

Carola Klöck and Michael Fink (eds.)

Dealing with climate change on
small islands: Towards effective and
sustainable adaptation?



Göttingen University Press

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The book has its origin in a symposium with the same title – “Dealing with Climate Change on Small Islands – Towards Effective and Sustainable Adaptation?”. The symposium brought together over 30 scholars and practitioners working in and on small islands across the world's oceans. Over three days, we discussed the challenges and specificities, but also achievements and lessons learnt, of climate change adaptation in small island contexts. The symposium was held in Hannover, Germany, in July 2018, with financial and logistical support of the Volkswagen Foundation. We are grateful for the financial support from the Volkswagen Foundation that made the workshop – and hence the present volume – possible in the first place. In particular, we are indebted to Anke Harwardt-Feye for her invaluable help in organising the symposium. Hellena Debelts and Kerstin Gebhardt from the University of Göttingen also were essential to making the meeting a success. They managed all logistical and organisational aspects of the workshop. Last, but certainly not least, we would like to thank all workshop participants for the fruitful, intense and enjoyable discussions and exchange in Hannover – and for pushing us to publish the workshop contributions in an edited volume.

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*Paris and Göttingen, 15 October 2019
Carola Klöck and Michael Fink*

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1

Dealing with climate change on small islands: Towards effective and sustainable adaptation?

Carola Klöck and Michael Fink

Small islands are so-called hotspots of climate change. Here, the adverse effects of sea-level rise, increasing temperatures, and changing weather patterns are already felt, making adaptation urgent (Mimura et al., 2007; Nurse et al., 2014). But while small islands may be uniquely impacted by the adverse effects of climate change, they are also uniquely resilient. Small islands are not only at the forefront of climate change impacts, they are also at the forefront of climate change responses. Island societies have long histories of resilience, of surviving, if not thriving, in resource-limited, dynamic, and isolated environments (Campbell, 2009; Nunn & Kumar, 2018). Over generations, sometimes over millennia, they have developed a wide range of practices to deal with climate variability and extreme weather events and incorporated them into cultural practices, myths, and songs. From this perspective, islands are traditionally “sites of resilience” (Campbell, 2009, p. 85) and “agents of knowledge production and territorial transformation” (Ratter, 2018). Accordingly, islanders “must be looked to and supported as inspiring champions of livelihood resilience and adaptation to climate change and disasters,” as De Souza and colleagues (2015, p. 1) write (see also e.g. Barnett & Campbell, 2010).

Small islands hold valuable lessons for both adaptation success and adaptation failure. Not every historical experience and traditional coping strategy is helpful for

dealing with current and future climate change, and not every so-called adaptation measure is effective. Quite to the contrary, some would argue that most adaptation interventions have failed in small island contexts (Nunn & Kumar, 2006). Why is this the case? What has worked, when, and why? Where do we see adaptation to climate change occurring in small island states? What types of measures are taken, by whom, and why?

The present volume seeks to explore adaptation to climate change in small islands across the world's oceans. We want to focus attention on the resilience, strengths, and agency of small island states – which may better be referred to as “big ocean sustainable states,” or “BOSS” (UNESCO, 2017) – but at the same time acknowledge the specific challenges that climate change poses to small islands. As the contributions to this volume highlight, islands are extremely diverse, in terms of geophysical, cultural, and socio-economic characteristics, climate change impacts, as well as perceptions of and responses to change, at different levels. This diversity confirms the need for context- and place-specific solutions; one-size-fits-all solutions do not exist. Nevertheless, we consider that the diverse experiences of islands hold valuable lessons: small islands can learn from one another – and we can all learn from small islands.

This inter-island and inter-regional exchange has so far been marginal. While the specific circumstances of small islands have received significant political and academic attention (Mimura et al., 2007; Nurse et al., 2014), much of this research focuses on single case studies; comparative work across different islands is relatively rare (Klöck & Nunn, 2019). The present volume adds to recent efforts at bringing together individual case studies (Moncada, Briguglio, Bambrick, & Kelman, 2018; Walshe & Stancioff, 2018). We recognise the need for dialogue: across geographical scales and regions; across academic disciplines; as well as across the science–policy divide. The volume therefore brings together scholarship on and from the three island regions: the Caribbean, the Pacific, and the Indian Ocean. The contributions in this volume include work from geography, anthropology, political science, psychology, and philosophy. Empirically, the focus is on the Pacific – where most small island research is located (Klöck & Nunn, 2019) – but some chapters also focus on the Caribbean, the Indian Ocean, or small islands in general.

The volume has its roots in a workshop held in July 2018 in Hannover, with financial and organisational support from the Volkswagen Foundation. Over three days, more than 30 workshop participants discussed the challenges and opportunities of climate change adaptation; commonalities and differences between islands and island regions; research gaps; as well as venues for dialogue between policy and practice (Klöck, Debelts, & Fink, 2019). Many of the workshop contributions are included in the present volume, in revised form. We would like to express our gratitude to all workshop participants for the intense and fruitful discussions in Hannover, and in particular thank all contributors to this volume – their contributions, as authors and/or as peer reviewers, are much appreciated.

Three areas of concern structure the present volume: governing long-term adaptation; the role of culture, knowledge, and perceptions; and migration and (im)mobility. In the remainder of this introduction, we outline why these areas are of particular relevance to small island states, and how the contributions to this volume address some of the research gaps in these areas.

1 Governing and funding long-term adaptation

For a long time, vulnerability and adaptation have been dominated by the systemic hazards approach, or a focus on physical exposure and technical solutions (Adger, 2006; Bassett & Fogelmann, 2013). In contrast, the social vulnerability approach highlights (lack of) human agency as critical for vulnerability and takes into account socio-economic drivers of vulnerability. It thus emphasises sensitivity to climate change impacts and adaptive capacity, in the terminology of the hazards approach (Keck & Sakdapolrak, 2013; Mikulewicz, 2018). From this perspective, adaptation is first and foremost a political process (Eriksen, Nightingale, & Eakin, 2015). Further, adaptation is long-term and transformational, in the sense of addressing underlying social, economic, and political drivers of vulnerability. Adaptation thus goes beyond short-term coping, and requires holistic approaches; rather than tackling physical climate change impacts in isolation, adaptation seeks to address inequities and improve the wellbeing of people and societies (Klepp & Chavez-Rodriguez, 2018).

Such a critical approach, or political ecology lens, foregrounds many of the inherent difficulties and challenges of adaptation. These include for example tensions between typically short-term political considerations, and the long time horizons of effective and transformational adaptation. A specific challenge of adaptation in Small Island Developing States (SIDS) relates not only to the often-times lacking political will to implement long-term adaptation measures, but also to the human and financial constraints. These are particularly acute in the context of small islands with their small populations, economies, and administrations. Adaptation hence often depends on the availability of external (aid) funding, which comes with its own challenges, including the short time horizons of aid-funded (pilot) projects, significant year-to-year fluctuations of flows, and considerable administrative burdens for planning and reporting (Barnett & Campbell, 2010; Overton, Prinsen, Murray, & Wrighton, 2012; Dornan & Pryke, 2016).

Part I of this volume explores some of these constraints, as well as ways to overcome them, from diverse vantage points. In the first chapter, **Patrick D. Nunn and Karen E. McNamara** examine why adaptation interventions in island contexts often fail, and explore how more long-term transformational change could be achieved.

The authors start from the assumption that many coastal areas – where most settlements, infrastructure, and economic activities are concentrated in small islands – will likely become uninhabitable over the coming decades. Although relocation away from the most vulnerable to less vulnerable locations is thus unavoidable, most responses to sea-level rise, coastal erosion, and flooding to date have sought to ‘protect’, that is, to stabilise the current coastline and maintain current settlements and infrastructure, through seawalls and other hard coastal protection measures. While such hard measures may work in more iconic and wealthier locations, such as capital cities, they often fail in rural and poorer locations, as is the case in many SIDS, where financial and technical resources are limited, where climate change perceptions and decision-making largely follow spiritual and traditional approaches, and where short-term concerns dominate.

In this context, ‘retreat’ rather than ‘protect’ seems the more sustainable, effective and long-term response – and hence can be classified as ‘transformational’ change. However, relocation away from exposed (coastal) areas is problematic, for a number of reasons, despite there being cases of success and even avoidance altogether. Because of this, and based notably on the experience of Fiji, where several villages have been, or are in the process of being, relocated, the authors identify factors that can make relocation successful, and hence transformational. In particular, the affected population needs to drive the entire relocation process, from the planning through to the implementation as well as monitoring and evaluation phases.

Virginie K. E. Duvat and Alexandre K. Magnan also consider relocation to be inevitable under some conditions, but their chapter at the same time points out that local adaptation is still often possible, even in the context of atolls, which are among the areas most vulnerable to the adverse impacts of climate change.

Their chapter strongly calls for nature-based solutions (NBS) to maintain, strengthen, and re-establish natural ecosystems, notably the atoll reef-island system. Empirical data from the Maldives – which is one of four countries worldwide that consists exclusively of low-lying atolls – shows that NBS can work: healthy coral reefs protect the coast and supply sediment to islands where (i) sediment transport pathways are kept clear and (ii) accommodation space remains available along the coast for sediment accumulation. However, on many islands, human activities have undermined the coastal protection services delivered by the reef ecosystem. The degree of undermining of these services by human disturbances currently largely determines the degree to which atoll islands are able to respond to climate-related pressures. Those islands that are still able to withstand sea-level rise (due to limited human undermining of these services) will likely continue to do so for at least the next few decades. The more disturbed the island, the lower the potential for NBS, and the higher the need for alternative solutions, including engineered solutions and – from the middle of the 21st century – internal and international migration under worst-case scenarios

There is a continuum of adaptation strategies for atolls that must be place-specific and tailored to the specificity of each island. The authors conceptualise this continuum as a five-pillar adaptation pathway, along which the role of NBS decreases, while the role of engineering and migration increases.

Most adaptation measures depend on the availability of external financing. While such funding is increasing, it is insufficient to meet adaptation needs. How then should such scarce finances best be distributed? **Christian Baatz and Michel Bourban** examine this question of distribution from a justice perspective, and argue for democracy as an appropriate additional criterion.

Research and politics consider that adaptation financing needs to be allocated to ‘particularly vulnerable’ countries, such as the SIDS. However, this vulnerability criterion is problematic for various reasons (such as the difficulty of measuring it), and therefore needs to be complemented with additional criteria. Cost effectiveness – maximising impact – is proposed in this context, but Baatz and Bourban demonstrate that this criterion is also problematic and difficult to measure. Instead, the authors argue for democracy. Democratic countries do not only tend to use funding more effectively, but also allow affected populations – those who are entitled to funding by virtue of their jeopardised human rights – to participate in decision-making on how funding is spent. Democracy, as measured for example by V-Dem indices, could thus also guide the allocation of adaptation financing, and influence not only how much financing vulnerable countries receive, but also to what extent that financing is conditional.

Beyond finance, political will as well as administrative capacity constrain effective adaptation, in particular in small islands, where small population sizes translate into small administrations. Harvesting synergies would be beneficial but is rare in practice, as the chapter by **Michelle Scobie** shows. The chapter uses the example of St. Lucia to identify interlinkages between issue-areas and levels of governance that can help overcome silos and address multiple goals at once.

Much (environmental) policy-making and implementation happens in silos, despite potential similarities and synergies. For example, climate change has much to do with disaster risk reduction or (sustainable) development more broadly. At the same time, policies are formulated at different levels, in global negotiations, regional programmes, or national plans. Interlinkages can help connect these processes and levels. In her review of policy documents at different levels, Scobie finds many thematic points of convergence, but also different priorities. Regional (Caribbean) and national (St. Lucian) documents put more emphasis on some areas such as finance, but use the language of global agendas, such as the Sustainable Development Goals, not least to attract funding. Even if many cross-references and similarities are implicit only, there are efforts to overcome thematic silos. In this context, St. Lucia dissolved its climate change unit, in an effort to integrate climate change into each ministry’s work.

Finally, **Adelle Thomas** examines research on adaptation planning, also in the Caribbean. Her chapter draws on the Caribbean Climate Risk and Adaptation Tool, CCORAL, developed by the Caribbean Community Climate Change Centre.

The CCORAL is a widely used policy tool that seeks to mainstream climate change into planning activities across the region. Based on this tool, Thomas conceptualises an adaptation planning cycle: within the wider adaptive space, or overall context, adaptation thus follows six distinct steps, from vulnerability and risk assessment through to monitoring and evaluation. To what extent are these steps followed? Through a review of peer-reviewed literature, the chapter seeks to identify strengths and gaps in academic research that can in turn inform future research and adaptation planning and practice.

While there is a growing body of literature that examines adaptation, including adaptation planning, in the small islands of the Caribbean and beyond, this literature does not pay equal attention to the various elements of the adaptation policy cycle. A large number of studies assess climate change risks, impacts, and vulnerabilities, for specific countries and/or for specific sectors. Several studies also examine the overall adaptive space, and highlight in particular the role of perceptions and availability of data as constraints to adaptation. In contrast, very few studies, if any, examine how – and why – stakeholders identify adaptation options, or select and prioritise among these. Similarly, relatively little is known about implementation, and even less about the long-term effects and effectiveness of implemented measures. Although studies mention the importance of monitoring and evaluation, the literature review finds no study that specifically examines monitoring and evaluation methods and practices, beyond some technical reports. The chapter thus concludes with a call for more research into those elements of the adaptation planning cycle that have received scant academic (and possibly political) attention, but are just as important for effective and sustained adaptation as the first step of risk and vulnerability assessment.

2 Cultures, perceptions, and knowledges

Just as the climate is changing, so are island societies. Social, economic, and cultural changes are omnipresent, and interact with environmental changes – indeed, these two spheres are closely interrelated and sometimes even conceptualised as one (see Pascht and Hetzel below). This perspective aligns with the political understanding of adaptation outlined earlier. Adaptation is about risks, and therefore about values: What risks are acceptable? What is at risk? How should these risks be avoided, and at what costs? The answers to these questions are all mediated by culture (O'Brien & Wolf, 2010; Adger, Barnett, Brown, Marshall, & O'Brien, 2013). This cultural perspective, though neglected in much adaptation research, makes visible differences across and within islands, countries, and regions (Adger et al., 2013), for example in how people perceive changes. Such perceptions are

crucial to understanding responses, for people will only act upon climate change if they perceive it as a risk (Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015). Beyond risk perception, action also requires perceived adaptive capacity: people need to feel empowered and able to act (Grothmann & Patt, 2005). Such feelings of empowerment shape, and are shaped by, discourses and narratives. Hence, alternative framings to the widespread gloom-and-doom scenario of inevitable inundation are needed to facilitate agency.

Culture is also intimately related to local knowledge – also referred to as traditional or indigenous knowledge (Lauer, 2017; Nalau et al., 2018). Particularly in the Pacific, island societies have accumulated a large body of local knowledge to deal with climate variability, which is constantly changed and adjusted (Lauer, 2017). While there is consensus that such local knowledge and experiences hold valuable lessons for, and need to be integrated into, climate change adaptation, we should be careful not to view local knowledge as a panacea, and integrating it with Western science as necessarily easy and effective (Mercer, Dominey-Howes, Kelman, & Lloyd, 2007).

Part II of this volume engages with a cultural understanding of climate change adaptation, and explores the role, variation, and effects of cultures, perceptions, and knowledges, with a focus on the Pacific.

First, **Katharina Beyerl, Harald A. Mieg, and Eberhard Weber** analyse perceptions of climate-related environmental changes in three Pacific island countries: Tuvalu, Samoa, and Tonga. Their chapter is premised on the assumption that risk perceptions matter, but that to date we have not paid enough attention to variations in perceptions. Accordingly, the chapter focuses on variation in perception across and within the three case countries.

Their large-N survey shows that respondents across the three countries have noticed changes in their environment, ranging from higher temperatures to sea-level rise, increased flooding, as well as changes in flora and fauna, and that they expect that most trends will intensify in the future. Yet, respondents' perceptions vary in terms of the specificity and severity of observed changes. For example, drought and sea-level rise were particularly prominent in Tuvalu, while increases in the intensity and frequency of extreme weather events have been noted more strongly in Samoa and Tonga.

This variance results in part from differences in weather conditions and geographies in the three countries, but is also explained by socio-economic factors. Notably, where respondents live (that is, settlement size and distance to the sea), how intensely they interact with their environment, and how religious they describe themselves to be are correlated with perceptions of change. When it comes to explaining observed changes, respondents are aware of the multiple causes and mainly attribute changes to careless and unsustainable human behaviour, rather than divine will, which is mentioned only occasionally. Comparative surveys help

to gauge where local priorities lie, which unsustainable behaviours contribute to local environmental changes, and thus how to shift to more sustainable practices.

The chapter by **Hannah Fair** shares the assumption that perceptions matter for climate change adaptation. In particular, the author examines the mediating role of religion and religiosity on climate change perceptions and adaptation, drawing on fieldwork in Vanuatu and with the Pacific Climate Warriors. While religion is often marginal in climate change adaptation discourse and practice, Fair calls for a spiritualisation of climate change, as a means to centre islander agency.

The Pacific is a deeply religious and spiritual region, which has often been seen as a hindrance to climate change adaptation. When changes are attributed to divine will, little can be done beyond prayer, resulting in faith-based apathy. Yet, Fair finds that the relations between trust in the divine, prayer, and agency are more nuanced. Many interviewees emphasise the ‘sin’ of carbon emissions, and take on responsibility. While such a local narrative stands against global discourses of climate justice, North-South divides, and differentiated responsibilities, it also enables local agency: Vanuatu becomes the centre not just of the problem but also of the solution. Finally, respondents also emphasise that God is with them in their suffering. This sense of God’s protective presence also underpins Pacific climate activism, which is interpreted as a form of spiritual devotion, as “doing God’s work”.

Clearly, religion plays a role in climate change and adaptation in the Pacific, but different understandings of this link co-exist. Overall, these understandings emphasise and enable local agency, in different forms. Spiritualising climate change thus underpins an alternative, and more empowering, framing of climate change.

Desirée Hetzel and Arno Pascht also examine climate change adaptation in Vanuatu. Their chapter focuses on two villages – Siviri (Efate, close to Vanuatu’s capital, Port Vila) and Dixon Reef (Malekula, in the north of Vanuatu) – where NGOs have organised workshops and training sessions to improve food security and to adapt to changing climate.

In both villages, inhabitants rely on agriculture and horticulture, which more frequent and/or intense cyclones such as Cyclone Pam (2015) and droughts threaten. Hetzel and Pascht hence explore how local villagers use, appropriate, modify, and/or reject innovative practices and methods taught in NGO workshops. They show that villagers are keenly interested in outside knowledge and experiment with new techniques, but may also decide against applying these techniques, temporarily abandon them, or resume them, as they see fit, and instead, or in parallel, turn to traditional practices. Village livelihoods are diverse and increasingly diversify in response to extreme weather events. Beyond diversifying their agricultural and horticultural practices, villagers also turn to the cash economy to purchase food. Such diversification processes, however, are not new; the NGO projects did not lead to significantly more diversification. From this point of view, adaptation is normal, and thus needs to be understood in a more holistic way that

does not distinguish between the social, the physical, and the other-than-human spheres.

Finally, the chapter by **Stefano Moncada and Hilary Bambrick** turns to Rabi Island (Fiji). The authors explore responses to climate variability in coastal communities to understand to what extent current coping is conducive to long-term adaptation to climate change, and how development status affects the responses taken.

Rabi Island shares many of the climatic challenges of islands across the Pacific (and elsewhere), but its inhabitants are an ethnic minority in Fiji, being resettled from Banaba Island (Kiribati) as a result of phosphate mining. Despite this additional barrier, Rabi Islanders draw on a variety of livelihood resources to respond to different climatic and non-climatic shocks, such as cyclones, droughts, and lack of easy market access. While many of these response measures – for example reducing consumption and shifting to other foods in case of drought – are sustainable, they may better be qualified as short-term coping rather than long-term adaptation. Long-term measures – for example upgrading infrastructure and housing, or installing a water management system – are known, but lack of resources prevent their implementation, while limited market access means that the communities are unlikely to increase income. The authors therefore conclude that development deficits need to be addressed to help remote coastal communities deal with climate change.

3 Migration and (im)mobility

In the context of climate change, small islands are almost automatically linked to migration. The narrative of islanders “fleeing” their “drowning” islands has dominated public and media discourse (for a critical review of this discourse, see Farbotko, 2005, 2010, 2012). Reality on the ground is rather different. Migration has always been part of island life. Islanders migrate, temporarily or permanently, within and across national boundaries, for various reasons that can include employment, health, education, or social relations. Given that the decision to migrate is always a multi-dimensional one, it is difficult – if not impossible – to separate climate change from other drivers of migration. It also remains rather unclear to what extent climate-related or environmentally induced migration follows different migration patterns (Campbell, 2014). One difference is the potentiality of no return: while migrants usually uphold strong relations to their home village, island, or state, this may no longer be possible when entire villages or islands become uninhabitable.

Migration and mobility are generic concepts that include a range of distinct phenomena: short-term and short-distance displacement, such as evacuations before or after extreme weather events; planned relocation of individual households

or entire communities over short distances; or temporary or permanent migration of individuals from rural outer islands to urban centres and capitals or across international borders (Campbell, 2010; McNamara & Des Combes, 2015). The rubric of migration and mobility also includes “trapped populations” that want to leave but are unable to do so, for example because they lack the necessary resources. In contrast, the “voluntary immobile” could leave, but do not want to do so, for example because they have deep cultural and spiritual bonds to the land, even if that land may be under threat of becoming permanently inundated (Zickgraf, 2018).

The third and last part of this volume addresses these different phenomena of migration and (im)mobility. First, **Carol Farbotko** explores questions of ontological security, or the “security of being”. Her chapter starts to unpack this concept, and calls for more research into ontological shifts and questions of being.

The author starts from the observation that climate change is often described and understood as an “existential threat”, particularly in (but not limited to) the context of small islands like those in the Pacific. If one accepts that some places may become uninhabitable, what does this mean for the affected populations and their identity? As Farbotko writes, “Are we still who we were? Will we still be ‘us’ in the future?” These questions are particularly acute in the Pacific, where identity has traditionally been closely intertwined with the land, as evidenced in the concept of **banua*. **Banua* refers to place and people, and is shared across large parts of the Pacific. At the same time, it was the people of the Pacific that first sailed out of sight of land – a key moment not only for the history of humankind but also for ontological security, for the people sailed out of sight of known land, and into a “new world of being”.

Climate change again threatens and changes ontological security, by threatening the land itself. This has profound implications for agency, as a stable sense of self – ontological security – underpins agency. In this context, Farbotko suggests that voluntary immobility may help maintain ontological security. When land continues to be inhabited by at least some, there remains a link, places of high cultural value can be maintained, and traditional knowledge can more easily be upheld and expanded.

Security has many dimensions. **Eberhard H. Weber, Priya Kissoon, and Camari Koto** focus on internal migration to urban informal settlements that are ‘dangerous places’ by many standards. Through a case study of two squatter settlements in Suva, Fiji, the authors seek to understand why people decide to leave their relatively safe rural homes and move instead to environmentally dangerous informal settlements.

While much research on the environment–migration nexus assumes that people migrate from areas threatened by climate change to safer, less exposed areas, the chapter shows how this assumption is not necessarily valid. Safety has different dimensions. Climate change does clearly affect urban squatter settlements such as

those investigated by Weber, Kisson, and Koto. Built in mangrove forests and consisting of substandard housing, informal settlements are prone to tidal flooding that climate change is expected to worsen, and are likely to experience severe damage in case of tropical cyclones that are also expected to worsen under climate change. Inhabitants of informal settlements are aware of these current and future threats – but security has many dimensions. As the chapter describes, urban areas offer more, and more diverse, livelihood opportunities, which can help improve settlers' economic security. Similarly, adverse environmental conditions also provide security: security from the threat of eviction. The worse conditions are, the less likely that the government or the private sector will seek to develop property. As Suva – like other urban areas in the Pacific Islands – is growing, formerly marginal areas become prime property. In the eyes of informal settlers, the threat of property development, and therefore eviction, is more urgent and severe than the threat of climate change.

Elfriede Hermann and Wolfgang Kempf examine how options of migration and *in situ* adaptation are debated in Kiribati. While the central Pacific atoll state of Kiribati is different from Fiji in many ways, the country can certainly also be considered a place that is particularly vulnerable to the consequences of climate change. With frequent flooding, widespread erosion and limited freshwater resources, Kiribati may become uninhabitable in the long run according to some climate science projections. Migration has thus been discussed in Kiribati as a form of long-term adaptation in connection with *in situ* adaptation for the short and medium term.

Hermann and Kempf draw on their extensive field work in Kiribati to examine how these discourses have developed, and how different governments – that of Anote Tong (2003–2016) and that of Maamau (since 2016) – have engaged with, or distanced themselves from, debates on migration as adaptation. The cultural conception of land that links land and people, as well as imaginations of the future help us to make sense of local understandings and discourses of climate change adaptation and migration. In particular, the authors use the notion of “politics of hope” to compare and contrast the divergent approaches to coping with the consequences of climate change of the Tong and Maamau governments. While both governments have always insisted on the need for strong mitigation, and hope for a future of the I-Kiribati on their own lands, they relate to migration in different ways. For the Tong government, migration/relocation may become inevitable in the long term, which is why it began to conceptually prepare for this worst-case-scenario by developing the concept of “migration with dignity”. It hoped that such steps would ensure the survival of I-Kiribati community and identity. In contrast, the current Maamau government refrains from debating relocation, and instead seeks to develop Kiribati *in situ*, including through land reclamation and coastal protection. It hopes that individual temporary migration abroad, and migrants' remittances, as well as urban–rural migration from the main island of South Tara-

wa to outer islands, will support this *in situ* development. Culturally specific notions of land, people, and the future underpin both these approaches to migration, for the objective of both is to ensure the long-term survival and wellbeing of the I-Kiribati as a people.

While much literature on climate migration focuses on atoll countries like Kiribati, migration and mobility are also present in other SIDS. **Ximena Flores Palacios** examines local perceptions of and experiences with migration in Lotofaga, a coastal village on the southern coast of Upolu, Samoa's main island. Through anthropological fieldwork in Lotofaga, Samoa's capital Apia, and the Samoan community in Auckland, New Zealand, Flores Palacios seeks to understand how and where people move, and to what extent climate change affects and changes past mobility patterns.

Lotofaga villagers are resilient, and they are mobile; strong social networks, based on extended families – *'aiga* – and local traditional knowledge and *fa'a Samoa*, the Samoan way of life, underpin Samoans' resilience. Migration is part of this; many extended families include members in Apia and abroad, mainly New Zealand. While economic factors have so far dominated migration decisions, whether to Apia or overseas, climate change is increasingly coming into play. Climate change, mostly sea-level rise and associated coastal flooding, also pushes villagers inland, with new houses being built further away from the coasts.

Much of Lotofagans' migration to date has been based on economic opportunities, although, as the chapter emphasises, migration is a complex process that results from a variety of factors. Disentangling climate change from this mix of factors is extremely difficult. This chapter addresses this difficulty and complexity through a focus on local voices and perspectives, which often reflect a more holistic understanding of people's actions on climate change and resilience.

Centering island perspectives, be they from Samoa, the larger Pacific, or the Caribbean and Indian Ocean, was also the purpose of the workshop we organised in Hannover, and the present publication that results from this workshop. We hope that, by bringing together work from different island regions and from different academic disciplines, we can offer a more nuanced picture of climate change adaptation in islands, one that highlights the specificities of island contexts and their diversity. Clearly, climate change presents extreme challenges to islands and islanders, and many barriers – such as limited resources, small and siloed administrations, and remoteness – make it difficult to implement context-specific, suitable, and sustained adaptation strategies. But despite these challenges and despite their diversity, islands and island societies share a great resilience in the face of change, as the contributions to this volume illustrate.

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PART I: GOVERNING AND FUNDING LONG-TERM ADAPTATION

2

Failing adaptation in island contexts: The growing need for transformational change

Patrick D. Nunn and Karen E. McNamara

Many islands are being visibly impacted by climate change to which they are disproportionately exposed. This situation requires a shift away from reactive short-term responses to longer-term transformational adaptation. For this to be effective, the singularity of island environments and societies should be acknowledged and optimal ways of management and engagement identified. There is considerable potential to learn from past intervention failures in island contexts.

The importance of aligning adaptation needs with interventions underpins such transformational change, which on islands principally involves the relocation of vulnerable (coastal) communities and infrastructure to less-vulnerable (inland) places, as well as other transformations such as changing livelihoods and quality-of-life improvements. Successful transformational adaptation also requires that all actors involved change their current attitudes and re-evaluate how they can contribute to adaptation that is effective and sustainable in island contexts.

