

An ecosystem services framework to evaluate indigenous and local peoples' connections with nature



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ABSTRACT

Indigenous and local peoples' connections with nature are not only limited to the benefits or services people derive from ecosystems, as considered by international frameworks, but also entail peoples' capabilities (knowledges and skills) that enable people to derive those benefits. Applying Sen's (1993) Capability Approach, this paper proposes an ecosystem services framework that underscores peoples' capabilities along with well-being benefits, to inform policy decision-making about the value of natural resources towards Indigenous and local peoples' well-being. We offer an economic perspective of considering Indigenous and local estates as a source of opportunities, and construct an integrated framework based on six case studies across the globe. We argue that supporting Indigenous and local peoples to utilize and build capabilities to manage natural systems will deliver manifold benefits to them as well as to the wider public. Moreover, learning Indigenous and local ethics to care for nature will help many of us to better manage and value our fast depleting natural resources.

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1. Introduction

Worldwide, Indigenous and local peoples' connections with nature are well-known (Posey and Oxford Centre for the Environment, Ethics and Society, 1999), however, these connections are often not incorporated into public policies at the national or international scale (Millennium Ecosystem Assessment (2003); The Economics of Biodiversity and Ecosystems (TEEB), 2010; de Groot et al., 2012; Costanza et al., 2014). The need to understand and value these connections to guide the public policies is beckoned by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), the MA, the World Resources Institute (World Resources Institute (WRI) (2017)) and TEEB (2010), amongst many other national and international agencies.

Since the popularity of ES concept, the trans-disciplinary experts from ecological economics including de Groot et al. (2010), Braat and de Groot (2012), Costanza et al. (2017) and several others have emphasized to recognize implicit mutuality of people-nature relationships and to advance ES frameworks, concepts and ideas that make ES the core of the economic theory and practice for achieving sustainable well-being of people. Braat and de Groot (2012) sets the agenda for the 'Ecosystem Services' journal describing how to identify, assess, and capture and manage the values to support science-policy-practice linkages—a key focal area for the IPBES. Over the last 17 years, ES research has progressed considerably (Costanza et al., 2017), but not so on policy front.

To incorporate the importance of peoples' connections with nature in policy decision-making, the IPBES and MA have proposed frameworks linking nature's ecosystem services (ES) and people's well-being (Millennium Ecosystem Assessment, 2003; Díaz et al., 2015, 2018; IPBES 2017a) (Fig. 1a and b). Earlier, frameworks proposed by TEEB (2010), de Groot et al. (2010) and Haines-Young and

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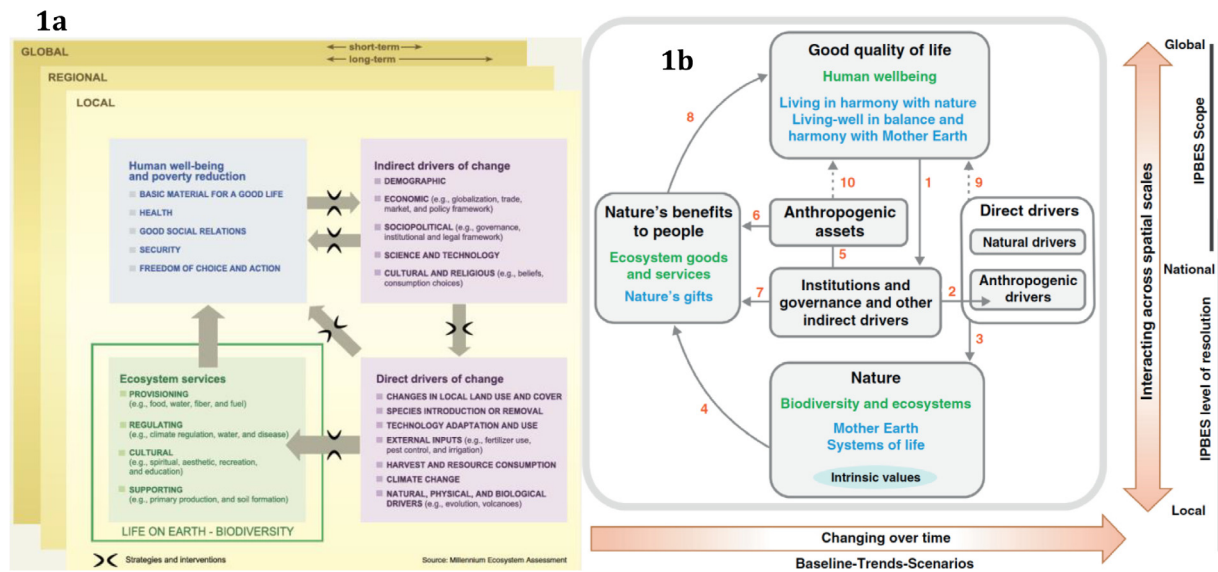


Fig. 1. The MA and IPBES frameworks: a. The MA framework links human well-being and ES (on the left-hand side), which are influenced through various direct and indirect drivers of change (on the right-hand side) (MA 2003; 2005e). b. IPBES framework includes six main elements: Nature, Nature's benefits, Good quality of life, Anthropogenic assets, Direct drivers, and Institutions and governance. The arrows denote the links between elements, along the temporal and spatial scales (side arrows). (Source: IPBES, 2017a; Díaz et al., 2015).

Potschin (2010) focused on three separate components—biophysical structure and function of ecosystems, institutional arrangements and human judgments or services, and human well-being (benefits and values)—to describe people-nature relationships. These frameworks, particularly the MA and IPBES, explicitly link nature with human well-being for clearly delineating how well-being is derived from nature. The MA framework categorizes ecosystem services as provisioning, regulating, cultural, and supporting; and human well-being into five constituents as the basic materials for life, security of resources, good health, social relations, and freedom and choice. Both ecosystem services and human well-being components are influenced through direct anthropogenic and natural drivers and indirect institutional, governance and other drivers (Fig. 1a). The IPBES framework, building on the MA framework, applies simpler terminology for including nature (biodiversity and ecosystems) and nature's benefits (ES) as two separate compartments, and links the latter with the quality of life (human well-being), without categorizing services or well-being. The direct and indirect drivers, including anthropogenic assets impact on nature and its benefits to people, and thus on the quality of people's life (Fig. 1b). Recently, IPBES has emphasized on Nature's Contributions to People (NCP) to particularly underpin nature's socio-cultural benefits (Díaz et al., 2018), which is in line with the TEEB (2010) definition of ES as the direct and indirect economic contributions of ecosystems to human well-being. Especially, the MA and IPBES frameworks explicitly underscore the influence of drivers on human well-being through nature's benefits to people, and advance our understanding of the role of nature for human well-being. However, they omit a key element of how people shape their natural systems: people's relationships with nature and their related capabilities – a set of skills and knowledges, which are of prime importance for Indigenous and local communities (Sangha et al., 2017; Chan et al., 2016; Comberti et al., 2015).

