



# Cascading loss and loss risk multipliers amid a changing climate in the Pacific Islands

Ross Westoby , Rachel Clissold , Karen E. McNamara , Anita Latai-Niusulu, Alvin Chandra 

Received: 20 April 2021 / Revised: 2 August 2021 / Accepted: 26 September 2021

**Abstract** Human society has experienced, and will continue to experience, extensive loss and damage from worsening anthropogenic climate change. Despite our natural tendencies to categorise and organise, it can be unhelpful to delineate clean boundaries and linear understandings for complex and messy concepts such as loss and damage. Drawing on the perspectives of 42 local and regional Pacific Islander stakeholders, an underexplored resource for understanding loss and damage, we explore the complexity and interconnectedness of non-economic loss and damage (NELD). According to participants, Pacific Islander worldviews, knowledge systems and cosmologies often make it difficult to separate and evaluate NELD independently, challenging the nomenclature of NELD categories developed through international mechanisms. Instead, NELD understandings are often centred on the interdependencies between losses, including the cascading flow-on effects that can occur and the nature of some losses as risk multipliers (i.e. one loss creating the risk for further losses). Most notably, losses to biodiversity, ecosystem services and land are critically linked to, and have cascading effects on, livelihoods, knowledge, ways of life, wellbeing, and culture and heritage. We argue that loss and damage is not always absolute, and that there are NELD that are arguably repairable. Concerning, however, is that biodiversity loss, as a risk multiplier, was considered the least repairable by participants. We put forward that NELD understandings must consider interconnectivity, and that biodiversity and ecosystem conservation and restoration must be the focus for interventions to prevent irreparable and cascading losses from climate change in the Pacific Islands.

**Keywords** Climate change · Interdependencies · Non-economic loss and damage · Pacific Islands · Repairable

## INTRODUCTION

The United Nations (2021) has issued a scientific blueprint for how the climate crisis is creating new risks for natural and human systems. Human relationships with nature have transformed and amplified losses to biodiversity, ecosystem integrity, flora and fauna species, and land productivity. Human society is increasingly faced with the widespread impacts of anthropogenic climate change. While biophysical and social systems will continue to change and adjust to these stressors (Adger et al. 2003), barriers and limits to adaptation have emerged (Dow et al. 2013; Spires et al. 2014). As a consequence of reaching an “adaptation frontier” (Preston et al. 2013, p. 1011), whereby socio-ecological systems can no longer exist in a safe operating space before reaching a limit, loss and damage will continue to accelerate across “social and ecological domains” as a result of climate change (Barnett et al. 2016, p. 976). Climate change loss and damage is diverse and complex in nature and does not necessarily follow a linear and teleological script.

Seminal work around loss by Tschakert et al. (2019) illustrated one thousand ways to experience loss from over 100 case studies from around the world. It showcased “numerous lived experiences with climate-related harm”, such as losses to culture and traditions, physical and mental health, sense of place and social fabric as well as identity and dignity, among others (Tschakert et al. 2019, p. 69).

McNamara et al. (2021a) conducted a systematic review to understand what was already known about non-economic loss and damage (NELD) (i.e. those irreducible to economic terms) in the Pacific Islands region and concluded that: “[n]on-economic loss and damage induced by climate change in the Pacific Islands region has been reported as fears of cultural loss, deterioration of vital ecosystem services, and dislocation from ancestral lands, among others”. NELD is a critical area of focus, as loss and damage research and practice has tended to prioritise identifying and addressing economic losses and damages that are easier to quantify and monetise (McNamara and Jackson 2019). There are, therefore, still limited in-depth understandings of NELD and how they can be addressed, rebuilt and worked through, which can discount certain experiences and distort or skew constructions of climate change and associated decision-making (Magee et al. 2016; McShane 2017; Thomas and Benjamin 2020).