1 Background: Climate-change challenges for island peoples

If one understands the science, then one knows the future is quite bleak for us all. As Head (2016) argues, we must mourn the future lost, otherwise we will continue to live in denial. For some small islands, the reality is that in the next ten to twenty years, coastlines will become uninhabitable. With this in mind, this chapter discusses transformational long-term approaches to adaptation in preference to short-term solutions that have driven most responses to adaptation to date. Throughout the Pacific Islands, people have significant internal resources and have a long history of adapting to environmental change (Nunn, 2007; Barnett, 2017; Bryant-Tokalau, 2018). Yet sinking piles of money into short-sighted ‘solutions’ is not the answer. This chapter offers pragmatic insights into this confronting reality.

As is implicit in the IPCC’s designation of ‘small islands’ as separate chapters in their last two assessment reports (Mimura et al., 2007; Nurse et al., 2014), such islands are recognised as uniquely and disproportionately exposed to climate change, recent and future. This is explainable largely by their high coastline to land area ratios, especially those at the lower end of the size spectrum. For many island groups, comparative smallness and remoteness help explain why many island societies are relatively impoverished, as measured by economic yardsticks, and therefore considered more in need than others of external assistance for adapting to future climate change (Betzold, 2015; Robinson, 2017; Nunn & Kumar, 2018).

There is ample evidence that recent climate change is causing or amplifying livelihood challenges for many island inhabitants. This ranges from issues of water security (Belmar, McNamara, & Morrison, 2016), unprecedentedly strong tropical-cyclone impacts (Cinco et al., 2016; Walsh et al., 2016), shoreline erosion and lowland flooding (Nunn, 2013; Betzold & Mohamed, 2017), to coastal-settlement relocation (Gharbaoui & Blocher, 2016; Charan, Kaur, & Singh, 2017). Prognoses for island futures highlight the mismatch (as elsewhere) between the magnitude of projected impacts and the insufficiency of preparedness of island societies (Nunn, 2010; Khan & Amelie, 2015) as well as the likelihood that entire islands, even whole island groups/countries, may be rendered uninhabitable within a few decades (Dickinson, 2009; Odalen, 2014; Schulte, Dridge, & Hudgins, 2015).

Most solutions adopted for climate-change adaptation in island contexts have been short-term, reflecting both the culturally grounded preferences of many islanders and their dependence on time-limited (aid) funding assistance (Nunn, 2009). The emphasis on short-term interventions will inevitably lead to an amplification of the magnitude of livelihood challenges for many island communities by the mid-21st century when *both* the pace of sea-level rise (and other manifestations of climate change) will likely have increased *and* the amount of external funding available for adaptation will likely have dropped significantly as donor nations divert funds towards the increasing costs of their own adaptation (Brown, Daigneault, & Gawith, 2017; Travis, Smith, & Yohe, 2018; Nunn & Kumar 2019a).

Given this situation, the need for a long-term fundamental reconfiguration of livelihoods on many islands – especially those where coastal subsistence dominates – seems clear. The most discussed manifestation of such ‘transformational’ adaptation in many island contexts in recent years has been relocation of vulnerable communities to less-vulnerable places (McNamara & Jacot des Combes, 2015; Jamero et al., 2017). Transformational change integrates adaptations at magnified scales or intensity, those that potentially shift locations and/or transform places, as well as those that are new to a particular region and resource system (Kates, Travis, & Wilbanks, 2012). Section 2 reviews the key challenges of climate-change adaptation in island contexts while Section 3 explains why this has often failed in recent decades. Section 4 makes the case for better aligning adaptation needs and interventions, arguing for the acceptance of the necessity of transformational change, while Section 5 discusses how this might best be driven.

2 Adaptation to climate change in island contexts

Most small islands considered in climate-change studies are part of Small Island Developing States (SIDS) but this chapter includes others that may be neither ‘developing’ nor part of independent island states. The heterogeneity of such islands complicates discussion of issues like their exposure to climate change. Indeed, it has been charged that the separation of islands (and island societies) from other inhabited landmasses reflects an inability to understand the diversity of island contexts (Stratford, 2008; Baldacchino, 2018); in other words, islands are often regarded as ‘others’ rather than a coherent category. It is clear that both the physical and socio-economic diversity of islands is something that should be acknowledged in any discussion of their commonalities. Islands may be comparatively large or high – two factors that unquestionably influence their vulnerability to climate change (Nunn, Kumar, Eliot, & McLean, 2016; Kumar, Eliot, Nunn, Stul, & McLean, 2018). Yet islands may also be ‘developed’, often close to (even part of) continental nations, or ‘developing’, typically more distant from continental shores and part of one of the groups of SIDS.

Notwithstanding this, the commonalities of islands justify the development of solutions for climate-linked stressors which are generally distinct from those developed for continental-coastal contexts. These commonalities across islands may be referred to as ‘islandness’ (Pelling & Uitto, 2001). For Kelman (2018), there are three main sources of devastation for SIDS: sea-level rise, ocean acidification, and changes to ecosystems (driven by temperature and rainfall changes) that disrupt food and water supplies. For more than three decades, sea-level rise has been recognized as the principal climate-linked stressor of future island livelihoods, both subsistence and non-subsistence, although there have been periodic reminders of the importance of other associated stressors, largely those related to natural disasters. For this reason, most vulnerability assessments of islands have focused on

their coasts – unarguably the most exposed parts – sometimes to the exclusion of their other inhabited or economically-important parts (Wang et al., 2017; Moffitt & Kumar, 2018).

Island coasts are exposed to the effects of sea-level rise and all its attendant consequences, primarily shoreline erosion, lowland flooding, and groundwater salinization. The universal response options – accommodation, protection, or retreat – encapsulate island diversity. For example, along island coasts where resources are available to construct and – most importantly – maintain appropriately designed artificial shoreline-protection structures, ‘protection’ appears to be the sensible mid-term option although, as elsewhere, it is doubtful this can be sustained indefinitely. Yet commonly along eroding coasts in ‘developing’ island contexts, such structures are also fated to collapse and disrupt, invariably marked by the degradation of structures (linked to an inability to maintain them) and irreversible changes to nearshore sediment-water dynamics that increase vulnerability rather than reduce it (Kench, 2012; Betzold, 2015; Magnan & Duvat, 2018; Nunn & Kumar, 2018). It seems clear that ‘soft’ shoreline-protection¹ solutions like mangrove replanting are likely to be more effective and sustainable in such situations (Gilman et al., 2006; see also Duvat & Magnan, this volume).

Most information about climate change available to people living on islands is generic/global. The lack of localization is acknowledged as a compounding issue for adaptation in other geographical contexts (Forsyth, 2013; Ireland & McKinnon, 2013) but is doubly so on islands where the historical tendency to treat them as ‘miniature continents’ spawned a legacy of inappropriate environmental management interventions (Doumenge, 1987; Gillis, 2014). In addition to localized knowledge, it is important for those involved in environmental governance on islands to be aware of their unique attributes, ranging from the changeability of reef-island form to the importance of offshore ecosystems in maintaining sediment supply to island beaches (Oost et al., 2012; Fujita et al., 2014).

Beyond exposure, underlying socio-economic and development challenges influence the impacts of climate change in island contexts, and as such remain a major concern in these places (Kelman, 2014). These challenges are often amplified by economic instability in these island contexts (Encontre, 1999; Pelling & Uitto, 2001). This is due to their limited capacity to exploit trading and other opportunities, reliance on only a few export products, limited ability to enjoy economies of scale, and significantly high unit costs for producing and marketing key commodities (Deidda, 2016). Another key factor influencing the sensitivity of islands to climate risks is the increasing challenges of high concentrations of populations and critical infrastructure in urban areas. Similar to rapid urbanization in other developing countries, this can often result in overcrowding, populations

¹ Soft solutions for shoreline protection are generally nature-based and often comprise revegetation. Hard solutions imply the presence of artificial shoreline structures that often fundamentally alter the process dynamics and form of coasts.

living in precarious environments, and greater pressures on resources and ecosystems (Bryant-Tokalau, 2018).

Adaptive capacity challenges in islands are pervasive. Betzold (2015) makes the case that islands' low adaptive capacity is typically driven by a lack of resources, institutional barriers, and inadequate awareness. Nunn (2013) has argued that the adaptive capacity of local communities has been further diminished because of a growing dependence on donor agendas and funding. Institutional challenges often arise from sub-optimal coordination between government tiers and inadequate understanding of climate-change challenges among local leaders. Spiritual beliefs, the influence of religious institutions, and a psychological distancing of climate change can all have significant effects on local communities' sense of urgency about and perceptions of climate change risk (Arnall & Kothari, 2015; Nunn, Mulgrew, Scott-Parker, et al. 2016).

One of the most profound challenges faced by today's island dwellers with respect to climate change is the widespread inadequacy of institutional responses. For islands within continental jurisdictions, a common complaint is that their geographically marginal nature frequently translates into marginalization in the policy and action contexts (Beer, 2004; Armstrong & Read, 2006).² Calls to establish a level of self-determination appropriate to island-specific environmental governance have generally gone unheeded (Stratford, 2008; Pittman, Armitage, Alexander, Campbell, & Alleyne, 2015). For islands that are part of independent SIDS, insufficient resources often hinder the development and enforcement of appropriate policy (Kelman, 2014). In archipelagic groups, most funds for climate-change adaptation flow into small 'core' areas where awareness is consequently greater, a situation that often leaves a massive 'periphery' where people's responses tend to be more autonomous and less informed by global knowledge (Nunn, Aalbersberg, Lata, & Gwilliam, 2014; Nunn & Kumar, 2018). Recent research shows that the value of traditional knowledge and coping capacity in such peripheral locations is likely to help their peoples better adapt to future climate change (Maru, Stafford Smith, Sparrow, Pinho, & Dube, 2014; Janif et al., 2016; Remling & Veitayaki, 2016; Mackay et al., 2018; Nunn & Kumar 2019b).

The diversity of islander views is rarely articulated on international stages. For different reasons, islanders' views about climate change are often represented by others, be they the representatives of largely continental jurisdictions (of which islands are only a small part) or designated larger-country representatives speaking on behalf of smaller (island) ones; Pacific SIDS have a history of the latter situation that some regret (Kelman, 2010). While representatives of many SIDS are vocal in international meetings, epitomised by Fiji chairing COP-23 (2017) in Bonn, the loudest voices are mostly those of their leaders who are apt to emphasize their

² A recent review makes the opposite point, namely that "islands tend to enjoy higher levels of constitutional recognition and jurisdiction than mainland territories ... [a] testament to opportunities arising from the conjuncture of geography and history" (Warrington & Milne, 2018, p. 176).

nations' need of adaptation funding rather than their people's need to adapt (Baldacchino, 2018).³

3 Why recent adaptation on islands largely failed

After more than thirty years, there are very few examples of externally driven community-level interventions for climate-change adaptations in poorer ('developing') island contexts that have been both effective and sustained. While this failure is rarely admitted explicitly (Piggott-McKellar, McNamara, Nunn, & Watson, 2019), it is manifest from considering the lack of awareness and indecision that typically characterises environmental governance in most such situations – something that would *not* be expected had adaptation been effectively mainstreamed (Patt & Schroter, 2008; Paton & Fairbairn-Dunlop, 2010; Chandra & Gaganis, 2016; Scott-Parker & Kumar, 2018). In richer ('developed') island contexts, the current situation is understandably different, with many such coastlines – from Oahu (Hawaii) to Singapore – marked by costly coastal-engineering solutions that armour exposed coasts (Romine & Fletcher, 2012; Chan, Chuah, Ziegler, Dabrowski, & Varis, 2018). Yet notwithstanding the availability of resources, the tendency of decision-makers to 'protect' island shorelines to allow a continuation of coastal living – rather than consider relocation – speaks to *both* the almost-universal desire of coastal dwellers to remain living on coasts *and* to the short-term political/societal gains associated with implementing a 'protect' strategy.

Many of today's coastal dwellers do not appreciate the long-term changeability of the places they live, having invested significantly in coastal places and consequently resisting prognoses suggesting these may become uninhabitable in the foreseeable future (Costas, Ferreira, & Martinez, 2015). For many coastal societies – and their leaders – climate-change denialism and the associated popularity of short-term fixes (like 'protect') to what are often portrayed as temporary problems (like shoreline erosion and lowland flooding) make perfect sense. Yet as has been amply documented in all island contexts, such interventions may be effective in the short term but are rarely sustainable in the sense *either* that they can remain effective without periodic injections of (scant) maintenance funding *or* that they do not create new problems for island coastal dwellers. For example, in the reef (atoll) islands of the Maldives artificial shoreline-protection structures "have a high failure rate ... [and are] implicated in the generation of additional island instability problems" (Kench, 2012, p. 168). In the case of such islands, which commonly rise only 2–3 m above mean sea level, the only way to sustain coastal/island living in the

³ This point reflects the tendency of many national leaders to portray their countries as needing money to address climate change, an approach that has undoubtedly increased revenue to many such countries over the past few decades. Yet, given that little of that funding has filtered down to most rural communities struggling to cope with the effects of climate change, it is reasonable to infer that community adaptation needs are not prioritised for funding in most cases.

face of projected 21st-century sea-level rise of perhaps 1 m is for seawalls to “completely surround the islands” (Cooper & Pilkey, 2012, p. xiii), something that might be achievable in richer/iconic island contexts but clearly not in all.

Choosing the ‘protect’ response in island contexts also often produces unanticipated impacts on the livelihoods of coastal people. These impacts range from beach narrowing/loss (Jackson, Bush, & Neal, 2012; Romine & Fletcher, 2012) to nearshore ecosystem degradation and biodiversity loss, something that threatens food security for coastal dwellers in rural locations in SIDS (Bell et al., 2009; Bellard, Leclerc, & Courchamp, 2014). In most island contexts, there is rarely sufficient data to adequately inform the design and positioning of ‘protective’ structures, many of which with hindsight can be seen as having promised benefits that have not eventuated (Duvat, Magnan, & Pouget, 2013; Beyerl, Mieg, & Weber, 2018; Nunn & Kumar, 2018).

While wealthier islands are likely to be able to find the funds in the future to sustain adaptation along coasts – whether involving accommodation, protection, or retreat – the situation is likely to become more challenging for people occupying the coasts of poorer islands including many SIDS. It is therefore imperative to understand the reasons why recent adaptation efforts along poorer-island coasts have largely failed – and what needs to happen to reverse this situation within the next decade or so.

The background to this situation is that the national governments of most (archipelagic) SIDS do not usually have the capacity (human or financial) to effectively engage all rural communities for the purposes of sidestream (not mainstream) issues like climate-change adaptation. This means that for such challenges, and the environmental governance context they fall within, communities are effectively required to make their own decisions (Nunn et al., 2014). Most such decisions are made by people with little formal education, informed largely by (perceived) precedent and analogy, and typically short-term. For most people in such communities, a belief in the security of coastal living is divinely supported and the idea of relocation consequently almost unthinkable, “barely conceivable at present” (Kempf, 2012, p. 250).

The ways in which community-level decision-makers in such places are influenced is also important to understand (Scott-Parker et al., 2017; Beyerl et al., 2018). Many such ‘persons of influence’ in rural SIDS communities have travelled to capital cities where they observe artificial shoreline structures effectively protecting the coast. These observations strengthen their belief in the efficacy of ‘protect’ responses and explain why many rural communities place so much faith in artificial structures of this kind (Nunn, 2013). Yet capital-city shoreline protection (and its ongoing maintenance) in SIDS is often aid-funded and aid-sustained, hardly therefore representative of the capacity of a particular island government. In this sense, it sends a misleading message to rural communities who often raise scarce cash to build a seawall that is opened with great fanfare, only to collapse 18–24 months later whereupon funds for its (less glamorous) repair are often inadequate, leading

to the situation where Pacific Island coasts are said to be “littered with the remains of collapsed and ineffective seawalls” (Dean, Green, & Nunn, 2016, p. 85).

So while it is clear that a sensible goal is the more effective empowerment of ‘persons of influence’ in rural island communities to make decisions about how that community might withstand the effects of long-term climate change, the issue is why has this not yet happened. There are many reasons but those that seem common to most such communities revolve around issues of communication and messaging, dependency and autonomy, long-term versus short-term planning horizons, and uncertainty and anxiety; each is discussed separately below.

3.1 Communication and messaging

Recent research stresses the need for effective communication in climate-change adaptation strategies (Moser, 2014; Rudiak-Gould, 2014). External interventions in poorer-country rural island communities run many risks in this regard. One is that interventions are generally designed and premised from the point of view of the intervenor’s society – one that is invariably non-communal and secular and which unquestioningly privileges (Western) science and the written word. In sharp contrast, many target communities are those where communal decision-making is usual; where decisions are invariably parsed through spiritual filters (‘What does God want us to do?’), and influenced more by spiritual than secular authorities; where hardly anyone has more respect for ‘Western’ scientific understanding over the ‘traditional’ knowledge that has accumulated in the community over generations; and where orality is more common than literacy as a way of communicating or reviewing important information (Paton & Fairbairn-Dunlop, 2010; Nunn, Mulgrew, Scott-Parker, et al., 2016b; Nunn & Kumar, 2018).

External agents (like donor countries and international organisations) that sponsor interventions for climate-change adaptation in such rural communities have been reluctant to recognise that such ‘barriers’ have two sides. Those that are perceived from the ‘inside’ are as important to break down as those – more often discussed (Biesbroek, Klostermann, & Termeer, 2013; Kuruppu & Willie, 2015; Mackay et al., 2018) – that appear to exist from the outside. So commonly does it appear that external agents of this kind are reluctant to learn how to identify and demolish these barriers that one might reasonably question whether in fact they wish to – or whether the process of funding interventions is in itself considered adequate reward.

3.2 Dependency and autonomy

Many SIDS exhibit high levels of dependency on their (richer) donor partners and international funding organisations for underwriting the costs of non-revenue generating activities like climate-change adaptation. This has long been recognised as unfortunate because sustained adaptation requires island nations to ‘own’ the chal-

lenge of climate change (Barnett, 2008; Nunn, 2009). Dependency at the national level in many SIDS and the associated availability of adaptation funding has led to many national leaders becoming fixated on accessing this funding by declaring their nations to be uncommonly needy. While this may be true, the fact that so little adaptation funding filters down from governments to communities is creating a divide where larger-scale projects – often incidentally associated with new prospects for revenue generation – are funded while the increasingly parlous situation in which many subsistence (coastal) communities find themselves is not being effectively addressed. To some extent, non-governmental organisations (NGOs) are filling this gap but their capacity is commonly insufficient to meet demand.⁴

Many rural communities in SIDS (and similar peripheral-island contexts) are also focused on ‘development’ activities, especially those which enhance cash revenues through increased production or value-added processing (Jaini, Advani, Shanker, Oommen, & Namboothri, 2018; Singh-Peterson & Iranacolaivalu, 2018). This focus often implicitly excludes the effects of environmental shocks like natural disasters or longer-onset climate-driven changes like sea-level rise, being premised on the assumption that novel production systems which drive livelihood improvement underwrite resilience-building. The upshot of this view is that community support for many such initiatives often collapses after such shocks or is only incompletely restored (Bunce, Mee, Rodwell, & Gibb, 2009; Mohan & Strobl, 2017).

It is important to discuss how such communities might be empowered to adapt autonomously, or at least in cooperation with others in the same district. While aspects of this are covered in discussions about the advantages of ‘bottom-up’ over ‘top-down’ initiatives in such situations – especially the value of localisation and ownership of solutions (Mertz, Bruun, Fog, Rasmussen, & Agergaard, 2010; Betzold, 2015) – the nuances of island contexts are also important to consider.

3.3 Long-term versus short-term planning horizons

In subsistence communities, which routinely acquire most of the food they consume from the surrounding environment, there is understandably a focus on short-term sustainability of food sources. Most planning is annual in such SIDS communities, a mixture of strategies at both community and family levels. Many such communities have reserve foods that are not usually consumed but may be so in times of exigency, such as after natural disasters (Johnston, 2014; McNamara & Prasad, 2014). In generally more isolated/smaller island contexts, strategies for conserving marine food sources (in particular) evolved over many generations and

⁴ Non-governmental organisations (NGOs) are active in many aspects of climate-change adaptation in the Pacific Islands, often filling voids that governments are unable to address. These aspects include a focus on peripheral (outer-island) communities, on livelihood sustainability within (largely) subsistence-based communities, and ways of income generation appropriate to these contexts.

involved periodically designating particular places off-limits (taboo) in order to allow their food-producing potential to be renewed (Johannes, 2002; Foale, Cohen, Januchowski-Hartley, Wenger, & Macintyre, 2011).

Few island communities are today wholly subsistence-based. Mass importation of cheap (often nutritionally poor) foods has allowed their penetration into the remotest island communities, a tendency that has eroded traditional subsistence-based strategies (Campbell, 2015).

3.4 Uncertainty and anxiety

Scientific uncertainty is often difficult to explain to non-specialists, something occasionally hailed as a justification for inaction with respect to climate-change risk planning (Barnett, 2001). For many stakeholders in poorer-island contexts, the value of scientific projections is not readily acknowledged. Often informal projections, typically based on remembered precedent or spiritual beliefs, are valued far higher in such contexts. And while this often gives such communities some comfort that builds psychological resilience (Farbotko & Lazrus, 2012), this is often simultaneously demolished by the ubiquitous media reports about climate change that, in the Pacific Islands, tend to focus on newsworthy extreme scenarios (un-supported by scientific consensus) rather than more accurate mainstream reports (Robie, 2014; Dreher & Voyer, 2015; Scott-Parker et al., 2017).

Anxiety about slow-onset climate change is difficult to document formally (Bourque & Willox, 2014). This is especially true both in communal societies (like those on many such islands) and by outsiders who inevitably lack sufficient cultural understanding to identify the presence or otherwise of such anxiety; a recent debate on the framing of climate change by fishers in the Lofoten Islands (Norway) exemplifies the latter point (Dannevig & Hovelsrud, 2016; Bercht, 2017). In many places, the situation is clearer for (rapid-onset) natural disasters, where traumatised survivors have often benefited from counselling, although in poorer-island contexts comparatively little has been formally reported (Sattler, 2017).

A key issue is the possibility and the practicality of relocation of coastal communities from vulnerable locations to less-vulnerable ones. In addition to the reluctance of many such communities to consider relocating within the same island, the issue of land tenure is often influential. Many coastal/lowland communities in SIDS hold title to the land they occupy yet not to places to which they might relocate. This is a problem because such communities, often being only partly within the cash economy, lack the means to lease land from others who expect to be paid for this. In addition, in-island relocation often means loss of identity, associated with separation from place, as well as a more pragmatic reconfiguration of subsistence livelihoods. These complex and difficult issues are discussed further in the following section.

Such problems may multiply when the issue of relocation from one island – likely to be rendered uninhabitable by sea-level rise – to another less vulnerable is

considered. In addition to the feared cultural attrition and loss of identity involved in resettlement, there are inevitably concerns about mixing with longer-term residents elsewhere. There are historical precedents in island contexts that show such concerns are justified, including the 20th-century relocation of Phoenix Islanders (in what is now Kiribati) to parts of what is now Solomon Islands (Donner, 2015) and the more recent relocation of Carteret Islanders to Bougainville in Papua New Guinea (Edwards, 2013; Connell, 2016). For such reasons, the prospective relocation of people from Kiribati to Fiji is being discussed circumspectly (Hermann & Kempf, 2017; see also Hermann & Kempf, this volume).

4 Aligning adaptation needs and interventions: the underpinnings of transformational change

Transformational change can help reduce the root causes of climate change vulnerability. Two key factors are identified in an islands context. First, frameworks about risk management should incorporate transformational adaptation and, second, research that grows the existing range of innovative transformational adaptations should be conducted. At the community level, supportive social contexts combined with incentives and the availability of appropriate and understandable options, and the availability of resources for action and leadership also influence the initiation and sustainability of such change (Kates et al., 2012).

There are numerous things that should be changed – or done better – in order for climate-change adaptation projects on islands to become more effective, sustainable, and, ultimately, transformational. Paramount among these is the need to recognise islands as environments that contrast with those of continents, meaning their environments and societies are often quite different. Especially yet not exclusively in SIDS, there are other issues (see below) that should be addressed before adaptation is likely to become successful in such terms. Behind all these concerns lies the issue of process, specifically the need to replace the commonly one-way direction of adaptation (intervention) efforts with genuine interaction in which both external agents and target communities/groups have at least equal say in the nature, design, and implementation of adaptation pathways (Mercer, Dominey-Howes, Kelman, & Lloyd, 2007).

This section asks whether we are doing the right kinds of things to prepare island dwellers for the challenges that future climate change will pose to the ways they live. Most projections suggest that the main climate-driven stressors of contemporary island life – temperature rise and sea-level rise – will continue at least for the next few decades and likely accelerate (Figure 1). In those island realms affected by tropical cyclones (hurricanes) it is likely that, while the frequency of these will decrease in the future, their average intensity will increase (Walsh et al., 2016); storms like Tropical Cyclone Pam (Vanuatu, 2015) and Severe Tropical Cyclone Winston (Fiji, 2016) may become more usual.

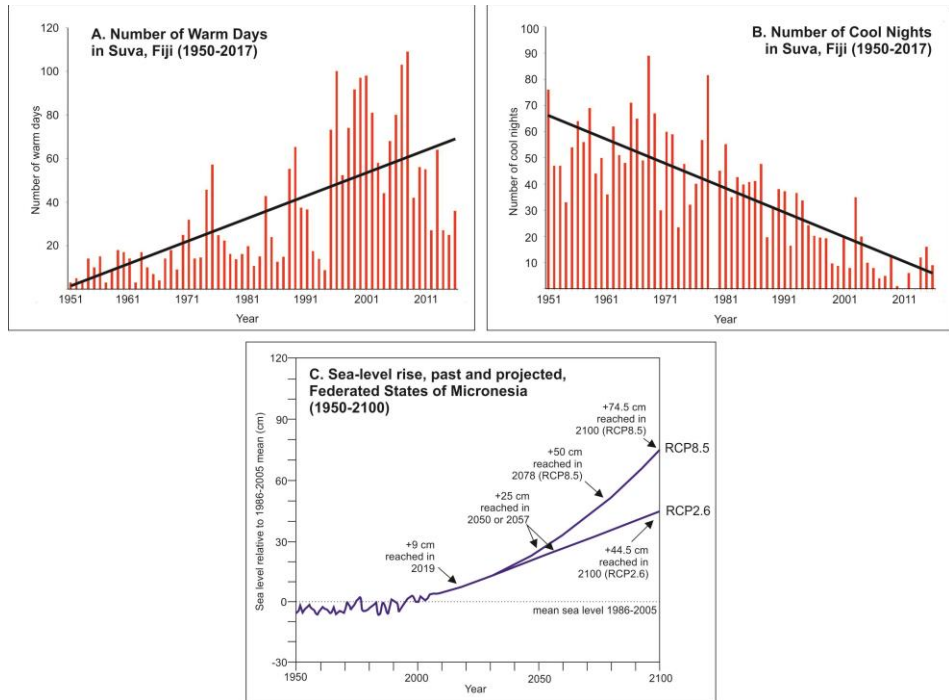


Figure 1: Examples of the evidence for climate change in island countries

A and B. Changes (1951–2017) in the numbers of warm days and cool nights in Suva (Fiji) showing the effects of global warming here. These trends are projected to continue. Data from Fiji Meteorological Service, provided by Simon McGree at the Australian Bureau of Meteorology.

C. Recent and projected (future) sea-level rise in the Federated States of Micronesia where the rate of sea-level rise is currently 2–3 times the global average (Becker et al., 2012). Projections are based on those of IPCC AR5 (2013–2014) and are considered conservative, more recent studies suggesting sea level in 2100 will likely be more than 1 m above present (e.g. Mengel et al., 2016). Given that emissions are following Representative Concentration Pathway (RCP) 8.5 closest, it is likely that the rate of sea-level rise will accelerate over the next few decades. Graph adapted from BOM (2014).

As in many other places, especially coastal ones, the multifarious impacts of temperature and sea-level rise and increased tropical-cyclone intensity will inevitably result in situations being reached by (at least) mid-century where most (coastal-dwelling) island people will be unable to continue living as they do currently. Given the experience of the past thirty years or so and the focus on short-term responses, it seems unlikely that the necessary adaptation to allow these people to be living the lives to which they aspire in or near such locations can be achieved incrementally (Kates et al., 2012). This is not to say that incremental change should never be

attempted. Patrick D. Nunn's recent research with the Navunievu community in coastal Vanua Levu Island in Fiji found that, in response to concern about sea-level rise and its effects on the village, local leaders have decreed that newly married couples must build their houses inland/upslope rather than on the low-lying coastal plain. After some decades, such adaptation may see most of the village relocated through autonomous and low-cost incremental action.

The alternative to incremental adaptation is transformational adaptation involving radical change intended to climate-proof community infrastructure and livelihoods as far as this is ever possible. In island contexts, transformational adaptation to future climate change invariably involves relocation of vulnerable communities and infrastructure to less-vulnerable locations, a process that may be accompanied by livelihood reconfiguration, and economic and cultural changes that may also be transformative (Piggott-McKellar, McNamara, Nunn, & Sekinini 2019). For (coastal) communities anywhere, this is not a trivial issue; on islands, there are particular concerns. Most islanders live along island coasts where they can readily access the greatest diversity of food resources and where interaction with other people is easiest; indeed on many islands, interior populations have only ever increased during times of conflict (Nunn, 2007). For this reason, not only are many island interiors/hinterlands comparatively sparsely inhabited but they also currently lack the infrastructure needed to service the needs of large numbers of coastal relocatees.

