

Integrated Measures of Indigenous Land and Sea Management Effectiveness: Challenges and Opportunities for Improved Conservation Partnerships in Australia

Beau J. Austin^{a,b,#}, Catherine J. Robinson^b, James A. Fitzsimons^{c,d}, Marcus Sandford^e, Emilie J. Ens^f, Jennifer M. Macdonald^a, Marc Hockings^g, David G. Hinchley^c, Fergus B. McDonald^c, Colleen Corrigan^g, Rod Kennett^h, Hmalan Hunter-Xenie^a, and Stephen T. Garnett^a

^aResearch Institute for the Environment and Livelihoods, Charles Darwin University, Australia

^bWater Flagship, Commonwealth Science and Industry Research Organisation, Australia

^cThe Nature Conservancy, Carlton South, Australia

^dSchool of Life and Environmental Sciences, Deakin University, Australia

^eDepartment of Prime Minister & Cabinet, Commonwealth Government of Australia, Australia

^fDepartment of Environment and Geography, Macquarie University, Australia

^gSchool of Geography, Planning and Environmental Management, University of Queensland, Australia

^hAustralian Institute of Aboriginal and Torres Strait Islander Studies, Australia

[#]Corresponding author. E-mail: beau.austin@cdu.edu.au

Abstract

As partnerships between Indigenous peoples and conservation practitioners mature, new methods are being sought to assess their effectiveness. The increasing diversity of income sources mobilised by Indigenous land and sea managers in Australia is intensifying the pressures on them to demonstrate their 'effectiveness' through a range of frameworks, tools and criteria. In this review, we use Indigenous land and sea management in Australia as a lens to explore the politics and practicalities of measuring the effectiveness of Indigenous conservation partnerships. We first outline current approaches to measuring effectiveness, followed by an explanation of some of the challenges. Available literature is then supplemented with the collective knowledge and experience of the authors to identify practical and achievable ways forward. We suggest four ways by which Indigenous groups and institutional investors can work together to establish meaningful criteria for ensuring effective conservation outcomes: i) develop new mutually-agreed definitions; ii) embrace the complexity of Indigenous-conservation alliances, iii) reflect regularly and collaboratively, and iv) negotiate which indicators of effectiveness can be aggregated across large scales. Well-executed evaluations of effectiveness can be powerful tools for enhancing conservation that conforms to local Indigenous values, facilitates adaptive management, and strengthens relationships between investors and Indigenous groups. By focusing on principles, process, flexibility and trust, generative 'good faith' approaches have the potential to support win-win outcomes for people and the environment and contribute significantly to global conservation and sustainability targets.

Keywords: Indigenous peoples, conservation, impact investing, monitoring, evaluation

Access this article online	
Quick Response Code:	Website: www.conservationandsociety.org
	DOI: 10.4103/cs.cs_16_123

INTRODUCTION

As partnerships between Indigenous peoples and conservation practitioners mature, stakeholders are seeking methods to

assess the effectiveness of Indigenous approaches to land and sea management. Indigenous rights, knowledge and values are emerging as central features of conservation policies and agreements designed to meet global conservation and sustainability targets (Butchart et al. 2015). In part, this has been prompted by the growing policy recognition that the knowledge held by Indigenous peoples and local communities is vital to sustaining biodiversity and human wellbeing (e.g. Aichi Targets 11 and 18: see Convention on Biological Diversity 2011a; 2011b). In some countries like Australia and Canada, where increasing proportions of land are being returned to the control of Indigenous communities, there is recognition that effective environmental management of these areas needs to be inclusive of Indigenous peoples' values and priorities. To that end, collaborative partnerships between Indigenous peoples and conservation agencies have shifted conservation paradigms and practices to add Indigenous cultural dimensions to social-ecological systems thinking (Berkes 2009; Poe et al. 2014; Tengö et al. 2014; Gavin et al. 2015; Robinson et al. 2016a) and seek 'win-win' global-community outcomes (Danielsen et al. 2005, 2014; Gomez-Baggethun et al. 2013; Davies et al. 2014; Diaz et al. 2015; Gavin et al. 2015). In turn, conservation agreements on Indigenous lands can contribute towards national obligations for meeting global protected area targets (Rose 2012; Kothari et al. 2013; Danielsen et al. 2014; Farhan Ferrari et al. 2015).

A small but growing area of scholarship has emerged around the development and critique of measures to evaluate the effectiveness of Indigenous land and sea management (ILSM). Some of this research has considered how measures of management effectiveness can be translated into co-managed conservation programs with Indigenous people (Porter-Bolland et al. 2012; Moritz et al. 2013; Poe et al. 2014; Gavin et al. 2015; Renwick et al. 2017). This has led to the production of frameworks for assessing Indigenous cultural, social and other benefits of a range of environmental initiatives, including those that involve or impact ecosystem services provision (e.g. Chan et al. 2012; Figgis et al. 2015; Bark et al. 2016; Hicks et al. 2016; Robinson et al. 2016a); social impacts (e.g. Ferraro and Pressey 2015); and wellbeing benefits of conservation (e.g. Danielsen et al. 2009, 2011; Roe et al. 2012; Gomez-Baggethun et al. 2013; Leisher et al. 2013; Staddon et al. 2014; Diaz et al. 2015; Farhan Ferrari et al. 2015). However, some scholars have raised concerns about whether such conservation partnerships constitute the neo-colonisation of contemporary ILSM practices (West 2006; Fache 2014), or whether state-funded ILSM programs are used to enforce a form of state welfare discipline on Indigenous people (Kerins & Green 2015). For the ILSM sector to grow and expand, these important questions need to be addressed through the collaborative development of rigorous, credible and intercultural measures of effectiveness.

In this review, we use ILSM in Australia as a lens to explore the politics and practicalities of measuring the effectiveness of Indigenous conservation partnerships. We pay specific attention to evaluating the effectiveness of ILSM that are

based on negotiated goals, mutual benefits and solving evaluation problems between different cultures and across decision-making scales. The review is the collaborative effort of contributing authors who are practitioners, academics and investors working towards the development of measures of ILSM effectiveness in northern Australia. Available literature and ILSM case studies are combined with the authors' collective experiences in designing and applying integrated monitoring and evaluation approaches in the field.

ILSM is an evolving sector where groups are trying to balance and reconcile the demands of investors with local aspirations and context-specific environmental, social, cultural political and economic challenges. We use the term 'investors' to refer to all sources of financial capital mobilised for ILSM purposes. In line with Aichi Biodiversity Target 20, this includes governments, the private sector and non-governmental organisations (Convention on Biological Diversity 2011c). Though acknowledging the financial contributions of local Indigenous organisations, we here refer mostly to non-local actors who currently provide the overwhelming majority of financial investment. Care must be taken to differentiate local and non-local investment into the future as ILSM organisations grow endogenous financial resources. All parties are learning how to work together to deliver multiple, sometimes conflicting, objectives (Haynes 2003; Kerins & Green 2011; Fache 2014; Altman 2016; Vincent & Neale 2016).

The paper describes the recent emergence of the ILSM phenomenon and the growing interest in evaluating ILSM success and then reviews current approaches to measuring ILSM effectiveness in northern Australia. We identify four key challenges to current evaluation practice, and present four practical ways that ILSM partners can implement collaborative measures of effectiveness. By describing the Australian experience, this review contributes to global debates about how best to ensure that ILSM both conserves environmental assets effectively and supports Indigenous and local peoples' wellbeing and rights (Convention on Biological Diversity 2011a, 2011b; Diaz et al. 2015; Tengö et al. 2017).

INDIGENOUS LAND AND SEA MANAGEMENT IN AUSTRALIA

Western science suggests that Indigenous peoples have occupied Australia for at least 60,000 years (Roberts et al. 1990; Tobler et al. 2017). An Indigenous world view maintains that the presence of Indigenous people on their ancestral estates began when the creator beings formed the land- and seascapes, the people and the lore (Rose 2000), with traditional custodians subsequently exercising cultural responsibilities that cared for and maintained local social-ecological systems (Gammage 2011; Ens et al. 2017).

Since the 1980s, the term "Indigenous land and sea management" (ILSM) has emerged as a contemporary expression of the relationships between Indigenous Australians and their traditional lands and seas, and includes a wide range of activities undertaken by individuals, groups and

organisations for customary, community, conservation and economic reasons (Hill et al. 2013). Contemporary ILSM has many manifestations, as Indigenous peoples find innovative ways to engage in ‘caring for country’ on different tenures and in commercial, semi-commercial and non-commercial ways (e.g. Altman 2001; Hemming and Rigney 2012; Leverington 2012; Wilson and Smits 2012; Smyth and Isherwood 2016). Ideally, ILSM can provide a means for local Indigenous peoples to re-assert control over Country¹ that was disrupted by settler colonialism, by reinstating traditional custodial and cultural responsibilities and building livelihoods based on natural and cultural resources (Hill et al. 2013).

Currently over 40% of Australia’s National Reserve System (NRS) is on Aboriginal land managed in 72 Indigenous Protected Areas (IPAs) managed by some of the members of national Indigenous ranger network (which now consists of at least 700 full time positions nationally) (Smyth 2015). The extent of the IPA estate is expected to exceed 50% of the NRS or approximately 10% of the Australian continent by 2020. The IPA network is fundamental to Australia’s commitment to manage a representative reserve system for effective conservation outcomes, especially given that in some cases Indigenous lands envelop entire bioregions (Rose 2012; Hill et al. 2013; Taylor et al. 2014; Woinarski et al. 2014).