People value nature's benefits for their relationships with, knowledge and understanding of, nature. These values are expressed through peoples' customs, and rituals involving a considerable element of reciprocity, some of which are explained through the concept of socio-ecological resilience proposed by Folke et al. (2016) or as a product of human energy and ecosystem (Braat and de Groot 2012). More specifically peoples' cultural rela-

tionships with nature are highlighted by Chan et al. (2012, 2016), Comberti et al. (2015), de Groot and Ramakrishnan (2005), Posey (1999), and several others, however, among those only recreational are usually evaluated in socio-ecological studies (Table 1). For example, global TEEB (2010) ES database includes 172 values on recreation, 12 on aesthetic, 11 cultural, 6 inspirational, and 2 spiritual out of 1310 values from >200 studies. Considering the importance of Indigenous people and local communities connections to nature globally, we must better recognize and articulate the implicit interdependence between people and their ecosystems to manage and use the resources to survive and thrive, as suggested by Costanza et al. (2017). Relationships between people and nature, and between people but involving nature, following Chan et al. (2016), form the foundation of living for many Indigenous and local communities across the globe. For example, peoples' relationships with land and with the other members of a clan who are supported by that land determine who belongs to whom and in what ways, as seen in the kinship system of Indigenous Australians (Altman, 1987; Dodson and McCarthy, 2005; James, 2009). However, the importance of knowledges and skills that are inherent in people's relationship with nature are not yet underscored. Besides, Indigenous and local contributions are least recognized when managing the natural systems through preserving peoples' languages, customs, and traditions.

Building and developing relationships between traditional (Indigenous and local) lands and people inherently entails specific capabilities to manage and value nature's services. However, to advance and maintain such relationships requires peoples' capabilities to be passed-on from one generation to another through shared life-long experiences and stories (James et al., 2018). Following Sen (1993), capabilities here refer to freedoms to achieve various opportunities (abilities and functionings) that a person may value doing or being. For example, a person's knowledge and skills enables him or her to live on traditional land. Without capabilities, one may not be able to value or use the available resources or opportunities, or vice versa. Many traditional societies pass on such capabilities through living on (cf living off) land. Thus, many social, knowledge and educational systems are directly or indirectly supported by the natural systems, which requires thoughtful consideration when developing an ES framework.

Table 1
A review of main ES studies that have included cultural services.

Reference	Type of cultural ES	Monetary assessment of cultural ES (Yes/No)	Methods used
Costanza et al. (1997, 2014) (>100 global studies)	Recreation and eco-tourism	Yes; Recreation/Ecotourism	Willingness To Pay (WTP)/Contingent Valuation (CV)
Van der Ploeg and de Groot (2010) reported 216 studies on cultural ES (TEEB – global database)	Aesthetic, recreation and inspiration	Yes; mainly Recreation/ Ecotourism	WTP/CV/Travel Cost Method (TCM) /Direct Market Method
de Groot et al. (2012) (>200 global studies)	Aesthetic, recreation and inspiration	Yes; mainly Recreation/ Ecotourism	WTP/CV/ TCM/Benefit Transfer (BT)
Chan et al. (2012, 2016), Comberti et al. (2015), Folke et al. (2016)	Various kinds of cultural ES	No (Preferred qualitative values)	Deliberative decision making, narrative approach, structural decision making, socio-ecological frameworks, paired comparisons, relational values, etc.
Milcu et al. (2013) reviewed 107 cultural ES studies	Mostly recreation and eco-tourism; <10 studies included cultural diversity or social relation, none on identity, ceremonial or language values of ecosystems	Yes; only 12 out of 107 studies assessed Recreation/Ecotourism	WTP/CV, and spatial valuation
Baulcomb et al. (2015)	Cultural ESs of coastal and marine environments	Discusses the importance and need of economic value, esp. for non-recreational ES	Suggests an augmented ES valuation framework for assessing the changes in cultural values due to different environmental management options.
Infield et al. (2015)	Various kinds of cultural ES	No	Suggested wellbeing approach to cultural ES

From an economic perspective, the natural systems afford opportunities for people to use capabilities that enable them to live, manage, appreciate, and value their lands in their ways. These opportunities are not only irreplaceable for the Indigenous and local societies, but also critical for their livelihoods and world-views. Considering nature's role as a source of opportunities for affording peoples' capabilities as roughly equivalent to the prospects offered by the current market economy, from Indigenous views as this research posits, may help inform policy makers to plan and develop suitable strategies.

The current MA, IPBES and other ES frameworks are generally created applying predominate (Western) knowledge systems, and have failed to fully contemplate the role of Indigenous and local peoples' relationships with, and the opportunities offered by, nature. However, while the IPBES framework does attempt to integrate socio-cultural perspectives of local peoples (Díaz et al., 2018), the ES frameworks do not include nature-related peoples' capabilities which are an integral part of peoples' well-being as advocated by Sen (1999a, 1999b). The Western knowledge systems, including the current scientific knowledge that has developed over the past few centuries, are disparate to Indigenous and local peoples' customs and practices. Traditional knowledge systems, however, are millennia old, specific to place, and are well assimilated into people's lifestyles (Ramakrishnan et al., 2005). The latter evolves with the geography, climate, ecological, and social diversity of a place over time, and shapes the socio-cultural and ecological fabric of a landscape. The need is to mainstream Indigenous knowledges and skills—capabilities—for policy decision-making, as emphasized by the Secretariat of the Permanent Forum on Indigenous Issues (2015).

This paper attempts to articulate peoples' connections with nature in terms of the opportunities and capabilities that nature offers to people; and proposes an Indigenous specific ES framework, which can benefit the modern economic frameworks to guide future policies.

Firstly, we provide an overview of peoples' connections with nature to paint the importance of natural landscapes shaped by peoples, representing a set of interconnected socio-ecological systems valued by the Indigenous and local communities. We elaborate these connections as expressed by Indigenous Australians—the longest living culture on earth. Secondly, we offer case studies

from different parts of the world to illustrate these relationships, particularly underlining peoples' capabilities in relation to nature. Thirdly, we analyse these connections and propose an Indigenous specific framework. This is followed by a discussion highlighting how consideration of natural landscapes, particularly for offering opportunities and capabilities to people, is essential for policy developments and achieving sustainable outcomes. Additionally, such appraisals will allow to improve peoples' well-being, the fine-scale management of landscapes, and to achieve conservation benefits.

From a policy perspective, this paper aims to:

1. Underscore and promote the recognition of Indigenous and local perspectives of natural systems, particularly the opportunities offered by, and the values and capabilities people derive from, nature;
2. Describe how peoples' landscape-related values, opportunities, and capabilities can be integrated into policy decision-making, and;
3. Investigate what lessons could be learnt from Indigenous and local communities to inform the wider global community.

Except where clearly used for the authors, *we* or *us* refers to people in general who use nature's resources, and return little of real value to nature.

2. Peoples' relationships with nature

At present, we face many challenges including fast depleting forest cover, land resources, and biodiversity, and rapid changes in the climate that influence our lives in a multitude of ways (World Resources report of 2000–2001; MA, 2005a–e; Intergovernmental Panel on Climate Change (IPCC), 2014; IPBES, 2017b, 2017c). Catastrophic events such as flooding, cyclones, bushfires, and heat waves frequently impact various local and regional areas (IPCC 2014). However, such events also offer us opportunities to re-think, learn, and sustain ourselves by living with respect and care for nature. There are many examples from which we can draw wisdom, such as long-established Indigenous beliefs and traditions that, within different contexts and structures,

have formed the basis for people to lead their lives with a profound sense of respect and care for nature.

