

Recognising the role of local and Indigenous communities in managing natural resources for the greater public benefit: Case studies from Asia and Oceania region

Kamaljit K. Sangha^{a,*}, Simone Maynard^{b,c}, Jasmine Pearson^d, Pariva Dobriyal^e, Ruchi Badola^e, Syed Ainul Hussain^e

^a Darwin Centre for Bushfire Research (DCBR), Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, NT 0810, Australia

^b Simone Maynard Consulting, Redbank Plains, Qld 4301, Australia

^c Australian Rivers Institute, Griffith University, Nathan, Qld 4111, Australia

^d School of Earth and Environmental Sciences, The University of Queensland, Brisbane, Qld 4072, Australia

^e Wildlife Institute of India, Dehradun, Uttarakhand, India

ABSTRACT

Many local and Indigenous communities across the globe afford ecosystem services to the wider global public through maintaining natural resources because of their duteous usage and astute management. However there is barely any recognition or financial support for them to continue maintaining or enhancing the flow of ecosystem services from their finely managed Indigenous and local lands. This paper offers insights using three case studies from the Oceania-Asia region—i.e. Australia, India and Fiji—that supports the highest Indigenous and local communities population. It describes the main cultural values and traditions, and land rights of Indigenous and local communities in relation to their natural systems, and the key issues and challenges that people experience in their respective regions. Lack of recognition of peoples' land rights, unregulated and exploitative use of resources, and inequitable distribution of benefits that accrue to private (often corporate) enterprises from using natural resources were the common issues among all case studies. To support conservative use and management of Indigenous and local lands, this paper argues to establish monetary mechanisms i.e. Payments for Ecosystem Services, Green Funds, Common Trusts, etc. to enable Indigenous and local communities to continue managing natural resources for the greater public benefit.

1. Introduction

Globally, the role of millions of local and Indigenous communities in maintaining natural resources through their duteous use to support their livelihoods and associated spiritual, cultural and social values, is barely recognised or supported through economic mechanisms (Reytar and Veit, 2017; de Groot and Ramakrishnan, 2005; Posey and Oxford Centre for the Environment Ethics and Society, 1999). This is in contrast to the intensive and exploitive resource use by modern developed societies who directly and/or indirectly benefit from well managed Indigenous and local lands, as acknowledged widely, for preserving biodiversity, water and land resources, and mitigating climate change. As the United Nations (2019) describes “Indigenous peoples are inheritors and practitioners of unique cultures and ways of relating to people and the environment...” – highlighting the need to support and maintain Indigenous ways of life.

Across the world Indigenous and local communities¹ represent 2.5

billion people; of whom 370 million are Indigenous living across 90 countries and representing about 5000 cultures (Reytar and Veit, 2017; Jacquelin-Andersen, 2018). They manage about 50–65% of the global landmass, most of which is communally regulated (World Resources Institute, 2019; Notess et al., 2018; Verschuuren et al., 2018; Veit and Ding, 2016). Out of that landmass, Indigenous and local communities' have legal ownership rights to 10%, and further management rights to another 8%. This 18% of the landmass under Indigenous and local communities' management shows at least two times less deforestation rates compared to any other land tenure (Rights and Resources Initiative, 2015; Notess et al., 2018), and potentially delivers a range of ecosystem services not just for the locals but also for regional and global human populations. Conversely, to date, many governments have either infringed upon, suppressed or ignored Indigenous norms and cultures to support and advance development that has caused serious ongoing impacts on communities (Jacquelin-Andersen 2018 – The Indigenous World 2018).

* Corresponding author.

E-mail address: Kamaljit.Sangha@cdu.edu.au (K.K. Sangha).

¹ We use the term ‘Indigenous and local communities/peoples’ recognizing peoples' historic connections with land and the natural environment, their unique cultures and traditions, following United Nations–Indigenous Peoples and Intergovernmental Panel on Biodiversity and ES (IPBES).

Such impacts are particularly severe in colonised countries where Indigenous and local communities have struggled for their basic human rights. Oceania supports the most diverse Indigenous populations in the world, ~6.5 million people including Aboriginal and Torres Strait Island Australians, Polynesians, Melanesians, and Micronesians who follow a vast majority of cultural traditions and ecological adaptations. A majority of the population in almost all Oceania countries except for Australia, New Zealand, Hawaii, New Caledonia, and Guam, is Indigenous with Papua New Guinea and Fiji supporting the largest proportions of their total populations. Asia comprises ~70% of the total global Indigenous population, with ~260 million Indigenous people. India alone supports 104 million people from 461 ethnic tribes following diverse customs, traditions, languages and cultural practices (Jacquelin-Andersen, 2018).

Peoples' diverse traditions and cultures that largely link to nature and inculcation of related values in peoples' lifestyles is prevalent among almost all Indigenous communities. In addition, many local communities across the globe hold cultural and spiritual values for nature which includes acclaiming and revering elements of nature such as river, plants or animals or the entire landscape such as Nanda Devi in northern India (Sangha et al., 2018; Ramakrishnan et al., 2005) and Te Awa Tupua in New Zealand (Roy 2017 – The Guardian). Likewise, Indigenous Australians use the term 'country' to describe their ongoing familial and customary relationships with traditional land and sea systems (Sangha and Russell-Smith, 2017). Importantly, across Pacific countries such connections have been maintained and kept strong to date.

Our modern economy, with its focus on economies-of-scale approach, overlooks the role that many Indigenous and local small-scale farming communities play for astutely using and managing land applying circumspect practices (Daly 2015; TEEB, 2018; Sangha et al., 2018). It is a well-known fact that such adeptly managed lands afford a range of ecosystem services such as mitigating climate change, water regulation, and biodiversity protection for the local and regional populations. Currently, there is hardly any fine-scale data on comparing this off-site ecosystem services delivery from Indigenous/locally versus privately managed lands. The same applies on resource use among the Indigenous/local versus non-Indigenous communities.

One broad source of information is the Ecological Footprint (EF) analysis by the Global Footprint Network that describes the amount of natural resources (use and overuse) required to sustain human activity and its impacts on biodiversity and the environment (<http://data.footprintnetwork.org/#/>). Lin et al. (2019) reported that the average EF per capita in North America and Europe is much greater than that in Asia-Pacific which support much greater local and Indigenous populations than the former. Undeniably, the developed societies require much more resources than the Indigenous and local societies thus exerting greater pressure on natural resources (Krieger and Leroch 2016; Ramakrishnan et al., 2005), which corollary to less resources available for the latter to deliver off-site ecosystem services to the regional or global populations as well as to support their own living from their locally managed lands.

Modern development has inevitably led to inequitable and bigoted distribution and exploitation of common resources worldwide (Notess et al., 2018). Typically, the developed societies take advantage of available resources to continue supporting their lifestyle whereas, many Indigenous and local communities practising traditional or conservative

living suffer from destitution (UN, 2009, 2019; Shiva, 2016; Sangha, 2018). We acknowledge that the reasons for that extend beyond the access to and use of natural resources. However, the current situation raises serious concerns for human ethics with profound ramifications for development (Daly, 1996; Keeley, 2015; Organisation for Economic Co-operation and Development (OECD), 2017; Sen, 1989; Shiva 2013, 2016). There is a need to carefully consider ethical approaches to any economic development related initiatives as advocated by the Nobel Laureate, Prof. Sen (1989) about three decades back.

Unfortunately, many Indigenous and local communities are often either evicted or deprived of their access to common resources while the developers are allowed to operate businesses using the same resources purely for the benefits of their private enterprises and/or the governments (tax/repayments, etc.), with little or no returns to the local communities (Krieger and Leroch, 2016; Shiva, 2016; Duchicela et al., 2015; North Australian Indigenous Land and Sea Management Alliance (NAILSMA), 2014; UN, 2009; Taneja and Thakkar, 2000 and many more). A worldwide common example is many conservation parks affording private nature-based businesses but offering little or no return to the local communities who live in proximity and would have conservatively used the area before the establishment of those parks (UNEP, 2017; NAILSMA, 2014; Sobrevila 2008; Clarkson et al., 1992).

This paper describes three case studies from the Asia Pacific region – each from Australia, India and the Pacific Islands – to suggest how local and Indigenous communities' values, usage, knowledges and skills, and management of natural resources benefit the wider community. We highlight the key issues and challenges for accessing, managing, and using natural resources. To improve the current situations, this paper offers a range of solutions for supporting equitable and sustainable development, applying ethical approaches, that benefit both the local and Indigenous communities as well as the global public.

2. Case studies

Our selected case studies from Australia, India and Fiji represent significant variation among the Indigenous populations, and their rights to access land and other natural resources, as described below.

Australia supports ~798,400 Indigenous people, i.e. 3.3% of its total population, who have land rights to 40% of the land mass (Table 1 – Australian Bureau of Statistics (ABS), 2016; Altman, 2014; Department of the Prime Minister and Cabinet, 2019). However, in north Australia (above the 600 mm rainfall isohyet) – where our case study is located – Indigenous land rights extend to 56% of total land area including exclusive and inclusive native title, and inalienable freehold land title under the Aboriginal Land Rights Act (1976) as Aboriginal Land Trusts prevalent mostly in the Northern Territory (NT) (Russell-Smith and Sangha, 2018). Most of this land is managed communally.

India is home to > 700 tribes of diverse cultural traditions, values and languages, comprising about 9% of its total population (Table 1). The Gangetic basin in the north – our case study site – supports a large percentage of Indigenous people, particularly in the states of Uttarakhand, Jharkhand, and others in the neighbourhood including Chhattisgarh, Assam, and Nagaland in the north-east. People's land rights are limited or near non-existence due to Indian Government's overly support for development, the related data is not readily available.