The Australian Government currently invests approximately US\$60m per year in ILSM, which, coupled with substantial investment by Indigenous communities and organisations, State and Territory governments, industry and philanthropic and non-government organisations, is yielding environmental, biodiversity, economic, social and cultural benefits (Garnett et al. 2009b; Campbell et al. 2011; Ens 2012; Fitzsimons and Looker 2012; Fitzsimons et al. 2012; Hill et al. 2013; Jupp et al. 2015; Moritz et al. 2015; Russell-Smith et al. 2015). This investment enables other benefits that are not easily measured; for example strengthening local identity, cultural wellbeing and local languages (Sithole et al. 2008; Witter & Satterfield 2014; Ens et al. 2016b), delivery of broader benefits such as contributing to climate change mitigation (Archer 2015; Walton and Fitzsimons 2015; Robinson et al. 2016a, 2016b) and the development of skills that can enable Indigenous autonomy, self-empowerment and self-determination (Barber and Jackson 2017). In addition, the growing capital investment in the Australian ILSM sector supports the development of other livelihood opportunities including controlled burning to generate carbon credits (Fitzsimons et al. 2012; Russell-Smith et al. 2015; Walton and Fitzsimons 2015), commercial harvest of wildlife (Austin and Corey 2012; Zander et al. 2014), eco- and cultural tourism (Hill et al. 2013), collaborative research (Ens et al. 2012, 2015; Walsh et al. 2013; Robinson et al. 2012), remote infrastructure management, government surveillance and compliance contracts, and other environmental management services (Gunn et al. 2010; Hill et al. 2013).

ILSM is now practised at such a scale that it prompts growing demands for measures of its effectiveness in delivery

of benefits to all parties. Investors in Australian ILSM were primarily interested in environmental benefits with social, cultural, and economic outcomes seen as supplementary ‘co-benefits’ (Barber and Jackson 2017; Austin et al. *in review*). The increasing diversity of income sources mobilised by ILSM practitioners to look after Country intensifies the pressures on them to prove their ‘effectiveness’ through a range of frameworks, tools and criteria.

DEMONSTRATING THE EFFECTIVENESS OF INDIGENOUS LAND AND SEA MANAGEMENT

Pressures such as climate change, expanding agricultural development, constantly changing policy and regulation, and macroeconomic trends are affecting the availability of resources (both financial and temporal) for the conservation sector. Concurrently, in Australia and worldwide, there has been a general shift towards decentralised, market-driven investment and practice (Hajjar et al. 2012), which has resulted in demands from investors for transparency, accountability and demonstrable effectiveness (Leverington et al. 2010). ILSM practitioners in northern Australia are increasingly being asked to demonstrate their effectiveness at producing positive outcomes from conservation investment.

Referring to protected area management, Hockings et al. (2006, p. 1) define management effectiveness as “...primarily the extent to which it is protecting values and achieving goals and objectives”. Hockings et al. (2006, p. 5) go on to discuss that measures of management effectiveness can:

- Enable and support adaptive management;
- Assist in the efficient allocation of scarce resources;
- Promote accountability and transparency; and
- Encourage community participation in management.

Although frameworks and approaches exist for assessing management effectiveness of protected areas (Leverington et al. 2010), these are primarily concerned with biophysical assets such as threatened species, ecosystems, internal planning processes and implementation of management systems, and often do not consider the contributions of Indigenous peoples and local communities to global conservation targets (Convention on Biological Diversity 2011a).

Proponents of assessing the effectiveness of ILSM investment argue that such an evaluation has three main benefits. Firstly, it enables the formation, strengthening and expansion of relationships with investors to create meaningful contemporary livelihoods within Indigenous peoples’ ancestral domains (Funder et al. 2013; Stacey et al. 2013). Secondly, at the individual project level, it assists ILSM practitioners to assess their own performance in line with their aspirations and management activities. Thirdly, it can drive effectiveness measures at a systemic level (which requires aggregation) to report on outcomes at national, regional and global scales (ANAO 2011; Farhan Ferarri et al. 2015). A fourth indirect benefit with specific regard to ILSM is that the skills and experience that Indigenous land and sea managers gain

by participating in monitoring, evaluation and reporting is potentially transferrable to other projects and forms of employment.

CURRENT APPROACHES TO MEASURING EFFECTIVENESS

Many Indigenous land & sea management (ILSM) organisations in Australia are using planning processes to drive management in locally appropriate directions, some of which are codified (Smyth 2011; Moorcroft et al. 2012; Davies et al. 2013; Hill et al. 2013; Carr et al. 2017). Values/assets described in these plans are similar, suggesting there is scope for semi-consistent measures to be negotiated and developed.

The most widely employed indicators used by Indigenous peoples to monitor the effectiveness of their ILSM activities involves regular visits to Country for harvesting and management of resources and for the performance of cultural obligations, such as intergenerational knowledge transfer and ceremony (Berkes et al. 2000; Muhic et al. 2012; Turner et al. 2000; Walker 2010; Ziembicki et al. 2013; Ens et al. 2016). These tools for measuring effectiveness are still used by many Indigenous Australians to monitor 'healthy people and healthy country' activities (Garnett et al. 2009b) and can be correlated with biodiversity surveys to provide expanded and enhanced data points for informing management decisions (Ziembicki et al. 2013; Ens et al. 2016a). However, as described in relation to Indigenous fire practices in northern Australia by Verran (2002), the performance of intertwined relationships between people and Country through, for example, burning, hunting and sharing resources, are considered the primary measure of effectiveness in the Indigenous domain.

The main investor in Australian ILSM, the Australian Government, employs a monitoring, evaluation and reporting system that measures the inputs, outputs, outcomes and budgeting of funded ILSM groups (Australian Government 2013). Measures include estimates of social, cultural, environmental, economic and education indicators. These data are then analysed at the program level by the Australian Government and are used to indicate relative effectiveness of funded projects. The reporting is supplemented by occasional independent reviews of the Australian Government's ILSM-related programs to form a more complete picture (e.g. Gilligan 2006; SVA 2016) and is designed to provide national-scale feedback on the impacts of funded ILSM activities.

A range of data on environmental values is also generated alongside program monitoring through research partnerships between Indigenous people and scientists employed by the Australian Government, state and territory governments, universities or non-governmental organisations. Examples of collaborative research include projects on biodiversity (Horstmann and Wightman 2001; Nesbit et al. 2001; Brennan et al. 2012; Ens et al. 2016a), carbon sequestration and

greenhouse gas mitigation (Yibarbuk et al. 2001; Fitzsimons et al. 2012; Russell-Smith et al. 2009), freshwater resources (Jackson et al. 2005; Weir 2009; Birkhead et al. 2011; Woodward et al. 2012; Dobbs et al. 2016; Ens et al. 2016a), threatened species (Ziembicki et al. 2013; Read and Ward 2011; Muhic et al. 2012; Jackson et al. 2015) and invasive species (Robinson et al. 2005; Collier et al. 2011; Ens et al. 2012; Hoffmann et al. 2012). When properly implemented, data generated through these research projects is owned, or at least shared, by local Indigenous peoples who can use it for local purposes (Ens et al. 2012, 2015; Jackson et al. 2015).

Various forms of qualitative evaluation and outcomes reporting have also been trialled across a range of ILSM programs (e.g. Robinson et al. 2016c; see also Walsh & Mitchell 2002). These approaches draw on video, artwork and photos to describe how programs change a range of biophysical, cultural, social and economic indicators (Walsh and Mitchell 2002, Petheram et al. 2011; Zurba & Berkes 2014). They acknowledge the value of Indigenous knowledges, practices and beliefs and create space for the authority of local knowledge holders, shifting the balance from investors to Indigenous community members (Berkes 2009; Danielsen et al. 2011). These tools are particularly useful where there is scant baseline information, lack of administrative capacity and English literacy, and where causality is hard to establish or is masked by other program inputs.

In addition, some Indigenous groups have found utility in the Social Return on Investment (SROI) method to provide an economic valuation of the impact of ILSM for local Indigenous people (SVA 2014, 2016; Jupp et al. 2015). An SROI analysis of five IPAs and their associated ranger programs in northern Australia found that these programs have generated significant economic benefits, as well as social, cultural, and environmental outcomes for rangers, community members, state and federal government and other stakeholders (SVA 2016). This mode of analysis is useful for comparing types of investment with different outcomes, although the required expertise from external experts is likely to be directed towards investors rather than local communities for their adaptive management or learning benefit (SVA 2016).

Many ILSM groups see utility in participatory research, which can help reduce power imbalances and support monitoring, evaluation and reporting activities in a bottom-up, holistic and integrated way (Danielsen et al. 2005, 2014; Garnett et al. 2009a; Sithole 2012; Ens et al. 2016a). For example, the Uunguu Monitoring & Evaluation Committee has recently successfully incorporated participatory ranking and interviews conducted by local Indigenous people to inform an evaluation of the effectiveness of the Wunambal Gaambera Healthy Country Plan (Austin et al. 2017a). This allowed for meaningful triangulation of monitoring and evaluation data collected by rangers, scientists and investors from a local Indigenous perspective.

Management and facilitation of ecosystem services by ILSM, such as contributions to clean air, catchment-based

water management, carbon sequestration and abatement, and pollination, are also either underway or being explored (Ens et al. 2015; Russell-Smith et al. 2015; Robinson et al. 2016a; Kok et al. 2017). Top-down and bottom-up evaluation and accounting tools for aggregating the contribution of Indigenous managed lands and seas to ecosystem function and global conservation targets are being developed and trialled with some success (Danielsen et al. 2014; Farhan Ferarri et al. 2015).