Australian Indigenous cultures, continuing over the past ~60,000 to 70,000 years on a dry continent (Rasmussen et al., 2011), are of particular importance. Indigenous Australians' relationship with nature involves intricate connections between their sacred, physical, and social worlds (Fig. 2). Peoples' cosmology is very diverse, *inter alia* depends on land, location, ancestral beings, and language, which plays a significant role in determining how people understand their *country*—a term commonly used to describe peoples' customary relationships with their traditional lands (Altman, 1987; Dodson and McCarthy, 2005; Grieves, 2007; Sangha et al., 2017). For example, peoples' totems and kinship system at a particular place involve their own ways of care and responsibility for nature's components specific to that particular location (Edwards, 1988; Grieves, 2007), which is equivalent to the management of micro-ecosystems in a modern context.

Indigenous Australians consider *country* as 'Mother', who fulfills their spiritual, social, religious, and material needs (Dodson, 1997). The presence of various plants and animals, and natural features are important to peoples' relationships, songlines, stories, and ceremonies. Many ceremonial activities are linked to land or water, and people have rights and responsibilities based on their specific

connections to a specific *country*. In technical terms, *country* offers opportunities for people to learn and perform rituals and cultural ceremonies, and to continue their spiritual-cultural relationships (Muir, 1998).

From an ecological perspective, this 'relatedness' to nature among many Indigenous people worldwide through their ethics, ceremonies, and norms, as demonstrated through an example in Fig. 3, may have significantly helped them to live sustainably over millennia, which further contributes to preserving the diversity of natural and cultural systems. However, not all the Indigenous and local communities were able to continue their relationships with nature to date nor all of them had positive contributions (Johnson, 2007).

Colonization and Industrial development over the last few centuries has impacted ~370 millions of Indigenous and local peoples living across 70 countries, including over seven million in high income countries such as the United States of America, Australia, New Zealand and Canada (Clarkson et al., 1992; Secretariat of the Permanent Forum on Indigenous Issues, 2009). Additionally, social exclusion, discrimination, racial inequity, partisan political agendas as well as land grabbing that continue to occur to date at various local, national, regional scales, has led to suppression and suffering of many local and Indigenous communities (James et al., 2018; Krieger and Leroch, 2016). As a consequence, many people are deprived of their rights and access to land, compromising peoples' knowledges and skills, and relationships with their landscapes. Some of these impacts are briefly mentioned in our case studies from Mexico, Tanzania, New Zealand and Australia, in the next section.

In this paper, our focus is Indigenous and local peoples who are able to maintain, recollect or revive relationships with their lands. Acknowledging the diversity in terms for how different people relate to traditional estate, we apply the common expression, landscape/land/traditional estate, to address both the land and water systems and associated peoples' values, for easy interpretation.

3. Case studies demonstrating Indigenous and local peoples' relationships including capabilities with nature

We offer six case studies from different parts of the world to demonstrate that peoples' connections with their natural landscapes extend much more beyond the commonly considered livelihoods, recreational or cultural benefits. The implicit feature of peoples' relationships with nature, as envisioned here, is in line with the ES concept proposed by Costanza et al. (2017), however we extend and apply it to encompass the diversity of the Indigenous and local people's views, values and capabilities. People learn to care for and manage their lands mostly by means of their imbued living with nature involving various rituals, customs, ceremonies and traditions. Through our case studies, we intend to outline that: i), peoples' relationships with nature involve both people obtaining benefits or services on one hand while undertaking duty to care for and manage their natural landscapes on the other; ii), peoples' capabilities enable them to connect with their traditional lands, and are critical to be passed on from one generation to the next for managing those lands.

These case studies are written by the Indigenous and local people of their geographic location or by people who have long experience working with Indigenous people at those places. Either way, our intent is to demonstrate some aspects of the perspective and capabilities of Indigenous people in relation to their lands.

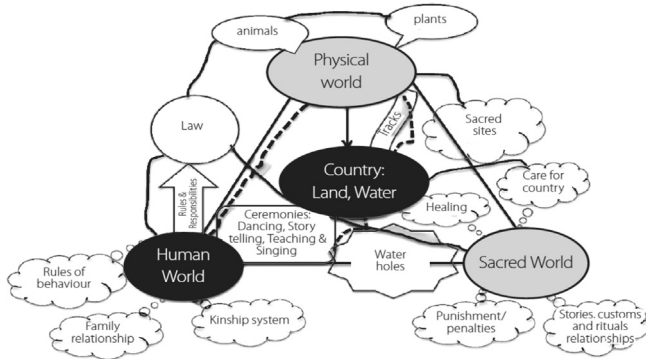


Fig. 2. Comprehension of Indigenous worldview (adapted from Aboriginal art cited by Sangha, 2015).

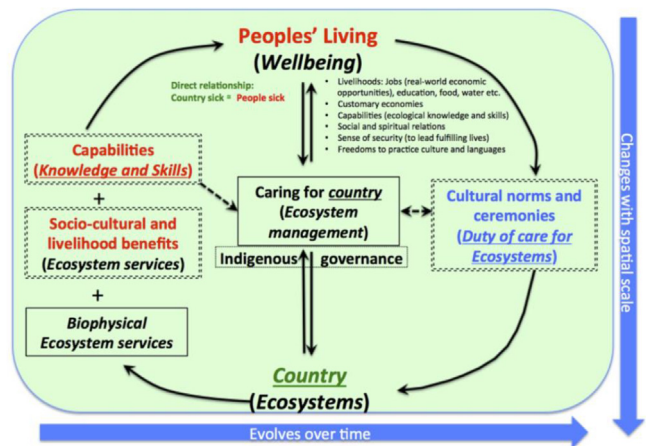


Fig. 3. An Indigenous perspective of living-on *country*, describing peoples' connections (non-italic) and the equivalent scientific terms (in italics) (Source: Sangha and Russell-Smith, 2017).

Namo Buddha: the holiest sacred landscape in Nepal – Kiran Paudyal, Ishwori Poudel, Nirmala Sharma

Introduction: Nepal possesses thousands of sacred natural sites and monuments ranging from mountain ranges to hidden caves with immense spiritual, cultural, historical and social importance for people (Dudley and Higgins-Zogib, 2011). Every sacred site hosts legends, wisdom, and myths which inextricably connect the present society to the past. Most of the sacred sites are characterised by the highly diverse forests that locals have protected over centuries.

Story: Namo Buddha—one of the holiest Buddhist pilgrimage site located 40km east of Kathmandu (Fig. P1)—harbours one of the three famous stupas of the Kathmandu valley which commemorates sacrifice and compassion (Shakya, 2011). The inspiring history of Namo Buddha is based on the charismatic animal, Tiger. About 6000 BP, a Prince Mahasattva, out of his love and compassion, offered himself to a dying but starving, tigress who just gave birth to five cubs. A stupa is constructed on the site and Lord Gautam Buddha visited there in 587 BC, and named the place as ‘Namo Buddha’ meaning homage to the Supreme Buddha (Shakya, 2011). Locals believe that reciting ‘Namo Buddha’ saves them from encountering a tiger in their surrounding forests (NBA, 2017).

The entire Namo Buddha landscape is spiritually and culturally connected to the Supreme Buddha. There are many holy sites in its scared forests. On the top of the hill, eight stupas are constructed with a tall Buddha statue (Fig. P1a). A glimpse of the ancient stupas, shrines, monasteries, religiously and spiritually significant forests annually attracts >100,000 people, including Buddhists around the world. Incredible snow-covered Himalayan range offers the Namo Buddha landscape as a great source of spiritual inspiration.