Fiji, located in the South Pacific Ocean, supports a significant

Table 1

Population of local and Indigenous communities in case study countries i.e. Australia, India and Fiji.

Case study country	Indigenous population (and as a proportion of the country population)	Land rights to total country land mass (estimate)
Australia	649,200 (3%)	40% (~3 m km ² ; Department of the Prime Minister and Cabinet, 2019)
India	104,000,000 (8.6%)	Not known
Fiji	476,700 (57%)	84% (14,911 km ² ; Native Land Trust Board, 2019)

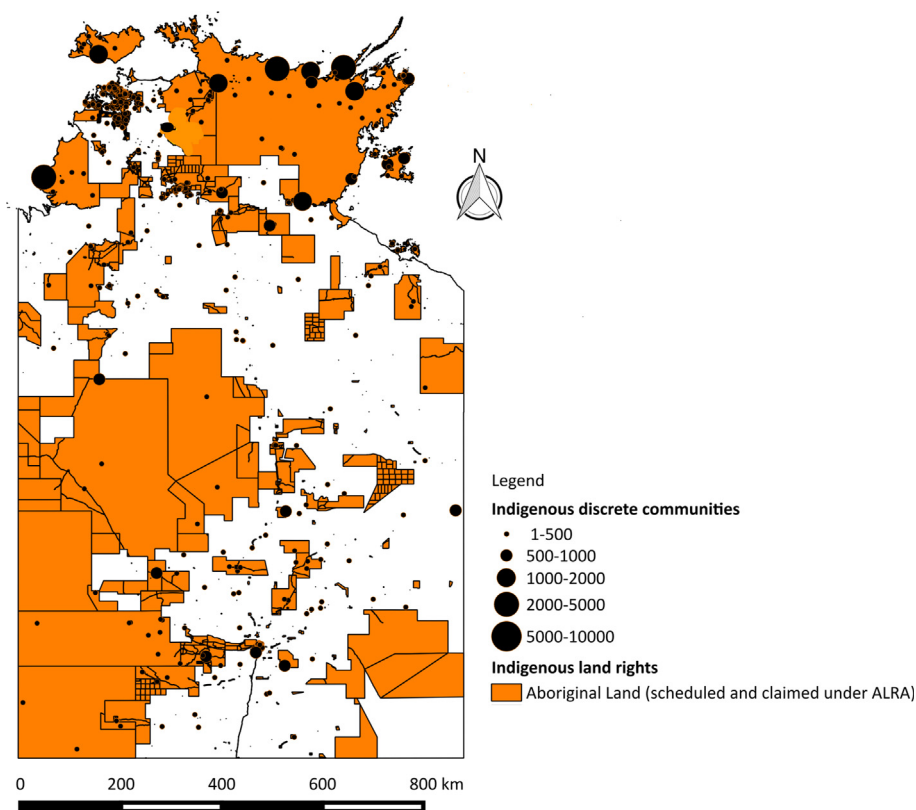


Fig. 1. Distribution of Indigenous communities and location of Borroloola in the Northern Territory and land rights (Data source: National Native Title Tribunal and ABS census, 2016).

proportion of iTaukei (Indigenous Fijians), comprising 57% of the total population (Table 1), and with iTaukei land rights extending to 84% of the total land mass. The Indigenous population is a mix of Melanesian and Polynesian people. The population of Bua province – our case study site – is mainly Fijian iTaukei (Indigenous Fijians), there is a small proportion of Fijian-Indians as well (Bakker 2014). iTaukei communities' rights to land are secured through customary title under the Native Land Act and their traditional fishing rights are protected by the Fisheries Act (Lal 2002).

2.1. Australia: the Gulf region, northern Territory

2.1.1. Background

The Northern Territory of Australia supports the highest proportion of Indigenous peoples i.e. 25.5% (58,248 persons) of its total population (228,883) with > 96 communities (of population from 100 up to 5000) and ~600 outstations which are mostly located in remote and rural locations (Fig. 1).

Borroloola, in the Gulf of the Carpentaria (mainly tropical with > 800 mm annual rainfall), is a main town in the region. It represents a medium sized community of 870 people (ABS, 2016). The town is located ~900 km away from the state capital city of Darwin, or about 600 km away from the nearby city of Katherine.

The socio-economic situation of Indigenous people in the region is poor with average median income of a person is < \$320/week and a household < \$1200/week which may typically support 10 or more people (Table 2). In contrast, the median income of a non-Indigenous person is > \$900 and household > \$1700 per week in the area. Despite > 66% of population (the age 15 year and above) eligible as labour workforce, > 60% Indigenous people are either out of labor force or unemployed in the community. Moreover, peoples' health status is poor with 28% suffering from diabetes, 7% from Chronic Heart Diseases and 6% from kidney disease (data obtained from the Department of

Health, NT 2018) (Table 2).

2.1.2. Peoples' cultural values and traditions, and land rights

Historically, Indigenous people from different clans, far and surrounding areas, settled in the town. Only those who belong to the area have access to their lands, not the others. There are five main clan groups – Garawa, Gudanji, Marra, Yanyuwa and Waanyi – who own their Indigenous estates, commonly called 'countries'. The clan lands are collectively registered as Aboriginal Land Trust (ALT), under the Aboriginal Land Rights Act (1976). These include the Narwinbi ALT (1350 km²), Garawa ALT (5200 km²) and Waanyi-Garawa ALT (~11,000 km² area), totalling ~17,000 km² area (Fig. 2). Essentially, the ALTs are communal-clan titles.

All these land trusts are of significant conservation values with part of the Narwinbi ALT and Sir Edward Pellew islands, and all of the Waanyi-Garawa ALT listed as Indigenous Protected Areas (IPA) in 2012 and 2016, respectively. Locals also have Native Title rights to several adjoining pastoral properties in the region (Fig. 2).

Traditionally before European colonisation in the early 1900s, each clan group supported themselves and managed their land applying traditional practices i.e. prescribed burning, cultural norms and regulations, collecting bush food and medicine, etc., and developing related knowledges and skills which are currently eroded to a large extent. These days local people hold various ceremonies, fire camps or cultural activities on their lands but not for subsistence. There are specific cultural and spiritual sites all across the landscape which are often visited and revered by the clan members. It is important to note that even to date the clan lands are much less developed compared to the adjoining pastoral estates that are mostly under non-Indigenous management/ownership (Russell-Smith et al., 2019a,b; Sangha et al., 2019).

Table 2
Socio-economic and health attributes of Borroloola community (Source: ABS 2016 and Department of Health, NT 2018).

Attributes		Indigenous (number and percentage (%))	Non-Indigenous (number and percentage (%))
Population	Indigenous and non-Indigenous	669 (77%)	175 (20%)
Median total income	Median total average personal income (\$/weekly)	320	938
	Median total household income (\$/weekly)	1,162	1,771
Labour and employment	Eligible workforce (more than 15 years old, % within respective total population)	440 (66%)	158 (90%)
	Total labour force (% of Indigenous eligible workforce)	178 (41%)	125 (70%)
	Persons without job (i.e. number of persons not in labor force + number of unemployed persons) (% of the eligible workforce)	262 (60%)	36 (20%)
Health	Number of persons aged > 15 who are suffering from diabetes (% of population > 15 years old)	123 (28%)	No Data
	Number of persons aged > 15 who are suffering from CHD (% of Indigenous population > 15 years old)	30 (7%)	No Data
	Number of tested people (> 31 years old) having severe risk of kidney issue (% within the tested people of 31 years old and more)	18 (6%)	No Data