The interconnected and cascading nature of loss and damage in the Pacific has emerged in other studies. Ecosystem and biodiversity losses have, for example, been observed to have inherent cascading effects on people and livelihoods (Goulding et al. 2016; Sattler 2017; Pearce et al. 2018; Thomas et al. 2019; van der Geest et al. 2020). Cámara-Leret et al. (2019) also refer to the impact of climate change on ‘biocultural heritage’, illustrating how climate change diminishes the wellbeing and cultural integrity of Indigenous peoples by affecting endemic plant species. Damage to the relationship between people and their customary lands from climate change also has severe implications for the material, cultural and social security as well as emotional and spiritual wellbeing of Pacific Islander people (Campbell 2019). In this way, NELD affects the interlinked socio-ecological system with embedded cultural, social and ecological structures, rather than affecting people and ecosystems separately. McNamara et al. (2021b) argue that, in the Pacific, NELD can undermine entire socio-ecological systems, and are understood, perceived and experienced through the lens of intangible values, identity and cultural landscapes. Works by Epeli Hau’ofa (2008) that traverse the breadth of Oceania remind us that this interconnectivity transfers to regional scales as there is a deep connection between everything. The ‘sea of islands’ are a conglomeration of islands not restricted by geopolitical boundaries but connected by the sea and seafarers (Hau’ofa 1998).

In this paper, we build on the growing body of work on NELD by arguing that NELD is complex, messy and highly interconnected, making it difficult and largely unconstructive to compartmentalise and create linear trajectories for how loss and damage will transpire. We also find that NELD is not always absolute, and that there are losses and damages that are arguably repairable. However,

we give caution here as, given this overwhelming interconnectedness, loss and damage that might be considered repairable may become more permanent due to cascading flow-on effects. This paper invokes a discussion on the interconnectedness of loss and damage and how we can address them while considering what may be more immediately repairable.

## METHODS

In this paper, we draw from local stakeholder perspectives of NELD in the Pacific Islands that were collected through an online questionnaire carried out between 18 September and 30 October 2020 (6 weeks duration). We created the questionnaire using the Checkbox survey software and followed ethical guidelines and approval from the University of Queensland (approval number 2020000640). The majority of the 27 questions were open-ended (creating significant qualitative data) and drew on stakeholder’s knowledge, experiences and practices. Questions centred around key topics including NELD knowledge gaps, understandings of NELD in the Pacific Islands, experiences of NELD and strategies to respond to NELD. We used the following 12 categories of NELD (based on Morrissey and Oliver-Smith 2013; UNFCCC 2013) to structure our questions around the range of existing and anticipated types of NELD: human life, human health, human mobility, territory, culture and heritage, Indigenous and local knowledge, biodiversity, ecosystem services, place attachment and sense of place, social cohesion, agency, and identity.

Using online searches, our own personal networks of colleagues and snowballing (i.e. asking colleagues to recommend others working in this area), we developed a list of 360 potential stakeholders working on climate change and disaster risk reduction in the region (adaptation, mitigation, loss and damage, humanitarian responses). All 360 potential stakeholders were emailed to participate in this study, followed by two reminder emails to help garner a high response rate. Overall, we yielded 42 responses (13% response rate) across five target stakeholder groups in the sample (see Table 1). Quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS) (v27) and qualitative data were, using the NVivo software program, analysed through content analysis to capture key themes and storylines.

While the n-value might appear low for a quantitative study, our sampling frame was very specific: only stakeholders working in this area. There were slightly more male than female participants, with the youngest participant being 19, oldest being 63 and mean age of participants being 42.6. Fiji was the most common country of origin

**Table 1** Sample size of stakeholder groups and countries represented in the questionnaire

Key informant stakeholder group	Sample size (n-value)	Respondent country of residence and work
Government (local, national and regional)*	15	American Samoa, Cook Islands, Federated States of Micronesia, Fiji, New Zealand, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands
Civil society (non-governmental organisations, faith-based organisations, community-based organisations, youth groups)	14	Australia, Fiji, New Zealand, Samoa, Vanuatu
Intergovernmental organisations inclusive of regional agencies	7	Fiji, Samoa, New Caledonia
Donors and development partners	4	Federated States of Micronesia, Fiji
Relevant others (universities, student associations, research-based organisations, private sector)	2	Australia, Cook Islands
Total	42	

\*Three participants chose not to disclose their country of residence and work

and residence for respondents, followed by the Cook Islands and Australia. There was representation of participants (as country of origin) from Fiji, Cook Islands, Papua New Guinea, Samoa, Vanuatu, Federated States of Micronesia, Solomon Islands, American Samoa and New Caledonia, however, several other Pacific Island countries were not represented by participants in this study, which remains a limitation. The questions and methods for this study were also designed to ascertain the views of professional ‘expert’ groups rather than laypeople’s views, primarily due to fieldwork restrictions due to COVID-19. A future study on laypeople’s views will be critical for further building upon, unpacking and refining the findings of this paper.