Ecologically, beautiful forests surround the Namo Buddha shrine with preserved Rhododendrons in the upper and the mixed hardwoods in the lower part, hosting many plants that are considered holy by the Buddhist community. Rhododendron and Cedar trees are used for hanging prayer flags, and their special flowers and leaves are used for offerings. Lama (monks) act as the main agents for protecting ~12ha of this sacred landscape as ‘religious forest’ under the Guthi¹ Act. The ‘religious forests’ are used only for cultural and religious practices, with very restricted harvest for the community.

Conclusion: The Namo Buddha landscape has been offering opportunities for the local people to learn and practice their customs, ceremonies and traditions, obtain benefits, and to pass on their value systems to the next generation. Local Lamas care for (manage) the landscape applying their site-specific knowledges and skills, which they gain from the previous Lamas following customary practices.

The Namo Buddha landscape indeed is a source of continuity for the local traditions, customs, cultural and spiritual values, and has significantly contributed to preserve the biodiversity and ES of the region.

¹Guthi means a trust endowed by any philanthropist through relinquishment of his or her title to a movable or immovable property or any other income-yielding property or fund for the operation of any shrine or festival, worship or feast of any God, Goddess or for the construction, operation or maintenance of any temple, shrine, rest house, shelter, inn, well and other community structures and services for any religious or philanthropic purpose (Government of Nepal).



Photos of the sacred landscape of Namo Buddha: (a) Hill top showing important shrines including modern monasteries, (b) The oldest Namo Buddha stupa (tomb) where Prince's bones were buried, (c) Statues of the Prince and tigress near the tigress's den, (d) A site where Prince offered his body to the tigress. Source: Namo Buddha Association (<http://www.namo-buddha.eu/va/>).

Indian Tribal people and their sacred landscapes – Kamaljit K. Sangha

(Excerpts from a book 'One sun, two worlds: an ecological journey' by Ramakrishnan et al. (2005) and the Centre for Environmental Education (CEE), <http://ecoheritage.cpreec.org/>)



Where there is 'sacred heart, there is a 'sacred grove'
 Where there is greed, there is doom
 Attending to the 'sacred groves', all is obtained
 Attending to 'forest of greed', all is lost
 Within the 'sacred heart', the sacred groves is at peace

By Saint Kabir of India

Introduction: Sacred groves are a vital feature of natural landscapes throughout India, comprising patches of forests or natural vegetation that range from hosting a few trees to forests of several acres. These groves are usually linked to local religious and ritual beliefs, with variable degrees of usage. There are about 4000 registered sacred groves across the nation, of an estimate 100,000–150,000, servicing a range of religious, spiritual and cultural values as well as sustenance needs of local people (Centre for Environment Education, 2017).



Photos: a sacred grove in North-East (left), and a sacred landscape in North-West India (right), and a map above showing sacred groves (Source CEE).

Story: In North-East India locals worship various components of nature—the forest, lakes, streams, rivers, the sun, moon and the mother Earth—both at the small scale of a grove as well as at the large scale of a landscape. For example, many villages host a small forest area with sacred trees in a temple, representing a sacred grove, where elders often sit together to discuss village matters. At the landscape scale, a large area such as ‘Demajong’ in Sikkim or the Nanda Devi area in Himachal Pradesh, encompassing both mountains and valleys, are considered sacred. Locals living in these areas have specific ways of caring for their sacred groves and landscapes through stories relating to the deities, and for particular plant and animal species applying specific knowledge of when and how to use, value or worship them. Customary practices to ritually visit various sites and performing rituals serve a special purpose of passing on local knowledges from generation to generation. People’s cultural norms decree responsibility of care for different components of nature and the procedures of how to do so. Most importantly, these places help locals to frame their spiritual and cultural worldviews.

Conclusion: These sacred landscapes provide many intangible values and tangible economic benefits, coupled with site-specific knowledge and skill sets that locals develop when caring for them. Indeed, the self-imposed restrictions through cultural norms and practices permit only small-scale alterations of the landscape, thus allowing people to continue practising their knowledges and benefiting from their services to date.

Cucapá people and the Colorado River Delta, Mexico and the US – Jaramar Villarreal-Rosas

Introduction: Cucapá Indigenous people have historically inhabited the Colorado River Delta region which supported resource-rich willow and cottonwood forests, swamps, and other coastal ecosystems, allowing them to sustain livelihoods. Apart from tools, food and shelter, the region offered intangible cultural elements such as the Cucapá worldview, myths, and symbolisms (Porcayo et al., 2016; Villarreal-Rosas and Olmos-Aguilera, 2017).



Photos: a) Location of the current Cucapá settlements; in light blue the Hardy River and in dark blue the channel of the Colorado River. b) The dry delta against the Cucapá Mountains (courtesy Erik Rochner, National Geographic); c) Cucapá member from El Mayor village with traditional costume and the Hardy River, the only branch of Colorado River with a constant flow in the Mexican territory in the background (courtesies Beatriz Limon and Antonia Torres Gonzalez).

Story: The Colorado River Delta region remained undisturbed until the 20th century when the Europeans colonized the area and transformed the landscape, especially for building infrastructure such as Hoover Dam to supply water for agriculture, urban and industrial sectors. To date, >100 dams have been built along the Colorado River Basin (National Geographic, 2014) which have provoked irregular flooding or severe droughts. As a consequence, downstream wetlands were polluted or dried up, and the Cucapá people were unable to continue with their traditional lifestyles and were compelled to move out to find mainstream jobs (Porcayo et al., 2016).

Nowadays, ~1500 Cucapá people reside in Arizona, US (Cocopah Indian Tribe), and in the states of Sonora and Baja California, Mexico. They are reconstructing their worldviews as a response to social, political, and environmental forces (Navarro Smith, 2016). Recent allocation of water rights in the US and sea fishing in Mexico has enabled people to continue parts of their culture. Although sea fishing is controversial due to use of modern fishing techniques, this activity has huge symbolic significance for offering an opportunity for the Cucapá people to reconnect to their historical river-based lifestyle. As a result, cultural expressions such as dancing and singing are being adapted to the existing social-ecological context, together with the re-discovery of some customs and knowledges that can possibly be now passed on to future generations.

Conclusion: Despite the serious impacts of development, the contemporary Cucapá identities are emerging under political and economic pressures. The Colorado River Delta, remains at the core of Cucapá peoples’ identity enabling them to learn language, customs, dancing and singing, while constituting the main sustenance provider, particularly in Mexico.

Natural Resource Planning, carbon economy, and Indigenous well-being in northern Australia – Luke Preece

Introduction: Indigenous people in northern Australia hold deep cultural connections to country (traditional land) through customary practices and values that are passed on from generation to generation. However, since their first contact with Europeans over the last two centuries, people have been exposed to a wide range of issues including dispossession of land, social exclusion, and the disruption of their culture, skills, kinship, and knowledges.

The region is remote with a very low population density, poor infrastructure, and provision of services in Indigenous communities offering little opportunities for local economies or to implement Indigenous land management practices.

Story: Over the past several years, The Nature Conservancy (TNC) has been partnering with Indigenous groups and several organisations to support managing traditional lands through Healthy Country Planning and Savanna Burning projects, allowing people to practice their knowledge and skills. This helps people to keep land in a healthy condition particularly through traditional practice of prescribed burning while implementing financial mechanisms to benefit people and the environment. As a result, the older people (senior Traditional Owners (TOs)) have been able to pass on their knowledge to the next generation, while living on, and caring for, land.