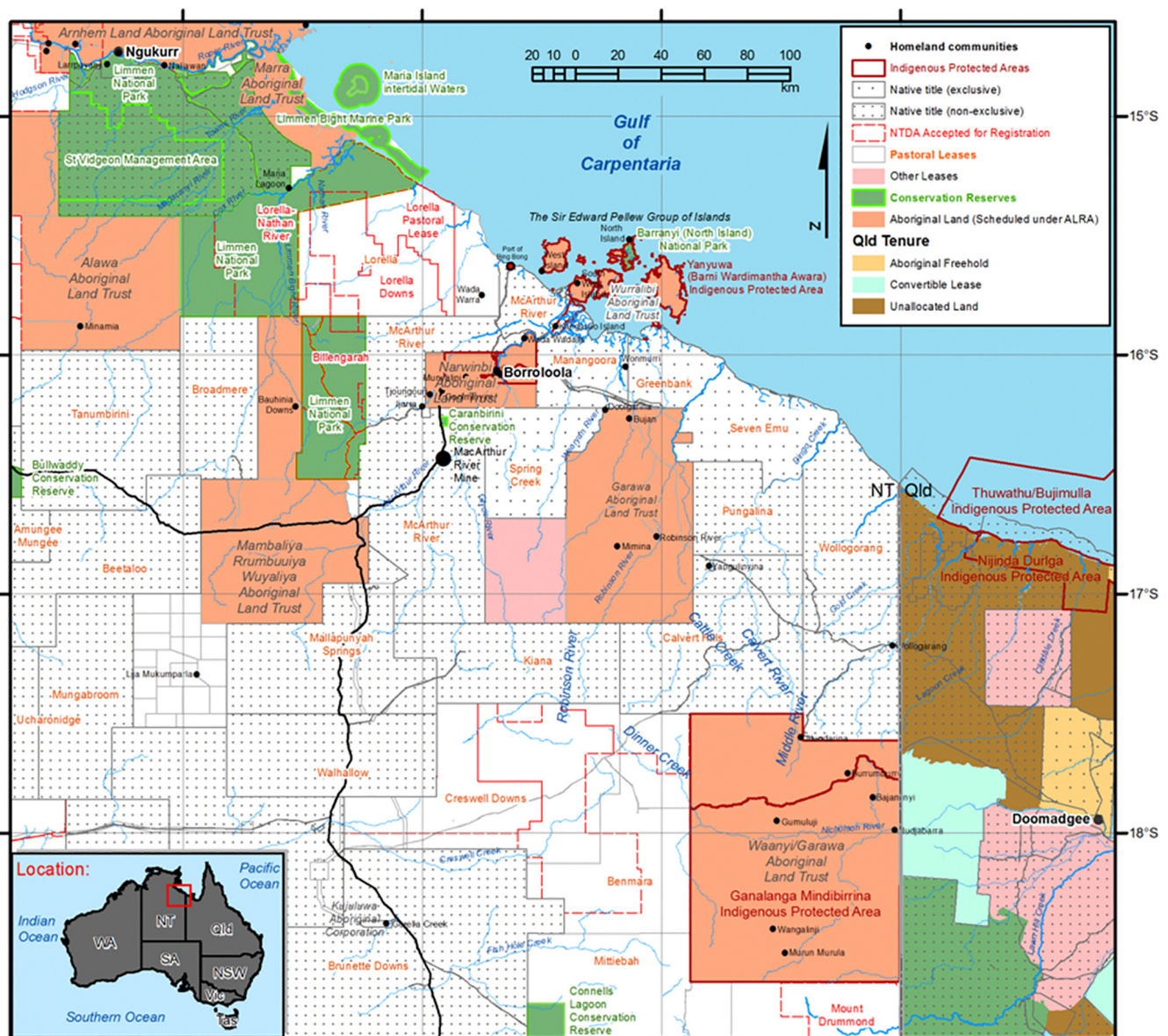


Fig. 2. Indigenous land rights in the Gulf, NT including native title, Indigenous Protected Areas, pastoral and conservation tenures, and land under Aboriginal Land Trust which is largely communal land belong to different clan group (Courtesy Andrew Edwards).

2.1.3. Key issues and challenges

Despite most of the land under Indigenous management/access, peoples' socio-economic and health situation is poor which is a consequence of a number of historical, political, socio-economic and cultural factors. However, lack of appropriate land-sector based work opportunities relevant to the locals' knowledge and skills is considered a main reason (Russell-Smith et al., 2009, 2019a). Currently, the IPAs generate employment for about 20 sea rangers (Li-anthawirriyarr) and 8–10 country (Waanyi-Garawa) rangers through the Commonwealth funded 'Working on Country' program. As a result, collectively rangers manage two ALTs and the sea country including an extensive area of Sir Edward Pellew group of Islands – an internationally significant conservation area, well-known for tourism. The region offers significant eco-tourism, recreational and commercial fishing, and carbon abatement potential, but lack of local governance and support for the locals to establish commercial enterprises on communal lands often leads to community conflicts and thwarts any progress.

In contrast, there is a privately owned, successful fishing business – King Ash Bay Fishing Club, operating on 200 hectares of land. However, the contribution of proximate Indigenous managed lands towards supporting this private business is totally ignored and locals are deprived of any benefits that flow from that business. Similarly, there is a zinc-lead McArthur River Mine, operating for the past > 20 years. Although, the mine has established a monetary trust for the community, there is actually significant erosion of peoples' cultural and spiritual interests in the landscape which has led to serious socio-ecological and economic conflicts (Kerins and Green, 2019).

Indigenously managed ~17,000 km² land under the ALT and other IPAs affords rich diversity of flora and fauna with hundreds of natural water springs apart from cultural and spiritual sites (Sangha and Lynch, 2019), which ensures an array of ecosystem services (climate mitigation, water regulation, habitat for biodiversity, etc.) for the local, Australian and global public but without much benefit to the land-rich but financially-poor Borroloola community itself.

The current situation in the gulf and the main town of Borroloola is illustrative of several remote communities in northern Australia, demanding recognition of the role of local communities in managing their natural resources and maintaining knowledge and skills that help people to deliver ecosystem services for the wider public.

2.2. Asia: 'Ganga' basin in north India

2.2.1. Background

'Ganga' is not just a river but a lifeline for about 500 million people (Sanghi and Kaushal, 2014) and has been the origin of beliefs, cultures and lifestyles in India (Kumar, 2017). Its resources have shaped the social and economic structure of people living in and outside the Gangetic basin that covers a total area of 2.5 m km² (Singh, 2008). In 2008 Ganga was declared the national river of India. Accredited to Ganga's sacred status, cultural and aesthetic values, the river is called 'Mother Ganga'.

Ganga is a transboundary river, covering large areas of India and Bangladesh – it originates in Gangotri and flows into the Bay of Bengal (Fig. 3a). The river and its basin supports diverse terrestrial, riparian and aquatic ecosystems including several unique floral and faunal species and local and Indigenous cultures in the region (Nale et al., 2017). This diversity exists because the Ganga flows through different biogeographical zones i.e. Himalaya, Gangetic Plains and Coasts. Dependence of people on Ganga varies in these three zones. In Himalayas, people are not directly dependent on the river while in Gangetic Plains and Coasts they are for sustenance and livelihoods.

The Indo Gangetic basin (here on called Ganga basin) is one of the most densely populated as well as one of the most productive agricultural areas of the world (Kumar et al., 2006; Erenstein et al., 2010). Rice, wheat and sugar cultivation is a primary source of income along with small-scale livestock, vegetables, horticulture production systems,

and tourism that are all dependent on natural resources (Ambastha et al., 2007; Keil et al., 2016).

2.2.2. Peoples' cultural values and traditions, and land rights

Ganga river holds a high religious and spiritual value in Hindu religion, along with other beliefs (Fig. 3b–d). Many cultural and religious values of the river are reflected in the ancient Indian scriptures such as *Vedas* and *Puranas*. As Ganga is considered 'Mother Goddess', several stories are popular of her journey from heaven to earth; one of the most famous is that she came on earth to reduce the suffering of people and to grant them *Moksha* i.e. salvation. Every year, several festivals and days are dedicated to celebrate the holiness of the river and its contribution to humankind (Fig. 3b, c). Apart from religious pilgrimage, Ganga and its tributaries also host various types of tourism activities such as rafting, boating, angling, and camping. The tourism activities provide the alternative livelihood opportunities to the local communities. Most importantly, the river supports significant agricultural economies in the whole basin for providing the most fertile soils in the world and freshwater for cultivation. Along with fishing and irrigation, the river is a main mode of transportation for local communities as well as for commercial purposes (Kumar, 2017).

Indigenous peoples' land rights are limited in India with many newspaper reports available online indicating violation of local rights in favour of development (Jacquelin-Andersen (2018) – The Indigenous World 2018). However, in the Himalayan area of Ganges, laws prevent non-domiciles from buying land especially where Indigenous communities reside, other than for the purpose of building houses. Some of the state-wise Acts such as The Agricultural Land Ceiling Act (1961) limits the area owned by a landowner to reduce the economic inequalities, and the Forest Right Act (2006) allows tribal communities and forest dwellers to access forest resources. However, local communities have lost many of their land rights after declaration of protected areas and developmental activities such as construction of hydropower plant (Grumbine and Pandit, 2013). Due to government support for development and infrastructure, often Indigenous rights are threatened.

2.2.3. Key issues and challenges

The major issues for conserving the Ganga basin to continue provide services for the locals, as mentioned above, include dense human population, rapid unplanned development for growing economy, pollution from domestic and industrial sources, multiple stakeholders with different priorities, high dependence and little or no effective regulation mechanisms. These issues are aggravated by poverty, lack of economic opportunities, and casteism leading to inadequate rights and distribution of resources for the majority population.

Pollution from industries and domestic resources, excessive use of pesticides and fertilizers in agricultural systems, and livestock disposal and drinking are degrading the quality of water in the river. Strong religious beliefs attached to Ganga such as cremation on its banks and immersing of ashes after cremation, dumping prayer ritual (*puja*) material from houses and temples that includes pictures, flowers, sugar, flour, milk, colours, cloths, and plastic, is another source of pollution to the river (Rai 2013). Ganga hosts millions of tourists, both recreational and religious, every year. Most of the tourism activities are unregulated, unorganized, and exert increased pressure on already sensitive and vulnerable natural system.

Overexploitation of Ganga's resources leading to loss of habitat for many fauna species as well as people's values and livelihoods at a fast rate raises serious concerns for policy development and implementation to manage the current resources and develop sustainable solutions.

Accredited to marketization and new easy access to remote areas has resulted in over exploitation of both physical (e.g. sand, water) and biological (e.g. fishes and forests) resources along the river. New fishing techniques although more productive in terms of catch with less efforts, challenge the sustainability and ecological health of the river ecosystem. The new market forces also promote the leakage of benefits to



Fig 3. The Ganga river and its values. a) The path of river Ganga and the Gangetic basin. b) Religious tourism both for people living in the basin and outside. c) People worshipping (performing ‘arti’) ‘Ganga Mata’ on the river banks. d) Angling in the river for livelihoods.

economically stronger outsiders.

The prevailing socio-economic situation among the regional population is another key factor impacting resource use in the Ganga basin. Most of the land is owned by few persons from high caste communities while most population, belonging to lower caste, are land-less who work as agricultural labourer, engage in fishing and other menial jobs. Disparity in resource distribution, high population pressure and less livelihood opportunities result in trapping the locals in the cycle of poverty with poor living conditions (Singh et al., 2011; Ansary and Anisujjaman, 2012).