## FINDINGS

### The interconnectedness of NELD types

According to stakeholders, deteriorating biodiversity and ecosystem services that support livelihoods were the most significant examples of climate-induced NELD being experienced now and anticipated for the future in the Pacific Islands. Concerns for biodiversity and ecosystems were followed closely by losses and damages to human health and then intolerable losses to Indigenous knowledge, identity, and culture and heritage. Losses and damages related to mobility, social cohesion, sense of place, agency, life and territory were the least prominent losses according to stakeholders. The key finding here, however, is the interconnectedness between these seemingly disparate categories of NELD. The inherent interconnectedness became clear when participants were asked to identify which NELD they valued most. Responses included “All of them are important to our living” and “We cannot value one over the other and be more concerned about one at the

expense of the other—all are linked to each other” (participants #17 and #15, 2020).

While there are casual links between all categories of NELD, the relationship and links between biodiversity, identity and culture were particularly emphasised. For many stakeholders, evaluating loss types independently from nature was difficult and unhelpful as it did not reflect their holistic worldview:

“I value all of them. All the types focus on the person in relation to her/his environment, their identity, resources and wellbeing” (participant #39, 2020).

My culture, identity and traditions are tied to my land and my ocean, this is inseparable. You can’t ask a Pacific Islander to choose what is important and what is not when it comes to the environment, given our cultural and spiritual ties to it (participant #35, 2020)

It is, therefore, clear that losses from climate change are not occurring to the ecosystem and people separately, but to an interconnected system with embedded social, cultural and ecological structures that form the foundation of identity, wellbeing, way of life, worldviews and self-esteem (Couzin 2007; Mustonen 2013; Williams and Hardison 2014; Movono et al. 2017; Yazzie et al. 2019). In this way, one stakeholder emphasised that climate change is “another mode of erasure” of Indigenous people altogether (participant #1, 2020).

It also became clear that the elements in the system are highly connected and held in balance, so that an impact on one aspect has a cascading effect on others:

Land, Family (Home), Spirituality, and Culture (Identity) are what makes a person whole. Remove any one of these elements and the equilibrium will be tipped or swayed to one side more than another causing an imbalance in how things are played out in society (participant #15, 2020)

The importance of ‘balance’ for health and wellness has been emphasised in other studies on Indigenous cultures (Mackean 2009; McKendrick et al. n.d). Ihara and Vakalahi (2011, p. 405) and Manuela and Sibley (2013, 2015), for example, noted from a Pacific perspective, “wellness does not exist without the balance of the spirit, body, mind and environment”.

Central to this balance in the system are the environment, biodiversity and ecosystem services. Pacific communities “rely heavily on terrestrial and marine ecosystems to provide services, including food security, water security, traditional medicine, building material, material for handicraft, coastal protection, etc.” and the environment is “the spiritual temple for the Fa’aSamoa (Samoan way of life)” (participants #31 and #1, 2020). Many studies have demonstrated the integral role that biodiversity and ecosystems play in providing critical material resources for nutrition and health, but also for the maintenance of cultural heritage and Indigenous knowledge (see Williams and Hardison 2014; Asch et al. 2018; Hanich et al. 2018). The connectedness between socio-cultural and ecological aspects was clear as many stakeholders outlined that losses to biodiversity, ecosystems and environment translated to cascading impacts on knowledge, way of life and wellbeing:

Climate change is impacting biodiversity and ecosystem services (drinking water, sources of food etc) everywhere (near the coast and in highlands all the same) and impacts a lot more people in the Pacific than the others [loss types]. These contribute to loss of ILK [Indigenous local knowledge] and reducing quality of human life (participant #23, 2020)

...local knowledge will be affected by changes in the environment linked to increasing temperatures and change in rainfall... (participant #31, 2020)

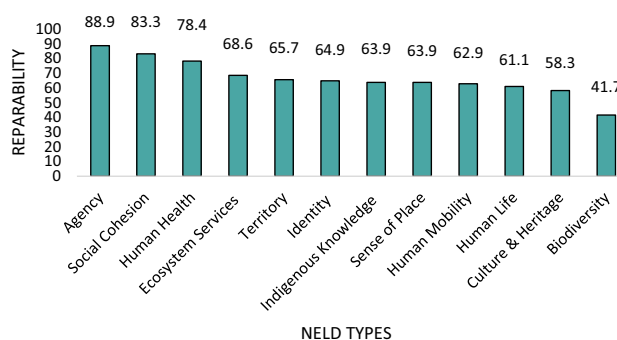
The inherent links between loss types could also be identified in the context of migration or displacement and loss of land. Loss of land and the deep connections to land have cascading risks to cultural and spiritual values. For instance, loss of land results in direct “loss of traditional and sacred grounds such as burial grounds, old village sites, cultural sites, sacred fishing grounds, traditional trees and plants, [and] traditional habitation” (participant #29, 2020). These losses multiply and indirectly result in further losses such as the “loss of traditional knowledge (that comes with loss of natural/native resources), loss of cultural ties to their land, loss of traditional family/vanua ties that comes with displacement, etc.” (participant #29, 2020). Losing land means cascading “loss [of] our cultural sites and medicines and place of practicing our custom songs and dances” (participant #19, 2020). It is the