Healthy Country Planning is a local evolution of the global Conservation Action Planning approach. This localised approach is more appropriate to the Indigenous perspective for incorporating both tangible and intangible values, and more specifically, the socially and culturally relevant targets that align with Indigenous language, culture and community aspirations (Carr et al., 2017). As at July 2017, approximately 20 Indigenous groups have active Healthy Country Plans on their country, and at least eight more groups are in the process of planning. Several of these plans have contributed to the declaration and management of several Indigenous Protected Areas in northern Australia, which now cover 13 million hectares.

Savanna Burning further supports 29 registered Indigenous carbon abatement projects on traditional lands (as at June 2017; Fig. P2) applying traditional burning practices that deliver multitude of social, economic and health benefits (Russell-Smith et al., 2013). The practice of early dry season burning reduces the occurrence of hot and extensive late season fires, mitigates greenhouse gas emissions and protects biodiversity, thus benefits the natural environment. The TOs can earn carbon credits through voluntary agreements or the Emissions Reduction Fund (an Australian Government initiative) worth an estimated value of over \$30 million (Australian Government, 2017). The immediate benefit of these projects is income to the Indigenous groups and jobs for the rangers.

In addition, both these initiatives offer market opportunities in remote locations that are contributing to empowering Indigenous communities while delivering many health and social benefits (Burgess et al., 2009; Cairney et al., 2017; Ens et al., 2016; Hill et al., 2013; Social Ventures Australia 2016).

Conclusion: Healthy Country and Savanna Burning projects enable people to access country to continue practicing culture, exchanging knowledge and building capabilities (Jackson et al., 2017). Restoring traditional burning also improves landscape heterogeneity, with demonstrable positive effects on mammals, birds and vegetation condition. Overall, Healthy Country Planning, Indigenous Protected Areas and Savanna Burning opportunities help people to re-build their identity with the traditional lands by connecting to country to learn, exchange, and pass-on their traditional knowledge and skills.

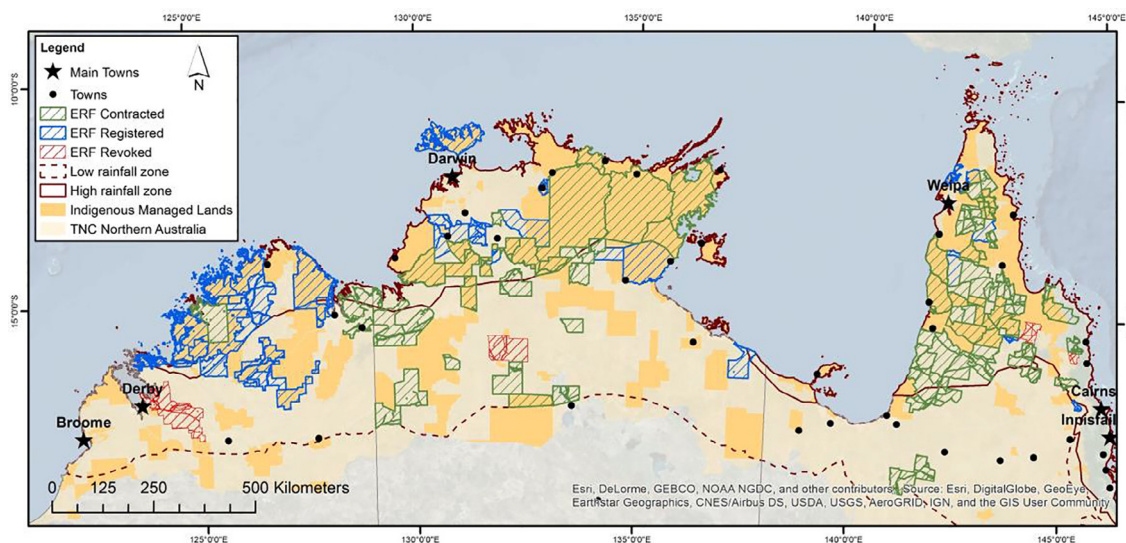


Fig. P1. Savanna burning projects in northern Australia funded under the Emissions Reduction Fund (ERF) of the Australian Government (as at June 2017), with 29 Indigenous carbon projects (i.e. 19 million hectares). Registered projects accrue Australian Carbon Credit Units, which can then be sold to the Australian Government/volunteer organisations through a contract.

Revival of Cultural Values, Knowledge and Practices to improve Land Use: An intergenerational view of Ngati Porou people and their land in New Zealand – Tui Warmenhoven

Introduction: Ngati Porou, a Maori tribe of New Zealand, hold fast to their identity, culture, language, traditional lands, resources and people, all of which have endured a number of environmental and social shocks over the last 200 years of European occupation. How these people revive their cultural values, knowledges and skills to pass-on to the next generation remains a challenge even to date.

Story: For the last century, farming and plantation forestry became the dominated land uses on the lands of Ngati Porou in the Waiapu river catchment (Fig. W1), which has resulted in serious social and environmental consequences. The most vexing issue for Ngati Porou is to continuously experience the contrasting values and objectives of the majority populace, particularly the non-Maori policy decision-makers.

The immediate challenge for Ngati Porou, the local and central government agencies and industry is to restore the Korowai of Papatuanuku (the cloak of mother earth) through extensive afforestation in the Waiapu river catchment (Fig. W1a). The tribe has forged a 100-year memorandum of understanding, by the way of Treaty settlement, to address not only the health of the land and water systems, but also the health of the people. Ngati Porou view the earth systems and people as one, and that people have a collective duty to care for mother earth (Fig. W1b).

Restoring the Korowai of Papatuanuku includes creation of sustainable local livelihoods, promotion of cultural values and practices, and supporting the aspirations of rangatahi (young adults) in the community through local training to enhance Indigenous capacity. The elders are the key players in this process, supporting collaborative work among the Ngati Porou researchers and the mainstream scientists, while highlighting the need for adaptations.

Conclusion: Ngati Porou through refurbishing the cloak for the catchment is also supporting resurgence of cultural knowledge underpinned by a Maori view, and restoration of currently disturbed ecosystems by planting native species that suit Indigenous values (Fig. W1b). This collaborative designing and executive process enables the locals to build their capabilities, particularly for the younger generation.