In conclusion, local economies in the Ganga basin revolve around the river Ganga and its resources. The growing population and rapid infrastructural development in the region present huge challenges and further disadvantage already marginal communities. Ganga water is exploited and diverted for agricultural, industrial and other purposes, resulting in myriad of problems that adversely impact on locals’ health, cultural and religious beliefs. Regrettably, the reputation of a millennia-old revered iconic river is severely damaged.

To address these issues, the Government of India has established a National Mission for Clean Ganga (NMCG) in 2011, with an investment of USD 3 billion in 2016 for the River Ganga project to be finished by 2018, but the outcomes are yet to be seen as on March 2019.

2.3. Pacific Island: Bua province, Vanua Levu Island, Fiji

2.3.1. Background

Throughout Oceania, many Indigenous communities hold a holistic worldview of the inseparability between nature and people (Friedlander, 2018). Hauðfa (2008: 39) captures this ideology in the following quote “Oceania is vast, Oceania is expanding, Oceania is hospitable and generous, Oceania is humanity rising from the depths of brine

and regions of fire deeper still, Oceania is us.” Located within the South-west Pacific Ocean, Fiji is comprised of 332 islands, stretching across 18,270 km². The population of Fiji is around 884,887 (Fiji Bureau of Statistics (FBoS), 2018), with Viti Levu (10,388 km²) and Vanua Levu (5587 km²) being the two largest and most developed islands.

Many Indigenous communities in Pacific Island Countries hold a wealth of knowledge about their local ecosystems and how to manage them. Owing to their ongoing interaction with mangroves, Fijians hold valuable insights into managing these environments and their resources (Johnston, 2014, 2015). The Bua province, a case study here, is one of Fiji’s fourteen provinces on western Vanua Levu Island (Fig. 4). Bua province covers an area of 1378 km² and is home to an extensive mature mangrove area (Nair, 2004). The 2017 census indicated that the province is home to 15,466 people (FBoS, 2018), of which Fijian *iTaukei* (Indigenous Fijians) are the dominant population and there is a small proportion of Fijian-Indians as well (Bakker, 2014).

2.3.2. Peoples’ cultural values and traditions, and land rights

iTaukei communities value mangrove ecosystems for a range of cultural, socio-economic and environmental reasons. Mangroves provide habitat and nurseries for juvenile fish, mudcrabs and various other fauna species (McLeod and Salm, 2006). They act as a natural buffer between the land and sea, which helps to protect the coastline against storm damage, extreme weather events and rising sea levels (Chong, 2014). Mangroves can also filter sedimentation and run-off, reduce erosion, and sequester immense amounts of carbon (Agrawala et al., 2003; Atwood et al., 2017; Blankespoor et al., 2017). In many coastal and rural communities throughout Fiji, mangroves are used for firewood, building products, art and traditional garlands. Goods and services provided by mangrove ecosystems also facilitate socio-economic growth in *iTaukei* communities for both subsistence and financial

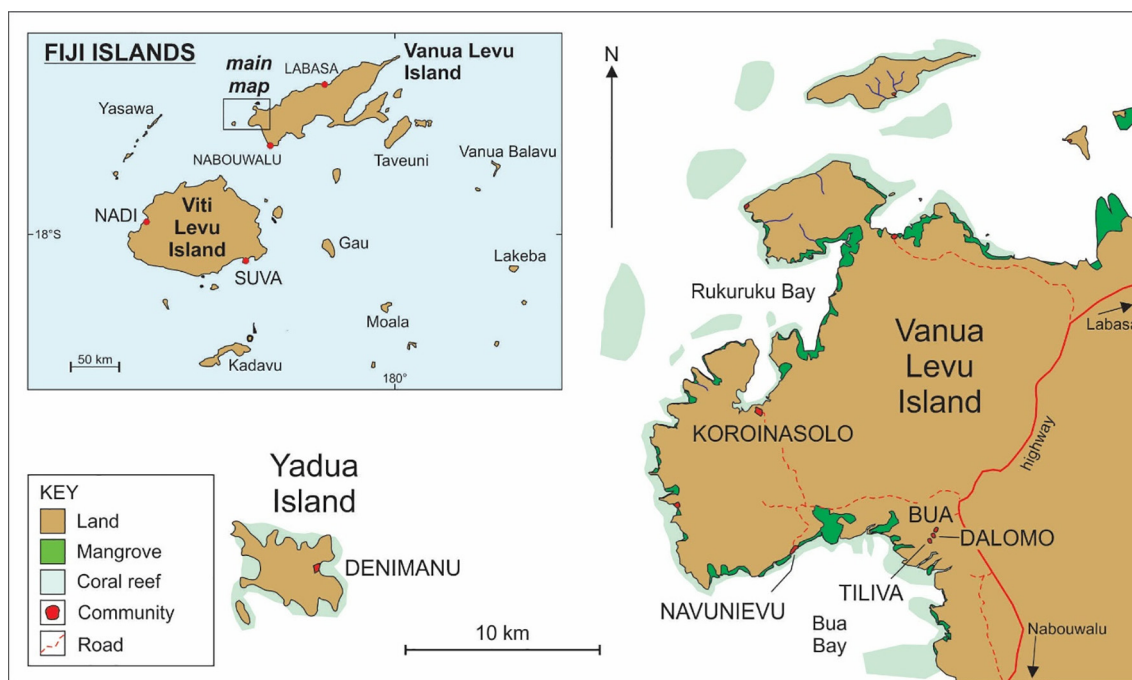


Fig. 4. Map of Vanua Levu, Fiji Islands showing key village sites: Bua, Dalomo, Denimanu, Koroinasolo, Navunievu and Tiliva.

purposes. For example, it is a common tradition for Fijian women to go out together collecting mudcrabs to sell at the markets or to other people within their village, which contributes to social cohesion and well-being for *iTaukei* communities.

Many villages within the Bua province have similar management techniques for protecting mangroves and associated coastal resources. The most commonly cited technique was the implementation of 'Tabu' areas. *Tabu* areas are essentially protected areas in which local people are prohibited from collecting resources for a certain period of time. This can apply to a particular part of land or sea, or a specific species which may need to be preserved for consumption in an upcoming ceremony (Siwatibau, 1984). The specific rules around this are usually decided at a community meeting led by the *Ratu*, village Chief. The traditions and customs around this practice vary between villages. For example, in Bua village, when someone in the village passes away, a *tabu* is put in place on certain mangrove and reef areas for 100 days. This means that for 100 days, no one is allowed to collect crabs, fish or any resources from these specific areas. In Koroinasolo village, a *tabu* was put in place by the *Ratu* after locals expressed concerns about declining crab and fish populations during a community meeting.

Another common management strategy is the process of knowledge transmission. Typically, the knowledge on mangrove ecosystems is passed on by parents and grandparents. One participant in this research emphasised "we have always had constant reminders from our grandparents and parents and ancestors to look after the mangroves." Friends were also reported to teach how to utilise mangrove resources. Through this knowledge sharing, the majority of locals pass on the importance of mangroves to younger generations.

In Fiji, *iTaukei* people have customary ownership of wetland areas where management needs to abide by traditional customs and meet the social, economic and cultural needs of communities (Ellison, 2009). Tribal lands and coastal waters are interpreted as a single unit called 'vanua', which can also be divided into multiple clans (*yavusa*) and family groups (*mataqali*) (Long, 2017). Each vanua has a Chief who holds ownership and responsibility over the land, water, resources and people within it (Cooke et al., 2002). For *iTaukei* people, the concept of vanua symbolises the interconnectivity of community and the environment, in which nature is perceived as part of the self (Long, 2017).

2.3.3. Key issues and challenges

In urban areas of Fiji such as Suva, Savusavu and Labasa, extensive mangrove areas have been cleared because of rapid population growth and the use of mangrove forests for expansion and waste disposal (Veitayaki et al., 2017). Intertwining stressors from logging, over-fishing, industrialisation, agriculture and pollution have contributed to loss and damage of these ecosystems (Gilman et al., 2006; Kainuma et al., 2010; Bhattarai and Giri, 2011). The tourism industry has also had a considerable impact on mangroves and associated coastal resources due to the concentration of tourism development in coastal zones (Xie et al., 2013). Climate change also threatens the future status of Fijian mangroves communities, especially with rising sea levels and the increase of extreme weather events. In rural parts of Fiji such as Bua, mangrove communities are abundant and in most areas remain relatively untouched.

In terms of resources in the Bua province, locals have observed a decline in mudcrab and fish populations over time due to local people or outsiders cutting mangroves down, and damage from extreme weather events such as cyclones. As a result, the locals either travel further out or spend more hours of the day searching for mudcrabs and other resources. Participants in this research expressed concerns as they were struggling to find a sufficient amount of resources for subsistence and income. This is a key challenge for Indigenous and local communities living in rural parts of Fiji, particularly as there has been an increase in the number of rural households experiencing poverty over time (Narsey, 2012).

In the Bua province many people perceive mangroves as 'government property' and believe a license is required to cut down mangroves which 'belong' to the government. Yet the law states that a licence is required only when cutting down mangroves for commercial reasons. There are no laws preventing the mangroves from being cleared for subsistence purposes (IUCN, 2013). The Forest Decree (1992) entails provisions for saving of customary rights in forest areas which includes the right to hunt, fish and collect fruits and vegetables growing wild, as well as cutting or removal of forest products for domestic use without the requirement for payment of fees or royalties. This could potentially indicate a lack of communication between government and local communities on their rights around natural resources access and usage of local mangrove ecosystems.

Table 3
A summary of peoples' values, ecosystem services that they contribute to deliver to the wider public, opportunities, and issues in the selected case studies.