The issues around relocation are slowly becoming the subject of mainstream science-informed discussions, yet understandably are commonly focused on the world's most densely-populated coastal districts (Collins, Jones, Nguyen, & Stanton, 2017). On islands, there are growing numbers of precedents for future relocation that have been studied, particularly with a view to understanding the particular nuances of inter-island population movements and, more generally, lessons learned and errors made (Connell, 2012; Donner, 2015).

For example, it seems clear that concerns about 'loss of place' often dominate negotiations for relocation, whether in richer contexts where people will lose money and perhaps expect compensatory payments *or* in subsistence contexts where people have strong intangible connections to land that require culturally grounded methods of severance and processes of working through loss and grief (Head, 2016). The same dynamic exists in both cases.

Similar parallels exist with 'acquisition of place'. In richer contexts, money (perhaps compensation, perhaps top-down sponsored investments) is used to create places to which people might be relocated; land purchase avoids many issues around lack of relocatee rights or unwelcomeness. In poorer contexts, where money to compensate relocatees or purchase land elsewhere for them may be insufficient, successful negotiations need to stress exigency (the urgent need to move), demonstrate extra-community support (from parties like religious organisations that are respected by all), and persuade inland landowning groups – preferably the

same cultural groups – to accept relocatees on the grounds that they have been unfairly and disproportionately impacted.

There are models of relocation process to follow (see following section). These involve the ‘establishment of place’ – the preparation of sites for relocation. In richer contexts, this involves the development of infrastructure and utilities intended to attract individual households and businesses from vulnerable locations. In subsistence contexts, this involves the allocation of land (and sea) from which to obtain food and places for the construction of dwellings/community as well as important intangible resources (e.g. memorialisation and access to ancestral lands) where the cultural identity of relocatees can be preserved.

None of the above can be effective and sustainable unless vulnerable people’s needs are aligned with the agendas of those who have the power to drive the necessary transformational adaptation. At present, in almost every island situation, most climate-change adaptation is undertaken to meet short-term goals rather than the longer-term ones implicit in climate changes like those shown in Figure 1. A fundamental shift in the ways we conceive and plan for environmental risk is needed (Martin, Maris, & Simberloff, 2016). The next section discusses how this might happen and who might drive it.

5 The way forward in island contexts: driving transformational change

Enabling transformational adaptation – especially relocation – in island contexts is easier to plan than to implement successfully. Relocation is complex and difficult, and is rarely what vulnerable local communities desire. This applies to islands in both richer and poorer countries. One of the principal challenges with relocation, identified above, is negotiating people’s ‘attachment to place’ enough to persuade those people that they should move to other (less vulnerable) locations. The other major challenges are around ‘acquisition of place’ that involves *both* the identification and preparedness of (new) places for relocatees *and* the ongoing support of those occupying/owning the areas where these places are located.

Relocation within higher islands⁵ requires the involvement of state actors at both national and subnational levels and – at least in poorer contexts – some contribution to the process by non-state actors, from NGOs to donor partners and international organisations charged with global oversight of adaptation.⁶ This section first considers *how* such transformational adaptation might best be carried out on islands and then *who* should best drive this process.

⁵ Defined as those islands where the highest point is at least 30 m above sea level (see Nunn, Kumar, Eliot, & McLean, 2016). On such islands, it is generally assumed that people can be relocated within the same island; on lower islands, relocation may be offshore.

⁶ Principal among such organisations is the Adaptation Fund which, since it was set up in 2010, has committed US\$477 million to 76 mostly-‘developing’ countries to counter the effects of climate change (www.adaptation-fund.org).

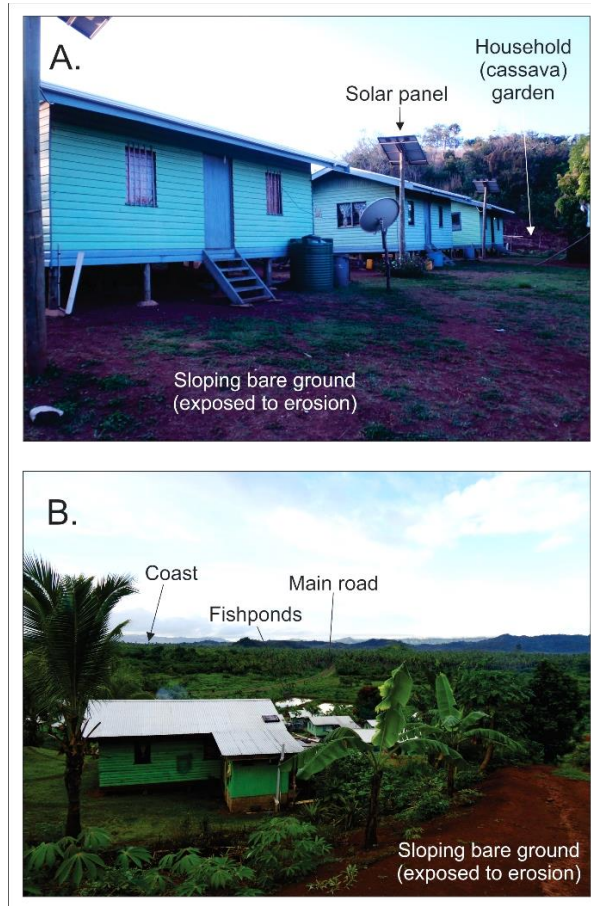


Figure 2: Relocated communities on Vanua Levu Island in Fiji

A. View of Korovou on Yadua Island (Bua) to which 19 families from neighbouring (coastal-lowland) Denimanu Village were relocated in 2016. Note the standard house design, which came with the provision of solar panels, water tanks, and flush toilets/showers that were not standard in the previous houses. Although only five minutes walk from the sea, Korovou reaches 35 m above sea level and is closer to most food gardens than Denimanu. Photo by Patrick Nunn.

B. View of Kenani (Cakaudrove) to which all residents from the (coastal-lowland) village of Vunidogoloa were relocated in 2014. Since the new village is more than an hour's walk from the sea, fishponds were constructed to partly replace seafoods in the residents' diet. Access to the main road has opened up possibilities for commerce. Much of the ground is composed of thick orange regolith which is liable to erosion and sometimes landsliding after its vegetation cover has been cleared, as it was for the construction of level house sites in this steep terrain. Photo by Anah Piggott-McKellar, used with permission.

The first step in transformational adaptation involving relocation on higher islands is to identify vulnerable communities and the time frames over which they need to be relocated. It is essential this process be driven in partnership with affected local communities. For relocation to be even remotely successful, then it needs to be not only unforced but also led and governed by those affected. The second step involves identifying the possible places to which these communities might relocate, including the advantages and disadvantages of each, again in an inclusive and transparent manner whereby affected communities are helping make decisions. The third step is to estimate the minimum cost of the preferred relocation which may include negotiable/indirect costs like compensation for loss and damage. Human rights, dignity, equity, and sustainability are all concepts that need to be closely considered during these ‘planning’ stages (Henly-Shepard, McNamara, & Bronen, 2018).

The next steps involve ‘implementation of relocation’ and will inevitably vary depending on the particular situation and whether it is suitable for incremental or wholesale relocation (Figure 2). Incremental pathways involve the initial (disproportionately assisted) movement of either the most-vulnerable or iconic elements of a community in the expectation that this would encourage later (disproportionately less assisted) and more autonomous relocation by other elements of that community. In contrast, ‘wholesale relocation’, which is more costly and often top-down, involves the relocation of an entire community at one time.

Recent relocations in Fiji exemplify both cases (Piggott-McKellar, McNamara, Nunn, & Sekinini 2019). The most exposed households (19 or 34%) in the Fijian community of Denimanu (Yadua Island, Bua) to be impacted by a combination of sea-level rise and storm surge during Tropical Cyclone Evan in 2012 were relocated in 2016 to a new site (Korovou) upslope (Figure 2, panel A). The cost of relocation was borne entirely by the Government of Fiji, something lauded by the affected people, some of whom yet regret the lack of contribution from Fiji’s wealthier donor partners and doubt the long-term viability of the relocation. This is an example of incremental relocation in the sense that only a portion of the Denimanu community was relocated and there is currently discussion amongst the remainder about when and where they too might need relocation, given the sea-level rise they have observed since 2012 (Martin, Nunn, Leon, & Tindale, 2018).⁷

A wholesale relocation driven by the progressive effects of sea-level rise is that of Vunidogoloa (Vanua Levu Island, Cakaudrove). Problems were becoming acute for people in the coastal village of Vunidogoloa in 2006 so a request was made to the Fiji Government to be relocated; all ~140 inhabitants moved to the new inland upslope site (Kenani) in January 2014 (McNamara & Jacot des Combes, 2015; Charan, Kaur, & Singh, 2017). The move was thoroughly planned, involved extensive community consultation and support, and was to land that the Vunidogoloa

⁷ Sea level is rising along Fiji’s coasts at a rate of about 5.5 mm/year, significantly higher than the global average of about 3.2 mm/year (BOM, 2014; Dangendorf et al., 2017).

people already owned (Figure 2, panel B). The costs of the move incurred by the Fiji Government were partly offset by the sale of forest growing on and around the new site.

Post-relocation monitoring and evaluation are also an important part of the process of transformational change, not least in order to identify lessons learned that might help improve comparable future relocations but also to ensure that any challenges related to the relocation are resolved as they arise.

The process of relocation outlined above needs to be driven by local communities but also requires the involvement of actors external to affected communities, not least to underwrite the costs of preparing new places for relocatees to live. These costs might involve landscape modification, the provision of basic infrastructure and utilities, as well as the cost of new houses. While relocation remains a comparatively novel use of external (aid) funding, it may remain attractive for external support but, as it becomes more commonplace, so such costs may come to be regarded as something island governments should be funding. It is therefore important, especially in SIDS, that pathways for relocation are developed which minimise the need for external funding and maximise the absorption of costs by affected communities and households. Diverting funds from short-term adaptation responses (like ‘protect’ and ‘accommodate’), which are unlikely to be sustainable on decadal scales, towards longer-term transformational responses would help underwrite the costs of these.

Transformational adaptation in island contexts does not only mean relocation. In many such places, it also means that livelihoods of the affected people need to change; for example, people accustomed to subsisting significantly from nearshore marine foods may find themselves in places where these are less easy to access so need to be substituted by other, comparable sources of food such as fishponds (see Figure 2, panel B). Transformational adaptation also provides opportunities for quality-of-life improvement, whether this refers to subsistence livelihoods and food security, or to human development indicators such as health or education, or more reliable transport networks.

6 Conclusion

Island people face many challenges from climate change. To date, the vast majority of efforts to address these challenges have been reactive and have favoured short-term goals rather than the long-term ones that are in line with current climate-change projections. There is a clear need for transformational adaptation in island contexts where, owing to their singular attributes, this need is more pressing than elsewhere. For example, if sea-level rise in the western Pacific continues at its current rates (two to four times the global average; Becker et al., 2012), then increasing numbers of island-coastal communities are likely to be rendered unviable within the next ten to twenty years.

Relocation of vulnerable coastal communities to less vulnerable locations on islands is hampered by their geography and by a dependency of many island jurisdictions on funding from elsewhere for such non-revenue generating activities. Transformational adaptation needs to occur within national institutions, which should take ownership of climate-change issues, ensure their localisation, and help empower subnational (and community-level) decision-makers to drive and sustain them.

While pathways for transformational adaptation have been studied and are proposed anew in this paper, there is still a significant challenge involved in persuading governments, and then ultimately the island communities which will be affected, of the need for such adaptations. This makes sense. It is not easy for anyone to suggest such transformations when there is significant risk to identity, livelihoods, and culture, real or perceived. Yet there needs to be pragmatic and realistic opportunities for weighing up the benefits of long-term anticipatory adaptation, such as relocation, rather than planning for more immediately comforting and cheaper short-term goals.

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3

Contrasting potential for nature-based solutions to enhance coastal protection services in atoll islands

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Based on the study of 107 inhabited islands of the Maldives, we assess to what extent the level of local human disturbance of the coastal protection services provided by the reef-island system influences the potential for nature-based solutions (NBS) to address climate change impacts in atoll contexts. The results show that in 2014–16, 68.2% of the Maldivian islands (classified Type 3) exhibited a significant human-induced undermining of these services, while respectively 7.5% and 20.6% experienced a high (Type 4) and very high (Type 5) level of undermining of these services, whereas hardly any inhabited island shows low levels of undermining (Types 1 and 2). Based on these findings and on our own expertise in atoll environments, we propose a five-pillar adaptation pathway approach for atoll islands: (i) increase ecosystem resilience; (ii) minimise the risk of maladaptation; (iii) facilitate internal relocation; (iv) promote island fortification associated with ground elevation, and (v) support permanent international migration (back-up plan). While the potential for NBS is high for island types 1, 2, and 3 (respectively undisturbed, little disturbed, and moderately disturbed islands), it is nil for island types 4 and 5, where the coastal protection services delivered by the reef-island system are no longer functional. Given that the Maldives Islands are the atoll country exhibiting the highest population densities among atoll countries and territories, our findings indicate that there is still a high potential for NBS in atoll contexts at large.

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1 Introduction

Small islands are widely acknowledged to be increasingly at risk of marine flooding and coastal erosion under climate change, as a result of the combination of gradual sea-level rise with more frequent extreme sea levels due to distant-source swells and intensifying intense tropical cyclones, and of the coral decline caused by ocean warming and acidification (Becker et al., 2012; Gattuso et al., 2015; Hoeke, McInnes, & O'Grady, 2015; Quataert, Storlazzi, van Rooijen, Cheriton, & van Dongeren, 2015; McInnes, Hoeke, Walsh, O'Grady, & Hubbert, 2016; Shope, Storlazzi, Erikson, & Hegermiller, 2016; Beetham, Kench, & Popinet, 2017; Vitousek et al., 2017; Perry et al., 2018; Storlazzi et al., 2018). Because they are very small (e.g. average size: 0.25 km² in the Maldives), low-lying (generally < 4 m in elevation) and mainly composed of unconsolidated reef-derived material (Woodroffe, 2008; McLean & Kench, 2015), atoll islands are particularly vulnerable to sea-level rise and increasing wave height and energy. Since the late 1990s–early 2000s, the extent to which these islands are liable to be physically destabilised by climate change has become a major global concern, as their destabilisation would eventually cause the disappearance of entire atoll nations (i.e. the Maldives, Marshall Islands, Kiribati, and Tuvalu), due to reef islands constituting the only habitable land in these countries (Barnet & Adger, 2003; Connell, 2003; McAdam, 2010; Nurse et al., 2014).

Since 2010, the scientific community has quantitatively assessed multi-decadal (i.e. for the past three or four decades to a century) land area change for 709 islands from 30 atolls in the Pacific and Indian Oceans, thereby providing data on island behaviour under contemporary sea-level rise (Duvat, 2019). Results put an end to the already-sinking-island scenario by proving the persistence of atoll islands and the maintenance of atoll countries' landmass despite higher than average (1.8 mm/yr) rates of sea-level rise over the past decades, i.e. rates ranging from 2.0 ± 0.6 mm/yr (on Pingelap and Mokil atolls, the Federated States of Micronesia) to 5.1 ± 0.7 mm/yr (on Funafuti, Tuvalu), with most values lying between 2 and 3 mm/yr (Becker et al., 2012). Despite accelerated sea-level rise over the past decades, only 11.4% of the 709 sample islands decreased in size, while 15.5% increased and 73.1% remained stable in area (Duvat, 2019). In addition, all of the islands > 10 ha experienced either areal stability (209/234 islands, i.e. 89.3%) or expansion (25/234 islands, i.e. 10.7%), while the islands < 10 ha underwent more contrasting behaviours, with 65.1% of these islands experiencing stability, while respectively 17.0% and 17.9% showed contraction and expansion. The high instability of very small islands makes some atoll countries, such as the Maldives, particularly vulnerable to climate change (Aslam & Kench, 2017; Duvat, 2019). More generally, these findings highlight, first, that climate change, particularly sea-level rise, does not constitute the main driver of atoll island change to date, and second, that until now, most atoll islands were able to naturally adapt to ocean-climate related pressures (McLean & Kench, 2015; Duvat, 2019).

Simultaneously, scientific advances on the drivers of atoll island change emphasised the major contribution of both climate-related extreme and rapid onset events (especially tropical cyclones and distant-source swells; Scoffin, 1993; Hoeke et al., 2013; Ford & Kench, 2014; Ford & Kench, 2016; Duvat, Volto, & Salmon, 2017) and direct, i.e. local, human disturbances (McLean & Kench, 2015; Aslam & Kench, 2017; Duvat, Salvat, & Salmon, 2017). The latter were found to be a major controlling factor of island change, not only in atoll capitals, e.g. Male' in the Maldives (Naylor, 2015), South Tarawa in Kiribati (Biribo & Woodroffe, 2013; Duvat, Magnan, & Pouget, 2013), and Fongafale in Tuvalu (Yamano et al., 2007), but also in rural and even in unsettled islands (Duvat & Pillet, 2017; Duvat, Salvat, & Salmon, 2017). In most cases, human-driven changes mainly consisted in land reclamation, carried out to face land shortage, and in coastal infrastructure (airport and harbour) development (Duvat, Salvat, & Salmon, 2017; Duvat, 2019). For example, in the Maldives, land reclamation caused the highest rates of island and atoll expansion recorded (Aslam & Kench, 2017; Fallati, Salvini, Strelacchini, & Galli, 2017), while also causing widespread shoreline armouring (due to the stabilisation of reclaimed areas by seawalls, dykes, and rip-rap) and extended reef degradation (due to the burial or mechanical destruction of reef flats by aggregate mining). Importantly, in most atoll countries and territories, engineered structures aimed at stabilising the shoreline eventually caused island destabilisation (Ford, 2012; Kench, 2012; Duvat, 2013; Duvat et al., 2013; Mann & Westphal, 2014; Duvat, Salvat, & Salmon, 2017). This is all the more so as most coastal protection structures are poorly designed and maintained, even in urban islands (Shaig, 2011; Duvat, 2013). Male', which is protected by emerged breakwaters and massive rock revetments along most of its shoreline (Naylor, 2015), is the exception. In atoll environments, the use of hard defence significantly also contributes to the degradation of the reef ecosystem, because the material used to build protection structures is often directly extracted from nearby reef flats and beaches (Biribo & Woodroffe, 2013; Duvat, 2013), while also undermining the capacity of islands to naturally adjust to ocean-climate related pressures through sediment reorganisation by obstructing reef-to-island sediment transport pathways (McLean & Kench, 2015; Duvat, 2019). This increases not only current, but also future climate-related risks. In such cases, because they fail to reduce risks and encourage further unsafe development, hard defences can be considered as maladaptive (Temmerman et al., 2013; Logan, Guikema, & Bricker, 2018).

An alternative to hard defence is to maintain and strengthen the natural coastal protection services delivered by ecosystems, especially the reef ecosystem, to island societies through the use of nature-based solutions (NBS). From a broad perspective, NBS describe "actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges (e.g. climate change, food and water security or natural disasters) effectively and adaptively, while simultaneously providing human well-being and biodiversity benefits" (Cohen-Shacham, Walters, Janzen, & Maginnis, 2016, p. 2). Despite the recognition of the potential for NBS

in coral contexts (Narayan et al., 2016; Beck et al., 2018), and more specifically in island contexts (e.g. the Maldives and Seychelles Islands; Ferrario et al., 2014), few local assessments of this potential have been conducted to date. This paper contributes to filling this gap through inventorying and classifying atoll-relevant NBS, and discussing their possible contribution to adaptation pathways for atoll countries and territories. Focusing on sea-level rise–related risks – especially coastal erosion and marine inundation – and based on the most recent literature and a case study (the Maldives), we investigate to what extent the level of human disturbance of the coastal protection services provided by the reef-island system may influence the potential for NBS to address climate change impacts in atoll contexts.

2 Nature-based solutions in atoll contexts

2.1 Coastal protection services provided by the reef-island system

Four major services are delivered by the reef ecosystem to island societies, including the provision of renewable resources (e.g. fish or construction material), biogeochemical services (i.e. nitrogen fixation and CO₂/Ca control), socio-economic and cultural services (contribution to revenues, local knowledge and beliefs), and biophysical services. The latter are generally referred to as coastal protection services, and include two major functions: (i) wave energy attenuation, and (ii) carbonate sediment supply to the coast (Moberg & Folke, 1999; Principe et al., 2012; McLean & Kench, 2015; Elliff & Silva, 2017).

Both the reef and the reef-derived coastal sedimentary system (i.e. beach or beach-dune system, depending on the setting), hereafter the ‘reef-island system’, reduce the energy of offshore waves. The reef first plays a major role in wave energy attenuation by causing wave break over the reef crest and wave friction over the reef flat (Principe et al., 2012; Quataert et al., 2015). Ferrario et al. (2014) estimated that reefs are able to attenuate on average 97% of incoming wave energy and to reduce on average 84% of the height of incoming waves. This reduces wave run-up, and thereby wave impact at the coast, i.e. the risks of marine inundation and erosion to which island societies are highly exposed (Quataert et al., 2015; Storlazzi et al., 2018). Various attributes control wave energy attenuation by the reef, including its dimensions, depth, topography, and rugosity, that is, roughness. Wave attenuation is higher when the reef is wide and has a contrasting topography and non-smooth surface. Although wave energy dissipation rates are proportional to reef flat width (UNEP-WCMC, 2006; Quataert et al., 2015), 50% of the energy attenuation occurs along the first 150 m of the reef flat (Ferrario et al., 2014). In addition, Quataert et al. (2015) showed that wave run-up usually increases with narrow reef flats, steep fore reefs, low reef flat frictions, and high frictions at the fore reef. The nature and condition of coral species growing on the reef flat influence its rugosity. In the extension of the reef flat, the coastal sedimentary system

(generally a beach system) contributes to absorb and dissipate wave energy. The second biophysical function of the reef, namely sediment delivery to the coast, is influenced by three main factors: (i) reef productivity, which directly reflects reef health; (ii) reef-to-shore sediment transport, driven by wave energy and the maintenance of clear sediment transport pathways and; (iii) the maintenance of accommodation space for sediment deposition at the coast (McLean & Kench, 2015; Duvat, Magnan, Etienne, Salmon, & Pignon-Mussaïd, 2016). The two biophysical functions exerted by the reef are interlinked, as a healthy reef provides sediments to the coast, which in turn increases wave energy attenuation and thereby contributes to lowering the risks of marine inundation and coastal erosion.

These two coastal protection services are increasingly threatened under global change. Ocean warming and acidification are expected to cause a decrease in coral reef resilience, due to increased coral bleaching and the weakening of the carbonate structure of the reef (Pandolfi, Connolly, Marshall, & Cohen, 2011; Ateweberhan et al., 2013; Elliff & Kikuchi, 2015; Gattuso et al., 2015; Hughes et al., 2017). Reef decline would first decrease reef rugosity, as a result of the death and then erosion of corals, which would decrease wave energy dissipation, which would in turn aggravate marine inundation and potentially cause substantial changes to atoll island volume and elevation (Quataert et al., 2015; Storlazzi et al., 2018). Second, it would reduce sediment delivery to the coast, which would accelerate erosion. Simultaneously, accelerated sea-level rise $> +1$ m by 2100 compared to 2000 (e.g. Schaeffer, Hare, Rahmstorf, & Vermeer, 2012; Kopp et al., 2017), if it did outstrip vertical accretion rates of corals (Montaggioni, 2005; van Woësik, Golbuu, & Roff, 2015; Perry et al., 2018), would considerably accelerate these processes. The expected decrease in the reef ecosystem resilience will be exacerbated where human disturbances (i.e. pollution, reef mechanical destruction, obstruction of sediment transport, etc.) have already undermined the two abovementioned functions of the reef-island system (Hughes et al., 2017).

These coastal protection services are of utmost importance to atoll islands because of their physical structure (i.e. entirely composed of reef-derived sediments and exposed to waves from all directions because they have a perimeter extending 360°) and low elevation (generally < 4 m). These islands are highly exposed to marine inundation and induced groundwater lens and soil salinisation, and prone to physical destabilisation, e.g. positional change or rapid change in volume and configuration (Woodroffe, 2008; Hoeke et al., 2013; Smithers & Hoeke, 2014; McLean & Kench, 2015; Duvat, 2019). Maintaining or restoring the coastal protection services seems all the more crucial in reef-dependent atoll environments where the reef provides not only physical security to people – as there is no elevated (i.e. > 4 – 5 m in general) land to which people can move in the case of a swell event – but also vital food supply. However, over the past decades, increasing human interference with natural processes has at least partly undermined these services on many atoll islands. In particular, atoll countries and territories have increasingly resorted to engineered protection structures to face coastal erosion and

marine inundation (Nunn, 2009; Kench, 2012; Duvat, 2013). While especially true for capital areas that benefited from international aid-funding – e.g. in Majuro (Ford, 2012), the South Tarawa Urban District (Duvat, 2013), and Male’ (Shaig, 2011; Kench, 2012; Naylor, 2015) – these options were also widely deployed in outer, rural islands. The poor design and maintenance of most of these structures (Kench, 2012; Duvat, 2013), however, limited their benefits in terms of better protecting island communities and lowering coastal risks. Even where these structures fulfil their functions, they contribute to undermining the natural coastal protection services provided by the reef-island system. Longitudinal coastal structures (e.g. seawalls or rip-rap) are indeed widely acknowledged to cause beach loss and to prevent sediment deposition at the coast, which respectively decreases wave energy attenuation and prevents island upwards adjustment to sea-level rise (e.g. McLean & Kench, 2015). In addition, marine structures such as breakwaters often alter the environmental conditions on which coral growth depends, notably by reducing the beneficial effects of waves on reef flats (e.g. oxygen and nutrient inputs, sediment removal from corals). These structures can also be destroyed by storm waves, therefore failing in providing safety to island communities, as reported in Male’ in April 1987 (Cazes-Duvat, 2005; Wadey, Brown, Nicholls, & Haigh, 2017). Finally, such options generate high maintenance costs that often exceed atoll territories’ internal capacities (Nunn, 2009). Many arguments thus converge to promote NBS in atoll contexts.

2.2 A typology for atoll-relevant NBS

Given the potential of NBS to both provide responses to climate change challenges (mitigation and adaptation) and address biodiversity loss, climate change, and human development together, they have gained growing attention over the last decade (e.g. Temmerman et al., 2013; Ferrario et al., 2014; Narayan et al., 2016). Recent analyses however remind us that NBS are actually the latest in a long line of approaches to support ecosystems’ conservation and management (Nature Editorial, 2017; Nesshöver et al., 2017; Rankovic, Chan, & Kaurans, 2017). The IUCN distinguishes three main types of NBS, including making better use of existing natural or protected ecosystems, developing sustainable management protocols and procedures for managed or restored ecosystems, and creating new ecosystems (Cohen-Shacham et al., 2016, p. 7). Such a typology being very generic, a more specific approach to coastal protection services in atoll contexts is needed.

Here, we propose a new clustering of NBS for island communities’ adaptation. It builds on early works from the IPCC that describe a given system’s vulnerability to climate change as a function of its exposure, sensitivity, and adaptive capacity (McCarthy, Canziani, Lear, Dokken, & White, 2001; Parry, Canziani, Palutikof, van der Linden, & Hanson, 2007). To act on these sub-components of vulnerability defines the very essence of adaptation and refers to four major areas of action (Magnan, 2018): (i) limiting the exposure of the social-ecological system to the

climate change–induced hazards; (ii) limiting the sensitivity of the reef system to climate change impacts; (iii) limiting the sensitivity of the human components (e.g. settlement patterns, etc.) of the atoll system to climate change impacts; and (iv) enhancing societal adaptive capacity to climate change. In atoll environments, NBS can be especially useful to address (i) and (ii), with cascading benefits on (iii) and (iv). Noteworthy is that this study only deals with the primary benefits to be expected on (i) and (ii), and considers the wide range of NBS that can both directly and indirectly contribute to strengthening the coastal protection services delivered by the reef system. Based on this, three generic clusters of coastal NBS can be identified according to their primary objective:

- *Cluster A – Mitigation of climate-related hazards and their impacts locally* – Cluster A refers to NBS that help reduce both the ocean drivers (i.e. relative sea-level rise or ocean acidification) and their impacts, e.g. coastal erosion and marine inundation, on atoll islands. An illustrative example is the protection or planting of mangroves in the intertidal zone, which helps raise the floor and hence attenuate relative sea-level rise. When considering other ocean drivers, the literature reports that pollution reduction (e.g., nutrient inputs, release of organic chemicals and trace metals such as mercury) can limit ocean acidification locally (Gattuso et al., 2018). The restoration of seagrass habitats can also help elevate local mean pH (Manzello, Enochs, Melo, Gledhill, & Johns, 2012; Anthony, Diaz-Pulido, Verlinden, & Andersson, 2013).
- *Cluster B – Direct intervention for maintaining the coastal protection services delivered by the reef system* – Cluster B includes NBS that preserve or enhance the role of the reef system in supporting human adaptation to both extreme and slow onset events (i.e. temporary/permanent erosion and marine inundation). Illustrative examples are beach nourishment, coral reef regeneration, and sand dunes revegetation.
- *Cluster C – Indirect protection/conservation of the coastal protection services delivered by the reef system* – Cluster C includes NBS that act more indirectly to preserve or strengthen the coastal protection function of the system, i.e. that aim at either enhancing good environmental conditions for the reef ecosystem and the reef-derived coastal sedimentary system, including coastal or intertidal vegetation, or avoiding additional anthropogenic pressures on these components. Illustrative examples are Marine Protected Areas (MPAs), or regulations prohibiting coastal vegetation clearing.