interactions and interconnectedness between people and land that give rise to culture heritage (e.g. knowledge, traditional customs, cultural practices, way of life) but also learning, self-esteem, security and sense of identity (Movono et al. 2017; Campbell 2019; Ford et al. 2020). The interconnectedness of these elements illustrates that ‘loss’ is messy with one category or ‘type’ interplaying with other categories. It is therefore critical that NELD studies, and the policy and practice that flows thereafter, consider the interconnectedness of NELD, as understood and described by participants in this study.

We draw upon Samoan notions here to further demonstrate these connections. The Samoan phrase *E atoa lio le masina* likens life to the roundness of the moon. This view is underpinned by the notion of the *va-tapuia* which according to Aiono Le Tagaloa (1996a, b) and Tamasese (2007) is a force that exists between the living and the dead, and between human and physical aspects of the environment such as land, sea, sky, plants and animals. Tamasese (2007, p. 18) discusses the literal meaning of *va-tapuia*, which is *tapu-ia* (sacred) and *va* (relationship) between human and all things animate and inanimate. *Va-tapuia* dictates how Samoans behave in their environment. These behavioural norms give rise to the principle of *va-fealoai* (mutual respect) that permeates human interaction with all elements of the environment. It is, therefore, clear how these understandings may translate to centering interconnectivity in the comprehension and experience of NELD.

### Are losses reparable?

Insights from stakeholders also showed that loss surprisingly, in some instances, can be reparable—and therefore doesn’t have to be an absolute given. Tautologically, one could argue that it is therefore actually not a loss, but what this alludes to is that, in some ways, a loss can be worked through, overcome and something new can emerge.



**Fig. 1** The percentage of participants who consider each NELD type to be reparable

Agency (see Fig. 1) was the most repairable loss, connoting the strong resilience and self-actualisation qualities of Pacific Islanders. Stakeholders shared that even though losses are inevitable, they believed that their capacity to control their own destiny is very much within their realm of control. Such strengths-based self-reflections are highlighted elsewhere in the literature, particularly through the Pacific Climate Warriors discourse, which encapsulate Pacific Island leaders fighting for climate justice in global fora and so forth (see Steiner 2015; Fair 2020).

Social cohesion was also considered to be highly repairable, highlighting a sense of strong social and cultural resources present in the Pacific Islands. Strong and enduring social cohesion is grounded in the connectedness and solidarity within countries, people feeling a part of a ‘community’ and a strong relationship between its members. In the Pacific Islands, varied and ‘tight’ networks within social and familial bonds have previously proved critical for rebuilding and recovery efforts, and can also be strengthened and reinforced in the face of adversities such as extreme weather events (Latai-Niusulu et al. 2020).

According to stakeholders, the least repairable loss types included biodiversity, and culture and heritage. There is already documented evidence, albeit limited, of these types of irreparable losses transpiring. In Papua New Guinea (PNG), for example, Cámara-Leret et al. (2019) highlight how climate-induced local extinctions of wild foods, medicine and ritual plants are having cascading impacts on ecosystem services and are ultimately affecting communities’ wellbeing and the cultural integrity of PNG bio-cultural heritage. This study reiterates the cascading effects of irreparable biodiversity loss on culture and heritage and highlights the danger in creating neat nomenclature around loss as this might dilute the importance of interconnections. It, therefore, becomes highly critical for biodiversity and ecosystem deterioration to be viewed through the lens of intangible values and cultural landscapes (Morrissey and Oliver-Smith 2013; McNamara et al., 2021b).