Growing national and international networks are being developed between Indigenous peoples that reflect contemporary and global pathways for local communities to share and build traditional knowledge and ILSM approaches, e.g., NAILSMA I-Tracker program (NAILSMA 2014), World Indigenous Network (<http://www.winlsm.net/>), Participatory Monitoring and Mapping Partnership (<http://www.pmppartnership.com/>), Arafura Timor Seas Ecosystem Action Program (Stacey et al. 2015), and Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) (Kok et al. 2017). By building relationships based on shared aspirations and experiences under colonisation, Indigenous peoples can self-organise in parallel to non-Indigenous regional governance mechanisms to share knowledge and develop policy that is both useful to Indigenous peoples and to non-Indigenous partners who are concerned about conservation and development issues that require regional or global solutions (Russell-Smith et al. 2015; Farhan Ferarri et al. 2015; FPP 2016).

There has also been a rapid adoption and adaptation of sophisticated digital tools to collect, analyse and map data from on-ground activities. For example, in northern Australia, accessing and interpreting satellite imagery that show where fires are burning and the location of 'fire scars' is critical to participation of many Indigenous groups in the carbon economy (Russell-Smith et al. 2015). Further, a range of monitoring, evaluation and reporting data is recorded using software that has been tailored to collect textual, numeric, audio and visual data using rugged hand-held devices so that Indigenous land and sea managers can monitor ecosystem health and environmental change (Ansell and Koenig 2011; Ens 2012a; NAILSMA 2014). Indigenous people are also combining GIS with other digital material to produce databases of their biocultural knowledge (e.g. Pert et al. 2015).

Barber and Jackson (2017) provide a systematic review of the full suite of benefits (or 'co-benefits') that are currently being realised from ILSM. However, protocols for identifying and implementing measures of this suite of benefits (to measure effectiveness) need to be carefully negotiated as they may contain Indigenous intellectual property emerging from local Indigenous peoples' relationships to Country, kin and ancestors. Local interpretations and contexts matter (Verran 2002; Robinson and Lane 2013; Barber and Jackson 2017), making generalisations difficult.

CHALLENGES IN EVALUATING EFFECTIVENESS

Though ILSM planning and operational capacity has developed at a rapid rate in Australia, it has been difficult to identify

appropriate mechanisms for assessing integrated effectiveness on a national scale. The complexity of interests and underlying assumptions concerning the practice and politics of managing land and sea, let alone measuring ILSM effectiveness, poses a formidable task for ILSM practitioners. Local Indigenous approaches to measuring effectiveness have always existed and continue to evolve (Berkes et al. 2000; Turner et al. 2000; Walker 2010; Muhic et al. 2012; Funder et al. 2013; Ziembicki et al. 2013; Ens et al. 2016a). However, such measurement mechanisms have tended to be oral or embedded in Indigenous cultural activities (e.g. ceremonies, art, dance, etc.) making them difficult to integrate with investor interests and global agreements (Ansell and Koenig 2011; Convention on Biological Diversity 2011a; Danielsen et al. 2014). The community-driven evaluation of ILSM conducted in 2007 is a rare published example of systematic interviews with Indigenous people about the successes and challenges they have experienced when managing their land in contemporary funding scenarios (Sithole et al. 2008).

Investor-led measures of effectiveness are usually more compartmentalised and focused on one (or at most a few) aspects of local peoples' lives and relationships to the environment (Austin et al. *in review*), and are not necessarily aligned with local perspectives of 'looking after Country'. Efforts to evaluate the socio-cultural benefits of ILSM and integration of these with environmental benefits are less well developed than the evaluation of biophysical assets (Fitzsimons et al. 2012; Davies et al. 2013; Renwick et al. 2014; Robinson et al. 2016a; Barber and Jackson 2017). This is partly because collecting and analysing multidimensional/multidisciplinary measurements of ILSM and other conservation outcomes is complicated and receives little funding (Wiseman and Bardsley 2015) and non-environmental benefits, often referred to as co-benefits (Robinson et al. 2016c), are usually of secondary concern (Austin et al. *in review*). This presents the challenge of reconciling diverse ILSM goals and judgements of efficacy between Indigenous groups and their funding partners (Robinson and Wallington 2012; Funder et al. 2013). Any monitoring program must include measures of effectiveness to meet this challenge and, as suggested by Danielsen et al. (2009), they need to be simple, quick and cheap to run with local participants.

Based on the literature and our collective experiences, we identify four major barriers or challenges that ILSM practitioners and their investors need to consider in order to develop mutually acceptable criteria for evaluating effectiveness.

Shared Understanding of Management Effectiveness in Indigenous Land and Sea Management

Davies et al. (2014, p. 304) note that "how a concept is defined determines what is measured and what is chosen to be measured determines how success is defined" (see also: Walsh et al. 2013; Muller 2014). Although there is recognition that Indigenous and non-indigenous peoples tend to conceptualise 'management' differently (Howitt and Suchet-Pearson 2006), little work has been done to unpack

what ‘management’, ‘evaluation’ and ‘effectiveness’ mean for Indigenous land and sea managers and their communities (Wiseman and Bardsley 2015; Austin et al. 2017a). This is due to the popularity of conceptualising ILSM as a propitious niche whereby Indigenous peoples’ interests in caring for their Country are assumed to align with investor interests in biodiversity conservation and ecosystem maintenance. However, such assumptions can mask differences in the modes of producing (and measuring) benefits from ILSM investment, and can inadvertently promote non-Indigenous peoples’ priorities over those of local Indigenous people (Haynes 2003; Fache 2014; Altman 2016).

Shared understandings of differences in measuring the performance of ILSM must begin by recognising Indigenous peoples’ ways of managing their lands and seas and their preferred ways of assessing performance. Indigenous peoples’ ‘measurement of success’ of their land and sea management is often based on knowledge and practice constructed from different ontologic and epistemic frameworks (Turnbull 1997; Verran 2002, 2013; Howitt et al. 2013). For Indigenous people, ‘Indigenous land and sea management’ is a rough and imperfect translation of the concept of ‘caring for Country’ where Country encompasses interconnected biophysical, spiritual, cultural, kinship relation, survival and ancestral domains (e.g. Smyth 1994; Rose 2000). This fundamentally different way of positioning human presence and activity in landscapes as enacting sets of relationships remains poorly understood by non-Indigenous people (Verran 2002) and hence is often ignored (Staddon et al. 2014; Wiseman and Bardsley 2015). However, this positioning is fundamentally important for Indigenous evaluations of whether land and sea are being ‘produced’ and ‘managed’ in the ‘right way’ for building their knowledge and lived practice (Verran 2013; Gavin et al. 2015).

Indigenous knowledge and practice related to land and sea management must be acknowledged as legitimate and employed to construct shared understandings (Convention on Biological Diversity 2011b; Tengö et al. 2014). This can be challenging for many conservation practitioners who may not be familiar with alternative knowledge systems to western science (Nakata 2007; Gavin et al. 2015). However, the integration of diverse ways of knowing, being, and doing are fundamental to the success of intercultural conservation partnerships, and should be included as a key pillar in measuring effectiveness.

The Issue of Equity

The participation of Indigenous peoples, environmental NGOs, governments and corporate investors in ILSM is driven by a variety of motives and regulated by diverse social institutions and cultural contexts (Hill et al. 2013; Funder et al. 2013; Krause et al. 2013; Klein et al. 2015). While there has been some progress with Indigenous-led governance of multi-stakeholder partnerships (e.g. Davies et al. 2013; Smyth 2015), Kerins (2016) describes instances where the interests of non-Indigenous partners in protected area joint management

arrangements are overriding the wishes and/or concerns of local Indigenous peoples (see also: Wilson et al. 2017).

Further, though Indigenous peoples’ Country supports a high proportion of Australia’s threatened species (Renwick et al. 2017) and contributes about 40% of Australia’s international conservation obligations on protected areas (SVA 2016), the government allocates approximately US\$87 million per annum to manage more than 40 million hectares of land and sea (Hill et al. 2013). That is, Indigenous land and sea management receives around 3% of Australia’s conservation budget, yet comprises at least 40% of the protected area estate (Hill et al. 2013).

Compounding these issues is the extremely high costs and logistically challenging nature of doing business in regional and remote Australia. ILSM activities operate over vast expanses of country with high seasonal climatic variability, and poor road and communication infrastructure (Wiseman and Bardsley 2015). Monitoring and evaluation is expensive and time-consuming and can therefore be difficult to maintain in the long term when resources are constrained (Hockings et al. 2009).

These issues when combined raise the questions about the equity of the distribution of benefits from effective ILSM. Are Indigenous land and sea managers appropriately resourced to do their work and, further, to report on their effectiveness? And who receives most of the benefits from ILSM – local Indigenous people or the investors?

Relying only on investor-led, top-down mechanisms for measuring effectiveness risks under-valuing local demands for equity and justice, or worse, ignoring these issues completely. Indigenous peoples want their interests to be treated with the same respect as those of institutional investors in ILSM programs (Convention on Biological Diversity 2011a; Funder et al. 2013; Langton 2013; Vincent and Neale 2016). This is seen as a matter of justice and the basis for ensuring equitable outcomes (Sikor et al. 2014), especially where ILSM investors may be in partnership with diverse Indigenous communities (Funder et al. 2013; Krause et al. 2013).