Case study	Peoples' land rights and values	Ecosystem Services delivered to the regional and global public (off-site)	Currently realised and potential Ecosystem Services-based opportunities	Major issues
The Gulf country, Australia	~17,000 km ² as Aboriginal Land Trust, and Native Title rights to the surrounding properties. People hold their ceremonies and cultural camps to practice traditional knowledge and skills	Climate and air quality regulation; Water regulation; Biodiversity protection and maintaining richness of species; Affording opportunity for people to experience nature and/or learn from nature; Affording opportunity for other Indigenous and non-Indigenous people to learn about cultural lores and practices	Realised: minimal/none; a carbon abatement project is currently under registration for one A.L.T. area. Potential economic opportunities: Eco-cultural tourism; commercial and recreational fishing; carbon abatement and sequestration projects	Lack of sustainable economic opportunities and local governance structures suiting local needs and aspirations
The Ganga basin, India	The local and Indigenous communities own relatively small parcels of land in the Gangetic basin that covers an area 2.5 m km ² . Relatively large parcels of land are owned by the wealthy people. Local and regional populations hold many unique religious, spiritual, cultural, livelihood, and natural values to the landscape, including worshipping the river, taking a holy dip, and cremating bodies on Ganga banks	Water supply and regulation; Climate and air quality regulation; Wetland biodiversity protection and maintenance; Affording precious millennia old religious customs/rituals, spiritual and natural values for the national and International public; Offering opportunities for people to experience closeness with nature through worshipping/practising cultural and spiritual practices, particularly yoga. Ganges and its banks present many sites for meditation; Strong historical connections of many Indian saints to hundreds of places in the Gangetic basin Climate regulation particularly, as mangroves offer a huge source for carbon sequestration; Air and water quality regulation; Biodiversity protection; Affording opportunity for other Indigenous and non-Indigenous people to learn about cultural lores and practices	Realised: Religious and spiritual tourism; Commercial yoga centres; Commercial eco-tourism to a limited extent—all unregulated and poorly managed. Potential economic opportunities: Community-based cultural/eco-tourism; Regulation and sharing of benefits from the commercial companies with the local communities; Active participation of the locals in decision-making to manage resources, hence creating local jobs Realised: minimal/none; small-scale fishing (fish sold at village markets) Potential opportunities: Carbon abatement and sequestration projects especially as mangroves store 3-5X more 'Blue Carbon' than the tropical forests (Flint et al., 2018); Community-based eco- and cultural-tourism and knowledge sharing experiences	Pollution, exploitation and unfair distribution of resources, lack of local involvement in decision-making, weak regulatory procedures, and lack of jobs for the local Indigenous populations. Commercial companies land grabbing, and reaping the benefits at a huge cost to the locals who are already marginalised and use Ganga's resources in their limited capacity
Bua Province, Vanua Levu, Fiji	Bua province covers an area of 1378 km ² but there is ~15,000 km ² <i>itaukei</i> land in Fiji. Local people hold customary rights to the resources obtained from mangroves, which are managed using traditional management practices			Destruction of mangrove communities in some villages. Poor regulation and governance mechanisms depleting fish and mudcrab stocks in some villages

Interacting with and utilising mangrove ecosystems is a part of everyday life for many coastal and rural communities throughout Fiji. Through traditions and customs, local people have sustainably managed these resources over time to support their livelihoods. Growing development challenges and climate change pose threats to mangrove communities and the livelihoods of those who depend on them. Results from this case study suggest a lack of governance is one of the key issues for mangrove access and usage. An improvement in communication between government and local communities could lead to more sustainable outcomes which benefit both the ecosystems and local people. External assistance with mangrove replantation and management in villages that have experienced significant mangrove loss and damage could also be beneficial. However, failed external projects in the past highlight that better planning and collaboration with local communities needs to go into these projects in order to produce sustainable outcomes in the long-term.

3. Summary of all case studies

Land rights vary from one country to another, with strong entitlements in the Bua province of Fiji, the Gulf country in the NT, and somewhat risky rights in the Ganga basin of India due to development pressure (Table 3). A commonality among all case studies was Indigenous and local peoples' poor economic situation. Lack of local governance and peoples' role in decision-making, exploitation of resources by the commercial enterprises and depriving locals of their share are the other common issues.

Contributions of conservatively managed Indigenous and local lands to the regional and global public are critical and substantial, including regulation of climate and water, protection of water and biodiversity resources, and supporting diverse economies among all the case studies. To date, many of these ES are not appropriately recognised let alone their quantification for the selected case studies. To guide sustainable and equitable development accounting for, that includes quantification and distribution of, ES at a local/regional scale is the first-step. Currently, there are very few realised land/sea-based economic opportunities that recognise or support conservative use of land by locals.

In contrast, over-exploitation of natural resources is particularly prevalent in the Ganga basin, India and the Gulf region, NT where commercial companies reap the financial benefits without offering due shares to the local communities (Table 3).

4. Discussion and conclusion

Many Indigenous and local communities hold unique values for their natural systems that enable them to conserve and manage those systems through engaging in various cultural practices and norms as demonstrated in our three case studies. Peoples' diligent management and conservative use of natural systems delivers a range of ecosystem services which are important for the wider regional and global public (de Groot and Ramakrishnan, 2005; Ramakrishnan et al., 2005; UN, 2009). Yet, Indigenous and local communities obtain little or no benefit or even recognition for their contributions to maintaining such ecosystem services (Sobrevila, 2008; Duchicela et al., 2015; WRI, 2019; Russell-Smith et al., 2019a; Sangha et al., 2018). In contrast, natural resource-based commercial businesses use or exploit the resources, which exist due to conservative practices of local and Indigenous peoples, and earn monetary profits with little consideration of those communities. They contribute to the plight of already marginal communities – a typical situation across the Asia Pacific, particularly evident in our case studies of the Gulf region in the NT and the Ganga basin of India.

Failure of our modern economic approaches to embrace the importance of nature's services for supporting human living is a main reason contributing to the quandary of local communities and exploitation of natural resources to date (Costanza et al., 1997, 2014;

Daly, 2013, 2015). Lack of consideration of a sustainable scale and equitable distribution of benefits from natural systems are the other key factors. Currently, none of the big corporates account for the cost of externalities that they cause to the local environment and people for exploiting natural resources (Trucost, 2013). Local social, historical, and political issues, lack of appropriate land rights, and governance procedures further complicate the situation that prevails in many already marginalised local and Indigenous communities across the globe (Sobrevila, 2008; UN, 2009).

Colonisation is another common pervasive factor that has contributed substantially to the disintegration of Indigenous and local community practices globally (Archer et al., 2019; UN, 2009). All the three case studies were colonised by British over a significant period of time: India over > 200 years, Fiji > 100 years, and Australia > 150 years with colonial rules and regulations that continue to exist even to date (Kerins and Green, 2019; Tharoor, 2017). Undeniably, colonisation has appallingly disturbed local socio-cultural fabric, economies, exploited local resources and ruined local knowledges and capabilities – a detailed account is provided by Tharoor (2017) in his book on *Inglorious Empire*.

In India, local and Indigenous communities were stripped off their lands, forced to cultivate the crops the rulers wanted, and to pay heavy taxes during the British colonial rule (Tharoor, 2017). Traditional communal systems were abolished. Despite India's independence for the last > 70 years, the legacy of British rule still remains in the form of continuation of pre-colonial policies, and hence exploitation of local communities (Vergheese, 2015, 2018). Typically, there is a lack of will to reform those policies and implement appropriate land rights. In addition, non-existence of mechanisms requiring equitable distribution of benefits further contributes to the suffering of local and Indigenous communities (Shiva, 2016).

The NT in Australia is the exceptional territory/state where Indigenous people have inalienable freehold rights to land through Aboriginal Land Trusts (under ALRA 1976) but these Trusts are established under the Commonwealth Government which is predominantly guided by the rules and regulations established by the majority ruling non-Indigenous people. Each ALT actually encompass separate clan areas which are bulked together simply for easy governance (Altman et al., 2011; Altman, 2014; Kerins and Green, 2019). Whereas, before colonisation the clans managed their areas with well-defined boundaries, duties and customs. The traditional owners of those lands now find it difficult to follow those customs due to amalgamation of clan lands and a mix of rights (James et al., 2019). Moreover, many people now live in community towns instead of their own homelands (Archer et al., 2019). This entire process has disturbed peoples' traditional knowledge and capabilities, which is now requiring time, efforts, and investment to empower communities so people can regain control of their lands and local economies.

In comparison to the other two case studies, Indigenous peoples in the Bua province of Fiji are relatively secure in terms of stronger land rights and access to resources. This stems from early decisions made by the First Governor of Fiji, Sir Arthur Gordon, who was adamant in ensuring the country did not suffer from colonisation in the same way that it had impacted parts of Africa, Australasia and the Caribbean (Chand, 2007). With intentions of protecting Fijian culture, Gordon banned the sale of Fijian land to foreigners and rejected land claims from white settlers (Firth, 2012). *iTaukei* communities' rights to land are secured through customary title under the Native Land Act and their traditional fishing rights are protected by the Fisheries Act (Lal, 2002). However, complex land ownership arrangements have meant that Indo-Fijian and *iTaukei* women are disadvantaged when it comes to land access for food production (Singh-Peterson and Iranacolaivalu, 2018). Despite their prosperity in land tenure and access to resources, Fiji's postcolonial voyage has been far from smooth-sailing. The country has endured challenges in adapting to the political and institutional structure of a Western societal model, with particularly stagnant economic

growth (Rodd, 2016). Since gaining independence in 1970, poverty levels in Fiji have been increasing with one in four Fijians unable to afford minimum living requirements in 1990/91, which then rose to one in every three in 2002/03 (Chand, 2007).