Because these are intertwined clusters, a given NBS could contribute to more than one of them. For example, mangrove replanting can both help mitigate relative sea-level rise (Cluster A) and create a vegetated barrier attenuating wave energy and reducing wave height (Cluster B). Table 1 applies this frame to examples of atoll-relevant NBS.

Table 1: Examples of NBS in atoll contexts, according to clusters defined above

	Clusters		
	A	B	C
	Mitigation of the climate-related drivers and hazards locally	Direct protection/conservation of the coastal protection service delivered by the reef system	Indirect protection/conservation of the coastal protection service delivered by the reef system
Mangroves replanting to help raise floor and then mitigate relative sea-level rise	X	X	
Restoration of the indigenous coastal vegetation (marine and terrestrial) to promote beach ridge formation and coastal feature upward growth, and therefore reduce the occurrence of marine inundation and coastal erosion	X		
Beach nourishment to control the risks of coastal erosion and marine inundation	X		
Alternatives to sediment dredging from reef flats (e.g., low-cost imported building material, awareness raising on alternatives to seawalls)		X	X
Alternatives to intertidal and coastal vegetation clearing (e.g., low-cost imported material for cooking)	X	X	X
Alternatives to aggregate mining from beaches and dunes for building and other purposes (e.g., low-cost imported material, new building standards using wood)		X	X
Marine Protected Areas to support healthy environmental conditions for the reef ecosystem, marine and coastal vegetation (mangroves, coastal vegetation, seagrass beds, etc.)			X
Coral farming		X	X
Assisted evolution and genetic modifications to enhance corals' adaptive capacities			X
Relocation of people and human assets to restore natural buffers (e.g., coastal retreat to reverse coastal squeeze trends), with co-benefits in terms of reducing the exposure of communities to the risks of coastal erosion and marine inundation			X

In most cases, facing the increase of climate change impacts on and human degradation of the atoll system requires the combination of a set of NBS. Furthermore, maintaining or restoring an ecosystem, here the reef system, implies acting on the various components of this system, i.e. (i) the nearshore and intertidal zones, where NBS mainly aim at reducing wave energy (e.g. through building or strengthening buffers, or through the plantation of vegetation); (ii) the coastal zone, which should be left undeveloped to also act as a buffering area; and (iii) in the “hold-the-line zone”, where buildings and infrastructure would be maintained, but upgraded to meet adequate standards, notably in terms of height and design (e.g. houses on stilts).

Especially in limited capacities contexts, NBS should not be thought of as being opposed (i.e. an alternative) to non-NBS options, but rather as being part of (i.e. combined with other measures) a more comprehensive solution to climate change. For example, the erection of an offshore breakwater in the nearshore zone, which is a hard structure, may guarantee the success of NBS aimed at restoring the various components of the reef-island system. In fact, by dissipating wave energy in the nearshore zone, such a breakwater may contribute to successful coral reef regeneration, vegetation restoration, and beach nourishment. On the other hand, breakwaters can also alter the environmental conditions on which coral growth depends, notably by reducing the beneficial effects of waves on reef flats, i.e., oxygen and nutrient inputs, and sediment removal from corals. This example first illustrates the importance of considering local context-specificities (nature, location, and extent of the environmental components in place, degree of human-induced disturbances, etc.) as a critical starting point for defining the appropriate balance between various options. Second, it raises a sensitive question: when are NBS the most promising options, and when do they become less effective? The next sections use the case of the Maldivian inhabited islands to answer this question.

3 Undermining of the coastal protection services by human activities in the inhabited islands of the Maldives

The assessment of change in atoll island land area, although essential to capture island behaviour, does not constitute a sufficient basis to design adaptation measures, because it has three major limitations. First, it masks the diversity of island situations. For example, islands that exhibited an increase in size may not have the same adjustment capacity in the face of ocean-climate related changes. Island growth can be driven either by human intervention (e.g. land reclamation), or by natural processes. While in the latter case islands may still have the capacity to adjust, in the former case they may not, due to the disruption of natural dynamics by land reclamation, as the latter generally causes a change in island configuration, the obstruction of sediment transport pathways, and aggregate extraction

from intertidal areas. Second, by focusing on island size, such an assessment does not document the real threats posed to inhabited islands that concentrate most human assets in a comprehensive way. Third, it provides no or limited indication of the potential undermining by direct (i.e. local) human disturbances of the coastal protection services delivered by the reef-island system. In order to address these limitations and capture the potential for NBS in atoll contexts, we conducted a nation-wide assessment of recent island change in the Maldives, using this country as illustrative of atoll contexts. Here, we focus on inhabited islands, and assess change in both island land area (which may be human-driven) and the degree of undermining of the coastal protection services provided by the reef-island system by human disturbances. These two variables are complementary to properly understanding an island's vulnerability to climate change and based on this, to designing island-specific adaptation measures.

3.1 Methodological background

Assessing changes in island size

The assessment is based on multi-date image analysis, using high resolution satellite images freely provided by Google Earth from the 2004–06 and 2014–16 time periods. Image availability and quality allowed assessing areal change for 107 inhabited islands out of 188 (i.e. 56.9%), including Male', the country's capital, and Hulhumale', an artificial island still under reclamation and expected to host ~150,000 inhabitants by 2020 (Naylor, 2015). Because they are distributed among the two Maldivian atoll chains extending from north to south, and because they include all island sizes (from 3.1 to 693 ha), the sample islands are representative of the situation of Maldivian inhabited islands.

Assessing the degree of undermining of coastal protection services by human activities

As a reminder, the coastal protection services delivered by the reef-island system include incoming wave energy attenuation and sediment supply to the coast. The latter is driven by reef productivity (i.e. reef health), reef-to-shore sediment transport (controlled by wave energy and the maintenance of clear sediment transport pathways), and the maintenance of accommodation space for sediment deposition at the coast. Despite recent attempts to evaluate the coastal protection service delivered by reefs (e.g. Ferrario et al., 2014; Quataert et al., 2015), such a task remains challenging, due not only to the complexity and variety of this ecosystem (Moberg & Folke, 1999; Elliff & Silva, 2017), but also to the great amount of work required if it was to be conducted island by island on a national scale. Yet, as nearby islands may exhibit highly contrasting situations, in regard not only to the exposure of human assets (i.e., people, infrastructures, and buildings), but also to

shoreline and environmental change (Duvat, Magnan, Wise, et al., 2017; Duvat, 2019), the island scale appears to be a very critical one.

To overcome these constraints, we designed a simple methodology allowing us to assess the degree of undermining of the coastal protection services provided by the reef-island system by direct, i.e. local, human disturbances. This methodology assesses the functionality of this system, i.e. the capacity to naturally respond and adapt to ocean-climate related pressures of its two major components, namely the coastal sedimentary system (extending from the base of the beach to the landward limit of active coastal features) and the reef ecosystem (extending seaward from the base of the beach to the atoll outer slopes). This assessment is based on photointerpretation, using the satellite images that were used to assess island area change. The adaptive capacity of the coastal sedimentary system was assessed based on a single variable, namely shoreline type, given that (i) natural shoreline is required for the maintenance of accommodation space for sediment deposition to occur at the coast (McLean & Kench, 2015; Duvat, Salvat, & Salmon, 2017), and (ii) shoreline hardening increases storm wave-induced sediment loss (Duvat et al., 2019; Pillet et al., 2019), which contributes to beach loss and thereby to the annihilation of the wave attenuation service provided by the beach. We classified shoreline type into five categories, i.e. entirely natural (100%; S1 in Panel A in Figure 1), predominantly natural (i.e. > 50% of shoreline length; S2), half-natural half-modified (between 45 and 50% of natural and the same proportion of modified shoreline; S3), predominantly fixed (i.e. > 50% of fixed shoreline; S4), and entirely fixed (100%; S5). The coastal protection service delivered by the coastal sedimentary system decreases from S1 to S5, as the degree of undermining of this service by human disturbances increases.

In addition, the functionality and adaptive capacity of the reef ecosystem was assessed by evaluating the extent of direct human pressures that (i) alter reef productivity and (ii) obstruct reef-to-shore sediment transport, including harbours, channel dredging across reef flat, erection of longitudinal marine protection structures (i.e. breakwaters), and sediment dredging from reef flat. Considering that the functionality of the reef ecosystem is inversely proportional to the extent of human disturbances, we distinguished three levels of undermining of the coastal protection service delivered by the reef ecosystem, from 'non-existent to limited' (R1 in Figure 1) to 'high to very high' (R3 in Figure 1).

Finally, the degree of undermining of the coastal protection services delivered by the reef-island system as a whole was obtained by aggregating these two indicators (S + R in Figure 1). This allowed distinguishing five island types, from *functional and potentially able to naturally adapt* (Type 1, i.e. T1 in Figure 1) to *non-functional and unable to naturally adapt* (Type 5, i.e. T5 in Figure 1). These five types correspond to various degrees of undermining of the coastal protection services delivered by the reef-island system: no undermining (Type 1), limited undermining (Type 2), moderate undermining (Type 3), high undermining (Type 4), and very high undermining (Type 5). Figure 2 provides real-world examples of these five types, using ex-

amples from the Maldives Islands. T1, T2, T3, T4, and T5 correspond to the five island types illustrated in Figure 1.

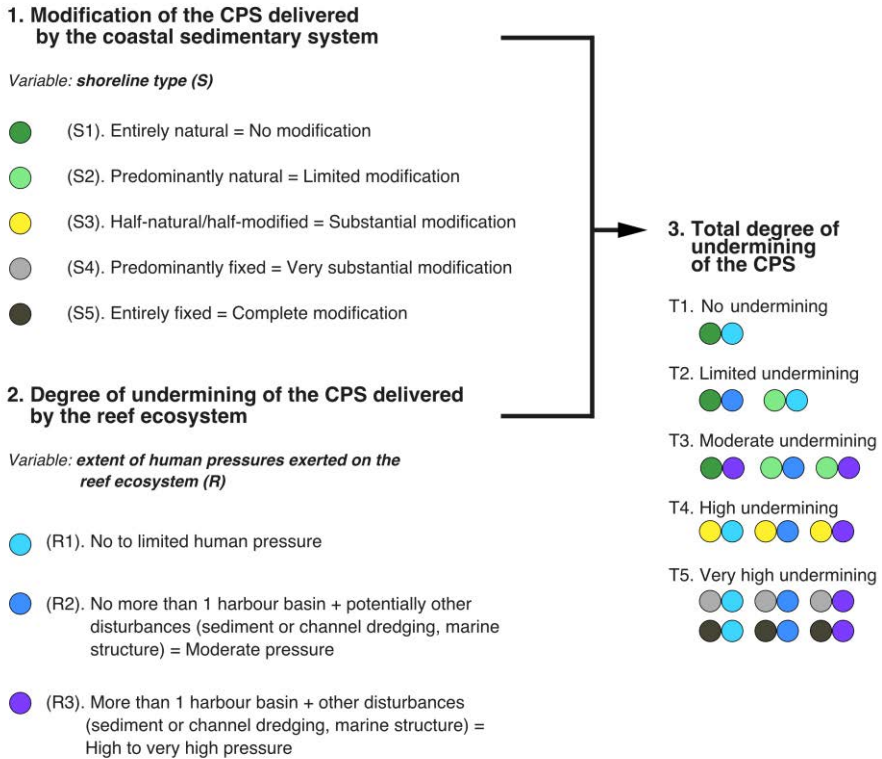


Figure 1: Methodology used to assess the degree of undermining of the coastal protection services (CPS) provided by the reef-island system by local human disturbances in atoll environments



Figure 2: Illustrative example of the five island types highlighting the contrasting degree of undermining of the coastal protection services (CPS) provided by the reef-island system by human activities in the Maldives (source: Duvat & Magnan, 2019).

A: Maafinolhu Island, Ihavandhippolhu Atoll, illustrates the situation of an undisturbed island (Type 1). B: Kudabados Island, North Kaafu Atoll, shows the situation of an island exhibiting limited undermining of the CPS by human activities (Type 2). C: Hirimaradhoo, Haa Alifu-Noonu Atoll, shows a significant undermining of the CPS, especially on its eastern coast (Type 3). D: Rasdhoo Island, Rasdhoo Atoll, illustrates a substantial undermining of CPS (Type 4), as a result of extensive shoreline modification and armouring, reef degradation, and sediment transport obstruction, due to the establishment of a harbour on its northern side and to the erection of breakwaters on its eastern side. Panels E (Fiecali Island, Faafu Atoll) and F (Muli Island, Meemu Atoll) show a very substantial undermining of CPS (Type 5), as a result of island artificial expansion, still in operation on F,

extensive shoreline armouring, and extensive reef flat mechanical destruction due to harbour establishment, boat channel, and sediment dredging.

3.2 Synthetic results

Change in island size

The results indicate that over the past decade (i.e. between 2004–06 and 2014–16), none of the 107 study inhabited islands underwent a reduction in size. Importantly, while 41.1% of them (i.e. 44 islands) remained stable in area, 58.9% (i.e. 63) increased in size. The latter underwent high rates of expansion, with respectively 47.6%, 27.0%, and 25.4% of these ‘growing islands’ exhibiting growth rates ranging from 3 to 10%, 10 to 25%, and more than 25% (Table 2). Although the period of analysis considered here is shorter than the one considered in abovementioned shoreline change studies (i.e. decadal vs. multi-decadal), the results confirm that the majority of inhabited islands, far from undergoing a reduction in land area, expanded, and in this case very rapidly. The highest rates ($> 10\%$) were however due to land reclamation, which was generally carried out for urbanisation or infrastructure construction purposes, and with consequences on the remaining potential for NBS.

Table 2: Change in inhabited island land area in the Maldives between 2004-06 and 2014-16

Change in land area	No. of islands	Percentage	
		Related to the total no. of islands	Related to the no. of islands in each land area change category
Decrease ($\leq -3\%$)	0	0.0	0.0
Relative stability ($\pm 3\%$)	44	41.1	100.0
Increase ($\geq 3\%$)			
$3 \leq x < 10\%$	30	28.0	47.6
$10 \leq x < 25\%$	17	15.9	27.0
$25 \leq x < 50\%$	3	2.8	4.8
$50 \leq x < 100\%$	8	7.5	12.7
$x \geq 100\%$	5	4.7	7.9
Total increase	63	58.9	100.0
Total	107	100.0	/

Human-driven undermining of the coastal protection services of the reef-island system

The results (Figure 3) show that Maldivian inhabited islands generally fall within types 3 to 5, therefore exhibiting a moderate to very high level of undermining of

the coastal protection services provided by the reef-island system by direct human disturbances. In 2014–16, 73 islands (68.2%) exhibited a moderate human-induced undermining (T3) of these services, while respectively 8 (7.5%) and 23 (21.5%) islands experienced a high (T4) and very high (T5) level of undermining (Figure 3, Panel A). Of note, these proportions were much lower in 2004–06 (72 islands falling within T3 to T5) compared to 2014–16 (103 islands). Importantly, only 7 islands (compared to 23 in 2014–16) belonged to T5 in 2004–06 (Figure 3, Panel A).

		2014-16					n.d.	Total 2004-06
		T1	T2	T3	T4	T5		
2004-06	T1	0	0	6	0	0	-	6
	T2	0	1	24	1	0	-	26
	T3	0	0	43	3	11	-	57
	T4	0	0	0	3	5	-	8
	T5	0	0	0	1	6	-	7
	n.d.	-	-	-	-	-	3	3
Total 2014-16		0	1	73	8	22	3	107

 Increase	in human-induced undermining (HIU) of the coastal protection services (CPS) delivered by the reef-island system
 No or limited change	
 Decrease	

Change in HIU of the CPS	No. of islds	%
Decrease	1	0.9
Relative stability	53	49.5
Increase	50	46.7
n.d.	3	2.8
Total	107	100

Figure 3: Human-induced undermining (HIU) of the coastal protection services (CPS) delivered by the reef-island system on Maldivian inhabited islands over the past decade. Panel A shows changes in island types (T1 to T5) between 2004–06 and 2014–16. See Figures 1 and 2 for the description of island types. Panel B summarises the results.

These results show a marked increase in human-induced undermining of the coastal protection services delivered by the reef-island system in only one decade (Figure 3, Panel B). They highlight that almost all inhabited islands currently exhibit a moderate to very high level of human-induced degradation of the coastal protection services delivered by the reef-island system to island communities. However, three contrasting situations can be distinguished: (i) T3 islands, representing 68.2% of inhabited islands, experience a partial degradation of these services, mainly due to the weakening of the functions of the reef ecosystem. On these islands, the reef ecosystem still partly fulfils its functions, and because the shoreline is predominantly natural, it is still able to adjust to ocean-climate related pressures. As a result, the coastal protection services are still functional along most of the

shoreline of these islands, with the exception of hardened shoreline sections and harbour areas exhibiting disrupted sediment production, transport, and deposition patterns. In contrast, T4 and T5 islands exhibit highly degraded coastal protection services. *(ii)* T4 islands (7.5%) experience extended reef flat degradation and shoreline hardening or destabilisation. As a result, along most of the shoreline of these islands, these coastal protection services are no longer delivered by the reef-island system. *(iii)* Last, on T5 islands (20.6%), the coastal protection services have been totally undermined by local human disturbances. On these islands, the reef ecosystem has been extensively damaged by the reclamation of the reef flat, and the shoreline is nearly entirely to entirely fixed, depending on cases. Such results suggest first, that the potential for NBS will be highly variable depending on the island type considered, and second, that this potential may rapidly decrease over time, especially on islands exhibiting high human disturbances. These findings advocate for the design of island-specific (i.e. based on island types) adaptation pathways taking into account change in island capacity to adapt.

4 NBS as triggers for atoll adaptation pathways

The emerging ‘adaptation pathway’ approach refers to long-term adaptation strategies based upon decision cycles that, over time, sequence a set of possible actions based on alternative external, uncertain developments (Haasnoot, Kwakkel, Walker, & ter Maat, 2013; Barnett et al., 2014; Wise et al., 2014). Adaptation pathways are fundamentally designed to cope with multiple-source uncertainty (climate change and socio-economic trends, emergence of tipping points, etc.) and hence to enhance systems’ flexibility (Brown, Nicholls, & Woodroffe, 2014; O’Brien et al., 2012; Noble et al., 2014). In addition, their context-specific nature is widely recognised. To date, applications of the adaptation pathway approach to atoll systems have been little explored. Here, based on our own expertise, we propose a five-pillar pathway (Magnan, 2018). Each of the pillars as well as the role of NBS in their implementation are described in a separate sub-section. Based on these developments, the final sub-section proposes a synthesis of the role of NBS in supporting such an atoll adaptation pathway.

4.1 A generic adaptation pathway for atoll contexts

The proposed five-pillar adaptation pathway framework for atolls considers multiple temporal scales and sea-level rise scenarios (Figure 4). While the first three pillars – *(i)* increase ecosystem resilience, *(ii)* minimise the risk of maladaptation, *(iii)* facilitate internal relocation – deal with short-to-medium-term strategies with expected long-term benefits, the two last ones – *(iv)* island fortification associated with ground elevation, and *(v)* permanent international migration – address medi-

um-to-long-term worst-case scenarios and must be considered, especially (v), as forming a back-up plan.

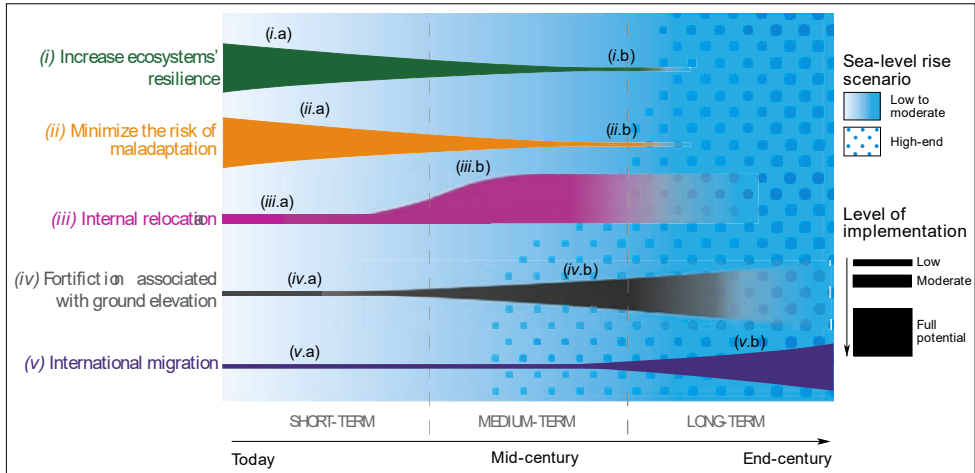


Figure 4: A five-pillar adaptation pathway framework for atoll countries to cope with sea-level rise over the 21st century. In this figure, sea-level rise is schematised for an approximately 1 m rise (deeper blue) in global mean sea-level by the end of the century compared to the pre-industrial period, and according to the IPCC Representative Concentration Pathways 8.5 (RCP8.5) high greenhouse gas emission scenario. The blue dots represent far higher sea-level rise scenarios (e.g. > 2 m), as suggested by very recent studies on ice-melting in Antarctica (DeConto & Pollard, 2016; Kopp et al., 2017) and/or in the case of the reaching of tipping points. Symbols (i.a) to (v.b) describe various stages of implementation of the (i) to (v) pillars (see main text). The thickness of the drawings therefore describes the theoretical level of implementation of each pillar. It goes from thin lines in the case of a low level of implementation to very thick lines in the case of a full implementation. Colours becoming transparent indicate the progressive obsolescence of the pillar, i.e. its decreasing ability to continue providing solutions to address sea-level rise and ocean change impacts in general. Of note, this figure does not consider the variability of the level of implementation of each pillar from one island or atoll to another and according to diversified local-to-national context-specificities. As a result, full implementation of pillar (i), for example, could refer to different potentials in different case studies.

In Figure 4, symbols (i.a) to (v.b) describe various stages of implementation of the pillars, with (iv.a) to (v.b) constituting a back-up plan in case of worst-case sea-level rise scenarios. (i.a) captures massive short-term actions to protect healthy ecosystems (sand dunes and beaches, coral reefs, mangroves, etc.) and restore already degraded ones. (ii.a) encompasses massive short-term actions to minimise the anthropogenic drivers of vulnerability, e.g. through the control of coastal urbanisation, risk awareness raising, improved access to freshwater and non-imported food

resources. *(i.b)* and *(ii.b)* represent the needed long-lasting efforts to maintain safe environmental and living conditions, for example to continue benefiting from some ecosystem services such as coastal protection and food supply, and to limit anthropogenic contribution to environmental problems. *(iii.a)* captures the preparation phase of an internal relocation plan considering not only the relocation of people to safer places within the same island or in neighbouring ones, but also options to unclog capital areas through regional development in outer islands, as done in the Maldives, for example. *(iii.b)* describes the implementation phase of the internal relocation plan, including long-lasting monitoring and adjustment efforts. *(iv.a)* represents the maintenance of the protected shoreline length as it is today or as planned in the already ongoing projects, without any new major protection works being undertaken. *(iv.b)* captures the development of ground elevation works preferably on uninhabited islands and/or artificial islands, together with the elaboration of a resettlement plan for urban and rural populations at risk, suggesting links to be made with *(iii.a)* and *(iii.b)*. *(v.a)* represents the elaboration of an international migration plan in contemplation of a possible high-end sea-level rise scenario. In accordance with the work undertaken by the international community on the definition of legal bases for international migration, such a plan must address multiple dimensions, from the issues related to the departure of people (e.g., education programmes, funding securing, etc.) to the hosting conditions in the country of destination (e.g. bi- or multi-lateral national agreements, access to living conditions comparable to the ones lost, maintenance of cultural and social values, etc.). Finally, *(v.b)* describes the implementation of the international migration back-up plan.

4.2 Increase ecosystem resilience

Because the reef ecosystem functions (i.e. wave energy dissipation and sediment supply to islands) are indispensable to atoll habitability and are increasingly undermined by both human activities and ocean changes (sea-level rise, ocean warming and acidification), one first unavoidable way to enhance adaptation pathways in atolls consists in maintaining or restoring ecosystem resilience. This pillar applies to the reef-island system as a whole, including the reef ecosystem, reef-derived beach, beach-dune system and its vegetation, and intertidal mangroves. It is all the more valuable that natural islands > 10 ha that have undisturbed nearshore dynamics are healthy, i.e. were either stable or increased in size over the past decades (Duvat, 2019). The fact that natural ecosystems have up to now at least partly adapted to changing ocean conditions advocates for ecosystem protection and restoration.

It is obvious that the three NBS clusters have a critical role to play in supporting this ecosystem resilience pillar (Figure 5). For instance, as mentioned earlier, mangrove replanting can seriously help mitigate relative sea-level rise impacts at the coast (Cluster A). Also, avoiding clearing the indigenous coastal vegetation belt

(Cluster B) that usually surrounds atoll islands would help limit storm-induced marine inundation, as indigenous species have proved to be more resistant and resilient than non-indigenous species (Stoddart, 1963, 1965; Duvat et al., 2016; Duvat, Volto, & Salmon, 2017; Duvat et al., 2019). While coral reef restoration (Cluster B) can also be of direct help, the development of Marine Protected Areas (MPA, Cluster C) can contribute to healthier ecosystems, and hence indirectly support the contribution of the latter to coastal risks reduction now and in the long run. MPA's contribution will however hugely depend on the effectiveness of management systems associated with each MPA, as shown in some recent studies (Abelson et al., 2016; Albright et al., 2016; Cinner et al., 2016).

This pillar is especially relevant for T1 and T2, as they still have healthy and functional ecosystems (Figure 5). It can also play an important role in T3 inhabited islands where the coastal protection services are still delivered by the reef system, although they were degraded by human activities along some shoreline sections. On T3 islands especially, restoring the functionalities of the reef-island system would produce short- and medium-term benefits that would help limit the path-dependencies to human intervention, e.g. the resort to coastal engineered structures to protect exposed human assets. In contrast, because coastal protection services have already been extensively to totally undermined by human activities on T4 and T5 islands, e.g. on atoll capitals (e.g. Male', South Tarawa), this pillar has a more limited potential on these islands.

4.3 Minimise the risk of maladaptation

According to Juhola, Glaas, Linnér, and Neset, (2016, p. 139), societal maladaptation is defined "as a result of an intentional adaptation policy or measure directly increasing vulnerability for the targeted and/or external actor(s), and/or eroding preconditions for sustainable development by indirectly increasing society's vulnerability". Minimising the risk of maladaptation strongly relates to limiting the prevailing anthropogenic drivers of vulnerability that operated over the last decades and contributed to past and current maladaptation (Magnan et al., 2016; Duvat, Magnan, Wise, et al., 2017). A classic example is the construction of new buildings in flood-prone areas, e.g. on recently accreted sand spits in South Tarawa Atoll as a result of uncontrolled in-migration from outer rural atolls (Duvat et al., 2013). Because of economic and social path-dependency effects (i.e. spatial concentration of economic activities and modern jobs, education and health opportunities, etc.), reversing recent trends in maladaptive anthropogenic features such as urbanisation, represents an area of 'unavoidable' solutions for adaptation (Magnan & Duvat, 2018; Magnan, 2018).

Here again, NBS could critically contribute to this end. For example, the consideration of the topography and elevation (Cluster C) is a prerequisite for urban planning to avoid the construction of new human assets in flood-prone areas. This can be supported by introducing the climate impacts buffering role of the envi-

ronment in education programmes (Cluster C). Similar to the previous pillar, making the indigenous vegetation a strong basis for any management and settlement plans (Cluster B) would bring important benefits in terms of coastal risk reduction. Finally, the development of nature-friendly building standards, the design of which considers the natural dynamics of the coastal sedimentary system, can be considered as a NBS. For example, houses on stilts (Cluster C) allow the maintenance of clear sediment transport pathways and hence sediment deposition at the coast, with benefits in terms of reducing both coastal erosion and marine inundation (for the latter, due to the upwards growth of coastal features). Building on stilts also reduces the direct exposure of human assets to marine inundation, hence referring to Cluster A.