Measuring Management Effectiveness in Complex Social-Cultural-Ecological Systems

Measuring effectiveness in natural resource management is challenging, irrespective of the socio-cultural context in which it occurs (Leverington et al. 2010). However, distances between ontologies, epistemologies and practices of Indigenous peoples and settler societies greatly increases complexity in ILSM because it involves both Indigenous and western knowledge systems, methods, and priorities. Navigating between these requires substantial investment in intercultural brokerage that is committed to honest translation of the interests of both Indigenous peoples and investors in ILSM (Nurse-Bray 2005; Maru and Davies 2011; Robinson and Wallington 2012).

Measuring ‘cultural’ or intangible outcomes is difficult because these are likely to vary more between localities than ecological objectives. There is a persistent bias towards

positivist biophysical science disciplines in the fields of natural resource management and conservation and hence outcomes that cannot be ‘translated’ into these disciplinary languages are often deemed irrelevant or ineffective (Moon and Blackman 2014). The social science methods needed to measure intangible or socio-cultural outcomes of ILSM are not commonly used. On occasions when social assessments are carried out, quantitative methods are often preferred over qualitative (or Indigenous) methods for determining effectiveness (Hockings et al. 2009). This emphasis on demonstrable, tangible and representable outcomes means that biophysical measurements (e.g. area burnt or sprayed for weeds) are given greater attention than longer-term socio-cultural benefits (e.g. intergenerational transfer of knowledge). For example, through decades of investment in training and skills development, Indigenous rangers are becoming highly skilled in using some biodiversity/species monitoring techniques in their work (Jackson et al. 2015). Some Ranger groups are now using biodiversity surveys to maintain endangered local Indigenous languages and knowledge which can be reported on alongside biodiversity conservation outcomes (Ens et al. 2016b). However, generally speaking, there is a relatively low level of competence in implementing social science and participatory methods which requires considerable investment in capacity building and training (e.g. Austin et al. 2017a). Some ILSM groups may have the current capacity to do such work, but others need time to develop these skills.

Grappling with Relativism

Most Indigenous people in Australia will only speak for and/or work on places for which they hold responsibilities within their own ancestral estates (Smyth 1994). The diverse cultural, linguistic, social, economic, environmental and political circumstances of the some 250+ Indigenous language groups across the continent, access to ancestral estates and the deep time connection to specific local places means that measures of ILSM effectiveness are diverse and often place-specific (Ens et al. 2015). For example, in recent consultations with Indigenous people in the development of a regional marine monitoring framework, the issue of data sharing between Indigenous and non-Indigenous groups was complicated by the politics of who has knowledge for the number and location of stocks of dugong and turtles (Austin et al. 2017b). This was partly about who had the authority to make decisions on behalf of these animals with which Indigenous people have close relationships. There are well established local Indigenous governance mechanisms that have endured to the present day, and some people felt these would be threatened because of the knowledge and power transferred by the inappropriate sharing of scientific data collected on turtle and dugong stocks (cf. Robinson 2016). The immediate issue of concern for these local Indigenous groups was about deciding who had the right to harvest these species, which hunting methods should be used, where harvests should take place and in which season.

This example highlights the difficulties of attempting to standardise measures of effectiveness that are agreeable to all parties, implementable and able to be aggregated across scales. As with similar non-Indigenous conservation initiatives, the indicators used for measurement of effectiveness at regional, national and global scales are often inappropriate and irrelevant for people at the local level (Boyd and Charles 2006; Staddon et al. 2014). This incommensurability across scales results in reporting only on issues that can readily be scaled up, which are likely to differ from those that represent Indigenous and local interests (Robinson and Lane 2013). As such, regional and global assessments run the risk of underestimating the true value of ILSM and misrepresenting Indigenous peoples’ collective interests.

THE WAY FORWARD

Well-executed evaluations of ILSM effectiveness can be powerful tools for enhancing conservation that respects local Indigenous values, facilitates adaptive management, and strengthens relationships between investors and ILSM groups (Austin et al. 2017a). This is not simply about compiling indicators relevant to Indigenous, biophysical and social sciences for monitoring and evaluation reports, but the coming together of diverse ways of being, knowing and doing (Robinson and Wallington 2012). This requires a commitment to the co-production of new knowledge through systems whose differences are open to re-negotiation and change on an ongoing basis, to enhance rather than detract from monitoring, evaluation and reporting efforts (Muller 2012; Verran 2013; Tengö et al. 2017). Such generative, ‘good faith’ approaches can be developed by focusing on principles, process, flexibility and trust.

CONCLUSION

This review has drawn on the literature and the experiences of ILSM in Australia to identify the challenges and opportunities for assessing the effectiveness of conservation partnerships between Indigenous communities and institutional investors. We recommend using generative, good faith-based evaluation methods and measures that can describe and detect changes in diverse and linked social, cultural, economic and conservation outcomes that arise from ILSM programs. This approach can support the co-production of useful measures of effectiveness that strengthen partnerships, create efficiencies and optimise return on investments, while opening pathways for new sources of income for Indigenous land and sea managers. In conclusion, we suggest four ways by which Indigenous groups and institutional investors can work together to establish meaningful criteria for demonstrating effectiveness.

First, develop new, mutually-agreed, definitions of diverse values produced from Indigenous conservation activities. The key concepts, terminology and language used in ILSM, especially in defining values and measures of effectiveness, determines the types of ‘worlds’ created (Verran 2013; Gavin et al. 2015). So far, the focus has been on terms like ‘return

on investment' as the basis for monitoring and evaluating effectiveness (e.g. SVA 2016), rather than the diverse socio-cultural concepts that Indigenous peoples use to define the right ways of looking after Country. The emphasis on economic criteria reduces the role of Indigenous communities to delivery agents of programs that largely serve the interests of institutional investors. Intercultural knowledge brokers should establish dialogue between Indigenous peoples and investors in a manner that unpacks key terminology to enable its reconstitution as locally meaningful concepts, language and subsequent ILSM practices. They need to draw on trans-disciplinary approaches (e.g. Austin et al. 2017a; Tengö et al. 2017) to enable meaningful engagement of Indigenous communities in project framing, design, implementation, monitoring and evaluation of their investment in conservation and looking after Country.

Underpinning this work is the need for strong local Indigenous governance that ensures equal participation in partnerships with investors and ensures accountability to all stakeholders (Muller 2008). Further investment in Indigenous capacity to design and participate in monitoring, evaluation and reporting frameworks is required, especially in terms of understanding their purpose in relation to ILSM. This must be matched by investment in facilitating more meaningful and respectful engagement between conservation scientists and Indigenous governance and knowledge practices (Gavin et al. 2015). The long-term success of ILSM can only be achieved when Indigenous communities are empowered to define conservation initiatives that reflect their values and priorities (Danielsen et al. 2005, 2011; Garnett et al. 2009a; Funder et al. 2013; Kok et al. 2017). 'Effective' participation of Indigenous communities must therefore be a key measure of effectiveness, which includes their active role in identifying, defining, and prioritising the full range of values that they aim to produce from investing their effort and the funds invested by external institutions.

Second, embrace the full complexity of Indigenous-conservation alliances. ILSM is about producing and maintaining complex social-ecological systems, not simply about doing conservation 'on the cheap' to meet the technocratic or accounting requirements of institutional investors. As such, oversimplifying indicators of effectiveness will most likely generate disagreement and conflict between Indigenous communities and institutional representatives, and lead to the perverse 'gaming' of measurements. The full complexity of the social-ecological systems that describe ILSM work and its context must be represented in the choice of monitoring indicators that make sense for Indigenous communities and institutional funders. These can include, for example, plant and animal species that have food value and cultural importance, maintenance of sacred sites, or right-way burning, all of which can be monitored, evaluated, and translated meaningfully across both contexts by mobilising multiple evidence-based approaches (Austin et al. 2017a, 2017b; Tengö et al. 2017). Supporting and enhancing the role of 'knowledge brokers' is fundamental to embracing

the complexity (and harnessing the full potential) of ILSM (Tengö et al. 2014; 2017; Robinson et al. 2016b). Knowledge brokers are Indigenous and non-Indigenous individuals and organisations who have substantial experience in creating linkages and meaningful relationships between disparate knowledge holders/producers. These people or organisations understand the strengths and limitations of their own knowledge systems, and can build relationships of trust and understanding between the knowledge systems of conservation scientists and Indigenous groups. The role of these intermediaries is crucial to effective conservation management outcomes (Pham et al. 2010, Robinson et al. 2016b).

Third, reflect regularly and collaboratively on lessons learned together. Socio-ecological systems do not exist as stable states (Gavin et al. 2015). Bio-cultural indicators, tools and partnerships are adaptive and open to revision. Measures of ILSM effectiveness must incorporate formalised moments of reflexivity that allow monitoring, evaluation and reporting processes to be reviewed so that they are relevant to changing landscapes and local conditions (e.g. Austin et al. 2017a). Regular reflection by all stakeholders on progress, lessons learned, and reassessment of conservation objectives can ensure that the indicators and measures of effectiveness continue to be meaningful for assessing ILSM outcomes.