### How do we address loss and damage?

Pacific Islanders have in-depth understandings of the world imbued in multiple and complex overlapping systems that are deeply embedded within cosmological understandings of how the Earth sustains itself and us. These foundational insights are clearly centred on the environmental ceiling that binds us all and these were reflected in the participants’ understandings of the interconnectedness of losses. Biodiversity, and the services that this diversity enables, is paramount and any losses will have cascading effects. To borrow the term ‘risk multiplier’, and with the knowledge that climate change increases risk multipliers for conflict and also disaster loss (UNFCCC 2018), we argue that

losses in themselves can be loss risk multipliers insofar as a loss can create risk for future losses.

It is, therefore, critical that biodiversity, as the least repairable loss with its loss multiplier potential, be the key focus for intervention to prevent other cascading losses from transpiring in the socio-ecological system. This was emphasised by the participants who centred discussions on good practice around minimising and addressing NELD through biodiversity and ecosystem conservation and restoration. Specific examples included the planting of mangroves, locally managed marine area network initiatives, and clean up campaigns, re-forestation projects and “the legal status in national policy for nature and natural components” (participants #6, #23 and #4, 2020). These strategies simultaneously protect features of cultural heritage, Indigenous knowledge and health through helping to preserve and maintain people-ecology interactions and the socio-ecological system.

While the mechanisms are being established and the international discourse on loss and damage is growing, according to one stakeholder: “there is very little knowledge on NELD in the region” (participant #2, 2020). Similarly, another stakeholder emphasised that there is a lack of prioritisation in terms of understanding loss at that local grassroots level: “...while NELD has been an objective of discussion at the national level, it is not part of conversation at the community level—especially the understanding of it and what it means for the Pacific people” (participant #42, 2020). These sentiments were reiterated by other stakeholders who argued: “...we need to first of all get the basics around loss and damage in place” (participant #16, 2020) and that there is “not an urgency, no finance available for this kind of survey [of loss and] damages” (participant #4, 2020). While there is limited documented understandings of the specifics of NELD at different scales in the Pacific Islands, this certainly does not mean that Pacific Islanders are not deeply aware of and familiar with such ideas. Future studies should continue to enrich and unpack the complex understandings and experiences of NELD at different scales in the Pacific.

Through these findings and previous studies (McNamara et al. 2021a, b), we put forward that biodiversity loss assessments—whether they are standalone or in-built to existing vulnerability assessments—should be a priority research area. Particular attention to the interactions within the socio-ecological system, and flow-on effects to Pasifika wellbeing, livelihoods and culture, among other elements need to be embedded into both biodiversity and ecosystem services assessments as well as research around loss in the Pacific, which is lacking to date (McNamara et al. 2021a, b). These assessments need to incorporate social science expertise, appreciating that biodiversity loss has direct links to other cascading losses that need to be



captured and focused on. Only through holistic assessments of loss can the true picture of direct impacts, losses and damages be accounted for and the opportunity costs of action and notions of triage be considered. In order to be holistic, these assessments must also gain understandings at a grassroots scale through incorporating local perspectives and using bottom-up approaches.

## CONCLUSION

Pasifika people's deep connection with land and sea and the interconnectedness of Pacific Islanders across territorial lines is an enduring feature of the Region (Hau'ofa 2008). Similarly, indigenous concepts such as *vanua* in Fiji or *Fa'afaletui* in Samoa (and those that are similar across all the Pacific Islands) highlight the deep connection between land and sea, place, and identity, and these are reflected in the way Pacific Islanders understand and experience the mosaic of experienced and anticipated NELD. These interconnections need to be integrated into the way NELD is also addressed. It is encouraging to see nations such as Vanuatu already linking priorities around climate change adaptation with diet-related non-communicable diseases and focusing on developing interconnected solutions to complex and wicked problems.

The interconnectedness of NELD types also demonstrate how some NELD are risk multipliers, cascading into further losses in other areas. Biodiversity and ecosystem services, for example, were identified as highly concerning risk multipliers as they play a crucial role in supporting livelihoods, cultural heritage and ways of life in the Pacific. A deep engagement with issues of biodiversity loss is warranted in the Pacific Islands. Combining the fact that biodiversity loss is the most significant loss being experienced now and anticipated in the future with the fact that it is also the least repairable invokes an urgency to act, particularly in ways that conserve and restore ecosystems and biodiversity. This reinforces the need in the Pacific for ecosystem and nature-based solutions as well as approaches that work to enhance people-nature connections, such as existing efforts through the Pacific Blue Economy (SPREP 2020). We emphasise the need to continue documenting these losses and implementing ecosystem-based solutions with upmost priority. This will help account for and prevent loss risk multipliers across the Pacific Islands.