Because “minimising the risk of maladaptation” allows limiting the exposure of human assets in all atoll contexts, it theoretically applies to all of the Maldivian inhabited island types, from T1 (undisturbed islands) to T5 (very highly disturbed islands that have lost the natural capacity to adapt). NBS contribution to this pillar however varies significantly across island types. For example, few T5 islands have proper coastal defences, i.e. adequately designed, calibrated, and continuous along the shoreline. Male’ is an exception, as its entire shoreline was equipped with properly engineered structures following the highly destructive 1987 distant-source swell event (Cazes-Duvat, 2005; Wadey et al., 2017). In such contexts, the potential for NBS remains limited, not to say almost nil in extreme cases such as Male’ where the reef ecosystem has been extensively destroyed by land reclamation (Naylor, 2015). Yet, various examples in developing and developed coastal countries demonstrate similar storylines as Male’ in 1987, i.e. the failure of massive engineered structures to protect people and human assets, due to low maintenance levels (e.g. New Orleans in the face of Katrina in 2005, France during the Xynthia storm in 2010; Temmerman et al., 2013). Collectively, these insights suggest that coastal protection structures should not be considered as a self-sufficient solution in the face of increased climate pressures, and that where they are not already prominent (T1 to T3 islands in this study), NBS should be considered. Whatever the option, the above advocates for the ‘unavoidable’ nature of this pillar.

4.4 Facilitate internal relocation

Before considering international migration, internal relocation possibilities should be assessed (e.g., Owen, Kench, & Ford, 2016), as this strategy may first help address the inextricable problems faced by some capital islands before becoming a way to cope with sea-level rise. Noteworthy is that this pillar is highly complementary to the previous one dealing with the risk of maladaptation, as well as that it will necessarily benefit from the first one on maintaining/restoring ecosystem resilience. A key specific point here is that atoll islands have contrasting topographic profiles, making some of them intrinsically more vulnerable to climate-related pressures than others (Woodroffe, 2008). Islands that have higher elevations, that

are little exposed to tropical cyclones due to their latitudinal location, and that either increased or remained stable in area over the last decades, should especially be considered as potentially offering valuable relocation opportunities, provided that they also meet other requirements (e.g. have freshwater and food resources) and do not raise inextricable land tenure problems. This could be the basis for a settlement plan using all of the NBS clusters, e.g. by settling areas located at the back of the most elevated coasts (Cluster A), maintaining the coastal indigenous vegetation (Cluster B), and using stilts for constructions as much as possible (Cluster C).

As in the case of South Tarawa in Kiribati, capital atolls generally have a high number of rural and uninhabited islands extending in continuity with the densely settled areas that could be, if they met the abovementioned conditions, considered for internal relocation. Furthermore, envisaging the relocation of the people and human assets of these densely populated islands (e.g. 13,000 inhabitants/km² on Betio, South Tarawa) on some other islands (either natural, or rural) in the same atoll would provide an opportunity to get out of the inherited path-dependency (i.e., resort to engineered structures to reduce risks, which in turn increases human assets' exposure, due to beach disappearance, and vulnerability as a result of the false sense of security caused by the construction of such structures) caused by the unsustainable development practices of the past decades.

4.5 Island fortification associated with ground elevation

In atoll countries having very low-lying and small islands, such as the Maldives (Aslam & Kench, 2017; Duvat, 2019), the protection of existing settlements and/or internal relocation may require ground elevation and coastal protection by adequate engineered structures. The option of creating such 'safer islands' had incidentally been envisaged by the Government of the Maldives after the December 2004 tsunami, with the Hulhumale' artificial island as a real-life test. Although controversial, this experience suggests that this 'fortification + ground elevation' pillar could constitute an option in the face of this country's specific constraints, including projected sea-level rise and rapid population growth (almost doubling of the population every 25 years over the past decades).

This pillar however requires, first, adequate material extraction sites to be identified to avoid destroying reef flats supporting islands (Cluster C), and second, long-run financial and technical international support. That is, it imposes potentially major negative collateral effects on the local environment, as well as a high dependence on external funding. Despite this, it should still be considered as it can offer one of the few available options for already densely populated areas such as the capital islands (e.g. Male'/Hulhumale' in the Maldives), where the space for pillar (i) (see Figure 5) is often low due to already high levels of coastal and marine environmental degradation. It can however largely benefit from the implementation of pillars (ii) and (iii). But as a whole, this pillar offers little room for manoeuvre.

vre for NBS. It should be more specifically considered in the future for T4 and T5 Maldivian islands for which other solutions are not appropriate given, first, the high level of degradation of the reef-island system, and second, the high number and crucial importance (i.e. people, buildings, infrastructure) of highly exposed human assets.

4.6 Permanent international migration

The permanent international migration of atoll populations option should be considered as a very last resort in case of high-end sea-level rise scenarios (Figure 5). On the ground, international migration of atoll populations remains mostly theoretical. On the one hand, there is still no scientifically based, uncontroversial evidence on the prevailing role of undergoing climate change impacts in people's decision to move abroad permanently (Connell, 2012). On the other hand, no example exists of a country ready to host an entire environmentally displaced nation. Despite this, we argue that this pillar must still be considered as being part of the panel of options for atoll countries, for three main reasons. First, because there is still uncertainty regarding the 21st century in terms of both the future rates of sea-level rise (especially in the second half of the century) and atoll island physical response to changing conditions (including ocean warming and acidification). Second, because even in the case of drastic greenhouse gas emissions mitigation at the global scale in the coming decades, sea level will continue to rise beyond the 21st century (Church et al., 2013), this fact imposing the need to not limit reflections on atoll population future to the next decades only. Third, because latency phenomena in human systems (i.e. in social, decision-making, and economic processes) call for a multi-decadal anticipatory approach. This last point means that the implementation of responses that are compatible with sea-level rise worst-case scenarios needs time to be designed, hence the usefulness, for example, of starting to discuss the legal status of climate refugees from now on and despite scientific controversies (e.g. Yamamoto & Esteban, 2014). Anticipating international migration is all the more important because it requires concerned communities to have financial means (Oakes, Milan, & Campbell, 2016) and to be provided with adequate resources in the country of destination (Allen, 2012).

Due to multiple sources of uncertainty, this pillar must thus be considered as a back-up plan rather than a priority strategy. There is however no space for nature-based action here, as NBS apply to the local context and as this back-up pillar precisely consists in leaving such a local context.

The previous sub-sections suggest that while various types of NBS can bring multiple benefits for enhancing societal adaptation and thus reduce long-term vulnerability to climate-related hazards, especially coastal erosion and marine inundation, their potential contribution is and will still be highly variable across space and time (Figure 5).

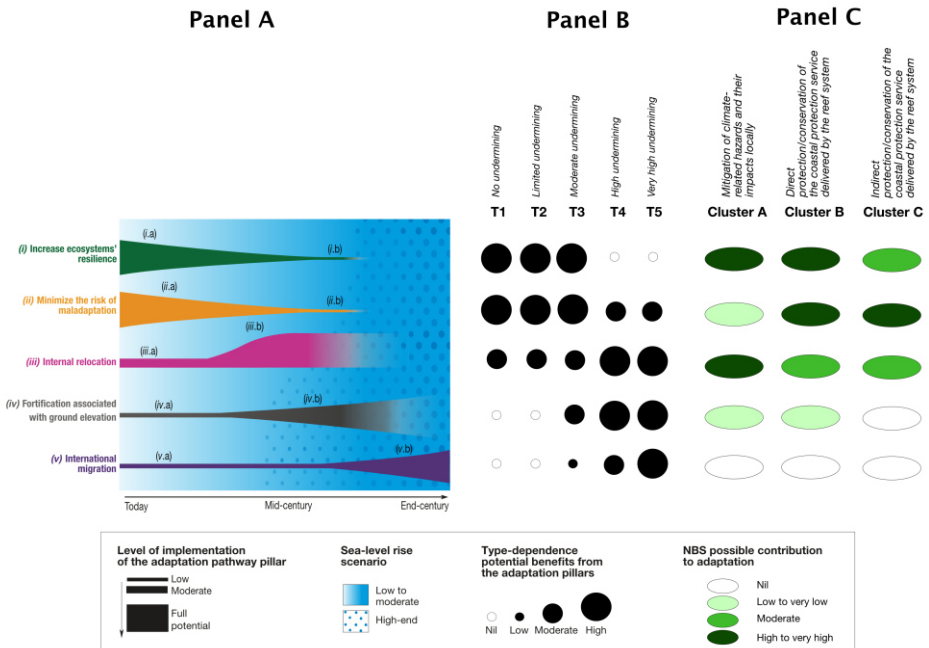


Figure 5: Contrasting potential contribution of nature-based solutions to atoll island adaptation pathways for five distinct island types. See Figure 4 for explanations of Panel A (adaptation pathways). Panel B shows the highly-variable (from nil to high) potential benefits that can be expected from each adaptation pillar for the five island types considered in this study. It highlights the decreasing potential benefits provided by pillars (i) and (ii), from island types T1-T3 to T4-T5. Panel C shows the decreasing contribution of NBS to adaptation from the (i) increase ecosystem resilience and (ii) minimise the risk of maladaptation to the (iii) internal relocation, and then to the (iv) fortification associated with ground elevation and (v) international migration adaptation pillars.

5 Concluding discussion on the potential contribution of NBS to atoll adaptation pathways

Using the case of the inhabited islands of the Maldives, we highlighted the variable contribution of NBS to enhance adaptation pathways in atoll islands. Such a potential contribution will however not only depend on island types, but also on three major contextual elements:

- As both the shaping and effectiveness of NBS critically depends on local context specificities, any change in the natural components of the considered system (reef-island system here, which may exhibit differences in configuration from one setting to another) due to the combined impacts of ocean changes,

i.e. sea-level rise, ocean warming, and ocean acidification, will affect NBS contribution.

- The potential effectiveness of any NBS also critically depends on in-place ecosystem condition and derived morphological features, and will thus be impacted by future levels of human-driven environmental degradation, either in terms of mechanical destruction (e.g. mangroves clearing or aggregate mining from reef flats) or more diffuse degradation (e.g. coastal water pollution), even if some NBS precisely consist of repairing anthropogenic damages (e.g. coral farming or beach nourishment). While NBS can have a critical role today in little-disturbed reef environments, this paper shows that they have a limited potential on significantly to highly disturbed environments.
- Finally, the type of climate scenario that will operate in the coming decades will also affect potential NBS efficacy. Although there is a gap in scientific research on the contribution of NBS under various end-century climate change scenarios, it is arguable that NBS could become ineffective if high-end climate change scenarios are reached in the coming decades.

All of this suggests a possible decreasing importance of NBS contribution as long as we progress into the adaptation pathway pillars sequencing (i.e. from top-left to bottom-right in both Panels A and C in Figure 5). The results emphasise that today, in the Maldives, NBS represent a promising area of action in more than two thirds of the 107 sampled inhabited islands, with multiple benefits that will in turn reduce coastal risks and increase NBS effectiveness in the future. As a result, in these inhabited islands (mainly T2 and T3) and in all ‘natural’ islands (T1), positive feedback loops can still be engaged, with a sequencing of NBS reflecting the first three pillars of the adaptation pathway approach presented in Figure 4 and Figure 5 (i.e. “increase ecosystem resilience”, “minimise the risk of maladaptation”, “facilitate internal relocation”). However, in already densely populated islands (T4 and T5), the space for NBS is already limited, and the “island fortification associated with ground elevation” pillar must be prioritised. This does not prevent NBS being used to help reduce coastal erosion and marine inundation, but the former will only have limited benefits for risk reduction. Finally, because it consists in leaving atolls, the “permanent international migration” pillar leaves no space for *in situ* NBS.

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4

Distributing scarce adaptation finance across SIDS: Effectiveness, not efficiency

Christian Baatz and Michel Bourban

Although Small Island Developing States (SIDS) receive high amounts of adaptation finance on a per capita basis, current and expected funding is much lower than present and future adaptation costs. Since funding is insufficient to cover all needs, adaptation finance ought to benefit those who are most entitled to the funding. These entitlements can be determined via prioritisation criteria. Vulnerability is the most prominent prioritisation criterion but must be supplemented with further criteria because of its shortcomings. In this contribution we thus investigate whether cost-effectiveness and democracy should play this role. To this end, we first discuss Stadelmann and colleagues' proposal to operationalise the cost-effectiveness criterion via three indicators (absolute economic savings, relative economic savings, and avoided loss of Disability Adjusted Life Years). We argue that this set of indicators fails to capture important adaptation benefits and may reinforce the current bias towards hard adaptation measures. We further claim that one should 'just' focus on safeguarding effective, that is successful, adaptation instead. To that effect, we propose 'democracy' as an alternative to cost-effectiveness. We first justify the criterion by providing intrinsic and instrumental reasons in its defence and, second, discuss how to operationalise it, using the example of SIDS. We conclude that although also challenging, democracy is less difficult to operationalise than cost-effectiveness.

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1 Introduction

While Small Island Developing States (SIDS) are not a homogeneous political, social, or cultural group, they share common characteristics that distinguish them as highly vulnerable to climate change, such as smallness, isolation, and remoteness. All SIDS are exposed to severe climate impacts, such as sea-level rise, stronger and more frequent storms, coastal erosion, cyclones, and changing rainfall patterns, and thus face high relative adaptation costs (Nurse et al., 2014). For instance, the costs of shore protection works aimed at reducing the adverse effects of sea-level rise in small islands is substantially higher in terms of both per capita and percentage of GDP than the costs of similar structures in larger territories with larger populations and higher levels of gross national income per capita (Nurse et al., 2014).

Many SIDS use international adaptation financing to meet adaptation costs and ease domestic constraints. Between 2003 and 2017, multilateral climate funds provided US\$ 1,380 million to the 38 UN member SIDS for 210 projects of both mitigation and adaptation. Approximately 56% of climate finance has contributed to adaptation efforts, 25% has contributed to mitigation, 3% has contributed to REDD projects, and 16% has had multiple foci (Watson, Bird, Schalatek, & Keil, 2017). To date, most adaptation finance has been provided through bilateral channels. Between 2010 and 2014, OECD countries self-reported committing an estimated US\$ 2 billion in adaptation finance to all 58 countries classified as SIDS, 51% of which went to Cabo Verde, Dominican Republic, Haiti, Guyana, and Timor-Leste (Robinson & Dornan, 2017). On a per capita basis, SIDS were among the largest recipients of adaptation aid between 2010 and 2015 (Betzold & Weiler, 2018, p. 116). However, it is difficult to measure aggregate flows of international adaptation finance. Even though OECD countries claim that US\$ 10.1 billion of bilateral aid was adaptation-related in 2012, Weikmans and colleagues (2017, p. 466) conclude that only US\$ 2.35 billion appeared to be genuinely adaptation-related, and that only US\$ 1.2 billion seemed to have targeted adaptation as a principal objective.¹

Still, despite growing and substantial (self-reported) adaptation finance flows to SIDS, they cover only a small part of actual adaptation needs (Watson et al., 2017, p. 1). In such a context of scarcity, finance should benefit those who are most entitled to the funding. These people can be determined, in principle at least, via so-called prioritisation criteria.

Vulnerability is the most prominent criterion in both political and academic debates. Scholars agree that adaptation finance ought to benefit those who are

¹ These significant differences are mainly a result of the over-coding of adaptation-relevant projects by donor countries, a problem caused by the absence of independent quality control in the Rio marker reporting system, a lack of clarity within aid agencies about the distinction between climate change adaptation and other types of environmental projects, and the pressure on developed countries to show that they are taking action on climate adaptation (Weikman et al., 2017, pp. 467–468).

most vulnerable to climate change (e.g. Ciplet, Roberts, & Khan, 2012, p. 60) and all major United Nations Framework Convention on Climate Change (UNFCCC) agreements have restated this principle (see Klein & Möhner, 2011, pp. 16–17). Yet, as Pickering (2012, p. 5) states, “broad agreement on this issue masks two important areas of disagreement, namely how vulnerability should be conceived and measured, and whether (and which) other principles could also inform prioritization”.

While SIDS have been recognised as ‘particularly vulnerable’ throughout the history of climate negotiations, from the UNFCCC to the Paris Agreement (Weikmans, 2016, pp. 5–7), this category is very broad. There is no consensus on the list of countries that should be classified as ‘highly vulnerable’ (Weikmans, 2016, p. 7). And even among SIDS, vulnerability varies considerably both between and within countries, as a result of geographical, social, and political factors (Sjöstedt & Povitkina, 2017). For instance, SIDS include both least developed countries like Comoros and Tuvalu and high-income countries like Singapore, Trinidad and Tobago, Barbados, and Bahamas.

Treating SIDS as a group with homogeneous entitlements therefore does not make much sense. A more refined approach is necessary and several studies have developed complex, aggregate global vulnerability indices (e.g. Barr, Fankhauser, & Hamilton, 2010; Chen et al., 2015). However, “the rankings of countries yielded by the various indicators diverge greatly” (Mathy & Blanchard, 2015, p. 757), “there is no agreed way of assessing [...] and comparing the vulnerability of countries” (Klein & Möhner, 2011, p. 16) and “all attempts to allocate adaptation funding based on aggregate national-level indices of vulnerability to climate change have been deeply unsatisfying” (Füssel, Hallegatte, & Reder, 2012, p. 323).² This may not come as a surprise since data aggregation requires a lot of empirical and normative assumptions, some of which are rather controversial. As long as no agreed methodology exists, aggregating many heterodox factors that influence vulnerability into a single number will “not reveal more but rather disguise[s] what is known” (Hinkel, 2011, p. 205). Therefore, basing the prioritisation of adaptation finance on such an index-based vulnerability ranking is too arbitrary and not a reasonable option (Barr et al., 2010, pp. 845–846; Füssel, 2010, p. 608; Hinkel, 2011, p. 206).

If vulnerability should not be the sole, and perhaps not even the main, prioritisation criterion, distributing funding on the basis of the (expected) benefits of different adaptive measures might be a reasonable complementary criterion. In this regard, Stadelmann and colleagues (2014, 2015) propose different cost-effectiveness indicators that enable such comparisons. Since we dispute that using these indicators as universal metrics in the prioritisation of adaptation finance is desirable and think that alternative indicators for cost-effectiveness would face similar problems, we propose ‘democracy’ as a better complementary criterion to

² The verdict also holds for more recent studies (Baatz, 2017).

vulnerability to check whether conditions exist that allow for desirable adaptation processes and outcomes.

All three criteria already seem to play some role in the distribution of international funding in practice. Countries that are more *vulnerable* to climate change tend to receive more bilateral adaptation finance, at least if the physical components of vulnerability, that is exposure and sensitivity to climate risks, are measured (Betzold & Weiler, 2018, p. 166). Since vulnerability is also influenced by social factors determining people's adaptive capacity (IPCC, 2014, p. 21), a distribution according to physical vulnerability may not prioritise the most vulnerable, all things considered. Bilateral donors also tend to give more adaptation finance to better governed countries, since they are perceived as better able to use resources in an effective and *efficient* manner (Betzold & Weiler, 2018, p. 116). Thus, (perceived) efficiency, i.e. cost-effectiveness, seems to influence funding decisions but is not used as a discrete allocation criterion. The level of *democracy*, on the other hand, is positively correlated with the amount of foreign aid a country receives (e.g. Dollar & Levin, 2006). Similarly, well-governed countries are substantially more likely to receive adaptation finance and to receive higher levels of adaptation aid per capita (Weiler, Klöck, & Dornan, 2018, p. 74). The notion of good governance and how it is measured by Weiler and colleagues, however, includes aspects that go beyond democracy (e.g. whether regulation enables growth), and the robustness of the indices usually employed to measure democracy has been questioned (e.g. Thomas, 2010). That being said, it is likely that democracy positively affects funding levels.

This chapter does not investigate whether and how these criteria are used, but aims at answering the normative question of whether cost-effectiveness and democracy *should* guide the distribution of scarce funding in the context of adaptation. We proceed as follows: Section 2 critically discusses Stadelmann and colleagues' proposal; Section 3 briefly argues that, instead, criteria and related indicators should show to what extent conditions allowing for effective adaptation prevail; Section 4 develops our proposal for a democracy criterion; and Section 5 summarises key findings.

2 Cost-effectiveness as a (further) prioritisation criterion?

Generally, adaptation funding should be effective, i.e. reach its desired goal(s). In human systems, the goal of adaptation is to reduce current and expected climate-induced harms (Field et al., 2014, p. 40; Hartzell-Nichols, 2011).³ Reducing harm is a very general goal when it comes to adaptation finance. Given scarce funding, among other things, a reasonable aim of international adaptation finance is not so

³ The IPCC adds that adaptation also aims at exploiting beneficial opportunities (Field et al., 2014, p. 40). As the goal of adaptation finance should be minimising or avoiding net harm, we ignore this aspect.

much to reduce – and ideally avoid – any kind of harm, but to minimise *serious* harm.

In order to determine which harm should count as ‘serious’, a normative theory is required. In line with previous works we adopt a human rights framework according to which all human beings have certain rights, as for example those laid down in the Universal Declaration of Human Rights (1948). Everybody is bound by these rights and the associated duties not to violate them, to contribute to protecting them, and to aid those deprived of their rights (Shue, 1980). On this account, all those harms are serious that undermine people’s ability to exercise their human rights.⁴ The account offers a sufficientarian threshold of what people are entitled to as a matter of justice. People may be entitled to more in terms of global justice (i.e. what people from everywhere owe them) and to much more in terms of national justice (i.e. what they are owed by fellow citizens). As citizens of country X they may be entitled to basic income, education, health services, and other goods that go (far) beyond what is established by this human rights account. We adopt a less demanding standard to avoid controversial but unnecessary assumptions.

There is a broad agreement in the literature that climate change will undermine and is already undermining the exercise of several internationally protected human rights, such as the right to life, to an adequate standard of health, to the means for subsistence, and to shelter and property – and this also holds for inhabitants of SIDS (Humphreys, 2010). Adaptation aims at maintaining or restoring the conditions under which people can exercise these rights in the face of climate change threats (for detail see Baatz, 2017, as well as Caney, 2012). This goal can be reached to varying degrees. If funding is insufficient to protect the human rights of all people foreseeably threatened by climate change, it seems reasonable to support those measures that best protect human rights: that is, which protect as many people as possible for a given amount of funding. Put in more general terms, those measures should be funded that are most efficient or cost-effective. Cost-effectiveness is a term prominently used in health care and denotes the measures that achieve the greatest improvement in health for a given amount of resources (World Health Organization, 2019). Here, cost-effectiveness analysis aims at identifying projects that deliver the greatest adaptation benefit, in terms of human rights protected, for a given amount of funding.

As with vulnerability, cost-effectiveness must be ‘measured’ or specified to guide funding decisions. To compare adaptation benefits across projects, Stadelmann and colleagues (2014, 2015) propose corresponding indicators. They argue that what is ultimately of interest is not the output or outcome (e.g. trained people or built dams) but the impact of a given adaptation project (Stadelmann, Persson, Ratajczak-Juszko, & Michaelowa, 2014, p. 110). But the impacts of a project are hard to predict, especially for soft and flexible measures as well as for those

⁴ Alternatively, one could adopt the capabilities approach (see e.g. Schlosberg, 2012; Govind, 2013; Shockley, 2014). This does not affect our argument below that the diverse nature of adaptation benefits heavily complicates measuring and comparing the cost-effectiveness of adaptation projects.

that support basic development. Moreover, even if it were possible to predict the likely effects, accurately measuring these effects in a way that makes them comparable across projects and regions would remain a major challenge (Stadelmann et al., 2014, p. 108).

Faced with these problems, Stadelmann and colleagues (2014, p. 110) “rely on a set of three indicators that try to proxy cost-effectiveness: absolute economic savings, relative economic savings, and human lives saved per USD of spending”. The absolute economic savings indicator is defined as the monetised assets saved by adaptation. Since it ignores non-monetised benefits and favours wealthy people and regions over poor ones, the authors use two additional indicators (Stadelmann et al., 2014, p. 110). Relative economic savings “are defined as the percentage of annual income saved, multiplied with the number of beneficiaries. [...] Human lives savings are measured in Disability Adjusted Life Years Saved (DALYs) [sic], an indicator systematically utilized by the World Health Organization” (Stadelmann et al., 2014, p. 111). The authors aim at avoiding a “monetary-only approach” while at the same time allowing for universal comparisons of projects, i.e. across different areas, that are not possible so far because existing approaches only work within areas or sectors (Stadelmann, Michaelowa, Butzengeiger-Geyer, & Köhler, 2015, p. 2149).

2.1 Absolute economic savings

Despite the shortcomings of absolute economic savings measured via saved monetised assets, the authors supplement rather than replace the indicator because “it is the usual way to measure macro-economic effectiveness, it is a standard indicator for evaluating the well-being of societies, it reflects overall utility as stated by market participants” (Stadelmann et al., 2014, p. 111). The fact that something is routinely used is not a justification for using it as well and it has been doubted for quite some time that absolute economic savings or even economic savings is a good indicator of the wellbeing of societies or, rather, people (e.g. Sen, 1999).

In the context of adaptation, the indicator is likewise problematic. The key objective of adaptation is to avoid serious harms caused by climatic changes; it protects what is of value against loss and damages and fulfils this function for people in very different situations. Where more valuable objects and opportunities exist, more can be lost. Therefore, more losses can be prevented by undertaking adaptation where many objects and opportunities exist. If all of these objects and opportunities were of equal worth, it would make sense to favour measures that protect more of them, as argued above. However, absolute economic savings hardly measure equally valuable things. According to this indicator, a loss of US\$ 100 for a member of the Singaporean elite and a subsistence farmer in the Comoros has the same weight (Stadelmann et al., 2014, p. 111). Moreover, while many fundamental losses are hardly captured by the measure (say, a person contracts dengue fever, does not receive medical treatment, and dies), comparatively trivial monetary losses

of affluent persons are fully accounted because they are reliably captured by this indicator.⁵

2.2 Relative economic savings and DALYs

There are different ways to adjust the economic savings indicator in order to dampen the bias in favour of wealthier people. The option suggested by Stadelmann and colleagues is measuring the percentage of annual income saved. The main drawback of the relative economic savings indicator (as percentage of annual income saved) is that it ignores all effects that are not income related. And while the protection of income is often very important, the adaptation literature stresses that vulnerability to climate change cannot be reduced to lack in income (Paavola & Adger, 2006, p. 605). Furthermore, the criterion ignores how the person that loses (part of) her income is situated, that is, how wealthy/poor she is (see also Persson & Remling, 2014, p. 29). This is relevant for losing, say, 10% of one's income might impose serious hardship on a poor person while it does not for a very wealthy member of society. Overall, the criterion is under- and over-inclusive: it does not capture human rights threats that are not related to income losses and captures income losses that are not related to human rights threats. An indicator that does not adequately capture whether adaptation is effective faces problems when comparing the cost-effectiveness of various projects.

The under-inclusiveness of relative economic savings is reduced by adding the third indicator, DALYs lost, which is more directly related to human rights threats. A reduction in DALYs may indicate that the right to life and to an adequate standard of health care are temporarily or permanently undermined.⁶ In combination, DALYs and relative economic savings might better indicate threats to human rights. The remaining problem is that both indicators do not capture many effects that are highly relevant.

We illustrate this point by drawing on the distinction between so-called hard and soft adaptation measures, referring to technology-driven infrastructure projects like dams or irrigation systems and to changes in planning, institutional settings, and behaviour respectively (Fankhauser & Burton, 2011, p. 1045). While “there is a well-known and long-observed practice in adaptation studies to prefer hard [...] over soft measures” (Fankhauser & Burton, 2011, p. 1045), the latter are at least as important as the former. Usually, non-climatic factors make people vulnerable to climate change: the “lack of social, political, and economic resources that poor and marginal communities fail to command is the main factor creating

⁵ It is noteworthy that, strictly speaking, human rights do not measure things of equal moral worth either, for one would probably say, for example, that the right to life is of greater importance than the right to establish unions. However, the problem of giving equal weight to unequal values is much graver in the case of economic savings.

⁶ However, mild diseases will increase the number of DALYs but will not undermine the exercise of human rights.

their inability to cope with climatic changes” (Khan & Roberts, 2013, p. 183). Activities that effectively reduce vulnerability (also) need to tackle these factors, and technology-based measures that address specific climate impacts are unable to do so (Roberts & Parks, 2007, p. 132; Klein & Persson, 2008, p. 40; Ayers & Dodman, 2010, p. 165). Effective adaptation often can be achieved by changes in practices, and when hard adaptation is effective it needs to be accompanied by design or regulatory, i.e. soft, measures (e.g. Fankhauser & Burton, 2011, p. 1045).

Therefore, it is crucial to overcome the bias towards hard measures, but the indicators proposed by Stadelmann and colleagues may rather reinforce it. Consider two examples: Protecting flood-prone shores of SIDS from inundation might allow for a straightforward calculation of losses prevented in the future. In comparison, a successful development policy, a reform of the schooling system, or a change in regulations may result in very beneficial developments in the long-run that are, at the same time, difficult to predict and to accurately calculate. It would be challenging, for example, to express the benefits of the schooling reform in terms of the avoided loss in DALYs or income. Using these indicators may thus favour hard over soft measures.