Finally, negotiate which indicators of ILSM effectiveness can be measured at large scales. Identification of spatially 'scalable' indicators from local to regional, national and global levels is only possible through cooperative initiatives led by Indigenous peoples and local communities with intercultural researchers and institutional investors (Austin et al. 2017b). The scalable indicators must be co-produced to encompass Indigenous and scientific ontologies for managing Country and conservation, according to specific contexts and bio-cultural motivations. The process of developing scalable indicators requires substantial investment in dialogue to build trust, respect, and shared understanding of ILSM effectiveness that can be meaningfully communicated beyond the local to the larger world.

NOTE

- 1 Country is the English term used by many Indigenous Australians to refer to their ancestral estates (Smyth 1994). The term is capitalised as Country has agency in Indigenous Australian cosmologies and the relationship between people and environment is one of intertwined dualities (Rose 2000).

REFERENCES

- Altman, J.C. 2001. *Sustainable development options on Aboriginal land: the hybrid economy in the 21st century*. Discussion Paper 226, Centre for Aboriginal Economic Policy Research. Canberra: The Australian National University.
- Altman, J.C. 2016. Kuninjku people, buffalo, and conservation in Arnhem Land: 'It's a contradiction that frustrates us'. In: *Unstable Relations: environmentalism and Indigenous people in contemporary Australia*. (eds Vincent, E. and T. Neale). Pp. 54-91. Perth: UWA Publishing.

- ANAO. 2011. *Indigenous Protected Areas*. Australian National Audit Office, Audit Report No. 14 2011-12, Performance Audit. Canberra: Commonwealth of Australia. <https://www.anao.gov.au/sites/g/files/net1621f/201112%20Audit%20Report%20No%2014.pdf> Last accessed: 29 July 2016.
- Ansell, S and J. Koenig. 2011. CyberTracker: and integral management tool used by rangers in the Djelk Protected Area, central Arnhem Land, Australia. *Ecological Management & Restoration* 12(1): 13-25.
- Archer, R. 2015. Ecosystems as country, law, culture and futures: an indigenous perspective. In: *Valuing Nature: Protected Areas and Ecosystem Services* (eds Figgis, P., B. Mackey, J. Fitzsimons, J. Irving and P. Clarke). Pp. 28-33. Sydney: Australian Committee for IUCN.
- Austin, B.J. and B.C. Corey. 2012. Factors contributing to the longevity of the commercial use of crocodiles by Indigenous people in remote Northern Australia. *The Rangeland Journal* 34: 239-248.
- Austin, B.J., T. V. igilante, S. Cowell, I.M. Dutton, D. Djanghara, S. Mangolomara, B. Puermora, A. Bundamurra, and Z. Clement. 2017a. The Unguu Monitoring and Evaluation Committee: Intercultural Governance of a Land and Sea Management Programme in the Kimberley, Australia. *Ecological Management & Restoration* 18(2): 124-133.
- Austin, B.J., C.J. Robinson, G. Lincoln, R. Dobbs, F. Tingle and S.T. Garnett 2017b. *Mobilising Indigenous Knowledges for Collaborative Management of Kimberley Saltwater Country*. Report to the Kimberley Indigenous Saltwater Science Project (KISSP), Western Australian Marine Science Institute (WAMSI). Broome.
- Austin, B.J., C.J. Robinson, M. Tofa and S.T. Garnett. in review. Investing for multiple impacts: outsider aspirations for Indigenous Land & Sea Management partnerships in Australia. *Society & Natural Resources*.
- Australian Government. 2013. *Monitoring, Evaluation, Reporting and Improvement Strategy – Caring for Our Country and the Biodiversity Fund*. Canberra: Department of the Environment. <http://www.nrm.gov.au/system/files/resources/c2f28fc7-cb08-4951-a10a-fce03b891cf7/files/2013-18-meri-strategy.pdf> Accessed on July 28, 2016.
- Barber, M. and S. Jackson. 2017. Identifying and categorizing benefits in state-supported Australian indigenous environmental management programs: international research implications. *Ecology & Society* 22(2): 11.
- Bark, R.H., C.J. Robinson, and K.W. Flessa. 2016. Tracking cultural ecosystem services: water chasing the Colorado River restoration pulse flow. *Ecological Economics* 127: 165-172.
- Berkes, F. 2009. Community conserved areas: policy issues in historic and contemporary context. *Conservation Letters* 2(1): 19-24.
- Berkes, F., J. Colding and C. Folke. 2000. Rediscovery of Traditional Ecological Knowledge as adaptive management. *Traditional Ecological Knowledge* 10(5): 1251-1262.
- Birkhead, J., R. Greiner, S. Hemming, D. Rigney, M. Rigney, G. Trevorrow and T. Trevorrow. 2011. *Economic and cultural values of water to the Ngarrindjeri people of the Lower Lakes, Coorong and Murray Mouth*. River Consulting: Townsville.
- Boyd, H., and A. Charles. 2006. Creating community-based indicators to monitor sustainability of local fisheries. *Ocean & Coastal Management* 49(5-6): 237-258.
- Brennan, K.E.C., P.J. Twigg, A. Watson, A. Pennington, J. Sumner, R. Davis, J. Jackson, B. Brooks, F. Grant and R. Underwood. 2012. Cross-cultural systematic biological surveys in Australia's Western Desert. *Ecological Management & Restoration* 13(1): 72-80.
- Butchart, S.H., M. Clarke, R.J. Smith, R.E. Sykes, J.P. Scharlemann, M. Harfoot, G.M. Buchanan, A. Angulo, A. Balmford, B. Bertzky and T.M. Brooks 2015. Shortfalls and solutions for meeting national and global conservation area targets. *Conservation Letters* 8(5): 329-337.
- Campbell, D., C.P. Burgess, S.T. Garnett, and J. Wakerman. 2011. Potential primary health care savings for chronic disease care associated with Australian Aboriginal involvement in land management. *Health Policy* 99(1): 83-89.
- Carr, B., J. Fitzsimons, N. Holland, T. Berkinshaw, K. Bradby, S. Cowell, P. Deegan, P. Koch, M. Looker, T. Varcoe, P. Walsh and F. Wiesenberger. 2017. CAPitalising on conservation knowledge: Using Conservation Action Planning, Healthy Country Planning and the Open Standards in Australia. *Ecological Management & Restoration* 18(3): 176-189.
- Chan, K.M.A., A.D. Guerry, P. Balvanera, S. Klain, T. Satterfield, X. Basurto, A. Bostrom, R. Chuenpagdee, R. Gould, B.S. Halpern, N. Hannahs, J. Levine, B. Norton, M. Ruckelshaus, R. Russell, J. Tam and U. Woodside 2012. Where are cultural and social in ecosystems services? A framework for constructive engagement. *BioScience* 62(8): 744-756.
- Collier, N., B.J. Austin, C.J. Bradshaw, and C.R. McMahon. 2011. Turning pests into profits: introduced buffalo provide multiple benefits to Indigenous people of northern Australia. *Human Ecology* 39(2): 155-164.
- Convention on Biological Diversity. 2011a. *Quick guide to the Aichi Biodiversity Targets: Protected areas increased and improved (Target 11)*. <https://www.cbd.int/doc/strategic-plan/targets/T11-quick-guide-en.pdf> Accessed on May 18, 2016.
- Convention on Biological Diversity. 2011b. *Quick guide to the Aichi Biodiversity Targets: Traditional knowledge respected (Target 18)*. <https://www.cbd.int/doc/strategic-plan/targets/T18-quick-guide-en.pdf> Accessed on May 18, 2016.
- Convention on Biological Diversity. 2011c. *Quick guide to the Aichi Biodiversity Targets: Financial resources from all sources increased (Target 20)*. <https://www.cbd.int/doc/strategic-plan/targets/T20-quick-guide-en.pdf> Accessed on May 18, 2016.
- Danielsen, F., N.D. Burgess and A. Balmford. 2005. Monitoring matters: examining the potential of locally-based approaches. *Biodiversity and Conservation* 14(11): 2507-2542.
- Danielsen, F., N.D. Burgess, A. Balmford, P. Donald, J. Jones, P. Alviola, D. Balet, T. Blomley, J. Brashares, B. Child, M. Enghoff, J. Fjelds, S. Holt, H. Hubertz, A. Jensen, P. Jensen, J. Massao, M. Mendoza, Y. Ngaga, M. Poulsen, R. Rueda, M. Sam, T. Skielboe, G. Stuart-Hill, E. Topp-Jorgensen and D. Yonten. 2009. Local participation in natural resource monitoring: a characterization of approaches. *Conservation Biology* 23(1): 31-42.
- Danielsen, F., M. Skutsch, N.D. Burgess, P.M. Jensen, H. Andrianandrasana, B. Karky, R. Lewis, J.C. Lovett, J. Massao, Y. Ngaga, P. Phartiyal, M.K. Poulsen, S.P. Singh, S. Solis, M. Sorensen, A. Tewari, R. Young and E. Zahabu. 2011. At the heart of REDD+: a role for local people in monitoring forests? *Conservation Letters* 4(2): 158-167.
- Danielsen, F., K. Pirhofer-Walz, T.P. Adrian, D.R. Kapijimpanga, N.D. Burgess, P.M. Jensen, R. Bonney, M. Funder, A. Landa, N. Levermann and J. Madsen. 2014. Linking public participation in scientific research to the indicators and needs of international environmental agreements. *Conservation Letters* 7(1): 12-24.
- Davies, J., R. Hill, F.J. Walsh, M. Sandford, D. Smyth and M.C. Holmes. 2013. Innovation in management plans for community conserved areas: experiences from Australian Indigenous protected areas. *Ecology and Society* 18(2): 14.
- Davies, T.E., I.R.A. Fazey, W. Cresswell and N. Pettoelli. 2014. Missing the trees for the wood: Why we are failing to see success in pro-poor conservation. *Animal Conservation* 17(4): 303-312.
- Diaz, S., S. Demissew, C. Joly, W.M. Lonsdale, and A. Larigauderie. 2015. A Rosetta Stone for nature's benefits to people. *PLoS Biology* 13(1): e1002040.
- Dobbs, R.J., C.L. Davies, M.L. Walker, N.E. Pettit, B.J. Pusey, P.G. Close, Y. Akune, N. Walsham, B. Smith, A. Wiggan and P. Cox. 2016. Collaborative research partnerships inform monitoring and management of aquatic ecosystems by Indigenous rangers. *Reviews in Fish Biology and Fisheries* 26(4): 711-725.
- Ens, E.J. 2012. Monitoring outcomes of environmental service provision in low socio-economic Indigenous Australia using innovative CyberTracker technology. *Conservation and Society* 10(1): 42-52.
- Ens, E.J., G.M. Towler, C. Daniels, R. the Yugul Mangi and Manwurrk