A final note is that while stakeholders with varying understandings of NELD in the Pacific Islands offer numerous insights, further work is needed at the grassroots interface to explore the localised experiences and manifestations of NELD across the region.

**Funding** This work was supported through an Australian Research Council Future Fellowship grant (number FT190100114).

## Declarations

**Conflict of interest** The views expressed in this paper are those of the authors and do not necessarily reflect those of the United Nations.

## REFERENCES

- Adger, W.N., S. Huq, K. Brown, D. Conway, and M. Hulme. 2003. Adaptation to climate change in the developing world. *Progress in Development Studies* 3: 179–195. <https://doi.org/10.1191/1464993403ps0600a>.
- Aiono-Le Tagaloa, F. 1996a. *O la ta Gagana*. Apia: Le Lamepa Press.
- Aiono Le Tagaloa, F. 1996b. *Motugaafa*. Apia: Le Lamepa Press.
- Asch, R.G., W.W.L. Cheung, and G. Reygondeau. 2018. Future marine ecosystem drivers, biodiversity, and fisheries maximum catch potential in Pacific Island countries and territories under climate change. *Marine Policy* 88: 285–294. <https://doi.org/10.1016/j.marpol.2017.08.015>.
- Barnett, J., P. Tschakert, L. Head, and W.N. Adger. 2016. A science of loss. *Nature Climate Change* 6: 976–978. <https://doi.org/10.1038/nclimate3140>.
- Cámara-Leret, R., N. Raes, P. Roehrdanz, Y. De Fretes, C.D. Heatubun, L. Roeble, A. Schuiteman, P.C. van Welzen, and L. Hannah. 2019. Climate change threatens New Guinea's biocultural heritage. *Science Advances* 5: eaaz1455. <https://doi.org/10.1126/sciadv.aaz1455>.
- Campbell, J. 2019. Climate Change, Migration and Land in Oceania. Toda Peace Institute, Policy Brief No. 37, Tokyo, Japan.
- Couzin, J. 2007. Opening doors to native knowledge. *Science* 315: 1518–1519. <https://doi.org/10.1126/science.315.5818.1518>.
- Dow, K., F. Berkhout, B.L. Preston, R.J.T. Klein, G. Midgley, and M.R. Shaw. 2013. Limits to adaptation. *Nature Climate Change* 3: 305–307. <https://doi.org/10.1038/nclimate1847>.
- Fair, H. 2020. Their sea of islands? Pacific climate warriors, oceanic identities, and world enlargement. *The Contemporary Pacific* 32: 341–369. <https://doi.org/10.1353/cp.2020.0033>.
- Gallopin, G. 1991. Human dimensions of global change: Linking the global and the local processes. *International Social Science Journal* 43: 707–718.
- Goulding, W., P.T. Moss, and C.A. McAlpine. 2016. Cascading effects of cyclones on the biodiversity of Southwest Pacific islands. *Biological Conservation* 193: 143–152. <https://doi.org/10.1016/j.biocon.2015.11.022>.
- Hanich, Q., C.C.C. Wabnitz, Y. Ota, M. Amos, C. Donato-Hunt, and A. Hunt. 2018. Small-scale fisheries under climate change in the Pacific Islands region. *Marine Policy* 88: 279–284. <https://doi.org/10.1016/j.marpol.2017.11.011>.
- Hau'ofa, E. 1993. Our sea of islands. In *A New Oceania: Rediscovering our Sea of Islands*, eds. E. Waddell, V. Naidu, and E. Hau'ofa, 2–18. Suva: School of Social and Economic Development, University of the South Pacific.
- Hau'ofa, E. 2008. *We are the ocean: Selected works*. Honolulu: University of Hawaii Press.
- Ihara, E., and H. Vakalahi. 2011. Spirituality: The essence of wellness among Tongan and Samoan elders. *Journal of Religion & Spirituality in Social Work* 30: 405–421. <https://doi.org/10.1080/15426432.2011.619916>.
- Latai-Niusulu, A., T. Binns, and E. Nel. 2020. Climate change and community resilience in Samoa. *Singapore Journal of Tropical Geography* 41: 40–60. <https://doi.org/10.1111/sjtg.12299>.