The major concerns – lack of recognition of Indigenous and local peoples' rights, unregulated and exploitative use of resources, and inequitable distribution of benefits – are common among all the three case studies except for relatively secure landrights in Fiji. The key question is how to address those concerns so we can support Indigenous and local peoples to sustain earth's natural resources for the greater public benefit.

Local Governments recognising and respecting Indigenous and local peoples' rights is the first step to enable people to manage their lands as they want to, followed by developing local governance structures by genuinely engaging with people and considering their aspirations and cultural responsibilities (Russell-Smith et al., 2019a). Details of local governance principles, particularly to govern common natural resources as is the case in many communities, are beautifully laid out by the Nobel Laureate, Prof Ostrom (1990). Those principles can be adapted to local conditions to better manage and govern natural resources owned by the Indigenous and local peoples across various states.

For sustaining the use of natural resources, a transformative set of national- and local-scale policies and procedures are necessary that ensure strict regulatory mechanisms and fair distribution of benefits. These can include safe resource use and extraction limits, obligatory social license, financial liability for negative externalities, and tax/levy on the corporate sector while establishing stringent limits of sustainable scale. Conservatively managed Indigenous and local lands require appropriate economic mechanisms for supporting locals to continue their practices. Globally, the monetary mechanisms such as Payments for Ecosystem Services (PES) – beneficiary pays the service provider – are well recognised at various local scales (Forest Trends et al., 2008; Farley and Costanza, 2010; UN, 2016; Barton et al., 2017; and several case studies by TEEB (2019)). In addition, establishing mandatory offset mechanisms for the corporates can also help to equitably distribute monetary benefits among the local and Indigenous communities.

A prime example of an effective PES scheme in northern Australia is government's Emissions Reduction Fund (ERF) supporting carbon abatement through ~30 carbon enterprises, worth ~AUD 40million per annum, on Indigenous lands (Russell-Smith et al., 2019b). Carbon income further enables local Indigenous communities to be on country, and to learn and practice their traditional customs and knowledge. Commonwealth funded 'Working on Country' programs particularly for supporting IPAs also represent PES to some extent (although, the service providers are not fully/directly credited for the provision of any specific ES). At international scale, REDD+ (Reduced Emissions from Deforestation and Forest Degradation, with enhanced community benefits) program that aims to reduce emissions, conserve carbon stocks, and promote sustainable management of forests in developing countries (<https://www.unredd.net/about/what-is-redd-plus.html>) serves a good example. Despite several examples of PES projects worldwide, relatively few recognise and support the efforts of Indigenous and local peoples with some exceptions as reported by The Nature Conservancy (2006), Forest Trends et al. (2008), and TEEB (2019).

PES is highly relevant for the Pacific Island communities such as Fiji where locals have contributed relatively little to the current changes in climate in contrast to that from several developed countries; yet Islander communities bear the brunt of climate change for experiencing frequent floods, storms and cyclones resulting in the loss of their homelands (Wing, 2017). Undeniably, the developed world owns a much greater share of climate change. Establishing common trust/bonds such as sovereign green bond in Fiji to mitigate and adapt to climate change can help local communities to be resilient (<https://cop23.com.fj/fiji-launches-first-emerging-market-green-bond-third->

[world/](#)). Such green bonds and PES mechanisms offer feasible pathways to equitably compensate marginal Island communities which then will enable people to adapt with climate change as well as to continue delivering ecosystem services for the wider public. However, we acknowledge that PES schemes need to be implemented with caution, in consultation with local and Indigenous communities applying transparent and accountable mechanisms (for details see Muradian et al., 2013; Schomers and Matzdorf, 2013).

Overall, there are significant opportunities for mitigating environmental damage, sustainably managing natural systems to continue delivering ecosystem services for the wider public while supporting livelihood options for local communities. These will further help to address various United Nations' Sustainable Development Goals, particularly reducing poverty; enhancing good health and well-being; supporting direct work and economic growth; reducing inequalities; developing sustainable cities and communities; and climate action (UN, 2016). As Veit and Ding (2016) advocate, application of PES schemes rewarding Indigenous and local communities for promoting sustainable use of resources is a feasible rational economic approach for development.

Using three case studies from Australia, India and Fiji, we present a case to support and reward the local and Indigenous communities through establishing common funds, green bonds, and PES schemes to promote conservative use of natural resources that leads to greater ecosystem services contributions for the well-being of regional and global public.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ecoser.2019.100991>.

References

- Agrawala, S., Ota, T., Risbey, J., Hagenstad, M., Smith, J., van Aalst, M., Koshy, K., Prasad, B., 2003. Development and Climate Change in Fiji: Focus on Coastal Mangroves. OECD, pp. 1–56.
- Altman, J., 2014. In: The Political Ecology and Political Economy of the Indigenous Land 'Titling Revolution' in Australia. Maori Law Review (2014 Indigenous Law Speaker Series), pp. 1–17.
- Altman, J., Kerins, S., Hunt, J., Ens, E., May, K., Russell, S., Fogarty, B., 2011. Indigenous Cultural and Natural Resource Management Futures. CAPER Topical Issue No. 9/2011.
- Ambastha, K., Hussain, S.A., Badola, R., 2007. Resource dependence and attitudes of local people toward conservation of Kabartal wetland: a case study from the Indo-Gangetic plains. Wetlands Ecol. Manage. 15 (4), 287.
- Ansary, R., Anisujjaman, M., 2012. Factors determining pattern of unmet need for family planning in Uttar Pradesh, India. Int. Res. J. Soc. Sci. 1 (4), 16–23.
- Atwood, T.B., Connolly, R.M., Almahasheer, H., Carnell, P.E., Duarte, C.M., Ewers Lewis, C.J., Irigoien, X., Kelleway, J.J., Lavery, P.S., Macreadie, P.I., Serrano, O., Sanders, C.J., Santos, I., Steven, A.D.L., Lovelock, C.E., 2017. Global patterns in mangrove soil carbon stocks and losses. Nat. Clim. Change 7 (7), 523. <https://doi.org/10.1038/nclimate3326>.
- Archer, R., Russell-Smith, J., Kerins, S., Costanza, R., Edwards, A., Sangha, K.K., 2019. Change and continuity: the North Australia cultural landscape. In: Russell-Smith, J., James, G., Pedersen, H., Sangha, K.K. (Eds.), Sustainable Land Sector Development in Northern Australia: Indigenous Rights, Aspirations, and Cultural Responsibilities. CRC Press, Florida, USA.
- Australian Bureau of Statistics (ABS), 2016. Census. Australian Government. <http://www.abs.gov.au/census>.
- Bakker, M.L., 2014. Bua: A Profile of the Demographic and Socio-economic Characteristics of the Population of the Province Based on the 1996 and 2007 Census Data. Bureau of Statistics, Suva, Fiji.
- Barton, D.N., Benavides, K., Chacon-Cascante, A., Le Coq, J.-F., Quiros, M.M., Porras, I., Primmer, E., Ring, I., 2017. Payments for Ecosystem Services as a Policy Mix: Demonstrating the institutional analysis and development framework on conservation policy instruments. Environ. Policy Gov. 27 (5), 404–421. <https://doi.org/10.1002/eet.1769>.
- Bhattarai, B., Giri, C., 2011. Assessment of mangrove forests in the Pacific region using Landsat imagery. J. Appl. Remote Sens. 5 (1), 053509. <https://doi.org/10.1117/1.3563584>.
- Blankespoor, B., Dasgupta, S., Lange, G.-M., 2017. Mangroves as a protection from storm surges in a changing climate. J. Hum. Environ. 46 (4), 478–491. <https://doi.org/10.1007/s13280-016-0838-x>.
- Chand, S., 2007. 50/50 by 2020: poverty and redistributive politics in post-independence Fiji. Pacific Econ. Bull. 22 (2), 22–35.