The shortcomings of these cost-effectiveness indicators can also be illustrated by the serious non-economic losses inhabitants of SIDS are facing. Sea-level rise may force many people to leave their home, even their country. To the extent that people will be dispersed through various places willing to accept immigrants in a limited number, they face the threat of cultural and linguistic loss that can undermine the social bases of self-respect (Zellentin, 2015, pp. 496–497; see also Farbotko, this volume). These as well as other non-economic losses and damages associated with ‘climate migration’ are not captured by the indicators.

Stadelmann and colleagues highlight the major challenge of measuring adaptation benefits in a way that makes them comparable across projects and regions. For the reasons just stated, we do not think that the indicators they propose even come close to meeting the challenge because too many important effects are not captured by them. However, we acknowledge that any indicator will face this problem because the benefits of adaptation are highly diverse and cannot be captured with one or two indicators (see examples of economic, social, and environmental benefits provided in Remling & Persson, 2015, p. 27). We thus doubt that it makes sense to universally compare the cost-effectiveness of adaptation projects as this would require a host of different indicators that are based on incommensurable values as well as the quantification of effects that are both hard to predict and hard to measure.⁷ But note that our argument leaves the door open to use relative economic savings and avoided DALYs losses⁸ for projects whose key aim is to protect

⁷ Scepticism regarding the usefulness of a cost-effectiveness criterion is also voiced by Paavola and Adger (2006, p. 605) and Persson et al. (2009, p. 89).

⁸ In the context of public health and medical ethics, the DALYs approach faces severe criticism on both methodological and normative grounds (e.g. Daniels, 2008; Klonschinski, 2016). We deal with this critique in future work on the (non-)relevance of efficiency considerations in adaptation finance.

people's income and health respectively. In this vein, it might make sense to compare similar projects across regions/countries or different types of projects with the same aim in one region/country.

3 Focusing on conditions for effective adaptation

Given the difficulties of determining cost-effective measures in a reasonable way, we suggest using alternative criteria that focus on the more basic challenge: ensuring that adaptation is effective at all. Due to the well-known barriers to adaptation,⁹ achieving effectiveness is far from trivial. Effectiveness is determined not only by case-specific factors, such as project idea and design, but also by the capacity of regional or national authorities to implement effective adaptation projects (Persson & Remling, 2014, p. 494). For this reason, implementation capacity could serve as a general criterion to prioritise funding. But higher implementation capacity usually means better governance and higher adaptive capacity (Pickering, 2012, p. 5). Since adaptive capacity is a component of vulnerability, higher adaptation and implementation capacity means lower vulnerability.

Faced with the trade-off between effectiveness (specified via implementation capacity) and vulnerability, Barr and colleagues (2010, p. 852) argue that low implementation capacity should not be a reason to provide less funding to a country: "Insufficient implementation capacity may point to [...] stricter monitoring arrangements and a stronger role for development agencies in project management. It also points to a need for capacity building as an adaptation (and development) priority". And "a more hands-on approach on project implementation may be required" in these cases (Barr et al., 2010, p. 854). Pickering (2012, p. 845) correctly stresses that "even 'hands-on' approaches may be insufficient to counter major obstacles to implementation such as civil conflict or entrenched corruption".

These considerations highlight that the reasons for low implementation capacities matter for funding decisions. If a country 'merely' lacks the bureaucratic apparatus, the know-how to develop effective adaptation measures, and/or the capacity to absorb, manage, and distribute substantial amounts of international funding, capacity building indeed is the correct way forward. If, on the other hand, the main problem consists in, say, kleptocratic forms of government, supporting the enlargement of the bureaucratic apparatus will most likely increase corruption levels and hardly benefit marginalised and vulnerable groups.

Therefore, universal criteria should indicate whether the conditions that allow for effective adaptation are present or can be facilitated via the funding. The next section proposes 'democracy' as one possible criterion to fulfil this function. We suggest that capacity building is more reasonable in democratic than in non-

⁹ Barriers to effective adaptation in SIDS include for instance access to financial, technological, and human resources, issues related to cultural and social acceptability of measures, and constraints imposed by the existing political and legal frameworks (Nurse et al., 2014).

democratic countries. Non-democratic countries would instead require something like ‘democracy building’.¹⁰ Next, we therefore defend the idea that prioritising democratically governed people is justified.

4 Towards a democracy criterion

By ‘democracy’, we refer “to a method of group decision making characterized by a kind of equality among the participants at an essential stage of the collective decision making” (Christiano, 2015). The degree of equality can be more or less deep: It can represent mere formal equality, such as the one-person one-vote rule in an election, or a more robust form of equality, such as equality in the process of deliberation. It may involve either direct participation of members of society in law and policy making or selection of representatives (Christiano, 2015). Democracy does not require perfect equality, but a certain degree of equality: regarding opportunities for political participation, individual freedoms, limited influence of private interests over the state, and so on.

4.1 Reasons for a democracy criterion

In this sub-section, we offer (what may be called) intrinsic and instrumental reasons in favour of a democracy criterion, starting with the former.

From the perspective of climate ethics, people in the Global South vulnerable to climate change are entitled to support from the Global North in their adaptation efforts (for detail see Baatz, 2013, 2017). Adaptation finance is owed to the persons whose rights are threatened or undermined and, once provided, it is owned by these people (Duus-Otterström, 2016). The human rights perspective entails that it is not owned by the representatives of a citizenry or the country as a collective.

However, it does not make much sense to pay adaptation finance to individuals. Adaptation that effectively protects people usually must be undertaken at the collective level. And since the benefits of various adaptive measures are difficult to estimate (see above), it must be decided at the collective level where to undertake which projects. Thus, adaptation usually involves a considerable amount of collective decision-making. But due to citizens’ entitlement to the funding, they ought to participate in the collective decision-making process, ideally with an equal say. This does not necessarily mean that everyone whose human rights are threatened ought to have the opportunity to personally participate in the decision-making on how to spend adaptation finance, but that their interests must be appropriately represented. According to the human rights account we endorse, people threatened by climate change are not seen as helpless and speechless victims but rather as bearers

¹⁰ We discuss in a separate paper under development whether adaption finance should also be used in this regard (Bourban & Baatz, 2019).

of the right to voice their interests and concerns as equals in policy discourses. If this is not possible, opportunities for political participation ought to be created.

In addition to this entitlement argument, the presence of democratic institutions is also likely to increase the effectiveness of adaptation finance. The following presents two such instrumental reasons in favour of the democracy criterion.

First, the incorporation of local knowledge in the planning of adaptation increases its effectiveness. While vulnerable people will often benefit from financial, technical, and informational support, their knowledge and awareness are important for effective adaptation (Khan & Roberts, 2013, p. 183; Biagini, Bierbaum, Stults, Dobardzic, & McNeeley, 2014, p. 105; Heyward, 2017, p. 482). The Intergovernmental Panel on Climate Change (IPCC) even observes that support by local actors and community engagement constitute a prerequisite for successful adaptation (Mimura et al., 2014, p. 881). Otherwise, there is the risk that activities are funded “which suit the interests of more powerful stakeholders, but struggle to bring benefits to the most vulnerable communities” (Fenton, Gallagher, Wright, Huq, & Nyandiga, 2014, p. 391; similarly Duus-Otterström, 2016, p. 665). There is a consensus in the literature that local adaptation governance should be democratised in order to prioritise the predicament of the poor and the marginalised (Mikulewicz, 2018, p. 26). Therefore, robust democratic decision-making increases the likelihood that local citizens affected by adaptation can incorporate their knowledge, ideas, and concerns into the decision-making process on how to adapt.

Second, democratic institutions and procedures make corruption and misuse of funding more difficult and these phenomena in turn undermine effective adaptation. As Paavola and Adger (2006, p. 606) put it: “Where democratic structures are absent, planning for climate change is little more than a rhetoric within a landscape of unsustainable development”.

According to Transparency International (2011, xxvi), the extent to which policy development and decisions are participatory, accountable, transparent, and respect the rule of law will determine how serious corruption risks are. The risk is lower if democratic institutions ensure working checks and balances between branches of the government and include effective non-governmental watchdogs, from the media to civil society organisations and independent academic institutions (Vogl, 2012, p. 153). Disclosure of information and participation in decision-making are especially crucial (Horstmann, 2011, p. 249), since they enable the general public and entitlement-bearers to retrace inappropriate capture of resources.

While the relationship between democracy and corruption is complex, recent empirical studies generally support the claim that democracy reduces corruption (Kolstad & Wiig, 2016) but also highlight that mere formal equality in the form of ‘one person one vote’ in regular elections is not enough: media freedom (Bhattacharyya & Hodler, 2015), income to meet basic needs (Neudorfer, 2015; Jetter, Agudela, & Hassan, 2015), limited economic inequality (You, 2016), availability of information (Boehm, 2015), and well-functioning checks and balances (Boehm, 2015; Saha, Gounder, Campbell, & Su, 2014) are additional conditions for

democracy to curb corruption. Regarding the definition of democracy as equality in collective decision-making mentioned above, these results suggest that the degree of equality must be sufficiently high: that is, it requires that most citizens can make use of certain rights and have access to information, that material inequality is limited, and so on. Thus, the higher the degree of equal opportunities for political participation, the less likely is corruption and misappropriation of public funding.

So far, our argument has linked non-democratic decision-making with corruption. We further assume that corruption hampers effective adaptation because part of the money is not used for adaptation at all and because it supports corrupted practices, possibly leading to a vicious cycle increasing both corruption and vulnerability (Transparency International, 2018, p. 2). In addition, corruption might also distort public decision-making towards the interests of those with the ability to bribe – and we assume that these persons are usually not those whose human rights are most threatened. We are not aware of empirical studies on the relationship between corruption and adaptation effectiveness. However, in this respect adaptation finance is very similar to development aid and the literature on corruption and aid effectiveness indicates a negative correlation: While some studies suggest that corruption increases desirable outcomes in certain settings, e.g. by alleviating the distortions caused by ill-functioning institutions (Méon & Weill, 2010), the bulk of recent contributions arrive at the opposite conclusion (e.g. Winters, 2010; Lee, Yang, & Kang, 2016; Smillie, 2017). To what extent these results accurately describe the corruption-effectiveness relationship and apply to the adaptation context remains to be seen (and investigated), but we consider this to be plausible.

In sum, we have argued that democracy makes corruption and bad policy making less likely (we have not argued that it safeguards against such problems). Also note that even if non-democratic governments allow for effective adaptation, the intrinsic argument that stresses the non-instrumental value of political participation remains valid. Citizens are to be recognised as equally worthy moral agents who must be allowed to speak for themselves. The misrecognition of its citizens is an injustice which undermines a government's role as a legitimate trustee of adaptation finance. For these reasons, the extent of democratic decision-making should be considered in the prioritisation of adaptation finance.

4.2 Specifying and 'measuring' democracy in SIDS

Just like vulnerability and cost-effectiveness, democracy is a complex concept. To be of use in the distribution of adaptation finance, the degree of democratic decision making somehow needs to be 'measured'. And here one may expect problems very similar to those of measuring vulnerability and cost-effectiveness. This subsection offers a first, tentative discussion of one way to operationalise the criterion

via the Varieties of Democracy (V-Dem) Indicators, a rather new approach to conceptualising and measuring democracy.

In the 2018 V-Dem report, the authors develop what they describe as the largest democracy database, with 450 indicators and indices of democracy covering 201 countries from 1789 to 2017 by relying on the expertise of over 3,000 scholars and country experts (Lührmann & Lindberg, 2018; Lührmann et al., 2018). They define democracy according to five core elements, each of them being measured by a different index: the electoral principle, the liberal principle, the egalitarian principle, the participatory principle, and the deliberative principle.

Following our definition of democracy and our justification of this criterion in the adaptation context, we focus here on the egalitarian and the participatory principles. Without some participation in decision-making and basic equality among citizens, citizens cannot voice their interests and concerns as equals in policy discourses (intrinsic reason) and cannot incorporate their ideas and values in the planning process (first instrumental reason). The lack of both aspects also makes corruption more likely, which will hinder planning and implementation of projects and programmes that protect those whose human rights are (most) at risk (second instrumental reason). Participation and basic equality might prevail even if national, regional, or local modes of decision-making in SIDS differ from those in Western liberal democracies. Thus, by focusing on the egalitarian and the participatory principle, the indicators are correlated with the key ideas behind the criterion.

The V-Dem Egalitarian Component Index measures to what extent social groups enjoy political participation according to their ability to make informed voting decisions, to express their opinions, to demonstrate, to run for office, and to influence policymaking. It is particularly interested in the degree of equality of protection of individual rights and freedoms from the state as well as the degree of equality in the distribution of resources to ensure that individuals can have access to the basic necessities enabling them to exercise their rights and freedoms (Sigman & Lindberg, 2015, p. 1). Each component of the index strives to capture these two theoretical dimensions of the egalitarian principle. Indicators used in the Equal Protection subcomponent include equal access to justice, social class equality in respect for civil liberties, and social group equality in respect for civil liberties (Sigman & Lindberg, 2015, p. 10). These measures reflect the extent to which rights and freedoms are applied equally across the population of a given country. Indicators used in the Equal Distribution of Resources subcomponent include educational equality, health equality, and the power distribution according to social groups and gender (Sigman & Lindberg, 2015, p. 11).

A challenge is potential trade-offs between components within the egalitarian index. As Coppedge and colleagues (2018, p. 14) explain, contradictions between and within principles are unavoidable because of democracy's multi-dimensional character. However, strong correlations among the indicators show that there are good grounds for the robustness of the egalitarian index. High degrees of equal distribution of resources and high levels of equality in participation are mutually

reinforcing dynamics, which suggests that the index does measure accurately the egalitarian principle and avoids insurmountable contradictions between its indicators (Sigman & Lindberg, 2015, pp. 14–17).

The V-Dem Participatory Component Index measures active participation by citizens in political processes by focusing on civil society organisations, mechanisms of direct democracy and participation, as well as representation through local and regional governments. The index relies on three arenas of participation: the electoral arena, political parties, and civil society. Each arena is measured by indicators from three dimensions: the institutional context, which refers to the procedures and structures allowing citizens to have opportunities to participate in elections, political parties, or civil society organisations; the organisational context, which asks whether citizens embrace these opportunities; and the cultural dimension, which asks how citizens make use of participation. For instance, indicators measure the degree to which elections are free, fair, and multi-party (first arena), the existence of bans on political parties and the autonomy of opposition parties (second arena), and the freedom to join and exit civil society organisations, the extent to which civil society is repressed, and its role in public policy consultation (third arena). Here again, although the degrees of correlation vary, there are strong correlations among indicators, especially between participation in political parties and in civil society (Fernandes, Cancela, Coppedge, Lindberg, & Hicken, 2015, pp. 21–25).

Despite these strong correlations that contribute to the robustness of the egalitarian and the participatory indices, one should keep in mind that the set of indicators used by V-Dem is not exhaustive. It is comprehensive, but the complex nature of equality and participation resists closure (Coppedge et al., 2018, p. 14).

Having introduced the V-Dem project and two of its indices, we next offer exemplary results on the level of political equality and participation in selected SIDS, briefly discuss how decision-makers can use this information, and comment on limited data availability in the case of SIDS.

Political diversity among SIDS is well illustrated by different levels of democracy. The V-Dem ranking is based on a scale from 0 (very undemocratic) to 1 (very democratic) and there is no threshold for a country to be considered as democratic or undemocratic. For 2017, SIDS that ranked the highest in the egalitarian index were Mauritius (0.67), Cape Verde (0.65), Barbados (0.63), Trinidad and Tobago (0.63), and Suriname (0.62), while SIDS that ranked the lowest were Cuba (0.25), Dominican Republic (0.24), Maldives (0.22), and Papua New Guinea (0.22). Regarding the participatory index, SIDS that ranked the highest were Jamaica (0.56), Suriname (0.53), Mauritius (0.51), and Cape Verde (0.48), while those that ranked the lowest were Maldives (0.2), Fiji (0.17), Singapore (0.14), Cuba (0.07), and Bahrain (0.04).¹¹

¹¹ We used the “Variable graph” to generate and compare these data: <https://www.v-dem.net/en/analysis/VariableGraph/>.

Equality and participation correlate strongly, indicating that these two essential components of democracy tend to be mutually reinforcing. Countries that score high in the egalitarian index, such as Mauritius, Cape Verde, and Suriname, also score the highest in the participatory index. Likewise, countries that score low in the egalitarian index also tend to score low in the participatory index, as the cases of Maldives and Cuba illustrate. Since the levels of equality and participation have risen since the 1950s in Mauritius, Cape Verde, and Suriname and have kept relatively constant since the 2000s (between 0.62 and 0.72 for the egalitarian index and between 0.48 and 0.56 for the participatory index, if we take into account all three countries), the V-Dem indices also show that there is a certain form of stability in relatively high levels of equality and participation in these countries that cannot be found in countries that are less democratic, such as Maldives and Cuba.

Instead of going into further detail regarding these data, we comment on how to make use of the information provided by the indices in the context of adaptation finance. On the one hand, with V-Dem a sophisticated and robust tool to measure democracy in recipient countries is available. On the other hand, contradictions between and within V-Dem indices remain possible and some arbitrariness in the choice of indicators cannot be fully avoided. For this reason, and not surprisingly, the indices should not be turned into or become part of a distributive formula. But we do think that this information should be considered in decisions regarding the distribution of funding.

Basically, the democracy criterion can play two distinct roles in the context of adaptation finance: it can affect either the modality or the amount of funding provided. In the case of the former, the conditionalities attached to the funding should increase with a decreasing level of democracy. The fewer opportunities for political participation there are, the higher the need to specify and to monitor how funding is used. In the case of latter, funding is reduced as levels of democracy are lower or even withheld in the case of very undemocratic countries. This might be justifiable by reference to highly insufficient available funding and in cases where confidence is low that imposed conditionalities can safeguard effective adaptation. However, poor governance is a driver of vulnerability and many people that are particularly vulnerable to climate change are governed in non-democratic countries. Withdrawal of funding would mean that these people would not benefit from adaptation finance. There are no easy answers on how to deal with this trade-off, unfortunately, and we further investigate the matter in a separate research paper under development (Bourban & Baatz, 2019). How this question is answered also affects whether level of democracy should influence the modality or the amount of funding provided, or both. Therefore, we remain agnostic here regarding which of the two roles the democracy criterion should play.

One problem that V-Dem shares with many other indices is low availability of data. Since comprehensive data are required for measuring its components, and despite its broad coverage of more than 200 countries, many SIDS are not yet covered by V-Dem (see Table 1). This research gap should be closed as soon as

possible to make full use of the democracy criterion and V-Dem respectively. As long as the gap persists, it may be possible to draw on other indicators that have data for these countries, such as the Worldwide Governance Indicators (WGI), especially the “Voice and Accountability” and “Control of Corruption” indices (World Bank, 2018), that cover almost all SIDS. This can make sense if these indicators exhibit strong correlations with V-Dem indices in countries covered by both. Also, if funding agencies have reliable information on the extent of democratic processes, they can use that information, for instance, to tie funding to additional conditionalities or provide more funding to another region/country. When only inconclusive data is available, the democracy criterion needs to be ignored. Whether and how to fund what kinds of adaptation projects in a given region, is then based on all other relevant considerations. For a multi-criteria, non-formulaic approach used by all bi- and multilateral funding agencies, such data gaps are not a fundamental drawback to our argument that considering democracy levels is desirable and in many cases possible.

Table 1: V-Dem’s Coverage of SIDS: UN member SIDS are marked with an asterisk; SIDS eligible to receive official development assistance (ODA) according to UNFCCC (2018) are highlighted in italics.

Currently covered by V-Dem	Bahrain*, Barbados*, <i>Cape Verde*</i> , Comoros*, Cuba*, <i>Dominican Republic*</i> , Fiji*, <i>Guinea Bissau*</i> , Guyana*, Haiti*, Jamaica*, <i>Maldives*</i> , Mauritius*, <i>Papua New Guinea*</i> , São Tomé and Príncipe*, <i>Seychelles*</i> , Singapore*, <i>Solomon Islands*</i> , <i>Suriname*</i> , <i>Timor-Leste*</i> , Trinidad and Tobago*, <i>Vanuatu*</i>
Currently not covered by V-Dem	American Samoa, Anguilla, <i>Antigua and Barbuda*</i> , Aruba, Bahamas*, <i>Belize*</i> , British Virgin Islands, <i>Cook Islands</i> , <i>Dominica*</i> , <i>Federated States of Micronesia*</i> , French Polynesia, Guam, <i>Grenada*</i> , <i>Kiribati*</i> , <i>Marshall Islands*</i> , <i>Montserrat</i> , <i>Nauru*</i> , Netherlands Antilles, New Caledonia, <i>Niue</i> , Northern Mariana Islands, <i>Palau*</i> , Puerto Rico, <i>Samoa*</i> , Saint Kitts and Nevis*, <i>Saint Lucia*</i> , <i>Saint Vincent and the Grenadines*</i> , <i>Tonga*</i> , <i>Tuvalu*</i> , United States Virgin Islands

Finally note that operationalising democracy as understood here is less difficult than operationalising cost-effectiveness (and possibly even vulnerability). We argued that adaptation benefits are diverse and that avoided DALYs losses and relative income only capture certain types of benefits. Perhaps a comprehensive approach of measuring cost-effectiveness comparable to the V-Dem project might remedy this shortfall. However, a universal cost-effectiveness criterion entails comparisons of things that are difficult to compare (improvements in, say, education, health, and ecosystems) and must rely on predictions of the (long-term) ef-

fects of adaptation measures, which are usually marked by substantial uncertainty. In contrast, the democracy criterion requires no such predictions for it checks whether desirable conditions predominate at present. Moreover, while we acknowledge that participation and equality are not easy to ‘measure’, these notions are less heterogeneous than the concept of adaptation benefits. That is to say, a comprehensive operationalisation of cost-effectiveness would require collecting and aggregating more, and more diverse data than required for the egalitarian and the participatory indices. Thus, although many questions on how to operationalise the democracy criterion are yet to be settled, the task seems less daunting than operationalising the cost-effectiveness criterion and possibly even the vulnerability criterion.

5 Conclusion

International funding to support adaptation projects in SIDS is scarce. To determine who is most entitled to adaptation projects, prioritisation criteria are needed. The most prominent criterion, vulnerability, faces drawbacks and should be complemented by further criteria. Cost-effectiveness could be such a criterion but so far indicators proposed to operationalise it are not suitable and/or are insufficient. Absolute or relative economic savings and avoided losses of DALYs do not capture important adaptation benefits and may reinforce the problematic bias towards hard adaptation measures. Rather than comparing adaptation benefits across projects, universal criteria and associated indicators should show whether the conditions that allow for effective adaptation are present or can be facilitated via funding. The criterion of democracy highly fulfils this function because equal opportunities for participating in collective decision-making increase the likelihood that local knowledge is incorporated into adaptation decisions and reduce the likelihood of corruption and misuse of funding. Moreover, such opportunities enable those entitled to adaptation projects to participate in making decisions about how to adapt, which is intrinsically valuable. In terms of the operationalisation of the criterion, the V-Dem indicators – especially the egalitarian and the participatory indices – seem to present a viable path, although whether and to what extent this claim holds requires more detailed investigation. We want to start rather than close this debate.

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5

Sustainable development and climate change adaptation: Goal interlinkages and the case of SIDS

Michelle Scobie

The international climate and sustainable development agendas are of particular significance for Small Island Developing States (SIDS), which are especially vulnerable to climate change impacts. SIDS' government departments are small in size with very limited financial, administrative, and technical resources. Policymakers must manage multiple national and international sustainable development and climate change forums, commitments, and policies. This chapter therefore asks: what framework can be used to integrate and simplify international sustainable development and climate policies? How can SIDS' national policies be integrated into such a framework? And what are the areas where fragmented or disconnected policies exist and (how) can policy fragmentation be reduced? The chapter thus makes three novel contributions to the literature. First, it proposes the use of interlinkages as a tool or framework to integrate climate and sustainable development goals. Second, it tests this approach with St. Lucia's national policy as a case study, finding commonalities but also identifying important differences between international and national goals. Third, it provides empirical evidence of the multiplicity and complexity of climate and sustainable development goals and targets that policymakers of SIDS must attempt to implement. This linkages framework and empirical example can help government agencies and development partners that work with SIDS on sustainable development and/or climate change to more efficiently use limited resources through integrated policy interventions.

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1 Introduction

Small Island Developing States (SIDS) are located in the Pacific, Indian, Mediterranean, and Caribbean Oceans. They share many development challenges. These include small size, remoteness, narrow resource and export base, lack of economies of scale for export industries, economies highly exposed to global markets, heavy dependency on imports, food and energy insecurity, extremely high levels of national debt, high levels of poverty and inequality, and climate change impacts including more frequent and intense natural hazards (CARICOM, 2013). SIDS must manage sustainable development and climate change adaptation and mitigation agendas with limited financial, administrative, and technical resources. Government departments traditionally implement these policies in separate agencies but joint policy development and execution could bring savings to the public purse (Scobie, 2016).

This study examines the problem of thematic and action areas of complexity and fragmentation between the United Nations' 2015 sustainable development goals (SDGs) in general and those related specifically to climate change (SDG13) in relation to SIDS. It offers a helpful framework to locate areas of conceptual and practical convergence between international, regional, and national climate change and sustainable development policies.

SIDS' national sustainable development and climate change policies are formed in part by several international agendas. Beyond the 2015 United Nations SDGs (17 goals and 169 targets) and the 2015 Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC), SIDS as a group have had their own sustainable development agendas. Barbados hosted the first UN Global Conference on SIDS' Sustainable Development in 1994 where SIDS developed the Barbados Programme of Action (BPOA) – the first SIDS sustainable development roadmap that outlined several development policy areas of special concern for SIDS: limited resources, climate change impacts and sea-level rise, coastal and marine resources, energy resources, freshwater resources, human resource development, management of wastes, capacity building for national institutions and administrations, natural and environmental disasters, regional institution building and technical cooperation, science and technology, tourism, transport, communication, and biodiversity. Since the Barbados Conference, the SIDS' sustainable development agenda has been developed in subsequent UN SIDS conferences. The most recent UN SIDS summit, held in Apia, Samoa in 2014 produced an outcome document, the SIDS Accelerated Modalities of Action (SAMOA) Pathway, that highlighted 17 sustainable development thematic and implementation goals and areas, ranging from climate change and disaster risk reduction (DRR) to gender equality and sustainable transportation.

SIDS in the BPOA also identified what they considered as pathways or actions for implementing sustainable development goals: capacity building; cooperation in the transfer of environmentally sound technologies; finance; institutional develop-

ment at the national, regional, and international levels; trade; and economic diversification. SIDS also highlighted the need for partnerships and improved monitoring and accountability (UNGA, 2014).

In addition to this broad level of cooperation across diverse regions, SIDS have region-specific goals and implementation agendas. In 2013, CARICOM, the regional economic integration and functional cooperation organization for fifteen Caribbean SIDS, produced the Kingston Outcome Document – a region-specific preparatory document for the 2014 Samoa summit (CARICOM, 2013). CARICOM also has a 2015-2019 Strategic Plan that addresses areas and action items related to sustainable development and climate change. Perhaps recognising the problem of having a plethora of goals and targets, and in an attempt to rationalise the implementation of multiple priorities, the CARICOM Strategic Plan sought to target, “a narrow range of specified outcomes within specified timeframes, focusing on a few practical and achievable goals” (CARICOM, 2014, p. i). However, even these lists of policy priorities are daunting especially in the context of SIDS’ capacity constraints.

Using St. Lucia as a test case, this chapter illustrates where international and regional policy areas intersect with national ones. St. Lucia is an Eastern Caribbean state with a population of about 183,000. Like many Caribbean Islands, St. Lucia suffered a worsening fiscal balance during the 2007/2008 financial crisis. The average fiscal balance for 2004-2013 was -4.9% of GDP. It has a high public debt and a large fiscal deficit. For example, its debt to GDP ratio exceeded the internationally accepted 60% debt sustainability benchmark in 2013. Unemployment is high among youth, who account for over 56% of its population (Government of St. Lucia, 2015a). St. Lucia depended heavily on the export of bananas, and since 2006 that industry has not recovered from the loss of preferential treatment for its bananas in the United Kingdom market after the United States’ banana company Chiquita successfully challenged that preferential regime at the World Trade Organisation (Ferguson, 1998; Moberg, 2005).

St. Lucia experiences climate change through increased frequency and intensity of extreme climatic events: higher amounts of rainfall, flooding, extensive landslides, strong winds, drought, rising sea levels and temperatures, damage to infrastructure and housing, loss of life and livelihoods, and increased vector borne diseases including dengue, chikungunya, and zika. The 2009/2010 drought (Taylor, Jones, & Stephenson, 2016) was not an anomaly and the country will face future water deficits that are already a concern for tourism establishments, small farmers, and food security (Government of St. Lucia, 2015a, p. viii). Annual storms and hurricanes affect the private sector, which suffers losses caused by logistical interruptions, resource constraints, and so on (Government of St. Lucia, 2015a). In October 2010, Hurricane Tomas caused damages in excess of US\$ 350 million, or “43.4 percent of Saint Lucia’s GDP – nine times its agricultural GDP, three times its tourism GDP, 62 percent of exports of goods and services, 19 percent of its gross domestic investment and 47 percent of its public external debt” (Govern-

ment of St. Lucia, 2015a, p. viii). St. Lucia will have to adapt to these extreme events and other climate change impacts and climate adaptation policy is integral to the state's development policy.