- Mackean, T. 2009. A healed and healthy country: Understanding healing for Indigenous Australians. *Medical Journal of Australia* 190: 522–523. <https://doi.org/10.5694/j.1326-5377.2009.tb02545.x>.
- Magee, L., J. Handmer, T. Neale, and M. Ladds. 2016. Locating the intangible: Integrating a sense of place into cost estimations of natural disasters. *Geoforum* 77: 61–72. <https://doi.org/10.1016/j.geoforum.2016.09.018>.
- Manuela, S., and C.G. Sibley. 2013. The Pacific Identity and Wellbeing Scale (PIWBS): A culturally-appropriate self-report measure for Pacific peoples in New Zealand. *Social Indicators Research* 112: 83–103. <https://doi.org/10.1007/s11205-012-0041-9>.
- Manuela, S., and C.G. Sibley. 2015. The Pacific Identity and Wellbeing Scale-Revised (PIWBS-R). *Cultural Diversity and Ethnic Minority Psychology* 21: 146–155. <https://doi.org/10.1037/a0037536>.
- McKendrick, J., R. Brooks, J. Hudson, M. Thorpe, and P. Bennett. n.d. Aboriginal and Torres Strait Islander Healing Programs: A Literature Review, Healing Foundation, Barton, ACT. Retrieved 29 March, 2021, from <https://healingfoundation.org.au/app/uploads/2017/02/Aboriginal-and-Torres-Strait-Islander-Healing-Programs-A-Literature-Review.pdf>.
- McNamara, K.E., R. Westoby, and A. Chandra. 2021a. Exploring climate-driven non-economic loss and damage in the Pacific Islands. *Current Opinion in Environmental Sustainability* 50: 1–11. <https://doi.org/10.1016/j.cosust.2020.07.004>.
- McNamara, K.E., R. Westoby, R. Clissold, and A. Chandra. 2021b. Understanding and responding to climate-driven non-economic loss and damage in the Pacific Islands. *Climate Risk Management* 33: 100336. <https://doi.org/10.1016/j.crm.2021.100336>.
- McNamara, K.E., and G. Jackson. 2019. Loss and damage: A review of the literature and directions for future research. *Wires Climate Change* 10: e564. <https://doi.org/10.1002/wcc.564>.
- McShane, K. 2017. Values and harms in loss and damage. *Ethics, Policy & Environment* 20: 129–142. <https://doi.org/10.1080/21550085.2017.1342960>.
- Morrissey, J., and A. Oliver-Smith. 2013. Perspectives on noneconomic loss and damage: Understanding values at risk from climate change. In *Loss and Damage in Vulnerable Countries Initiative Report*, eds. K. Warner, and S. Kreft. <https://doi.org/10.13140/RG.2.1.1668.1041>.
- Movono, A., H. Dahles, and S. Becken. 2017. Fijian culture and the environment: a focus on the ecological and social interconnectedness of tourism development. *Journal of Sustainable Tourism* 26: 451–469. <https://doi.org/10.1080/09669582.2017.1359280>.
- Mustonen, T. 2013. Rebirth of Indigenous Arctic Nations and polar resource management: Critical perspectives from Siberia and Sámi areas of Finland. *Biodiversity* 14: 19–27. <https://doi.org/10.1080/14888386.2012.725652>.
- Pearce, T., R. Currenti, A. Mateiwai, and B. Doran. 2018. Adaptation to climate change and freshwater resources in Vusama village, Viti Levu, Fiji. *Regional Environmental Change* 18: 501–510. <https://doi.org/10.1007/s10113-017-1222-5>.
- Preston, B.L., K. Dow, and F. Berkhout. 2013. The climate adaptation Frontier. *The Climate Adaptation Frontier. Sustainability* 5: 1011–1035. <https://doi.org/10.3390/su5031011>.
- Sattler, D.N. 2017. Climate change and extreme weather events: the mental health impact. In *Climate Change Adaptation in Pacific Countries*, eds. W. Leal Filho, 73–85. Cham: Springer.
- Spires, M., S. Shackleton, and G. Cundill. 2014. Barriers to implementing planned community-based adaptation in developing countries: A systematic literature review. *Climate and Development* 6: 277–287. <https://doi.org/10.1080/17565529.2014.886995>.
- SPREP (Secretariat of the Pacific Regional Environment Programme). 2020. Valuing the Ocean: Pacific Blue Economy. Retrieved 29 March, 2021, from <https://www.sprep.org/attachments/Publications/FactSheet/Oceans/valuing-ocean-pacific-blue-economy.pdf>
- Steiner, C.E. 2015. A sea of warriors: Performing an identity of resilience and empowerment in the face of climate change in the Pacific. *The Contemporary Pacific* 27: 147–180. <https://doi.org/10.1353/cp.2015.0002>.
- Tamasese, T. 2007. Bio-ethics and the Samoan indigenous reference. *International Social Science Journal* 60: 115–124. <https://doi.org/10.1111/j.1468-2451.2009.01705.x>.
- Thomas, A., and L. Benjamin. 2020. Non-economic loss and damage: Lessons from displacement in the Caribbean. *Climate Policy* 20: 715–728. <https://doi.org/10.1080/14693062.2019.1640105>.
- Tschakert, P., N.R. Ellis, C. Anderson, A. Kelly, and J. Obeng. 2019. One thousand ways to experience loss: A systematic analysis of climate-related intangible harm from around the world. *Global Environmental Change* 55: 58–72. <https://doi.org/10.1016/j.gloenvcha.2018.11.006>.
- Thomas, A.S., S. Mangubhai, C. Vandervord, M. Fox, and Y. Nand. 2019. Impact of Tropical Cyclone Winston on women mud crab fishers in Fiji. *Climate and Development* 11: 699–709. <https://doi.org/10.1080/17565529.2018.1547677>.
- UNFCCC (United Nations Framework Convention on Climate Change). 2013. Non-Economic Losses in the Context of the Work Programme on Loss and Damage. UNFCCC, United Nations, Bonn.
- UNFCCC (United Nations Framework Convention on Climate Change). 2018. Climate Change Is a Major Multiplier of Disaster Losses. Retrieved 29 March, 2021, from <https://unfccc.int/news/climate-change-is-a-major-multiplier-of-disaster-losses>
- van der Geest, K., M. Burkett, J. Fitzpatrick, M. Stege, and B. Wheeler. 2020. Climate change, ecosystem services and migration in the Marshall Islands: Are they related? *Climatic Change* 161: 109–127. <https://doi.org/10.1007/s10584-019-02648-7>.
- Westoby, R., K.E. McNamara, and R. Clissold. 2021. Ways of healing in the Anthropocene. *Climate and Development*. <https://doi.org/10.1080/17565529.2021.1881425>.
- Williams, T., and P. Hardison. 2014. Culture, law, risk, and governance: contexts of traditional knowledge in climate change adaptation. In *Climate Change and Indigenous Peoples in the United States: Impacts, Experience and Actions*, ed. J.K. Maldonado, B. Colombi, and R. Pandya, 23–36. Cham: Springer.
- Yazzie, J., P. Fulé, Y.-S. Kim, and A. Sánchez Meador. 2019. Diné kinship as a framework for conserving native tree species in climate change. *Ecological Applications* 29: e01944. <https://doi.org/10.1002/eap.1944>.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## AUTHOR BIOGRAPHIES

