based on the literature review, individual and small-group interviews, focus groups, regional workshops and the national fire forum:

Key lessons regarding **fire knowledge sharing**

- **Indigenous peer-based knowledge sharing** on country, for example through “fire walks”, promotes and grows Indigenous knowledge which is highly valued by Indigenous fire practitioners and leaders across Australia, and critical to effective partnerships.
- **Knowledge sharing between Indigenous and non-Indigenous fire experts and practitioners** are key to managing contemporary landscapes. These can be formal or informal and need to be co-designed with Traditional Owners and empower Indigenous decision-making to effectively support Indigenous fire management partnerships.
- **Knowledge sharing relationships are key for collaborative and adaptive management.** They inform partnership negotiation, design, and the monitoring and evaluation of the multiple benefits, risks, opportunities and practices of Indigenous fire management projects and partnerships.
- **Successful Indigenous fire knowledge practices and partnerships** are embedded in and influenced by knowledge about people, country and fire institutions. Systems thinking can help link Indigenous and non-Indigenous knowledge and facilitate knowledge partnerships.

Key lessons from the **legal and policy context**

- **The protection of Indigenous groups' intellectual and cultural knowledge** has been a focus of international and national policies and forums and provides important levers for ensuring traditional knowledge is better protected and valued in fire management partnerships
- **A series of legal developments and policy changes** have enabled better recognition of the active role Indigenous people play in managing land and natural resources, including fire and the responsibilities land holders have to sustainable landscape burning practices.
- **There is inconsistent translation of legal and policy instruments** that support innovative Indigenous fire knowledge translation into programs and practices across the continent.

Key lessons regarding **environmental fire management projects and partnerships**

- **Effective projects and partnerships must be based on acknowledgement and respect for both extant Indigenous knowledge and skill, and the need to (re)build effective, practical and innovative knowledge from available knowledge systems.** Without respect for quality knowledge that addresses fire management concerns and interests the untutored burning practices of Indigenous and non-Indigenous people and park managers can lead to uncontrolled burns in protected areas, build mistrust between among fire managers, and adversely affect key species, habitats and values.
- **Conservation agreements provide a significant opportunity for practical recognition of Indigenous fire knowledge and management.** Even so tensions between Traditional Owners and park rangers can persist over fire knowledge credibility, use and priorities making management authority, planning and implementation contested. Conservation agreement-making needs to facilitate appropriate partnership relations that enhance Indigenous knowledge systems, capture environmental imperatives, and harness partnership values to operate at multiple scales.
- **Interactions between international, national and state /territory laws and policies can impede the operation and continuity of Indigenous customary institutions.** Conservation agreement-making needs to facilitate appropriate partnership relations that enhance Indigenous knowledge systems, capture environmental imperatives, and harness partnership values to operate at multiple scales.
- **Efforts to assist non-Indigenous fire managers to understand Indigenous fire management priorities, and vice versa are critical** for building collaborative and adaptive landscape burning regimes and should be appropriately and equitably resourced.

Key lessons regarding **savanna carbon projects and partnerships**

- **Savanna carbon project partnerships collaboratively negotiated between Traditional Owners and other key partners can offer innovative on-country enterprises** that provide economic, social, environmental and cultural benefits for Indigenous communities and broader Australia.
- **There is growing Indigenous community capacity to manage carbon abatement projects.** This knowledge and capacity needs support so that prospective Indigenous land managers gain confidence to secure relevant agreements for savanna carbon projects, understand the legal requirements relevant to generating income from carbon projects and deal with the governance, planning and contracting services needed to negotiate and sustain agreed benefits from carbon abatement activities and contracts.
- **Flexibility in savanna-burning abatement methodologies** (to account for diverse local climate, geographic and biophysical factors) **and flexibility in the design of savanna carbon abatement partnerships** could enable Indigenous communities to undertake landscape burning across Northern Australia.

Key lessons regarding **Indigenous jobs, training and the community**

- **Indigenous fire management sits within the holistic responsibilities for ‘caring for country’.** The creation of employment within this context is about work that is

meaningful and has strong synergies with the religious, economic, social and cultural values sought by Indigenous people in their country.

- Indigenous land and sea managers with active fire programs report that **a lot of community resources go in to maintaining fire projects and partnerships to achieve locally desired outcomes.** Though there are often stresses on local resources, it is acknowledged that practical partnerships are important to enable fire activities to continue.
- **Re-introducing effective fire management, building the skills, gaining the confidence and business acumen and developing practical partnerships is a long term task.** Important precedents have shown that fire management enterprise can be viable. With the evolution of support services and institutions the pathways to engagement in this burgeoning economy appear to be getting easier, but adequate resourcing remains a key uncertainty for interested Indigenous groups and their partners.