- Rangers. 2012. Looking back to move forward: Collaborative ecological monitoring in remote Arnhem Land. *Ecological Management & Restoration* 13(1): 26-35.
- Ens, E.J., P. Pert, P.A. Clarke, M. Budden, L. Clubb, B. Doran, C. Douras, J. Gaikwad, B. Gott, S. Leonard, J. Locke, J. Packer, J. Turpin, and S. Wason. 2015. Indigenous bio-cultural knowledge in ecosystem science and management: Review and insight from Australia. *Biological Conservation* 181: 133-149.
- Ens, E., C. Daniels, J. Roy, E. Nelson and P. Dixon. 2016a. Creating multi-functional landscapes: Using exclusion fences to frame feral ungulate management preferences in remote Aboriginal-owned northern Australia. *Biological Conservation* 197: 235-246.
- Ens, E., M.L. Scott, Yugul Mangi Rangers, C. Moritz, and R. Pirzl. 2016b. Putting indigenous conservation policy into practice delivers biodiversity and cultural benefits. *Biodiversity and Conservation* 25(14): 2889-2906.
- Ens, E., F. Walsh, and P.A. Clarke. 2017. Aboriginal people and Australia's vegetation: past and current interactions. In: *Australian Vegetation*, Third edition (ed. D.A. Keith). Pp. 89-112. Oxford: Oxford University Press.
- Fache, E. 2014. Caring for Country, a form of bureaucratic participation: conservation, development, and neoliberalism in Indigenous Australia. *Anthropological Forum* 24(3): 267-286.
- Farhan Ferrari, M., C. de Jong, and V.S. Belohrad. 2015. Community-based monitoring and information systems (CBMIS) in the context of the Convention on Biological Diversity (CBD). *Biodiversity* 16(2-3): 57-67.
- Ferraro, P.J. and R.L. Pressey. 2015. Measuring the difference made by conservation initiatives: protected areas and their environmental and social impacts. *Philosophical Transactions of the Royal Society B* 370: 20140270.
- Fitzsimons, J. and M. Looker. 2012. Innovative approaches to land acquisition and conservation management: the case of Fish River Station, Northern Territory. In: *Innovation for 21st Century Conservation* (eds Figgis, P., J. Fitzsimons, and J. Irving). Pp 78-85. Sydney: Australian Committee for IUCN.
- Fitzsimons, J., J. Russell-Smith, G. James, T. Vigilante, G. Lipsett-Moore, J. Morrison, and M. Looker. 2012. Insights into the biodiversity and social benchmarking components of the Northern Australian fire management and carbon abatement programmes. *Ecological Management & Restoration* 13(1): 51-57.
- Figgis, P., B. Mackey, J. Fitzsimons, J. Irving, and P. Clarke. (Eds) 2015. *Valuing Nature: Protected Areas and Ecosystem Services*. Sydney: Australian Committee for IUCN.
- FPP. 2016. *Local Biodiversity Outlooks – Summary and Conclusions*. Report produced by the Forest Peoples Programme, the International Indigenous Forum on Biodiversity and the Secretariat of the Convention on Biological Diversity, Moreton-in-Marsh, England. <http://www.forestpeoples.org/sites/fpp/files/publication/2016/12/lbo-summary-2016-english-design-v6.pdf> Accessed on May 23, 2017.
- Funder, M., F. Danielsen, Y. Ngaga, M.R. Nielsen and M.K. Poulsen. 2013. Reshaping conservation: the social dynamics of participatory monitoring in Tanzania's community-managed forests. *Conservation and Society* 11(3): 218-232.
- Gammage, W. 2011. *The biggest estate on earth: how Aborigines made Australia*. Sydney: Allen & Unwin.
- Garnett, S.T., G.M. Crowley, H.M. Hunter-Xenie, W. Kozanayi, B. Sithole, C. Palmer, R. Southgate and K.K. Zander. 2009a. Transformative knowledge transfer through empowering and paying community researchers. *Biotropica* 41(5): 571-577.
- Garnett, S.T., B. Sithole, P.J. Whitehead, C.P. Burgess, F.H. Johnston, and T. Lea. 2009b. Healthy country, healthy people: policy implications of links between Indigenous human health and environmental condition in tropical Australia. *Australian Journal of Public Administration* 68(1): 53-66.
- Gavin, M.C., J. McCarter, A. Mead, F. Berkes, J.R. Stepp, D. Peterson, and R. Tang. 2015. Defining bio-cultural approaches to conservation. *Trends in Ecology & Evolution* 30(3): 140-145.
- Gilligan, B. 2006. *The Indigenous Protected Areas Programme 2006 Evaluation*. Canberra: Department of the Environment and Heritage.
- Gomez-Baggeth E., E. Corbera, and V. Reyes-Garcia. 2013. Traditional ecological knowledge and global environmental change: research findings and policy implications. *Ecology and Society* 18(4): 72.
- Gorman, J. and S. Vemuri. 2017. A precursor to entrepreneurialism on Aboriginal lands of the Northern Territory of Australia. *International Journal of Entrepreneurship* 21(1): 16-31.
- Gunn, R., B.D. Hardest, and J. Butler. 2010. Tackling 'ghost nets': Local solutions to a global issue. *Ecological Management & Restoration* 11(2): 88-98.
- Hajjar, R., R. Kozak, and J. Innes. 2012. Is decentralization leading to "real" decision-making power for forest-dependent communities? Case studies from Mexico and Brazil. *Ecology and Society* 17(1): 12.
- Haynes, C. 2003. Seeking Control: disentangling the difficult sociality of Kakadu National Park's joint management. *Journal of Sociology* 49(2-3): 194-209.
- Hemming, S. and D. Rigney. 2012. Ngarrindjeri futures: negotiating a future through Caring for *Ruwe/Ruwar* (lands, waters and all living things). In: *Innovation for 21st Century Conservation* (eds Figgis, P., J. Fitzsimons and J. Irving). Pp. 186-191. Sydney: Australian Committee for IUCN.
- Hicks, C.C., A. Levine, A. Agrawal, X. Basurto, S.J. Breslow, C. Carothers, S. Chamley, S. Coulthard, N. Dolsak, J. Donatuto and C. Garcia-Quijano. 2016. Engage key social concepts for sustainability. *Science* 352(6281): 38-40.
- Hill, R., P. Pert, J. Davies, C. Robinson, F. Walsh, and F. Falco-Mammone. 2013. *Indigenous Land Management in Australia: Extent, scope, diversity, barriers and success factors*. Cairns: CSIRO Ecosystem Sciences.
- Hockings, M., S. Stolton, F. Leverington, N. Dudley and J. Courrau. 2006. *Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas*. Gland, Switzerland and Cambridge, UK: IUCN.
- Hockings, M., S. Stolton, N. Dudley, and R. James. 2009. Data credibility: what are the "right" data for evaluating management effectiveness of protected areas? *New Directions for Evaluation* 122: 53-63.
- Hoffmann, B.D., S. Roeger, P. Wise, J. Dermer, B. Yunupingu, D. Lacey, D. Yunupingu, B. Marika, M. Marika and B. Panton. 2012. Achieving highly successful multiple agency collaborations in a cross-cultural environment: experiences and lessons from Dhimurru Aboriginal Corporation and partners. *Ecological Management & Restoration* 13(1): 42-50.
- Horstman, M., and G. Wightman. 2001. Karpanti ecology: Recognition of Aboriginal ecological knowledge and its application to management in north-western Australia. *Ecological Management & Restoration* 2(2): 99-109.
- Howitt, R. and S. Suchet-Pearson. 2006. Rethinking the building blocks: ontological pluralism and the idea of 'management'. *Geografiska Annaler: Series B, Human Geography* 88(3): 323-335.
- Howitt, R., K. Doohan, S. Suchet-Pearson, S. Cross, R. Lawrence, G.J. Lunkapis, S. Muller, S. Prout and S. Veland. 2013. Intercultural capacity deficits: Contested geographies of coexistence in natural resource management. *Asia Pacific Viewpoint* 54(2): 126-140.
- Jackson, M.V., R. Kennett, P. Bayliss, R. Warren, N. Waina, J. Adams, L. Cheinmora, T. Vigilante, E. Jungine, K. Woolagoodja, F. Woolagoodja, J. Umbagai, J. Holmes and F. Weisenberger. 2015. Developing collaborative marine turtle monitoring in the Kimberley region of northern Australia. *Ecological Management & Restoration* 16(3): 163-176.
- Jackson, S., M. Storrs, and J. Morrison. 2005. Recognition of Aboriginal rights, interests and values in river research and management: perspectives from northern Australia. *Ecological Management & Restoration* 6(2): 105-110.
- Jupp, T., J. Fitzsimons, B. Carr and P. See. 2015. New partnerships for managing large desert landscapes: experiences from the *Martu Living Deserts Project*. *The Rangeland Journal* 37(6): 571-582.