**Ross Westoby** (✉) is a Research Fellow at Griffith University's Climate Action Beacon. His research interests include the intersectorality between society and environment, with a particular interest in climate loss and adaptation across the South Pacific and in Australia.

*Address:* Griffith Institute for Tourism, Griffith University, Nathan, Brisbane, Australia.  
e-mail: r.westoby@griffith.edu.au

**Rachel Clissold** is a Senior Research Assistant in the School of Earth and Environmental Sciences at The University of Queensland. Her research interests include climate change adaptation, gender and development more generally.

*Address:* School of Earth and Environmental Sciences, The University of Queensland, St Lucia, Brisbane, Australia.

e-mail: r.clissold@uq.edu.au

**Karen E. McNamara** is an Associate Professor in human geography in the School of Earth and Environmental Sciences at The University of Queensland. Her research interests include resilient livelihoods, climate change adaptation, non-economic loss and recovery, human mobility and gender.

*Address:* School of Earth and Environmental Sciences, The University of Queensland, St Lucia, Brisbane, Australia.

e-mail: karen.mcnamara@uq.edu.au

**Anita Latai-Niusulu** is the Head of the Department of Social Sciences at the National University of Samoa. Her research interests include islanders' resilience and survival strategies, climate change and other environmental challenges affecting islanders, sustainability, environmental governance/ management, urban and children's geographies.

*Address:* Department of Social Sciences, National University of Samoa, Apia, Samoa.

e-mail: a.latai@nus.edu.ws

**Alvin Chandra** is an Adjunct Senior Research Fellow in the School of Earth and Environmental Sciences at The University of Queensland. His research interests include loss and damage, small island developing states, and UN Climate mechanisms.

*Address:* United Nations Environment Programme, Nairobi, Kenya.

e-mail: alvin.chandra@un.org; a.chandra@uq.edu.au