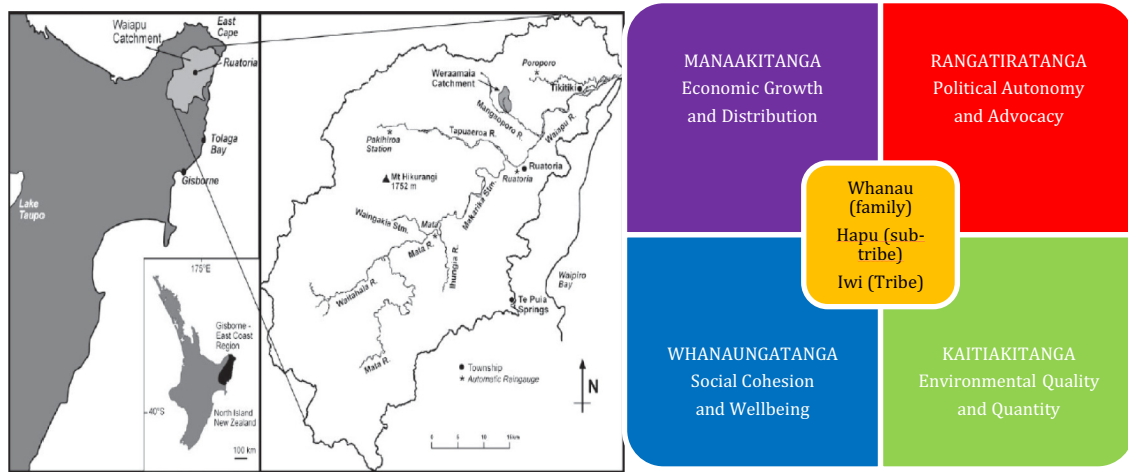


Fig. W1: (a) Location of the Waiapu Catchment, East Coast on the left and the major tributaries are shown on the right. (b) Ngati Porou view focusing on the collective tribe and an integrated cohesive perspective of well-being, modelled by ‘Hirini Matunga’ Ngati Porou Resource Planner.

Traditional conservation practices of the Ikoma ethnic tribe, Tanzania – Juma J. Kegamba

Introduction: In the western part of Serengeti plains, Tanzania, the Ikoma ethnic tribe has relied on a combination of livestock and crop cultivation. However, colonization earlier by the Arabs and later by the Germans and British in the 19th and 20th century has significantly impacted peoples' living over time particularly, through dispossession of tribal land to set-up modern agricultural systems and conservation parks. Only recently, the Ikoma people have regained access to the landscape enabling them to lead their lives in their ways.

Story: The Ikoma people grow food crops such as millet, sorghum, cassava, maize, and a cash crop of cotton on a small scale. The movements of the Ikoma ethnic group can be traced back before European colonisation in Africa, and is associated with the movement of wildebeest in Serengeti (Kideghesho, 2008). Their name, Ikoma originated from a shrub called Mkoma (*Grewia bicolor*), which was used to construct huts.

The Ikoma people have a long historical connection with the Serengeti landscape for practicing their culture and supporting livelihoods—bush meat being their main source of food (Holmern et al., 2004). The Ikoma tribe regards elephant as their sacred animal, and keeps two elephant tusks called “Machaba”— an ancestral trophy, with a belief that it has the power to pre-empt bad omens. The tusks are kept with the respected person chosen from the tribe, and in 1990, government allocated a certificate of “Machaba” ownership (No. A 05342) (Kideghesho, 2008). Due to these strong cultural attachments to elephant tusks, the Ikoma people believe that a person who kills or wounds elephant offends “Machaba” and is the enemy of their tribe.

Historically, the Ikoma people lived in Serengeti plains, the part of the current Serengeti National Park (SNP) (Kideghesho, 2008) (Fig. K1). During SNP's establishment in 1950s and 1960s, the Ikoma people were forcefully evacuated from the area and relocated to the west where they were left with colonial administration (Kideghesho, 2008). The colonial rules denied access for the Ikoma people to their traditional land, depriving them of resources and knowledges that were used for generations (Knapp 2012). As a result, the Ikoma and other local people perceive conservation as a burden on their life.

Following a new policy reform in 1998 (reviewed in 2007), the government of Tanzania initiated a community-based conservation program—Wildlife Management Areas (WMA) (Songorwa 1999; Wilfred 2010). Under this program, the Ikoma people were the first Indigenous community to be engaged by the government in establishing a WMA—The IKONA (Ikoma and Natta, sub tribes of Ikoma)-WMA—in 2005. Since then, many WMAs have been established in Tanzania (Makupa, 2013).

Now IKONA-WMA is the most successful conservation area in Tanzania, delivering multiple socio-economic and cultural benefits, helping Ikoma people to practice their knowledge and skills, and to build capabilities (Makupa, 2013). Through revenues generated from IKONA-WMA, each Ikoma's village has a primary school, teachers' houses, water holes (Marambo) for livestock and human usage, a dispensary, and an ambulance. The revenues are collected from licensed hunting and photographic activities conducted in the WMA. In addition to that, IKONA-WMA is rich in wildlife resources, which are managed by the local traditional council called “Litongo.” Now, the Ikoma people feel connected again to their cultural and natural resources, and are able to pass on their cultural practices and knowledge to the next generation.

Conclusion: With positive changes in policy legislation allowing to set-up community conservation areas, the Ikoma tribe has realised new opportunities to revive their cultural and knowledge connections with the Serengeti landscape, in addition to provision of facilities for their people and improving wildlife resources.

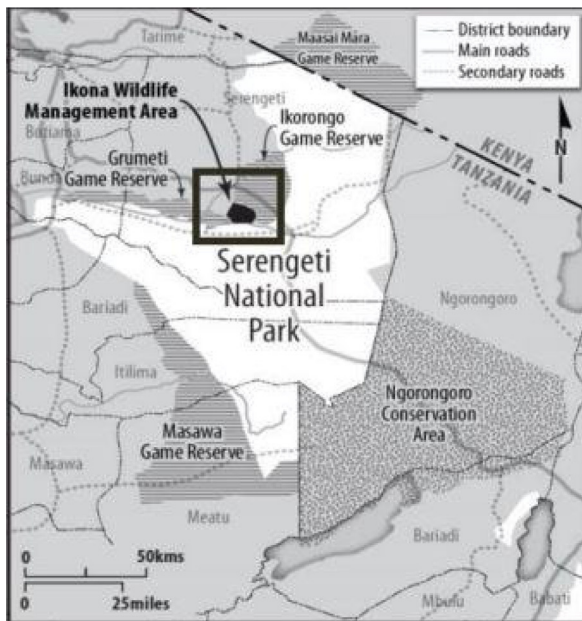


Fig. K1: Map showing location of SNP on the left and the Ikoma dancers on the right (courtesy National Geographic).

As demonstrated from the case studies, Indigenous and local peoples derive substantial well-being including livelihoods, cultural, spiritual and capability benefits due to their reciprocal, site-specific, knowledge-based connections to their natural landscapes, often over millennia. Peoples hold implicit relationships with nature that involve a profound element of respect and duty of care. In all case studies, peoples' long involvement with their landscapes have led to build knowledges, skills and other capabilities to maintain the health of both nature and people. Connections to place or nature's components are tied to religious and spiritual customs and rituals (such as in Nepal and India), which links people's identity to those places and their aspirations for the future. Indigenous peoples' identity is temporal and intergenerational, both in the past through respect for ancestors and to the future through aspirations of youth. In some cases, such as northern Australia and Tanzania, these deep connections and knowledges of place have led to better governance and/or market arrangements that have then led to multiple social, environmental and economic benefits. Such case studies may indicate to the wider public that there is a need to re-think human well-being as well as economies that shape that well-being, to achieve better outcomes.

4. Indigenous-specific ES framework

To mainstream the importance of nature's contributions to Indigenous and local peoples' well-being for policy decision-making, we propose an Indigenous specific framework that incorporates nature-related opportunities and peoples' capabilities. This is the gap that currently exists in the MA (2003) and IPBES frameworks (Díaz et al., 2015, 2018; IPBES, 2017a; Pascual et al., 2017). The *Secretariat of the Permanent Forum on Indigenous Issues* (2015) has particularly emphasized including traditional ecological knowledge and peoples capabilities in the UN declaration on the rights of Indigenous peoples. The importance of the right opportunities and peoples' capabilities for human well-being is well described by Sen (1999a, 1999b) in his theory on Capability Approach, which perfectly applies to Indigenous and local communities, and helps us to integrate Indigenous well-being with their traditional landscapes.