- Chong, J., 2014. Ecosystem-based approaches to climate change adaptation: progress and challenges. *Int. Environ. Agreements: Politics Law Econ.* 14 (4), 391–405. <https://doi.org/10.1007/s10784-014-9242-9>.
- Clarkson, L., Morrissette, V., Regallet, G., 1992. Our Responsibility to the Seventh Generation: Indigenous People and Sustainable Development. International Institute of Sustainable Development, Winnipeg, pp. 92.
- Cooke, A.J., Polunin, N.V.C., Moce, K., 2002. Comparative assessment of stakeholder management in traditional Fijian fishing-grounds. *Environ. Conserv.* 27 (3), 291–299.
- Costanza, R., Cumberland, J., Herman, E.D., Goodland, R., Norgaard, R., 1997. An Introduction to Ecological Economics. CRC Press LLC, US.
- Costanza, R., Kubiszewski, I., Giovannini, E., Lovins, H., McGlade, J., Pickett, K.E., Ragnarsdóttir, K.V., Roberts, D., Vogli, R.D., Wilkinson, R., 2014. Development: time to leave GDP behind. *Nature* 505 (7483), 283–285.
- Daly, H., 2013. A further critique of growth economics. *Ecol. Econ.* 88, 20–24. <https://doi.org/10.1016/j.ecolecon.2013.01.007>.
- Daly, H.E., 1996. *Beyond Growth: The Economics of Sustainable Development*. Beacon Press.
- Daly, H.E., 2015. *Economics for a Full World*, Great Transition Initiative (June 2015). URL: <http://www.greattransition.org/publication/economics-for-a-full-world>, accessed on 9 August, 2017.
- Department of the Prime Minister and Cabinet, 2019. Indigenous Land Rights. (accessed on 10 February 2019). <https://www.pmc.gov.au/indigenous-affairs/land>.
- de Groot, R., Ramakrishnan, P.S., 2005. Cultural and amenity value. In: Hassan, R., Scholes, R., Ash, N. (Eds.), *Millennium Ecosystem Assessment: Volume 1 – Current State and Trends. Findings of the Condition and Trends Working Group*. Island Press, pp. 455–476.
- Duchicela, L.F., Jensby, S., Uquillas, J., Lukic, J., Sirker, K., 2015. Indigenous Peoples Development in World Bank-financed Projects: Our People, Our Resources. Striving for a Peaceful and Plentiful Planet. Case Studies Report. The World Bank Group.
- Ellison, J.C., 2009. Wetlands of the Pacific Island region. *Wetlands Ecol. Manage.* 17 (3), 169–206. <https://doi.org/10.1007/s11273-008-9097-3>.
- Erenstein, O., Hellin, J., Chandna, P., 2010. Poverty mapping based on livelihood assets: a meso-level application in the Indo-Gangetic Plains, India. *Appl. Geogr.* 30 (1), 112–125.
- Farley, J., Costanza, R., 2010. Payments for ecosystem services: From local to global. *Ecol. Econ.* 69 (11), 2060–2068. <https://doi.org/10.1016/j.ecolecon.2010.06.010>.
- Fiji Bureau of Statistics (FBoS), 2018. Census 2017 of Population & Housing. URL: <https://www.statsfiji.gov.fj/> (last accessed 27th Jan 2019).
- Firth, S., 2012. Reflections on Fiji since independence. *The Round Table* 101 (6), 575–583.
- Flint, R., Herr, D., Vorhies, F., Smith, J.R., 2018. Increasing Success and Effectiveness of Mangrove Conservation Investments: A Guide for Project Developers, Donors and Investors. IUCN/WWF, Geneva, Switzerland/ Germany, Berlin, Germany, pp. 106.
- Forest Trends, The Katoomba Group, The United Nations Environment Programme (UNEP), 2008. *Payments for Ecosystem Services Getting Started: A Primer*. Forest Trends and The Katoomba Group, Nairobi.
- Friedlander, A.M., 2018. Marine conservation in Oceania: past, present, and future. *Mar. Pollut. Bull.* 135, 139–149.
- Gilman, E., Van Lavieren, H., Ellison, J., Jungblut, V., Wilson, L., Areki, F., Brighthouse, G., Bungitak, J., Dus, E., Henry, M., Kilman, M., 2006. Pacific Island Mangroves in a Changing Climate and Rising Sea-UNEP Regional Seas Reports and Studies 179, 1–58.
- Grumbine, R.E., Pandit, M.K., 2013. Threats from India's Himalaya Dams. *Science* 339 (6115), 36–37. <https://doi.org/10.1126/science.1227211>.
- Hauōfa, E., 2008. Our sea of Islands. In: *We Are the Ocean: Selected Works*. University of Hawaii Press, Honolulu, pp. 39.
- International Union for Conservation of Nature (IUCN), 2013. Review of Policy and Legislation Relating to the Use and Management of Mangroves in Fiji. Mangrove Ecosystems for Climate Change Adaptation and Livelihood. Pacific Mangroves Initiative. URL: https://www.iucn.org/sites/dev/files/content/documents/fiji_policy_and_legislation_review_report.pdf.
- Jacquelin-Andersen, P., 2018. *The Indigenous World 2018*. International Work Group for Indigenous Affairs, Copenhagen, Denmark, pp. 640.
- Johnston, I., 2014. Disaster management and climate change adaptation: a remote island perspective. *Disas. Prevent. Manage.* 23, 123–137. <https://doi.org/10.1108/dpm-062013-0096>.
- Johnston, I., 2015. Traditional warning signs of cyclones on remote islands in Fiji and Tonga. *Environ. Hazards* 14 (3), 210–223. <https://doi.org/10.1080/17477891.2015.1046156>.
- James, G., James, B., Morrison, J., Paton, D., 2019. Resilient communities and reliable prosperity. In: Russell-Smith, J., James, G., Pedersen, H., Sangha, K.K. (Eds.), *Sustainable Land Sector Development in Northern Australia: Indigenous rights, aspirations, and cultural responsibilities*. CRC Press, Florida, USA.
- Kainuma, M., Spalding, M., Collins, L., 2010. Pacific Islands. In: *World Atlas of Mangroves*. Taylor and Francis, London, United States, pp. 161–180.
- Keeley, B., 2015. In: *Income Inequality: The Gap between Rich and Poor*, OECD Insights. OECD Publishing, Paris. <https://doi.org/10.1787/9789264246010-en>.
- Keil, A., D'Souza, A., McDonald, A., 2016. Growing the service economy for sustainable wheat intensification in the Eastern Indo-Gangetic Plains: lessons from custom hiring services for zero-tillage. *Food Security* 8 (5), 1011–1028.
- Kerins, S., Green, J., 2019. Chapter 7: 'like a rusty nail, you can never hold us blackfellas down'; cultural resilience in the Southwest Gulf of Carpentaria. In: Russell-Smith, J., James, G., Pedersen, H., Sangha, K.K. (Eds.), *Sustainable Land Sector Development in Northern Australia: Indigenous Rights, Aspirations and Cultural Responsibilities*. CRC Press (Taylor and Francis Group), NY, pp. 177–202.
- Krieger, T., Leroch, M., 2016. The political economy of land grabbing. *Homo Oeconomicus* 33 (3), 197–204. <https://doi.org/10.1007/s41412-016-0022-3>.
- Kumar, D., 2017. River Ganges – historical, cultural and socioeconomic attributes. *Aquat. Ecosyst. Health Manage.* 20 (1–2), 8–20.
- Kumar, R., Singh, N.P., Singh, R.P., Vasisht, A.K., 2006. Rural infrastructure and agricultural growth: interdependence and variability in Indo-gangetic plains of India. *Indian J. Agric. Econ.* 61 (3), 469.
- Lal, B., 2002. Making history, becoming history: reflections on Fijian coups and constitutions. *Contemporary Pacific* 14 (1), 148. <https://doi.org/10.1353/cp.2002.0020>.
- Lin, D., Hanscom, L., Murthy, A., Galli, A., Evans, M., Neill, E., Mancini, M.S., Martindill, J., Medouar, F.-Z., Huang, S., Wackernagel, M., 2018. Ecological Footprint Accounting for Countries: Updates and Results of the National Footprint Accounts, 2012–2018. *Resources* 7 (58), 1–22. <https://doi.org/10.3390/resources7030058>.
- Long, M., 2017. Vanua in the anthropocene: relationality and sea level rise in Fiji. *Symplekē* 26 (1–2), 51–70. <https://doi.org/10.5250/symplekē.26>.
- McLeod, E., Salm, R.V., 2006. *Managing Mangroves for Resilience to Climate Change*. World Conservation Union (IUCN).
- Muradian, R., Arsel, M., Pellegrini, L., Adaman, F., Aguilar, B., Agarwal, B., Corbera, E., Ezine de Blas, D., Farley, J., Froger, G., Garcia-Frapolli, E., Gómez-Baggethun, E., Gowdy, J., Kosoy, N., Le Coq, J.F., Leroy, P., May, P., Méral, P., Mibielli, P., Norgaard, R., Ozkaynak, B., Pascual, U., Pengue, W., Perez, M., Pesche, D., Pirard, R., Ramos-Martin, J., Rival, L., Saenz, F., Van Hecken, G., Vatn, A., Vira, B., Uramo, K., 2013. Payments for ecosystem services and the fatal attraction of win-win solutions. *Conserv. Lett.* 6 (4), 274–279. <https://doi.org/10.1111/j.1755-263X.2012.00309.x>.
- Nair, V., 2004. *Setting Priorities for Marine Conservation in the Fiji Islands Marine Ecoregion*. WWF SPPO, pp. 6.
- Nale, J.P., Gosain, A.K., Khosa, R., 2017. Environmental flow assessment of River Ganga—importance of habitat analysis as a means to understand hydrodynamic imperatives for a sustainable Ganga biodiversity. *Curr. Sci.* 112 (11), 2187.
- Narsey, W.L., 2012. Poverty in Fiji: Changes 2002–03 to 2008–09 and Policy Implications. Fiji Islands Bureau of Statistics, Suva, Fiji, pp. 118.
- Native Land Trust Board (NLTB) Statistics, 2019. Land Rights. (accessed on 10 February 2019). <http://nltb.com.fj/statistics.html>.
- North Australian Indigenous Land and Sea Management Alliance (NAILSMA), 2014. Beyond respect: a central role for Indigenous people in Australian land and sea management. Prepared for the VI IUCN World Congress on Protected Areas, Sydney, November 2014. The North Australian Indigenous Land and Sea Management Alliance, Pty. Ltd.
- Notess, L., Veit, P.G., Monterroso, I., Sulle, A.E., Larson, A.M., Gindroz, A.-S., Quaevdweg, J., Williams, A., 2018. The scramble for land rights: Reducing inequity between communities and companies. World Resources Institute (WRI), Washington DC.
- OECD (Organisation for Economic Co-operation and Development), 2017. *Income Inequality*. OECD. <https://data.oecd.org/inequality/income-inequality.htm>.
- Ostrom, E., 1990. *Governing the commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- Posey, D., Oxford Centre for the Environment Ethics and Society, 1999. *Cultural and Spiritual Values of Biodiversity*. Intermediate Technology publications and UN Environment Programme, London and Nairobi.
- Rai, B., 2013. Pollution and conservation of Ganga river in modern India. *Int. J. Sci. Res. Publ.* 3 (4), 1–4.
- Ramakrishnan, P.S., Boojh, R., Saxena, K.G., Chandrashekar, U.M., Depommier, D., Patnaik, S., Toky, O.P., Gangwar, A.K., Gangwar, R., 2005. *One Sun, Two Worlds: An Ecological Journey*. UNESCO, Man and the Biosphere Programme (MAB); Oxford & IBH Publishing.
- Reytar, K., Veit, P., 2017. 5 Maps Show How Important Indigenous Peoples and Local Communities Are to the Environment. World Resources Institute, Washington DC, USA. <https://www.wri.org/print/57261>.
- Rights and Resources Initiative, 2015. *Who Owns the World's Land? A Global Baseline of Formally Recognized Indigenous and Community Land Rights*. RRI, Washington, DC.
- Roy, E.A., 2017. New Zealand River Granted Same Legal Rights as Human Being. *The Guardian* (accessed on 10 January 2019). <https://www.theguardian.com/world/2017/mar/16/new-zealand-river-granted-same-legal-rights-as-human-being>.
- Rodd, A., 2016. Adapting postcolonial island societies: Fiji and the Solomon Islands in the Pacific. *Island Stud. J.* 11 (2), 505–520.
- Russell-Smith, J., James, G., Pedersen, H., Sangha, K.K., 2019a. *Sustainable Land Sector Development in Northern Australia: Indigenous Rights, Aspirations, and Cultural Responsibilities*. CRC Press, Florida, USA.
- Russell-Smith, J., Edwards, A.C., Sangha, K.K., Yates, C.P., Gardener, M.R., 2019b. Challenges for prescribed fire management in Australia's fire-prone rangelands – the example of the Northern Territory. *Int. J. Wildland Fire*. <https://doi.org/10.1071/WF18127>.
- Russell-Smith, J., Sangha, K.K., 2018. Emerging opportunities for developing a diversified land sector economy in Australia's northern savannas. *Rangeland J.* 40, 315–330. <https://doi.org/10.1071/RJ18005>.
- Russell-Smith, J., Whitehead, P., Cooke, P., 2009. *Culture, Ecology and Economy of Fire Management in North Australian Savannas: Rekindling the Wurrk Tradition*. CSIRO Publishing, Collingwood, VIC.
- Sangha, K.K., Edwards, A.C., Russell-Smith, J., 2019. Valuing the North Australian conservation estate (Box 4.5 in Chapter 4). In: Russell-Smith, J., James, G., Pedersen, H., Sangha, K.K. (Eds.), *Sustainable Land Sector Development in Northern Australia: Indigenous Rights, Aspirations and Cultural Responsibilities*. CRC Press (Taylor and Francis Group), Florida, USA, pp. 78–79.
- Sangha, K.K., Lynch, D., 2019. Land sector opportunities in the Gulf region (Box 7.2 in Chapter 7). In: Russell-Smith, J., James, G., Pedersen, H., Sangha, K.K. (Eds.), *Sustainable Land Sector Development in Northern Australia: Indigenous Rights, Aspirations and Cultural Responsibilities*. CRC Press (Taylor and Francis Group), Florida, USA, pp. 189–193.
- Sangha, K.K., Preece, L., Villareal-Rosas, J., Kegamba, J.J., Paudyal, K., Warmenhoven,