- Kerins, S. 2016. Kimberley conservation threatens to take a step back on Indigenous rights. *Australian Environment Review* 31(5): 186-189.
- Kerins, S., & J. Green. 2015. Indigenous country in the southwest Gulf of Carpentaria: Territories of difference or indifference? In: *Engaging indigenous economy: debating diverse approaches*. (ed. Sanders, W.) CAEPR Research Monograph 35. Pp.111-128. Canberra: ANU Press.
- Klein, C., M.C. McKinnon, B.T. Wright, H.P. Possingham & B.S. Halpern. 2015. Social equity and the probability of success of biodiversity conservation. *Global Environmental Change* 35, 299-306.
- Krause, T., W. Collen & K.A. Nicholas. (2013). Evaluating safeguards in a conservation incentive program: Participation, consent, and benefit sharing in Indigenous communities of the Ecuadorian Amazon. *Ecology and Society* 18(4): 1.
- Kok, M.T.J., K. Kok, G.D. Peterson, R. Hill, J. Agard and S.R. Carpenter 2017. Biodiversity and ecosystem services require IPBES to take novel approach to scenarios. *Sustainability Science* 12(1): 177-181.
- Kothari, A., P. Camill & J. Brown. 2013. Conservation as if people also mattered: Policy and practice of community-based conservation. *Conservation & Society* 11(1): 1-15.
- Langton, M. 2013. *The Quiet Revolution: Indigenous People and the Resource Boom*. Sydney: ABC Books.
- Leisher, C., L.H. Samberg, P. Van Buekering & M. Sanjayan. 2013. Focal areas for measuring the human well-being impacts of a conservation initiative. *Sustainability* 5(3): 997-1010.
- Leverington, A. 2012. Opportunities for enhancing conservation management and resilience through tenure resolution in Cape York Peninsula. In: *Innovation for 21st Century Conservation* (eds. P. Figgis, J. Fitzsimons and J. Irving). Pp.94-99. Sydney: Australian Committee for IUCN.
- Leverington, F., K.L. Costa, H. Pavese, A. Lisle & M. Hockings. 2010. A global analysis of protected area management effectiveness. *Environmental Management* 46(5): 685-698.
- Maru, Y. and J. Davies. 2011. Supporting cross-cultural brokers is essential for employment among Aboriginal people in remote Australia. *The Rangeland Journal* 33, 327-338.
- Moon, K. and D. Blackman 2014. A Guide to Understanding Social Science Research for Natural Scientists. *Conservation Biology* 28(5): 1167-1177.
- Moorcroft, H., E. Ignjic, S. Cowell, J. Goonack, S. Mangolomara, J. Oobagooma, R. Karadada, D. Williams & N. Waina. 2012. Conservation planning in a cross-cultural context: the Wunambal Gaambera Healthy Country Project in the Kimberley, Western Australia. *Ecological Management & Restoration* 13(1): 16-25.
- Moritz, C., E.J. Ens, S. Potter and R. Catullo. 2013. The Australian monsoonal tropics: an opportunity to protect unique biodiversity and secure benefits for Aboriginal communities. *Pacific Conservation Biology* 19(4): 343-355.
- Muhic, J., E. Abbott & M.J. Ward. 2012. The warru (*Petrogale lateralis* MacDonnell Ranges Race) reintroduction project on the Anangu Pitjantjatjara Yankunytjatjara Lands, South Australia. *Ecological Management & Restoration* 13(1): 89-92.
- Muller, S. 2008. Accountability constructions, contestations and implications: Insights from working in a Yolngu cross-cultural institution, Australia. *Geography Compass* 2(2): 395-413.
- Muller, S. 2012. 'Two ways': bringing Indigenous and non-Indigenous knowledges together. In: *Country, Native Title and Ecology* (ed. Weir, J.). Pp.59-79. Canberra: ANU Press.
- Muller, S. 2014. Co-motion: making space to care for country. *Geoforum* 54: 132-141.
- NAILSMA 2014. *Looking After Country: the NAILSMA I-Tracker story*. Darwin: North Australian Land and Sea Management Alliance.
- Nakata, M.N. 2007. *Disciplining the savages, savaging the disciplines*. Canberra: Aboriginal Studies Press.
- Nesbitt, B., L. Baker, P. Copley, F. Young and Anangu Pitjantjatjara Land Management 2001. Cooperative cross-cultural biological surveys for resource management: experiences in the Anangu Pitjantjatjara Lands. In: *Working on Country: Indigenous Environmental Management in Australia* (eds. Baker, R., J. Davies & E. Young). Pp.187-198. Melbourne: Oxford University Press.
- Nurse-Bray, M. 2005. *Having a Yarn: Engaging with Indigenous Communities in Natural Resource Management*. Townsville: Cooperative Research Centre for the Great Barrier Reef.
- Pert, P.L., E.J. Ens, J. Locke, P.A. Clarke, J.M. Packer & G. Turpin. 2015. An online spatial database of Australian Indigenous Bio-cultural Knowledge for contemporary natural and cultural resource management. *Science of the Total Environment* 534: 110-121.
- Petheram, L., C. High, B. M. Campbell, and N. Stacey. 2011. Lenses for learning: Visual techniques in natural resource management. *Journal of Environmental Management* 92(10): 2734-2745.
- Pham, T.T., M.B. Campbell, S.T. Garnett, H. Aslin & M.H. Hoang. 2010. Importance and impacts of intermediary boundary organizations in facilitating Payment for Environmental Services in Vietnam. *Environmental Conservation* 37(1): 64-72.
- Poe, M.R., K.C. Norman & P.S. Levin 2014. Cultural dimensions of socioecological systems: Key connections and guiding principles for conservation in coastal environments. *Conservation Letters* 7(3): 166-175.
- Porter-Bolland, L., E.A. Ellis, M.R. Guariguata, I. Ruiz-Mallén, S. Negrete-Yankelevich & V. Reyes-García. 2012. Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics. *Forest Ecology and Management* 268: 6-17.
- Read, J.L., & M.J. Ward. 2011. Bringing back warru: initiation and implementation of the South Australian Warru Recovery Plan. *Australian Mammalogy* 33(2): 214-220.
- Renwick, A., C.J. Robinson, T. Martin, T. May, P. Polglase, H.P. Possingham & J. Carwardine. 2014. Biodiverse planting for carbon and biodiversity on Indigenous land. *PLoS One* 9: e91281.
- Renwick, A.R., C.J. Robinson, S.T. Garnett, I. Leiper, H.P. Possingham & J. Carwardine. 2017. Mapping Indigenous land management for threatened species conservation: An Australian case-study. *PLoS One* 12: e0173876.
- Roberts, R.G., R. Jones and M.A. Smith. 1990. Thermoluminescence dating of a 50,000 year old human occupation site in northern Australia. *Nature* 345: 153-156.
- Robinson, C.J., D. Smyth & P.J. Whitehead. 2005. Bush tucker, bush pets, and bush threats: cooperative management of feral animals in Australia's Kakadu National Park. *Conservation Biology* 19(5): 1385-1391.
- Robinson, C.J. and M.B. Lane. 2013. Boundary riding Indigenous knowledge contributions for natural resource decision-making in Northern Australian regions. In: *Reclaiming Indigenous approaches to community and land-use planning in the twenty-first century* (eds. Walker, B., T. Jojola, and D. Natcher). Pp. 396-413. Montreal: McGill-Queen's University Press.
- Robinson, C.J. and T.J. Wallington. 2012. Boundary work: engaging knowledge systems in co-management of feral animals on Indigenous lands. *Ecology and Society* 17(2): 16.
- Robinson, C.J., G. James & P.J. Whitehead. 2016a. Negotiating Indigenous benefits from payment from ecosystem (PES) schemes. *Global Environmental Change* 28: 21-29.
- Robinson, C.J., A. R. Renwick., T. May, E. Gerrard, R. Foley, M. Battaglia, H. Possingham, D. Griggs, & D. Walker. 2016b. Indigenous benefits and carbon offset schemes: An Australian case study. *Environmental Science and Policy* 56: 129-134.
- Robinson, C.J., K. Maclean, R. Hill, E. Bock & P. Rist. 2016c. Participatory mapping to negotiate Indigenous knowledge used to assess environmental risk. *Sustainability Science* 11(1): 115-126.
- Robinson, C.J. 2016. Hunting for Country and Culture: the challenges surrounding Indigenous collaborative partnerships on the coast of Northern Australia. In: *The Challenges of Collaboration in Environmental Governance: Barriers and Responses* (eds. Margerum, R.D. and C.J. Robinson). Pp.355-370. Northampton: Elgar Press.