Climate change mitigation is also part of St. Lucia's climate and development policy. At the time of this study, St. Lucia's climate change and sustainable development goals were contained in the St. Lucia 2015 Intended Nationally Determined Contribution (INDC) (of November 17, 2015) and the 2015 Saint Lucia Climate Change Adaptation Policy (Adaptation Policy). Although the island contributes approximately 0.0015% to global emissions (per capita rate of 3.88 tCO₂-eq) (Government of St. Lucia, 2015b), it has ambitious climate goals and is committed to lead by example to reduce global emissions (St. Lucia Renewable Energy Roadmap, 2016). Mitigation policies will have important economic co-benefits for St. Lucia's economy: clean energy alternatives can reduce its fuel import bill since it is heavily dependent on fossil fuels. To date, however, its climate goals have been difficult to achieve and renewable energy deployment uptake is slow. Renewables are still very costly and the regulatory framework needed to give potential investors security of integration of sustainable energy into the existing power grid is still to be implemented (Scobie, 2019). The expected investment cost (capital finance) of the mitigation targets for 2030 are US\$ 218 million and the government costs (planning, research, policy making, implementing regulations, enforcement, capacity building, public education) are estimated at US\$ 23 million (Government of St. Lucia, 2015a, p. vii).

How do SIDS' policymakers, faced with limited resources and acute economic and environmental vulnerabilities, integrate multiple goals and targets into national policy in a coherent and efficient manner to facilitate policy integration and efficient policy implementation? This chapter addresses this research question in three stages. First, it develops a framework to simplify, integrate, and link the SDGs with SDG13 on climate change. Second, it determines how far international climate and sustainable development policies, as exemplified by the SDGs, accord with national policy for SIDS. Third, it finds the goals and policy areas now framed as stand-alone action points that facilitate and entrench fragmented or disconnected goals.

Recent studies have sought to find pathways to link policy areas. Some have highlighted linkages between water- and the health-related SDGs (Hall, Ranganathan, & Raj, 2017) or SDG14 for oceans (in particular to avoid overfishing) and the other SDGs (Singh et al., 2018). This paper continues this line of research and makes three novel contributions. First, it identifies the linkages between the SDGs in general and the climate goal specifically and proposes this model of associating the two policy realms as a way to facilitate policy integration. Second, it offers the framework as a lens to relate the international goals to regional and national policy agendas for climate and sustainable development with St. Lucia as a case study. Third, the study provides empirical evidence of the overwhelming multiplicity and complexity of climate and sustainable development goals and targets that policymakers from SIDS must integrate and makes the case for better integration of

sustainable development and climate targets in international and national development policy and projects.

2 Interlinkages approach to SDGs and climate change

Finding synergies is important for good governance. The environmental governance literature has sought to understand the synergies, interlinkages, or interconnections between actors, actor interests, and contexts (Ruiz-Mallén, Fernández-Llamazares, & Reyes-García, 2017), goals (Griggs et al., 2014; Måns Nilsson, Griggs, Visbeck, Ringler, & McCollum, 2017; M. Nilsson, Lucas, & Yoshida, 2013), agendas (Roberts, Andrei, Huq, & Flint, 2015), and policy domains or approaches (Boas, Biermann, & Kanie, 2016a; Reed, Van Vianen, Deakin, Barlow, & Sunderland, 2016). Interlinkages, interconnections, synergies, and so on refer to the relationships between factors, their overlap, similarity, and causal elements. Studies that try to highlight the interlinkages or areas of commonality between policy areas are useful to identify, for example, possible compatibility (Ribas, Lucena, & Schaeffer, 2017), or co-benefits (von Stechow et al., 2016), or to avoid unwanted impacts from actions in one sector or by one group of actors. Several studies have set the foundation for this chapter through the analysis of specific SDGs from thematic and implementation perspectives. Thematic studies have explored commonalities between related goals (Griggs et al., 2014; Måns Nilsson et al., 2017), examining how particular goals relate to or are integrated with each other (Le Blanc, 2015), such as water, food, and energy (Ringler et al., 2016; Yillia, 2016); nutrition and agriculture (Shingirai & Happy, 2017); water and health (Hutton & Chase, 2016); health and development (Janardhan, 2016); and women's empowerment and education (Zhang, Prouty, Zimmerman, & Mihelcic, 2016). Others point to the apparent dissonance and trade-offs between development goals and climate change mitigation in specific areas such as energy security (Wagner, Ross, Foster, & Hankamer, 2016), sustainable energy (von Stechow et al., 2016), poverty alleviation (Nelson, Lemos, Eakin, & Lo, 2016), dependence on fossil fuels and carbon neutrality and economic growth (Schandl et al., 2016), and climate and development policy (Reed et al., 2016; von Stechow et al., 2016).

Some studies have focused on implications for implementing the SDG goals: climate adaptation and development policy in developing states (Lamb, 2016; Sherman et al., 2016); the SDGs' transformative power for economic, climate, and social justice policy (Koehler, 2016); and the reduced effectiveness of SDGs implementation processes because of insufficient focus on ecological and relational inclusive development when compared with social development (Gupta & Vegelin, 2016). Others have focused on specific actions, such as landscape approaches to social and environmental goals (Reed et al., 2016); the use of economic growth and technology as tools for SDG implementation (Salleh, 2016); global governance approaches to integrate the SDGs development agencies with the global financial

system (Radermacher, 2016); reform towards a common agenda for global institutions through a nexus approach that mirrors the interrelatedness of the SDGs (Boas, Biermann, & Kanie, 2016b); the effectiveness of multi-stakeholder partnerships in sustainability policy domains such as climate change, health, and biodiversity (Pattberg & Widerberg, 2016); or the relevance of household-level interventions for food, energy, water, or health (Toole, Klockner, & Head, 2016). Finally, some studies have questioned the value of related actions: regarding whether an integrated sustainable development multi-sectoral approach could achieve desired outcomes (Nordbeck & Steurer, 2016) and the unwanted consequences of maladaptive responses to climate change for sustainable development (Magnan et al., 2016). States should be wary of implementing climate policy independently of other sustainable development policies. The SDG and climate agendas have co-benefits but may also lead to unwanted consequences. In some cases, 2 °C pathways for emission reduction that include, for example, increased use of bioenergy may not be socially optimal since those pathways may negatively affect local food security, some types of livelihoods, water security, biodiversity, and so on (von Stechow et al., 2016). Similarly, adaptation measures such as building sea walls to protect low-lying areas against storm surges caused by rising sea levels may be maladaptive actions that destroy coastal ecosystems, swamps, marshlands, and biodiversity (see also Nunn & McNamara, this volume). Other papers have addressed ways towards effective climate policymaking and implementation such as my own studies on policy coherence and on accountability in climate policy in Caribbean SIDS (Scobie, 2016, 2017).

This study follows along the lines of earlier environmental governance research, by searching for interlinkages between goals, but is geographically broader since it addresses international to national scales, as well as thematically richer, since it examines the climate change goal in the context of all the SDGs, as well as the implementation pathways chosen by states to achieve these goals. This is arguably the first study that focuses on SIDS and the complex universe of climate and sustainable development policies at the international, regional, and national levels that SIDS' policy implementers manage. It is the first or among the first to use the interlinkages approach to find areas of thematic compatibility between SDG13 on climate change and sustainable development goals more generally. With SIDS as its context, its premise is that the resource constraints of small states make policy integration more of an imperative. The intention of the study is to help remedy climate policy coherence weaknesses by identifying points of compatibility (and dissonance) between two related agendas. It is a good framework to help policymakers and implementers avoid fragmentation in policy development. This may reduce the problem of overlaps and duplication of financial, administrative, and technical resources – particularly acute in development policy in SIDS (Scobie, 2016).

3 Methodology

This chapter highlights the areas where there are thematic interlinkages between the SDGs in general and specifically those related to climate change – a subset of the SDGs. The analysis also highlights what states have considered to be means or pathways to implementation, detailed in the international and national policy documents listed above and illustrated in Figure 1 below. Admittedly, several of the areas that states have listed as “means of implementation” for climate and sustainable development policy can also be found under the list of goals or targets either in the same or other documents. This division between goals and means of implementation used by states is replicated in this paper because it is this framework that national policymakers apply for their own policy formulation.

St. Lucia is used as a case study for the second stage of the research: how far does international policy accord with regional and national policy for SIDS. A content analysis was undertaken of four of the main SIDS’ climate change and sustainable development agendas as well as St. Lucia’s national policy documents. These documents include the 2014 SAMOA Pathway, the 2013 Kingston Outcome Document (regional outcome document for the UN Samoa summit), the 2014 CARICOM Strategic Plan, the CARICOM Climate Change Implementation Plan, and finally St. Lucia’s climate and sustainable development policies. Data on the policies for St. Lucia was obtained from the 2015 St. Lucia Adaptation Policy and its 2015 INDC submission to the UNFCCC. Caribbean climate change implementation plans were taken, for the purposes of this study, from two key documents: the Regional Framework for Achieving Development Resilient to Climate Change (CCCC, 2009) and its Implementation Plan (CCCC, 2012).

One of the challenges of governance research in the global south and the Caribbean in particular, is the limited publicly available data on government policy and on project implementation. To address this gap in data, interviews were conducted in 2016 and 2017 with St. Lucia’s experts directly involved in climate change and sustainable development policy. These interviews, conducted with ten senior government officials and five leaders of the private sector in St. Lucia, were conducted on the condition of anonymity. The open-ended interviews were helpful for providing guidance on how policies were being conceived and implemented. The small sample size is proportionate to the population (approximately 183,000). Respondents knew each other and reported similar challenges in policy formulation and implementation.

Finally, the research uses the interconnections or interlinkages approach as a pathway to overcome the problematic fragmented or disconnected goals in policy documents. To do this, the framework was used to identify the areas where goals in international, regional, and national policy documents could be integrated (see Figure 1, Table 1, and Table 2). The tables were created using a content analysis of the documents in Figure 1. First, the study found the areas of possible policy synergies between the targets of SDG13 and all the goals and targets of the other 16

SDGs. The study then proceeded to find the areas of synergy among the policy and implementation plans of the remaining documents in Figure 1. The findings are highlighted in Table 1 and Table 2.

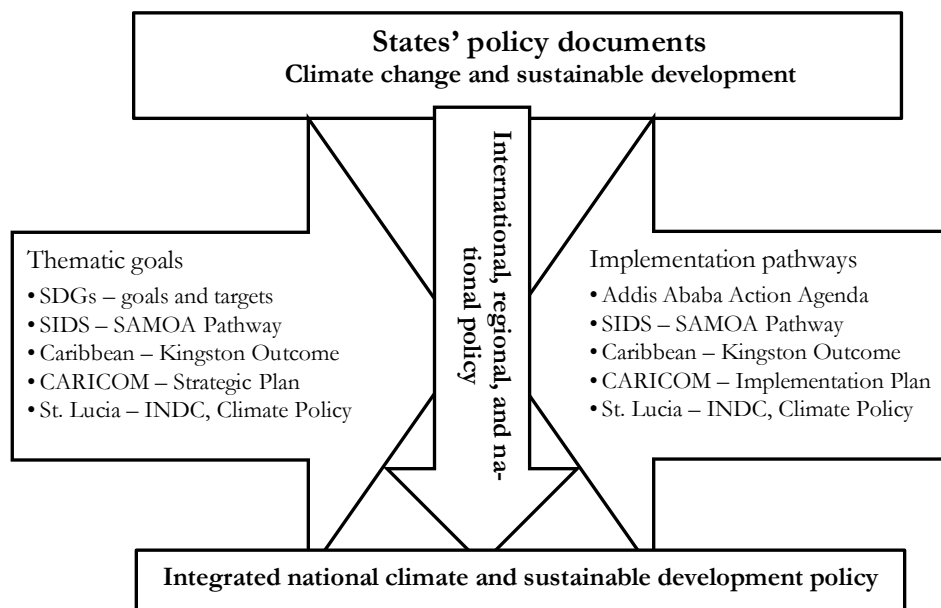


Figure 1: Framework to address the thematic and implementation interlinkages between the agendas of SDG13 on climate change, other UN SDGs, and the development policies of SIDS, CARICOM, and St. Lucia.

4 SDGs and climate change policy in SIDS

4.1 Thematic framework

The thematic interlinkages framework helps us to answer the following questions: how can climate targets of SDG13 integrate the targets of the remaining SDGs or what are the interconnections between the climate SDG and the others? And, are the same types of interconnections evident at the level of SIDS' policies and at the level of national policy of St. Lucia? This framework – as illustrated below – identifies the several levels of connections between the climate SDG13 and the remaining SDGs and the regional, and national sustainability goals for Caribbean SIDS. This is useful to facilitate policy integration, especially in the context of limited resources. The framework also helps to illustrate which of the international and SIDS-specific thematic areas are most relevant for Caribbean SIDS and for St. Lucia's policy and where the latter two have other development priorities that are

not prominent in the international frameworks. Obviously not all international goals have local relevance but where SIDS national goals are not aligned with the international agenda, there may be less attention and funding available from the international institutions for those local goals. Where possible, and for this reason, it is in the interest of SIDS to align their national agendas to global ones.

Table 1: Thematic links between SDG13, the other SDGs, and regional and national policy

International	Regional			National
SDGs related to climate change	CARICOM Strategic Plan	St. Lucia Climate Policy	Kingston Outcome Document	SAMOA Pathway
1. Poverty Alleviation	Poverty reduction	Climate proofing to reduce vulnerability – driver of poverty	Poverty alleviation	Disaster risk reduction
2. Food Productivity	**	Agriculture/Food Security	Revitalise the agricultural sector Food and nutrition security	Food Security and Nutrition
3. Health	Universal access to health services; Reduce mortality to NCDs and HIV	Public health impacts of climate change	**	Health and NCDs
4. Education for Sustainable Development	Innovation and entrepreneurship	Adaptation awareness and resilience building for public and for private sector	**	**
5. Gender Equality	Mainstream inclusiveness	Gender mainstreaming in development policy	Gender equality in sustainable development programmes	Gender equality, women's empowerment
6. Water Access, Management	**	Water conservation and management- distribution and efficiency	Freshwater waste management	Water and sanitation; Management of chemicals and waste, including hazardous waste

International	Regional			National
7. Energy	Renewable Energy	Energy efficiency Renewable Energy Target (35%) by 2025 and 50% by 2030 - geothermal, wind, and solar energy sources.	Energy resources// security //Suitable and sustainable renewable energy technologies// Equitable and universal energy access	Sustainable energy
8. Inclusive Economic Growth	Sustainable economic growth Innovation and entrepreneurship	Link between economic growth/resilience and economic impacts of extreme events	Tourism	Sustained and sustainable, inclusive and equitable economic growth with decent work for all
9. Infrastructure, Industrialisation, Innovation	Technology as a tool to build regional economic competitiveness	Climate proof/risk assessment for critical infrastructure		Sustainable transport
**10. Equality within and among Countries	**	**	**	**
**11. Safe, Resilient, Sustainable Cities	**	**	**	**
12. Sustainable Consumption and Production	Tourism and agriculture	Vulnerability of tourism sector to climate impacts	Tourism	Sustainable consumption and production
14. Oceans, Seas, Marine Resources	**	Adaptation to ocean and coastal changes caused by climate change	Coastal and marine governance// Tourism	Oceans and seas

International	Regional			National
15. Terrestrial Ecosystems, Forests, Desertification, Land Degradation, Habitat, and Biodiversity Loss	**	Land use planning and risk assessments to reduce vulnerability to extreme events Biodiversity conservation Forest management	Land management// Biodiversity	Biodiversity// Desertification, land degradation and drought// Invasive alien species
**16. Peaceful and Inclusive Societies	**Address transnational crime Regional security	**	**	**
17. Means of Implementation, Partnerships for Sustainable Development	**	International financing Partnerships with the private sector Sustainable Financing for climate policy Human, institutional and technical capacity building Data building and management Technology transfer	Data collection and management	Means of implementation including partnerships// Monitoring and accountability
**	Resilience to natural disasters	Climate proofing	Natural disasters	Disaster risk reduction
**	**	**	**	**Social development
**	Improve efficiency of community organizations	**	**	**

Notes: **References to similar policies and goals are absent.

Table 1 illustrates the thematic interconnections between SDG13 and the remaining climate and sustainable development policy documents that form the basis of SIDS' policy: the SAMOA Pathway, the 2013 Kingston Outcome Document, and

the CARICOM Strategic Plan. Highlighted with the two asterisks (**) are the areas where references to similar policies are missing when comparing international, regional, and national goals and objectives.

All SDGs and 55 of their targets are related to SDG13 and its targets. For example, the climate goal is linked to SDG1 on poverty alleviation, specifically targets 1.1, 1.2, 1.3, 1.5, and 2. Although the study produced a detailed mapping of the SDGs' interlinkages with SDG13, this was not reproduced here in the interest of space. While the SDGs divide objectives into "goals" and "targets", the CARICOM Strategic Plan refers to multiple "goals" and "objectives" for each of its strategic priorities. At the national level, St. Lucia's adaptation and mitigation targets are linked to at least ten of the SDGs including improved quality of life and poverty alleviation – two areas most affected by hurricanes. St. Lucia's INDC highlights six policy goals or areas, all linked to sustainable development: energy demand and electricity generation; transportation; agriculture and fisheries; waste; land use/land use change and forestry; industrial processes; and a wide general category (including governance, education, and national policy development).

St. Lucia's INDC recognises the close connection between climate change mitigation and sustainable development: "the best way to address climate change impacts is by integrating adaptation measures into sustainable development strategies", and "adaptation [disaster risk preparedness] measures are conducive to sustainable development, even without the connection with climate change" (Government of St. Lucia, 2015a, p. 5). The majority of SIDS' development goals are related to the international SDGs and climate change agendas, with a few exceptions. Notably, SIDS did not directly address SDG10 (equality between countries) or SDG11 (cities). SIDS thematic goals are strongly weighted towards attention given to the impacts of natural hazards, waste management, and organisational and institutional efficiency. SIDS view sustainable development as directly related to reducing and managing environmental vulnerability. Natural hazards affect the economy, the environment, and the society. The high levels of poverty mean that limited resources are available to address basic needs. SIDS' economies take longer to recover since the infrastructure and sectors upon which SIDS' narrow export bases depend are usually destroyed. Institutional change and comprehensive infrastructure and waste and water management in these contexts require sustainable financing but most financed projects are pilot projects that operate on time scales that are short compared to what these islands need to make the projects sustainable. The war on crime, which may be linked to SDG16 (peaceful societies), has become one of the Caribbean SIDS' development hurdles. Climate change impacts contribute to unemployment, poverty, and weakened social services, which leads to social exclusion, youth unemployment, and higher incidence of crime. Caribbean SIDS are particularly vulnerable to crime since they are geographically located between the southern suppliers and northern consumers of illicit drugs and are affected by the illicit narcotics trade of transnational crime (UNODC, 2012).

4.2 Implementation policies

The previous section illustrated the thematic interlinkages between the sustainable development and climate change agendas at international to national levels. This section does the same for the implementation agendas as defined by states. Although it is difficult to draw a clear line between key sustainable development and climate change goals and their implementation pathways, states have often separated goals from implementation pathways, either as sections of a single document, as in the SAMOA Pathway, or in two separate international processes and outcome documents, as with the SDGs and the Addis Ababa Action Agenda (AAAA). The linkages are illustrated in Table 2. Highlighted with the two asterisks (**) are the areas where references to similar policies are missing when comparing international, regional, and national agendas.

Table 2: Links between means of implementation of climate and sustainable development policy at international, regional, and national levels

International	Regional			National
Addis Ababa Financing Action Agenda	SAMOA means of implementation	Kingston Outcome Document	CCCCC Implementation Plan for Achieving Development Resilient to Climate Change	St. Lucia Climate Policy
Domestic public resources	Partnerships	**	**	Mobilisation of community and private sector finance
Domestic and international private business and finance	Partnerships, financing	Investments for technology development	Investment for achieving objectives; Gain international funding	Facilitate private investment into climate proofing
International development cooperation	Financing	Financing for development	Systems for cooperation among regional agencies	Sustainable financial flows for climate change
International trade as an engine for development	Trade, partnerships	**	**	**
Debt and debt sustainability	Financing, trade	Debt management and flexible financing	**	**

International	Regional			National
Addressing systemic issues	Partnerships; Technology// capacity building	**	**	Create the enabling environment – legislation, fiscal, governance
Science, technology, innovation, and capacity building	Data and statistics; Institutional support to SIDS	Data collection and management	**	Technology transfer and capacity building
Data, monitoring and follow-up	Institutional support to SIDS	Data collection and management	Systems for monitoring and evaluation	Data building and management
**	**	Reclassification of SIDS for greater access to concessionary financing	**	**

Note: **References to similar policies and goals are absent.

The AAAA was the outcome document of the 2015 Addis Ababa Third International Conference on Financing for Development. It is a global framework for financing sustainable development that aligns financing flows and policies with economic, social, and environmental priorities. At the level of SIDS, the 2014 SAMOA Pathway outlined SIDS' action agenda for sustainable development just one year earlier and some of these pathways were also reflected in the AAAA. SIDS focused on seven areas: partnerships, financing, trade, capacity building, technology, data and statistics, and institutional strengthening. The 2013 Kingston Outcome Document includes a roadmap entitled "Strengthening the Implementation Framework", with 21 action areas related to sustainable development and climate change that overlapped in some areas with the SAMOA Pathway. Interestingly, Caribbean states also include some different implementation priorities: debt management, expansion of concessionary financing for SIDS, and the importance of financial agencies' reclassifying Caribbean SIDS (many now classed as high- or medium-income countries) to low-income countries. Caribbean SIDS argue that existing classifications ignore their levels of income inequality, economic and climatic precariousness and vulnerability and bars their countries' access to development financing.

The 2013 Kingston Outcome Document identified five implementation pathways towards sustainable development – all are linked to the region's climate change agenda. St. Lucia's national policy documents did not distinguish between

goals and actions. The Adaptation Policy outlines three adaptation pathways that it calls “measures” or future outputs: facilitation, implementation, and financing.

Understandably SIDS’ implementation pathways focus on financing for climate policy and sustainable development policy. Sustainable financing for environmental projects in SIDS has lacked continuity for several reasons. A policy may be terminated when a new political party is elected and discontinues a programme or when political will wanes (Scobie, 2016). Many SIDS continue to depend upon external project funding often available only through pilot or time-limited projects. Development programmes are often shaped by the requirements of external funding agencies and interventions lapse when the funding is exhausted. St. Lucia notes this funding trap: “There is a gradual recognition that the current situation of financial support for climate change action in Saint Lucia – characterized by a large number of international funds with complex administrative processes, minimal transparency or accountability, and conflicting mandates that do not always address or respond to Saint Lucia’s concerns or priorities – is untenable” (Government of St. Lucia, 2015a, p. 18). To remedy this problem, the Adaptation Policy focused on local and sustainable funding by involving the private sector in adaptation financing. All policy documents in Table 2 address the need to mobilise domestic resources. SIDS also continue to emphasise international support (partnerships, private investment, funding from developed states) as a *sine qua non* for policy implementation. In the SAMOA Pathway this is framed in the language of “partnerships” between the state and other (wealthier) actors. The Kingston Outcome Document suggests that private funding is helpful for “encouraging investment” in technology development.

Table 2 also highlights areas of notable disconnect between international and SIDS agendas. SIDS’ access to concessionary financing is contentious and while addressed in their policy documents, this issue is not reflected in the AAAA. Although international goals and action agendas do not have to incorporate all priorities of particular states or groups of states, it is remarkable that the international or global agenda is silent on an issue that Caribbean SIDS consider central to achieving their climate and sustainable development objectives.

4.3 Discussion on interlinkages

The overview of climate and sustainable development goals and targets – from international to national – shows many areas of convergence, but also some areas of divergence in the case of SIDS. The interlinkages approach is helpful for uncovering the thematic links between international, regional, and national climate and sustainable development goals. The climate SDG13 is linked to all of the remaining 16 SDGs and to 55 of the 169 SDG targets. Several (at least 18) SIDS development goals are also linked to SDG13. At the Caribbean level, there are links between at least 11 of the regional development priorities and SDG13 (6 of the Kingston Outcome Document and 5 of the Strategic Plan goals) (CCCC, 2009,

2012). This framework or interlinkages approach also reveals areas of divergence where international goals have no related area of focus for SIDS, such as DRR and crime.

There are many commonalities between what states have identified as implementation agendas. At least eight action points for the AAAA are linked to goals in the SAMOA Pathway. Perhaps the most striking point of divergence is the issue of access to finance. Caribbean SIDS share a “twin resource mobilization problem”: limited possibilities to mobilise both domestic and external funding (Bourne, Alexander, Conrad, & Jhinkoo, 2015) and Caribbean SIDS struggle to attract regular flows of foreign direct investment. St. Lucia’s Adaptation Policy states that its execution is in part predicated on external financing: “the success of the CCAP will be dependent on national budgetary contributions, as well as support from regional agencies and programs and international donor and financial institutions” (Government of St. Lucia, 2015a, p. 17). Most Caribbean SIDS are now classed as upper-middle-income countries although they continue to struggle with the vulnerabilities and challenges that all SIDS have to achieve social and economic development and to adapt to climate change. Their debt service obligations reduce fiscal capacity for capital investment and economic growth. The Kingston Outcome Document prioritises the reclassification of SIDS to low-income states so that they may have access to concessionary financing. The World Bank’s allocation to Caribbean States is small and has been decreasing. Overseas development assistance has also decreased as aid has shifted to low-income and post-conflict nations (Bourne et al., 2015). Within this context, it is understandable that Caribbean SIDS would include their reclassification to low-income countries, for the purpose of concessionary financing, as a priority and it is significant that the issue is not reflected in the international action agendas.

Another notable finding from the table is the way SIDS have framed some of their traditional challenges to suit new international agendas. Policymakers interviewed for this paper lamented but confirmed that SIDS have had to reframe their development priorities in the language of, or to concord with, the international goals, in order to tap into the international funding streams associated with these international goals. For example, SIDS’ tourism and agricultural sectors have always suffered from natural hazards such as flooding or storms that predate climate change. For these states, DRR and resilience have greater national priority. However, framing DRR as climate resilience concords better with the international climate adaptation agenda and allows SIDS to tap into climate funding. Similarly, St. Lucia’s climate policy includes mitigation although the island’s carbon footprint is minimal. Specifically, St. Lucia’s economy will benefit from reduced fuel import costs and lower economic exposure to fluctuations in global fuel prices. This economic policy is framed, also for the purposes of obtaining international funding and technical support, as a mitigation goal related to clean energy production and an SDG related to energy security.

SIDS do not mention equality between countries (SDG10) among their sustainable development targets. Their references to comparisons between countries refer to their special needs for financing and capacity building for sustainable development. In addition, SIDS have not addressed safe, resilient, and sustainable cities (SDG11) and this may be because of scalar realities: few SIDS have the sustainability challenges of larger urban populations (Mycoo & Donovan, 2017). Urbanisation for SIDS can relate to a small town connected by villages along the coast, or on a single island state and SIDS need not separate urbanisation as a separate sustainable development challenge (UN-HABITAT, 2015). Singapore's entire population (5.1 million) and most of Puerto Rico's (3.7 million out of 3.74 million), for instance, are urban. Of the 49 remaining SIDS, few have urban populations over 1 million people: Dominican Republic (7.0 million), Cuba (8.5 million), Bahrain (1.2 million), Haiti (5.4 million), and Jamaica (1.4 million). In each case, all major cities within the state are included in this calculation of urban populations (UN-HABITAT, 2015). Also on the point of divergence, SIDS generally gave less priority to SDG16 (peaceful and inclusive societies), although, as discussed above, crime and regional security were mentioned in the CARICOM Strategic Plan (UNODC, 2012).

5 Conclusion

This study points to the links between several areas of international and national climate and sustainable development policy, goals, and targets. The implementation strategies are listed in policy documents as separate goals and action items that are then the responsibility of separate international and national agencies responsible for implementation. The UN's 34 funds, programmes, and specialised agencies reflect these thematic goals or targets and institutionally entrench them through their streams of development cooperation to SIDS. In practice, SIDS' national agencies, structured around the goals and targets of the SDGs, compete for an always shrinking pot of development funds. Separate implementation of goals by agencies when, as this study exemplifies, the goals are interlinked, leads to a duplication of efforts and the inefficient use of scarce resources that SIDS can ill afford (Helgason, 2016; Scobie, 2016).