- T., RamaKrishnan, P.S., 2018. An ecosystem services framework to evaluate Indigenous and local peoples' connections with nature. *Ecosyst. Serv.* 31 (Part A), 111–125.
- Sangha, K.K., 2018. What kind of development we want to afford sustainable living? *J. Environ. Sci. Eng. A* 7, 34–48. <https://doi.org/10.17265/2162-5298/2018.01.005>.
- Sangha, K., Russell-Smith, J., 2017. Towards an indigenous ecosystem services valuation framework: a North Australian example. *Conserv. Soc.* 15 (3), 255–269. <https://doi.org/10.4103/cs.cs.16.156>.
- Sanghi, R., Kaushal, N., 2014. Introduction to our national river Ganga via cmaps. In: *Our National River Ganga*. Springer, Cham, pp. 3–44.
- Schomers, S., Matzdorf, B., 2013. Payments for ecosystem services: a review and comparison of developing and industrialized countries. *Ecosyst. Serv.* 6, 16–30. <https://doi.org/10.1016/j.ecoser.2013.01.002>.
- Sen, A., 1989. *On Ethics and Economics*. Wiley-Blackwell Publishers.
- Shiva, V., 2013. *Making Peace With the Earth*. Pluto Press.
- Shiva, V., 2016. *Earth Democracy: Justice, Sustainability and Peace*. ZED Books Ltd., London, UK.
- Singh, I.B., 2008. The Ganga River. In: Gupta, A. (Ed.), *Large Rivers: Geomorphology and Management*. John Wiley & Sons, pp. 347–371.
- Singh, N.P., Singh, R.P., Kumar, R., Padaria, R.N., Singh, A., Varghese, N., 2011. Labour migration in Indo-Gangetic plains: determinants and impacts on socio-economic welfare. *Agric. Econ. Res.* 24, 449–458.
- Singh-Peterson, L., Iranacolaivalu, M., 2018. Barriers to market for subsistence farmers in Fiji – a gendered perspective. *J. Rural Stud.* 60, 11–20. <https://doi.org/10.1016/j.jrurstud.2018.03.001>.
- Siwatibau, S., 1984. Traditional environmental practices in the South Pacific – case study of Fiji. *Ambio* 13 (5–6), 365–368.
- Sobrevilla, C., 2008. *The Role of Indigenous Peoples in Biodiversity Conservation: The Natural but Often Forgotten Partners*. The International Bank for Reconstruction and Development. The World Bank, Washington, D.C. 20433, U.S.A.
- Taneja, B., Thakkar, H., 2000. Large Dams and Displacement in India. Submission no. SOC166 to the World Commission on Dams. <http://www.dams.org/kbase/submissions/showsub.php?rec=SOC166>.
- Tharoor, S., 2017. *Inglorious Empire: What the British did to India*. C Hurst & Co, London, UK.
- The Economics of Ecosystems and Biodiversity (TEEB), 2018. *TEEB for Agriculture & Food: Scientific and Economic Foundations*. UN Environment, Geneva.
- The Economics of Ecosystems and Biodiversity (TEEB), 2019. *The Economics of Ecosystems and Biodiversity: Case Studies Across the Globe*. TEEB (accessed on 9 January, 2019). <http://www.teebweb.org>.
- The Nature Conservancy, 2006. *Ecosystem Services: Status and Summaries*. A Report. The Nature Conservancy.
- The United Nations (UN), 2009. *State of the World's Indigenous Peoples*. Department of Economic and Social Affairs, Division for Social Policy and Development, Secretariat of the Permanent Forum on Indigenous Issues. United Nations Permanent Forum on Indigenous Issues (UNPFII).
- Trucost, 2013. *Natural Capital at Risk: The Top 100 Externalities of Business*. Trucost and TEEB for Business Coalition.
- UN, 2016. *The Sustainable Development Goals Report 2016*. United Nations, New York, USA.
- UN, 2019. *Indigenous Peoples*. Department of Economic and Social Affairs. (accessed on 11 February 2019. United Nations). <https://www.un.org/development/desa/indigenouspeoples/about-us.html>.
- UNEP (United Nations Environment Programme), 2017. *UNEP Stories—Indigenous People and Nature: A Tradition of Conservation*. (accessed on 23 Jan 2018). <http://web.unep.org/stories/story/indigenous-people-and-nature-tradition-conservation>.
- Veit, P., Ding, H., 2016. Protecting Indigenous Land Rights Makes Good Economic Sense. URL: <http://www.wri.org/print/44554>, accessed on 4 May 2018. World Resources Institute (<http://www.wri.org>).
- Veitayaki, J., Waqalevu, V., Varea, R., Rollings, N., 2017. Mangroves in small island development states in the Pacific: an overview of a highly important and seriously threatened resource. In: DasGupta, R., Shaw, R. (Eds.), *Participatory Mangrove Management in a Changing Climate: Perspectives from the Asia-Pacific*. Springer, Tokyo, Japan, pp. 303–327.
- Vergheze, A., 2015. British rule and tribal revolts in India: The curious case of Bastar. *Mod. Asian Stud.* 50 (5), 1619–1644. <https://doi.org/10.1017/S0026749X14000687>.
- Vergheze, A., 2018. Rival claims: ethnic violence and territorial autonomy under Indian federalism. By Bethany Lacina. Ann Arbor: University of Michigan Press, 2017. xviii, 261 pp. ISBN: 9780472130245 (cloth, also available as e-book). *J. Asian Stud.* 77 (3), 827–828. <https://doi.org/10.1017/S002191181800075X>.
- Verschuuren, B., Mallarach, J.-M., Bernbaum, E., 2018. Making the cultural and spiritual significance of nature work for protected areas. *Oryx* 52 (2). <https://doi.org/10.1017/S0030605318000212>.
- Wing, T., 2017. *Submerging Paradise: Climate Change in the Pacific Islands*. Climate Institute, Washington, DC, pp. 1–16.
- World Resources Institute (WRI), 2019. *Various Reports and Projects on Ecosystem Services*. (accessed on 1 November 2018). <http://www.wri.org>.
- Xie, P.F., Chandra, V., Gu, K., 2013. Morphological changes of coastal tourism: a case study of Denarau Island, Fiji. *Tourism Manage. Perspect.* 5, 75–83.