- Roe, D., E.Y. Mohammed, I. Porras and A. Giuliani. 2012. Linking biodiversity conservation and poverty reduction: de-polarizing the conservation-poverty debate. *Conservation Letters* 6(3): 162-171.
- Rose, B. 2012. Indigenous Protected Areas – innovation beyond the boundaries. In: *Innovation for 21st Century Conservation* (eds. Figgis, P., J. Fitzsimons and J. Irving). Pp.50-55. Sydney: Australian Committee for IUCN.
- Rose, D.B. 2000. *Dingo makes us human: Life and land in an Australian Aboriginal culture*. Cambridge: Cambridge University Press.
- Russell-Smith, J., C.P. Yates, A.C. Edwards, P. J. Whitehead, B.P. Murphy, and M.J. Lawes. 2015. Deriving Multiple Benefits from Carbon Market-Based Savanna Fire Management: An Australian Example. *PLoS One* 10: e0143426.
- Russell-Smith, J., P. Whitehead & P. Cooke (eds.). 2009. *Culture, ecology and economy of fire management in North Australian savannas: rekindling the Wurrk tradition*. Melbourne: CSIRO Publishing.
- Sikor, T., A. Martin, J. Fisher & J. He. 2014. Toward an empirical analysis of justice in ecosystem governance. *Conservation Letters* 7(6): 524-532.
- Sithole, B., H. Hunter-Xenie, L. Williams, J. Saegenschnitter, D. Yibarbuk, M. Ryan, O. Champion, B. Yunupingu, M. Liddy, E. Watts, C. Daniels, G. Daniels, P. Christophersen, V. Cubillo, E. Phillips, W. Marika, D. Jackson, and W. Barbour. 2008. *Aboriginal land and sea management in the Top End: a community-driven evaluation*. Darwin: CSIRO.
- Smyth, D. 1994. *Understanding Country: The importance of land and sea in Aboriginal and Torres Strait Islander societies*. Canberra: Australian Government Publishing Service.
- Smyth, D. 2011. *Guidelines to Country-Based Planning*. Consultancy Report to Queensland Department of Environment and Resource Management, Cairns. <http://www.ehp.qld.gov.au/cape-york/pdf/country-based-planning-guideline.pdf> Accessed on Aug 13, 2015.
- Smyth D. 2015. Indigenous Protected Areas and ICCAS: Commonalities, contrasts and confusions. *Parks* 21(2): 73-84.
- Smyth, D. & M. Isherwood. 2016. Protecting sea country: Indigenous people and marine protected areas in Australia. In: *Big, Bold and Blue: Lessons from Australia's marine protected areas* (ed. Fitzsimons, J. and G. Wescott). Pp.307-325. Melbourne: CSIRO Publishing.
- Stacey, N., A.V. Izurieta and S.T. Garnett. 2013. Collaborative measurement of performance of jointly managed protected areas in Northern Australia. *Ecology and Society* 18(1): 19.
- Stacey, N., J. Karam, M. Jackson, R. Kennett & T. Wagey. 2015. Knowledge exchange as a tool for transboundary and coastal management of the Arafura and Timor Seas. *Ocean & Coastal Management* 114: 151-163.
- Staddon S.C., A. Nightingale and S.K. Shrestha. 2014. The social nature of participatory ecological monitoring. *Society and Natural Resources* 27(9): 899-914.
- SVA. 2014. *Evaluative Social Return on Investment Report: Social, Economic and Cultural Impact of Kanyirninpa Jukurrpa's On-Country Programs*. Melbourne: Social Ventures Australia.
- SVA. 2016. *Consolidated Report on Indigenous Protected Areas following Social Return on Investment analyses*. Report for the Department of Prime Minister and Cabinet, prepared by Social Ventures Australia Consulting. <http://www.socialventures.com.au/assets/Consolidated-SROI-Report-on-IPA-WoC.pdf> Accessed on May 26, 2016.
- Taylor, M.F.J., J. Fitzsimons & P. Sattler. 2014. *Building Nature's Safety Net 2014: A decade of protected area achievements in Australia*. Sydney: WWF-Australia.
- Tengö, M., E.S. Brondizio, T. Elmqvist, P. Malmer and M. Spierenburg. 2014. Connecting diverse knowledge systems for enhanced ecosystem governance: the multiple evidence based approach. *Ambio* 43(5): 579-591.
- Tengö, M., R. Hill, P. Malmer, C.M. Raymond, M. Spierenburg, F. Danielsen, T. Elmqvist and C. Folke. 2017. Weaving knowledge systems in IPBES, CBD and beyond—lessons learned for sustainability. *Current Opinion in Environmental Sustainability* 26: 17-25.
- Tobler, R., A. Rohrlach, J. Soubrier, P. Bover, B. Llamas, J. Tuke, N.J. Bean, A. Abdullah-Highfold, S. Agius, S. O'Donoghue, I. O'Loughlin, P. Sutton, F. Zilio, K. Walshe, A.N. Williams, C.S.M. Turney, M.P. Williams, S. Richards, R.J. Mitchell, E. Kowal, J.R. Stephen, L. Williams, W. Haak & A. Cooper. 2017. Aboriginal mitogenomes reveal 50,000 years of regionalism in Australia. *Nature* 544(7649): 180-184.
- Turnbull D. (1997). Reframing science and other local knowledge traditions. *Futures* 29(6): 551-562.
- Turner N.J., M.B. Ignace and R. Ignace. 2000. Traditional Ecological Knowledge and Wisdom of Aboriginal Peoples in British Columbia. *Ecological Applications* 10(5): 1275-1287.
- Verran, H. 2002. Alternative Firing Regimes of Environmental Scientists and Aboriginal Landowners. *Social Studies of Science* 32(5-6): 729-762.
- Verran, H. 2013. Engagements between disparate knowledge traditions: Toward doing difference generatively and in good faith. In: *Contested Ecologies* (ed. Green, L.). Pp.141-161. South Africa: Human Sciences Research Council (HSRC) Press.
- Vincent, E. & T. Neale (eds.). *Unstable Relations: environmentalism and Indigenous people in contemporary Australia*. Perth: UWA Publishing.
- Walker, J. 2010. *Processes for effective management: Learning from Agencies and Warlpiri people involved in managing the Northern Tanami Indigenous Protected Area, Australia*. PhD Thesis. Darwin: Charles Darwin University.
- Walsh, F.J., P.V. Dobson and J.C. Douglas. 2013. Anperrirrentye: a framework for enhanced application of Indigenous ecological knowledge in natural resource management. *Ecology and Society* 18(3): 18.
- Walsh, F. and P. Mitchell. 2002. *Planning for country: Cross-cultural approaches to decision-making on Indigenous lands*. Alice Springs: Jukurrpa Books, IAD Press.
- Walton, N. & J. Fitzsimons. 2015. Payment for ecosystem services in practice – savanna burning and carbon abatement at Fish River, northern Australia. In: *Valuing Nature: Protected Areas and Ecosystem Services* (eds. P. Figgis, B. Mackey, J. Fitzsimons, J. Irving and P. Clarke). Pp.78-83. Sydney: Australian Committee for IUCN.
- Weir, J.K. 2009. *Murray River country: an ecological dialogue with traditional owners*. Canberra: Aboriginal Studies Press.
- West, P., J. Igoe & D. Brockington. 2006. Parks and peoples: the social impact of protected areas. *Annual Review of Anthropology* 35: 251-277.
- Wilson, E., N. Nielsen, P. Scherrer, R.W. Caldicott, B. Moyle & B. Weiler. 2018. To climb or not to climb? Balancing stakeholder priorities at an iconic national park. *Journal of Ecotourism* 17(2): 140-159.
- Wilson, G. & J. Smits. 2012. Conservation for culture and livelihoods – Angas Downs, Northern Territory. In: *Innovation for 21st Century Conservation* (eds. Figgis, P., J. Fitzsimons and J. Irving). Pp.136-141. Sydney: Australian Committee for IUCN.
- Wiseman, N.D. & D.K. Bardsley. 2016. Monitoring to learn, learning to monitor: A critical analysis of opportunities for Indigenous community-based monitoring of environmental change in Australian rangelands. *Geographical Research* 54(1): 52-71
- Witter, R., & T. Satterfield. 2014. Invisible losses and the logics of resettlement compensation. *Conservation Biology* 28(5): 1394-1402.
- Woinarski, J., B. Traill and C. Booth. 2014. *The Modern Outback: nature, people and future of remote Australia*. Sydney: Pew Charitable Trusts.
- Woodward, E., S. Jackson, M. Finn & P.M. McTaggart. 2012. Utilising Indigenous seasonal knowledge to understand aquatic resource use and inform water resource management in northern Australia. *Ecological Management & Restoration* 13(1): 58-64.
- Yibarbuk, D., P.J. Whitehead, J. Russell-Smith, D. Jackson, C. Godjuwa, A. Fisher, P. Cooke, D. Choquenot, and D.M.J.S. Bowman. 2001. Fire ecology and Aboriginal land management in central Arnhem Land, northern Australia: a tradition of ecosystem management. *Journal of Biogeography* 28(3): 325-343.
- Zander, K.K., B.J. Austin & S.T. Garnett. 2014. Indigenous peoples' interest in wildlife-based enterprises in the Northern Territory,

Australia. *Human Ecology* 42(1): 115-126.

Ziembicki, M.R., J.C.Z. Woinarski and B. Mackey. 2013. Evaluating the status of species using Indigenous knowledge: Novel evidence for major native mammal declines in northern Australia.

Biological Conservation 157: 78-92.

Zurba M., and F. Berkes. 2014. Caring for country through participatory art: creating a boundary object for communicating Indigenous knowledge and values. *Local Environment* 19(8): 821-836.

Received: September 2016; **Accepted:** January 2018