The review has also identified six key **protocols for effectively and appropriately incorporating Indigenous knowledge into fire management goals and practices**, and it is hoped that these protocols help to guide efforts to incorporate Indigenous fire knowledge into fire management across Australia. These include

1. Indigenous fire management projects and enterprise can be rekindled predominantly on the lands for which the project owners have some customary responsibility and often other legal rights.
2. Fire management partnerships must recognise and support Indigenous fire knowledge and fire management as part of local Indigenous governance systems.
3. Broad support for Indigenous fire management and enterprise development relies on applying the best methods for learning, sharing and passing on fire knowledge.
4. Place-based partnership approaches are needed to design and deliver Indigenous fire management programs across Australia.
5. Partnerships established to support Indigenous fire knowledge in contemporary land-management activities need to work with contemporary institutional and governance arrangements.
6. Indigenous fire management programs and partnerships can and should deliver environmental, social, cultural and economic benefits for Indigenous people.

Critical areas for future research were identified at the national fire forum. It is clear that research into Indigenous fire knowledge needs to be collaborative, assuming a primary role for Indigenous people in research design, implementation and analysis, and protecting their expert contributions. To support this, Indigenous fire knowledge and fire program research should focus on:

- Developing appropriate relationships with Indigenous groups such that frameworks to guide Indigenous fire management based partnerships at a local and regional scale can be scaled up to inform and guide other projects across Australia.
- Developing practitioner and partner focused monitoring and evaluation frameworks that track the benefits and return on investment from Indigenous fire management programs and management activities.
- Analysing different models and opportunities for Indigenous fire management enterprises and partnerships, including in different land tenure environments such as with Aboriginal freehold, Native Title interests, Parks and Conservation Reserves; in different climatic and vegetation zones; and population, land use and demographic environments.
- Facilitating local/regional Indigenous sanctioned fire management partnership protocols and processes in fire management regulatory structures and programs across the country.
- Assessing the impact of fire and carbon management partnerships and contracts on the duties, roles and responsibilities and long term values of Indigenous land managers, including administration, monitoring and evaluation, firefighting, community liaison, transmission of cultural and technical knowledge, familial connection, customary economic resources etc over time.
- Creating the industry services, structures and resources needed to support regional fire programs.
- Developing appropriate guidance for insurers and insurance to deal with externally generated emissions (eg, fires lit by tourists), accidental burns into neighbouring project areas etc
- Informing and supporting Indigenous and partnered projects in collaborating and aggregating benefits to a) maximize returns to collaborating project owners, b) mitigate the negative effects of market driven tendency for competition amongst individual Indigenous projects.
- Understanding how Indigenous 'peer-to-peer' fire knowledge learning and sharing assists contemporary fire management practices and can guide fire management partnerships, including identifying effective methods for Indigenous fire knowledge learning and sharing and determining how that learning can be applied in new fire management contexts.
- Developing an effective Indigenous land management industry network and voice to provide ongoing credible, independent information and advice to policy makers, investors and service providers about the successes, needs, challenges, diversity and aspirations of the 'industry' – this must be the voice of ILMs not NGOs and partners.

For millennia, Australia's Indigenous fire managers have tended the landscape to make it reliably productive for human beings, as well as a host of plant and animal species. The dislocation and suppression of Indigenous fire regimes through the process of colonisation has had a significant effect on this ongoing relationship. Traditional Aboriginal owners have in many places maintained burning regimes and varying levels of practical knowledge about the right way to burn on their country. They have in some areas found opportunity to rescale their burning activities over large areas and with the help of key partnerships and innovative resourcing arrangements been able to show the manifold value of re-introducing traditional style burning to governments, researchers and investors. Increasing recognition of the role of the environmental and other effects of these regimes has stimulated new opportunities to rekindle the practice of Indigenous fire management over many more customary estates. As a burgeoning industry, Indigenous land and sea management, substantially fueled by fire management outcomes has the potential to support, augment and sustain contemporary livelihoods for large numbers of people and enhance values in the national environmental estate. Australia's fire future relies on ensuring a productive relationship between Indigenous groups with the specific knowledge and the authority to respond to fire management issues and the regional, state and national systems of institutional support and coordination that can identify key patterns and processes at scale. Embedding knowledge protocols that promote respectful partnerships with Indigenous people, recognise their knowledge and governance systems, and deliver benefits to their communities is critical to building and maintaining this productive relationship.

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