The key concepts for developing such a specific framework, as reflected in the six case studies, that underscore Indigenous and local peoples' connections with their traditional estate or natural landscape are:

1. 'Oneness' through caring for, and managing traditional lands involving ethics, knowledge, skills and customs;
2. Continuity over time.

'Oneness' with nature through connections to place, traditional land and peoples' worldviews, or dependence on nature is the core to living for many local and Indigenous peoples, even to date despite experiencing adverse circumstances (Muir 1998; Posey 1999; Ramakrishnan et al., 2005; Infield et al., 2015 and others). These connections contribute to sustain peoples' lives from the means—values and items originating from traditional lands—to the end—a recipient, merger, or infusion with the landscape, his or her spirits or spiritual beings (Fig. 4). Peoples' dependence on nature helps them to establish traditional norms and practices by embedding 'care for land' ethics in their living (Dodson 1997; Ramakrishnan et al., 2005). These deep relationships contribute towards specific customs and wisdom, languages, and the diversity of the landscapes.

Edgar (2003) notes that in Australian and many other Indigenous societies, time is considered not as horizontal but vertical, i.e. the past underlies and is within the present. Thus, lands relate to ancestors, with an on-going cycle of stories and experiences,

implying continuity and the evolution of knowledge that is transmitted from one generation to another, as shown in Fig. 4. The continual nature of peoples' relationships, including values with their lands is evident from how the existing knowledge, use of resources, and related capabilities are transferred from one generation to another over millennia; evident in Indigenous Australian communities (Heil and Macdonald 2008). The traditional estate, thus, embodies peoples' stories and connects time to place.

To understand and evaluate the role of traditional estates in peoples' lives, the main elements to consider from a modern economic viewpoint are:

1. Opportunities offered by land;
2. Relationships that exist with, and because of traditional land;
3. Well-being benefits, including capabilities, flowing from land.

Opportunities in the form of work, provisioning livelihoods, and for developing emotive, spiritual and cultural values, and skills and experiences, endure because of traditional estate. Peoples' relationships with their local natural landscape define their identity, value systems, cultural practices and traditions, which shape the land through specific duty of care traditions and management procedures. Relationships between people and their lands, and among people but involving lands of a region with different tribes/clans (sharing knowledges and practices to manage land, exchange of items that are derived from land) are invariably shaped by the local values, and the geographical and climatic characteristics of a region (Sangha and Russell-Smith, 2017). In fact, land forms the basis for people to develop suitable opportunities and to build relationships. Well-being benefits for health, jobs, cultural values, kinship relationships, and traditional knowledges, are only achievable through the use and transfer of a set of land-specific capabilities. Caring for land utilizing peoples' capabilities contributes to deliver well-being benefits, in addition to forestalling people from delinquency (Grievies, 2007; Burgess et al., 2009; Sangha et al., 2017).

However, for policy development since many of the above-mentioned values fall outside the usual economics framework, our proposed framework (Fig. 4) could help envisage how various Indigenous and local communities' well-being attributes can be incorporated into those formal frameworks for developing appropriate public policies.

To evaluate these connections, we need appropriate valuation techniques both for the monetary—where feasible—and non-monetary values or benefits that people obtain from traditional estate. The ES valuation techniques (details in Costanza et al., 1997a and several other books on natural resource economics), both revealed and stated preference methods, can be useful to account for several benefits that Indigenous and local peoples obtain from their natural landscapes. The former includes the replacement/substitute method, tradeoffs, hedonic pricing, etc., and the latter contingent valuation, ranking or choice modelling (Costanza et al., 1997b; de Groot et al., 2012). For example, the monetary value of bush food and medicine is often measured by applying revealed preference methods where values can be inferred from the market using replacement prices. The non-monetary values, such as vital cultural and spiritual benefits, are rather difficult to measure but stated preferences methods such as contingent valuation, ranking, choice modeling are applied to infer these values. However, they fail to evaluate the complex socio-cultural, spiritual and capabilities benefits that Indigenous people obtain from their estates (Sangha et al., 2017, Stoeckl et al., 2018).

It is acknowledged that the monetary estimates obtained by using above methods may not reflect the 'real' value of people-nature relationships, and do not account for people's capabilities linked to natural systems (Sangha et al., 2017). For example,

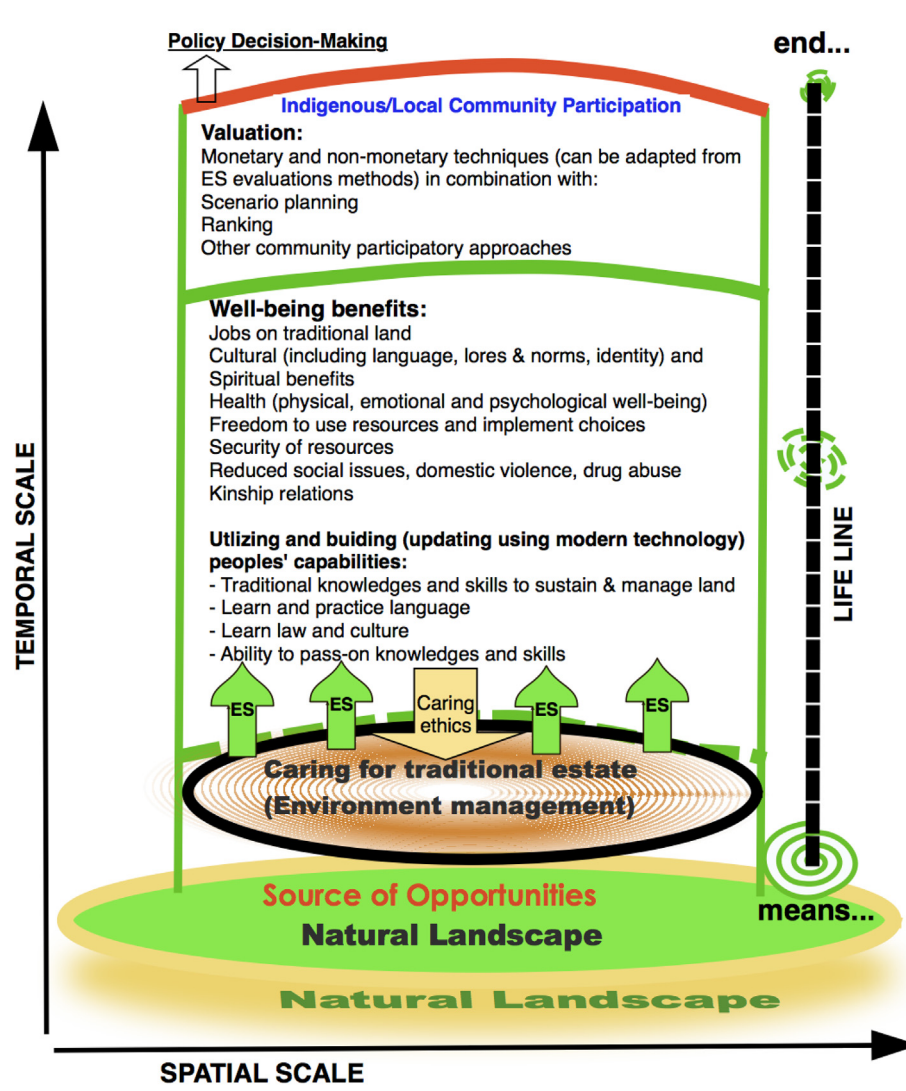


Fig. 4. An Indigenous-specific ES framework, reading from bottom to top, demonstrating natural landscape (traditional estate/land) as a pivot for opportunities and well-being for people, however requires appropriate valuation measures to inform policy decision-making. The temporal scale on the left represents time, and the spatial scale at the bottom represents place, linked relationships to peoples' stories through connections with land, embracing various socio-economic, cultural, spiritual and natural perspectives, and caring ethics. Means, offered by the landscape, and ends of lifeline, on the right, represent the natural landscape as a provider and recipient, 'merger,' for people as spiritual beings. However, natural landscape from Indigenous and local perspectives is a much bigger diffused entity (orange shade) than what we consider as a source of opportunities (green abstract).

application of replacement method for assessing the value of bush food fails to capture the associated benefits such as gaining knowledge about how, when, and where to collect bush food from, and the stories related to a place or product itself. There is need for caution when valuing such non-market benefits. To appropriately understand these values, the valuation techniques need to be coupled with participatory approaches such as scenario planning, ranking, focus group meetings, involving active and genuine engagement of local and Indigenous communities, to fully understand and evaluate how natural systems advance Indigenous peoples' well-being. Such comprehensive valuations can lead to develop integrated assessments that can assist in effectively influencing public policies.

5. Discussion and conclusion

A holistic vision of Indigenous and local peoples living with nature containing socio-economic and cultural basis including capabilities, and the continuity of such communion inherent in

Indigenous worldviews are perhaps the key lessons for many of us to learn, and to develop and apply similar nature-related ethics to live sustainably. This paper offers an economic perspective of Indigenous and local peoples' relationships with nature by highlighting the opportunities nature offers to people, and the capabilities people develop and maintain through their relationships with nature, allowing to mainstreaming people-nature relationships.

Indigenous and local case studies clearly demonstrate that traditional ways, if supported, maintained and appropriately applied, can help sustain natural resources because of peoples' ethics, customs and traditions which are site-specific, thus offering micro-management of earth's diverse ecosystems (James, 2009; Ramakrishnan et al., 2005; Russell-Smith et al., 2013; James et al., 2018). In places where such traditions are lost, as has occurred due to colonization and industrialization, sustainable land use practices can be applied in collaboration with neighborhood communities while integrating scientific knowledge, addressing access and belongingness to land, empowering communities, and developing culturally relevant governance and

management procedures. These mixed approaches, where applicable, can afford alternatives to collectively revive peoples' interests to care for land and build capabilities to establish relationships with their traditional estate.

Developing a framework, as proposed in this paper, is just one tool among many others including modeling or assessing nature's contributions to people, that can inform policy decision-making. It is essential to outline the critical elements while developing such tools—the capabilities in this case that enable Indigenous peoples' to lead their lives and manage their resources (Sangha et al., 2017). Such considerations are important to modernize the current economic theory if we want to live sustainably as Costanza et al. (2017) points to its weaknesses for excluding various accounts of nature's contributions towards peoples' wellbeing.

Incorporating Indigenous and local estates related opportunities and peoples' capabilities into policy framework can directly inform the decision-makers, as also suggested by Polishchuk and Rauschmayer (2012). Our proposed framework (Fig. 4) outlining the main well-being benefits people derive from traditional estates and the valuation techniques to be applied in participation with people, shows how traditional management and care of natural systems is economically important for the local, national, and regional policies. Following IPBES (2017b, 2017c) and MA (2005c, 2005e), investment in supporting local and Indigenous peoples on traditional lands, promoting their capabilities, and developing suitable opportunities to utilize peoples knowledges can deliver multiple benefits, such as preserving biodiversity, maintaining the flow of services, and saving the government costs on weed and pest management (Polishchuk and Rauschmayer, 2012; Sangha et al., 2017). However, there is a need to recognize Indigenous and local peoples' efforts and develop initiatives to support people for managing their traditional lands.

Payments for Ecosystem Services (PES) schemes deliver monetary incentives to the provider (who offers a service) from a user or beneficiary (who benefits from that service). These schemes usually involve direct benefit for one party from the improvement in, or availability of, a service to the other (see PES case studies on TEEBweb.org) (Muradian et al., 2013; Jacka et al., 2008; Kumar et al., 2014). However, the case of Indigenous and local stakeholders is different where people manage the lands that benefit the local, regional, and global communities. For example, Aboriginal people in northern Australia manage wildfires to mitigate greenhouse gas emissions that benefit the public regardless of state boundaries, and provide multiple economic, social, cultural and environmental benefits. The fire management program is mainly funded through the Emissions Reduction Fund (an Australian Government programme) and some volunteer organisations (Russell-Smith, 2016; Russell-Smith et al., 2013). Similarly, some philanthropic, environmental and commercial organisations, willing to enhance Indigenous peoples' well-being, environmental outcomes or to offset their environmental impacts, favor such arrangements (e.g. Pew Charitable Trust, Qantas airlines, environmental organisations mining companies, etc.). The collaborative and culturally appropriate PES initiatives to support Indigenous and local peoples' efforts are, thus, essential for maintaining peoples' capabilities that will benefit present and future global citizens. This also provides an opportunity to learn and improve our current knowledge systems for including nature-related Indigenous ethics and management practices.

Like Indigenous and local societies, we often fail to realize that many poor agricultural and rural people derive their capabilities from land, while they benefit the wider public for carefully working with their lands. For example, many agricultural societies support their livelihoods through managing, caring for, and cultivating land in a sustainable manner. By doing so, people use their capabilities, which are largely not recognised under the formal

educational systems. The small-scale agricultural systems fundamentally represent Economies-in-Society-in-Nature (ESN) (a term used by Costanza et al., 2012); encompassing both nature's resources—opportunities—and related peoples' knowledge systems—capabilities. The ESN systems demand recognition beyond the current financial benefits or costs, for supporting peoples' worldviews, capabilities and for ensuring benefits to wider audience which are often not considered in the current financial approaches (Polishchuk and Rauschmayer, 2012, Sangha and Russell-Smith, 2017).

We recognize that the importance of natural landscapes managed by the local and Indigenous people is far beyond the monetary yardsticks. An economic valuation of nature's benefits to people is a useful argument to express the value of nature, without any intention to replace or undermine the values that Indigenous and local peoples hold for their landscapes. Our proposed framework might not be applicable globally, due to inherent natural and cultural diversity, but could be used in addition to ecosystem services frameworks and valuations to guide the development of locally relevant policy.

As demonstrated through this study, the ES approach, outlined in the ES agenda by Braat and de Groot (2012) and related frameworks, are useful but require incorporating critical elements—opportunities offered by the traditional lands and peoples' capabilities—when assessing the role of natural systems for Indigenous and local peoples' well-being. Our framework, presented in Fig. 4, can assist to explore and recognize local, agricultural, and Indigenous peoples' role in managing and preserving nature's fast depleting resources. Developing culturally appropriate strategies to offer incentives to people will stimulate a much-needed change and will help educate the present and future generations.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.ecoser.2018.03.017>.

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