Alternatively, and using this framework, any action, for example on SDG1 (poverty alleviation), should involve departments in government working on poverty alleviation (Kingston Outcome Document goal), poverty reduction (CARICOM Strategic Plan), DRR (SAMOA Pathway), and climate change (SDG13). Projects should be co-created and jointly implemented by public and private stakeholders in the related areas (Scobie, 2016) – always linking these goals and the many sub-goals and targets under each heading in the framework table (detailed in the documents mentioned above). Similarly, departments working on SDG8 (inclusive economic growth) should work with all departments and stake-

holders working on climate change, but also with those working to reduce the impacts of extreme events (St. Lucia Climate Policy goal) on innovation and entrepreneurship and sustainable economic growth (CARICOM goal), tourism (Kingston Outcome Document), and decent work (SAMOA Pathway).

There is also scope, using the table, to link some of these policy and implementation areas to departments and stakeholders working on other SDGs related to SDG8 and climate change. There are linkages between the inclusive economic growth goal (SDG8) and equitable and universal energy access (Kingston Outcome Document goal), and departments working on energy can develop joint projects with those on inclusive economic growth. In the cases where the national or regional goal is not also a goal at the international level – like the CARICOM goal on the need to address crime and regional security – to obtain international funding and technical assistance, departments working on that goal, would then have to find ways to link that goal with other related SDGs. Since SDG16 (on peaceful and inclusive societies), to which the CARICOM goal on crime may be linked, is also linked to climate change, CARICOM states can then leverage the importance of climate policy to help to avoid some of the societal weaknesses exacerbated by climate impacts – such as poverty and poor social services – to SDG16 to leverage funding associated with climate change and SDG16 for the CARICOM goal on crime.

More recently, St. Lucia created an institutional structure to facilitate collaboration on climate change and the framework of this paper can assist in establishing areas of joint interest and action among agencies. Saint Lucia's National Adaptation Plan (NAP) 2018-2028 (published after the study was completed) signalled the creation of a National Climate Change Committee – comprised of representatives from ministries of sustainable development, agriculture, physical planning, health, education, tourism, finance, infrastructure, national insurance, national conservation, electricity, solid waste management, air and sea ports, water and sewage, and the bankers association – to improve institutional coordination between the government agencies that manage climate related goals. Interview partners noted that the success of such cross-departmental efforts depends on the willingness of departments to share information and resources and to allow other agencies to lead on international financing projects. According to Caribbean policymakers, although in some government departments such a collaborative culture exists, in many others it is lacking unless specific funding and performance targets are introduced (Scobie, 2016).

This chapter illustrates where there are linkages between climate goals and the SDGs at international to national levels with St. Lucia as an example, while showing areas of convergence and divergence and the challenging complexity and multiplicity of goals. In doing so it responds to calls in the literature to identify nexus points in development approaches (Boas et al., 2016a). By identifying the areas of connection between the SDGs and climate change, the study offers policymakers a

framework to approach international, regional, and national climate change and development policy more holistically in policy formulation.

International funding and development assistance are managed through separate UN agencies that are structured along the lines of the SDGs. SIDS policymakers struggle to implement multiple targets and goals that they have committed to at international and regional forums. They have limited resources and the handicap of economic and environmental vulnerability that reduce their control over future income and future expenditure. The national ministries or agencies of government often replicate the thematic divisions of the SDGs and independently implement policies that have the potential to achieve several SDGs. It is up to policy implementers to recognise the interrelationships if they are to use resources more efficiently and St. Lucia's National Climate Change Committee is a promising example of an institutional structure that may facilitate this. For SIDS policymakers and their development partners and committees like the St. Lucia Climate Change Committee, the frameworks presented in the tables of this chapter are tools for policymaking and implementation since they immediately signal the otherwise separate development goals and potentially can more readily help identify how several sustainable development and climate goals can be achieved through one policy intervention.

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6

Adaptation planning in Caribbean Small Island Developing States: A literature review

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Planned adaptation has been recognised as essential to address the implications of climate change for Small Island Developing States (SIDS). Many SIDS have developed national, sub-national, and sectoral adaptation plans. The Caribbean Climate Risk and Adaptation Tool (CCORAL) has been developed and utilised broadly throughout the region to guide practitioners in adaptation planning. This chapter utilises the CCORAL framework of adaptation planning to develop the concept of an adaptation planning cycle. It uses this conceptualisation as a framework to assess academic literature focused on Caribbean SIDS that aligns with different aspects of the adaptation planning cycle. Through this exercise, the strengths and gaps in existing peer-reviewed literature are identified in order to inform future research needed to assist in adaptation planning for the region.

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1 Introduction

Small Island Developing States (SIDS) across the globe are well recognised for their high vulnerability to impacts of climate change (UN-OHRLLS, 2017). While these small islands have negligible contributions to the global greenhouse gas emissions that drive climate change, they are highly exposed to climatic hazards (Nurse et al., 2014). Thus, while both mitigation and adaptation are essential to reduce impacts of climate change, many SIDS have concentrated their climate action on adaptation (Mycoo, 2017; Robinson, 2017). This is certainly the case in the Caribbean, where adaptation planning and implementation has begun in earnest.

The Caribbean Community Climate Change Centre (CCCCC) was developed as the body responsible for supporting the region in addressing climate change and developing programs to facilitate sustainable development in the context of climate change (Thomas & Lindo, 2019). Since becoming fully operational in 2004, the CCCCC has implemented a variety of projects and programs that support climate resilient development in the region. To guide action in the Caribbean, the CCCCC developed the Regional Framework for Achieving Development Resilient to Climate Change in 2009 and advised countries to take a risk management approach in considering the challenges of climate change in their development plans (CCCCC, 2009). To support science-based decision-making, the CCCCC developed regionally specific climate change risk management and adaptation planning guidance. One of the guidance tools developed in 2012 is the Caribbean Climate Risk and Adaptation Tool (CCORAL). CCORAL facilitates assessing climate change impacts in projects, programs, strategies, or legislation and is intended to mainstream climate change adaptation across planning in the region. The tool takes users through a multi-step process intended to understand the climate influence on potential activities and identify prospective adaptation actions that can be implemented to reduce risk. Training with CCORAL has been conducted in all of the member states of the Caribbean Community (CARICOM) with over 500 individuals in government, non-governmental organisations, banks, and regional organisations (Thomas & Lindo, 2019).

As adaptation planning has increased in the region, academic research on adaptation in Caribbean SIDS has also been growing. The majority of publications focus on governance, institutions, and planning (Robinson, 2018). This chapter utilises the CCORAL framework of adaptation planning to develop the concept of an adaptation planning cycle. It then uses this conceptualisation to assess academic literature focused on Caribbean SIDS that aligns with different aspects of the cycle. Through this exercise, it identifies the strengths and gaps in existing peer-reviewed literature that can inform future research needed to assist adaptation planning for the region.

2 Conceptual Framework

Literature reviews of adaptation have taken a variety of forms, from assessing literature on adaptation responses for specific geographic locations (Hunt & Watkiss, 2011), to reviewing publications on distinct approaches to adaptation, such as community-based adaptation (Forsyth, 2013). Literature reviews on adaptation planning in particular have also varied in their approaches. For example, Araos et al. (2016) use a systematic review framework to identify adaptation planning in large cities while Walker, Haasnoot, and Kwakkel (2013) review planning approaches for adaptation that take uncertainty into account. This chapter takes a novel approach to reviewing literature on adaptation by assessing peer-reviewed studies that align with adaptation planning guidance that has been developed for practitioners in the Caribbean. Since CCORAL has been used extensively in the region to plan adaptation, an assessment of how the academic literature fits within the CCORAL framework provides a practitioner-focused assessment of scientific research.

CCORAL provides a framework and resources to allow users to identify appropriate adaptation actions. Resources that CCORAL recommends include several ‘end-to-end’ climate risk management tools that contain guidance on moving from assessing vulnerability to determining risk to identifying, appraising, and costing adaptation options. These tools were recommended for their relevance to the Caribbean context and to Caribbean decision-making processes (CCCCC & Acclimatise, 2015). The first of these risk management tools is the Caribbean Risk Management Guidelines for Climate Change Adaptation Decision Making which provides a risk management framework to identify and implement adaptation options focused specifically on the Caribbean (CARICOM Secretariat, 2003). The second tool is the Climate, Environment and Disaster Risk Reduction Integration Guidance, which provides guidance for countries to integrate adaptation, disaster risk reduction, and environment into development (CEDRIG, n.d.). Last, Climate Proofing for Development is a guideline to incorporate climate change into development planning and offers a methodology for identifying and prioritising adaptation options (Hahn & Fröde, 2011).

All of these guidelines include assessment of risk and vulnerability as well as clear steps for identifying, assessing, selecting, and costing adaptation options. These are common features of guidelines for adaptation planning in many frameworks beyond those identified by CCORAL. For example, the United Kingdom Climate Impacts Programme (UKCIP) has proposed a step-by-step methodology to move from identifying problems through to monitoring action (UKCIP, 2010). There are also a host of other frameworks and guidelines that follow a similar approach (e.g. US National Climate Assessment Framework, WeAdapt Adaptation Planning).

From the guidelines and frameworks recommended by CCORAL, the process of adaptation planning can be generalised as including the following steps:

- (i) assessment of impacts, vulnerability, or risk;
- (ii) identification of adaptation needs and options;
- (iii) prioritisation of adaptation options;
- (iv) selection and elaboration of adaptation strategy;
- (v) implementation of adaptation strategy; and
- (vi) monitoring and evaluation of adaptation strategy.

The process is intended to be cyclical with monitoring and evaluation then feeding back into assessing how impacts, vulnerability, or risk have been affected due to implementation of the adaptation strategy (CARICOM Secretariat, 2003). The planning process may also be iterative and several steps may be repeated (CEDRIG, n.d.; Hahn & Fröde, 2011). For example, identification and prioritisation of adaptation options may go through several cycles before moving to the next step of selecting and elaborating on a particular adaptation strategy. The process of elaborating on the adaptation strategy may reveal weaknesses or gaps in the strategy selected and require conducting the identification and prioritisation stages again. Thus, the adaptation planning process is flexible but, ideally, all steps should be taken in order for effective adaptation to take place.

While this framework encapsulates the practical steps that should be taken to plan adaptation, it is missing discussion of the contextual environment that planning takes place in. Wise et al. (2014) highlight that adaptation planning takes place in an “adaptive space” where a number of factors – such as cultural, political, economic, and environmental characteristics of a particular place – affect the procedural aspects of adaptation planning. There are a number of challenges and barriers in the adaptive space that can affect the outcomes of adaptation planning. These include coordination challenges between different areas of government, issues of engagement with a variety of sectors, the need for effective leadership of the planning process, availability of funding, and integration of adaptation into non-climate focused policies and plans (Mimura et al., 2014). Thus, the process of adaptation planning is very much influenced by the context in which the planning takes place.

Figure 1 presents the adaptation planning process and adaptive space, highlighting the iterative process between planning steps and that these steps take place in a particular contextual environment. The combined procedural processes and contextual environment is termed the adaptation planning cycle for the purposes of this chapter.

Using this conceptualisation of the adaptation planning cycle, I conducted an extensive literature search to identify peer-reviewed literature that addressed any of the components of the cycle and that included Caribbean SIDS in particular. I assessed literature that included at least one Caribbean SIDS including cross-regional SIDS studies and studies that did not focus on SIDS in particular. I reviewed literature to determine which aspect of the adaptation planning cycle it focused on and evaluated the major findings from each paper.

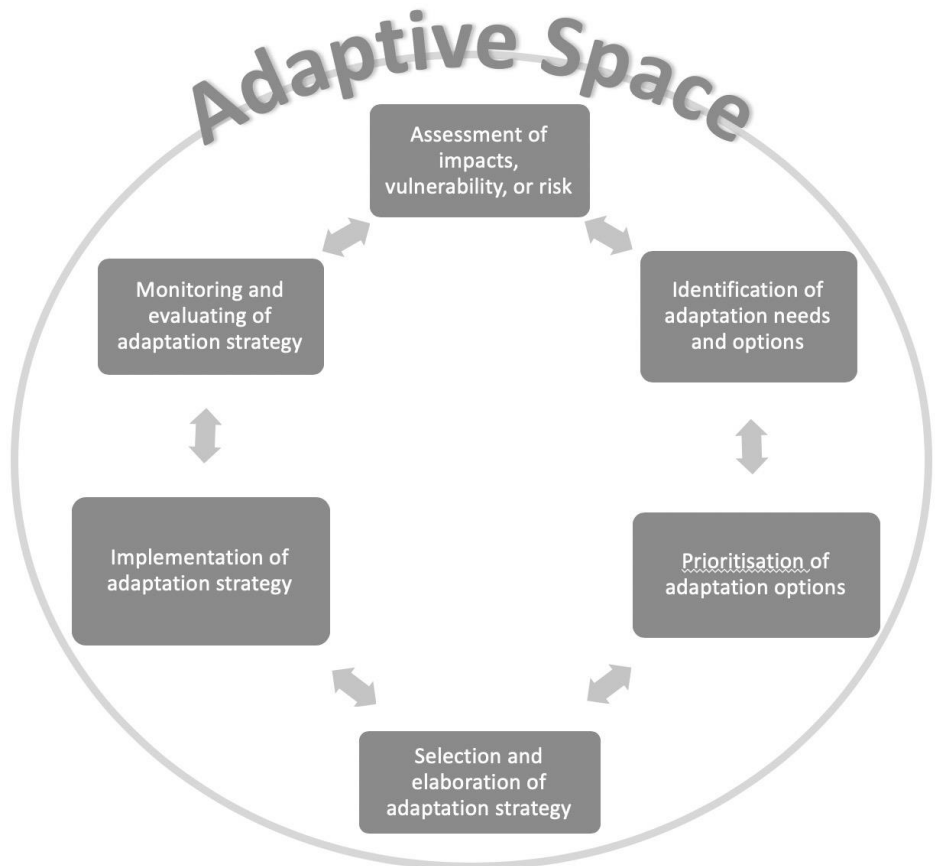


Figure 1: Adaptation Planning Cycle

I found additional studies that address climate change and Caribbean SIDS during the literature search that did not focus on the stages of the adaptation planning cycle. While these studies are valuable and add to the broader literature available on Caribbean SIDS, this particular literature review assesses only studies that focus on topics that are part of the adaptation planning cycle. Thus, this chapter is not an exhaustive review of all peer-reviewed literature on climate change and Caribbean SIDS.

Each of the papers relevant for this literature review are further detailed in the following sections: 3.1 Adaptive space, 3.2 Assessment of impacts, vulnerability or risk, 3.3 Identification and prioritisation of adaptation options, 3.4 Implementation of adaptation strategy, and 3.5 Monitoring and evaluation of adaptation strategy. I combined literature on identification and prioritisation of adaptation options into one section since the found literature addressed both of these issues, despite the

separation of these steps in the adaptation planning cycle. I did not find any studies that focused on selection and elaboration of the adaptation strategy.

3 Literature review

3.1 Adaptive space

Robinson (2018) uses a resilience lens to identify limits to adaptation at the national level in Caribbean SIDS. Analysing National Communications (NCs) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) and interviews with governmental officials, the study identifies limits to adaptation that are related to the adaptive space. These limits include lack of finances, limited technical capacity and resources, lack of data and records, and issues related to human resources. Financing and organisational capacity are identified as the major limits to adaptation planning and implementation and include lack of national funding, limited skilled labour, and ineffective governance structures.

Robinson and Gilfillan (2017) assess the effectiveness of regional climate change adaptation organisations in both the Caribbean and Pacific, focusing on the CCCCC in the Caribbean. Regional organisations have the potential to provide financial, technical, and capacity-building support for SIDS governments in the adaptation planning cycle. However, there have been very few assessments of their effectiveness in coordinating regional adaptation strategies and programs. The authors develop a qualitative tool – Framework for Assessing Regional Organizations Coordinating Climate Change Action (FAROCCCA) – and use it, along with interviews of regional experts, to assess the CCCCC. Strengths of the organisation include an institutional framework that supports adaptation, high-capacity staff, access to financing streams, policies/plans that support climate research, and achieving immediate outputs of adaptation projects. Weaknesses include challenges in retaining staff, limitations in evidence-based project design, and questionable effectiveness of projects at sub-national scales. The authors identify potential areas of improvement which include developing robust indicators for monitoring and evaluation of adaptation projects, and strengthening the design of projects and programs. To be most effective at supporting adaptation, the authors suggest that instead of focusing on project implementation, regional organisations should focus on filling information deficits, assisting countries to develop financeable projects and access funding, and building national capacity.

Robinson (2017) explores drivers and barriers of mainstreaming adaptation into policies and programs at the national level in Caribbean and Pacific SIDS. Drawing from interviews with national governmental representatives and regional organisations, the study identifies a number of drivers of adaptation mainstreaming. These include the effectiveness of institutions or organisations, the presence of a climate ‘champion’ that can utilise connections with informal networks, and high

levels of risk and exposure. Barriers to mainstreaming are found to include weak planning and governance, limited human resources, and lack of coordination of development priorities.

Betzold (2015) reviews literature on adaptation in small islands across regions. The article focuses on barriers to adaptation that are categorised as relating to perception and awareness, resources, and institutions. Religious beliefs, along with the view of climate change as a foreign concept by SIDS residents, relate to the low prioritisation of adaptation action. Reliance on foreign aid may lead to adaptation efforts being focused on those prioritised by donors while also discouraging the usage of limited domestic funds on adaptation. The need for extensive local participation and ownership in adaptation is identified as a fundamental requirement for successful adaptation. While Betzold utilises literature from across SIDS regions, including the Caribbean, much of the literature she surveys focuses on Oceania and the author calls for further research on these topics from different regions to facilitate cross-regional comparison.

Tompkins, Lemos, and Boyd (2008) conduct an ethnographic study of disaster risk reduction approaches in Cayman Islands and Brazil and make linkages to effects on adaptive capacity to climate change. In the Cayman Islands, they identify factors that contributed to the decreased vulnerability of the territory to hurricanes, and the reduced impact of these storms, as compared to other islands in the region. The factors are all related to the capacity and efficiency of the national institution tasked with hurricane management and include support and buy-in from both key stakeholders and the wider population, annual revisions of plans and strategies based on the experiences of each hurricane season, and a focus on mainstreaming disaster risk reduction into all areas of policymaking.

Tompkins (2005) also focuses on the Cayman Islands to explore factors that contributed to improved national responses to weather risks and climate change adaptation planning. The study assesses changes to government institutions in response to multiple hurricanes focusing on constitutional order, rules, regulations, and organisational arrangement. The study finds that the institution or agency responsible for adaptation planning should operate as a learning-based organisation that is flexible and able to change with the development of new information. Adaptation planning agencies should be integrated across government departments and ministries and include a wide array of stakeholders. Such agencies should also remain abreast of up-to-date information and use this knowledge to advance guidance and advice. Tompkins also identifies a number of actions that can be undertaken to increase the profile of climate change and contribute to planned adaptation at the national scale. These include: (i) compiling clear information on climate change hazards and impacts, (ii) integrating this information into physical planning processes, (iii) providing education and awareness raising for all parts of society, and (iv) mainstreaming the usage of climate risk assessments across all areas of government planning and policymaking.

This review of literature focused on the adaptive space shows a number of factors that affect the contextual environment in which adaptation planning takes place. The most commonly discussed factor is institutional capacity. All of the literature reviewed highlights that the institution or organisation responsible for adaptation plays a critical role in the planning and implementation of adaptation. It appears that institutional capacity plays an even larger role in the adaptive space than availability of or access to funding, which is also identified as a significant factor. As detailed by Robinson (2018), the capacity of institutions affects how SIDS are able to access international funding that may reduce reliance on limited national funds.

Perception and awareness of climate change is also identified as a key factor in the adaptive space that affects awareness of risk and exposure and public support for adaptation (Betzold, 2015; Robinson, 2017; Tompkins et al., 2008). The availability of information, data, and records on climate change also affects the process of adaptation planning since without needed material, it is difficult to identify the need for adaptation or to develop effective strategies (Robinson, 2018, Tompkins et al., 2008; Tompkins, 2005). Regional organisations such as the CCCCC were identified as being able to improve the adaptive space at the national level through addressing challenges such as information deficits, which would alleviate the lack of data and records; providing assistance with developing financeable projects, which would address limited technical capacity, human resources constraints, and lack of funding; and providing national capacity building, which would improve institutional capacity (Robinson & Gilfillan, 2017).

3.2 Assessment of vulnerability, impacts, and risk

My research did not find any studies focused on the process or analysis of vulnerability, impact, or risk assessments as part of an overall adaptation planning process. However, there are a plethora of studies that evaluate vulnerability, risk, and impacts of climate change for Caribbean SIDS. For example, Donner, Knutson, and Oppenheimer (2007) use global climate models to evaluate the effect of climate change on the 2005 Caribbean coral bleaching event that resulted in damages to coral reefs across the region. They find that as global temperatures rise the likelihood of continued mass bleaching will increase. Scott, Simpson, and Sim (2012) evaluate the vulnerability of tourism properties and economic activities in the coastal zone to rising sea levels across CARICOM. They find that with 1 m of sea level rise, 60% of resort properties would be at risk of beach erosion damage and approximately 30% of resort properties would be either partially or fully inundated. Lewsey, Cid, and Kruse (2004) assess projected impacts of climate change on coastal infrastructure in the eastern Caribbean, identifying factors that may lead to increased impacts including location of critical infrastructure in high-risk areas and degradation of coastal ecosystems. Cambers (2009) utilises beach monitoring data to highlight beach erosion trends across eight Caribbean islands showcasing in-

creased erosion in islands that have been affected by tropical cyclones. Cashman, Nurse, and John (2010) use climate modeling to project changes in temperature and rainfall across the Caribbean and resultant implications for water resource availability.

The above studies are illustrative of the literature that focus on evaluation of vulnerability, risk, and impacts of climate change for Caribbean SIDS. There are a range of studies that assess climate change risks, impacts, and vulnerabilities across different sectors, such as transportation (Monioudi et al., 2018), tourism (Scott, Simpson, & Sim, 2012), agriculture (Lallo et al., 2018; Popke, Curtis, & Gamble, 2016; Rhiney, Eitzinger, Farrell, & Prager, 2018), freshwater (Donk, Van Uyvtan, Willems, & Taylor, 2018; Karnauskas, Schleussner, Donnelly, & Anchukaitis, 2018), and fisheries and marine-dependent livelihoods (Baptiste & Kinlocke, 2016; Forster, Lake, Watkinson, & Gill, 2014). Other studies examine impacts for marginalised societal groups (Baptiste & Rhiney, 2016; Dulal et al., 2009; Hogarth & Wójcik, 2016; Kelman, 2010; Middelbeek, Kolle, & Verrest 2014; Smith & Rhiney, 2016), for the region as a whole (Rhiney, 2015), or for the climate and ocean (Karmalkar et al., 2013; Palanisamy, Becker, Meyssignac, Henry, & Cazenave, 2012). This review underscores that there are many studies that fall under this category of the adaptation planning cycle without being exhaustive in detailed assessment of all such studies.

The many studies that provide assessments of risk, vulnerability, and impacts highlight that this is the part of the adaptation planning cycle with the highest amount of research. While I found no studies that evaluate the process of conducting vulnerability, risk, or impact assessments as part of the adaptation planning cycle, the studies that do exist provide valuable input for practitioners tasked with conducting such assessments to inform adaptation strategies.

3.3 Identification and prioritisation of adaptation options

Feld and Galiani (2015) provide a range of adaptation options that may be effective in Latin America and the Caribbean. Adaptation practices and policies are provided by sector for water resources, coastal zones, agriculture, livestock, energy, biodiversity, and health. A review of cost-benefit analysis as a methodology to select context-specific adaptation measures from a range of options is provided along with discussion of the limits of this approach. While the paper claims to be applicable to the Caribbean, the vast majority of literature cited and discussed centres on Latin America with no discussion of the particularities of small island contexts.

Mercer et al. (2012) review ecosystem-based adaptation (EBA) in Caribbean SIDS, with a particular focus on assessing the usage of local knowledge in developing adaptation strategies and integration of local knowledge with external knowledge. While regional and national adaptation actions have stressed the importance of ecosystems, there is a focus on coastal ecosystems and very limited

inclusion of the relevance or benefits of including local knowledge in developing adaptation measures. However, at the local scale, non-governmental organisations are the key actors in developing and implementing EBA approaches and at this scale there is much attention given to integrating local and external knowledge. Nevertheless, methodologies or approaches for effectively integrating different types of knowledge are seldom provided in the limited project documentation that is included. The authors detail the strengths and weaknesses of a variety of methodologies that can be used to integrate local and external knowledge for adaptation and highlight the need for EBA approaches to be applied to the array of ecosystems at risk in the region rather than continuing to focus on coastal ecosystems. Actions to improve the usage of EBA and integrate local and external knowledge are provided including the need for local champions, drawing upon previous development experience, and regular monitoring and evaluation of climate change adaptation in general.

These were the only two studies found that detail adaptation options available for SIDS. While Feld and Galiani (2015) provide a range of adaptation options across various sectors, the study lacks consideration of the specific context of SIDS. Including consideration of SIDS-specific characteristics, such as limited economies of scale and small land area, is essential in research on adaptation options that are applicable for Caribbean SIDS. Mercer et al. (2012) do focus on SIDS and underscore the importance of including local knowledge when identifying and evaluating adaptation options.

3.4 Implementation of adaptation strategies

Mycoo (2018) reviews current adaptation strategies in the Caribbean and assesses their feasibility if global average temperatures were to exceed 1.5 °C above pre-industrial levels. Adaptation strategies that have been implemented by Caribbean SIDS in the past or that may be required for future climate impacts are assessed for their feasibility as global temperatures warm. Adaptation strategies are categorised according to human settlements and coastal infrastructure, integrated coastal zone management and coastal setbacks, health, EBA, economic diversification, freshwater resources and water security, and disaster risk reduction. The study finds that while Caribbean SIDS have been innovative in adapting to climate change thus far, there is a need for substantial scaling up and acceleration of implementation as temperatures increase. Given the significant challenges that further climate impacts pose to SIDS and limited human, technical and financial capacities at the national scale, it is essential that prioritisation of adaptation options takes place.

Robinson (2018) identifies trends in adaptation action in Caribbean SIDS using analysis of National Communications submitted to the UNFCCC. The most commonly reported adaptation action was assessment of vulnerability and impacts, followed by adaptation research and workshops or trainings. Interviews with gov-

ernment officials in the region revealed that most adaptation strategies include public education and awareness, development of climate change policies, and organisational capacity building. The majority of adaptation strategies were identified as taking place in the water, agriculture, and coastal resources sectors with some limited action in forestry, fisheries, and tourism.

Ebi, Lewis, and Corvalan (2006) review strategies, policies, and measures that small islands across regions have taken to adapt to increased vulnerability to climate-sensitive diseases. In the Caribbean, health organisations recommend a variety of adaptation measures including improving public health infrastructure, creating enabling environments, improving water systems, and strengthening vaccination programs. Drawing from research conducted across SIDS regions, the authors identify recommendations to improve adaptive capacity in the health sector. These include (i) increasing research on climate-sensitive diseases, (ii) building institutional capacity, (iii) improving awareness of health implications of climate change, and (iv) implementing long-term adaptation strategies, policies, and measures.

Literature that assesses the implementation of adaptation strategies in Caribbean SIDS shows that adaptation has taken place across sectors and at a variety of spatial scales. Adaptation strategies often include public education and capacity building. However, as highlighted by Mycoo (2018), as climate risks increase there is a need for substantial scaling up of adaptation across the region. Small, incremental adaptation strategies may be insufficient to address increased risks. In the light of limited funding and institutional capacity, Caribbean SIDS must prioritise and escalate adaptation strategies.

3.5 Monitoring and evaluation of adaptation strategies

Despite the importance of monitoring and evaluation being mentioned in several of the papers that were reviewed (Mercer et al., 2012; Mycoo, 2017; Robinson, 2018), there is a paucity of peer-reviewed studies that focus on this stage of the adaptation planning cycle. Scobie (2018) assesses accountability in climate change governance in the Caribbean, drawing from a survey and interviews with Caribbean climate change experts. The study finds that there are limited accountability measures being used in practice due to inadequate resources and perceptions that accountability mechanisms are prohibitive of timely policy implementation.

While there are a number of technical papers and other grey literature on monitoring and evaluation for adaptation in Caribbean SIDS (e.g. Pierre-Nathaniel, 2017; Rahat & Holvoet, 2016) there is a lack of peer-reviewed literature that addresses specific monitoring and evaluation methodologies and practices that are applicable in the Caribbean context. However, as detailed in studies focused on areas other than Caribbean SIDS, monitoring and evaluation is a critical component of adaptation planning and will be increasingly important as risks escalate (Lamhauge, Lanzi, & Agrawala, 2013).

4 Discussion

The adaptation planning cycle provides a framework for a practitioner-focused assessment of scientific research. Planning, policies, and actions that are based on science are particularly important when addressing an issue as multi-faceted and complex as climate change (Lacey, Howden, Cvitanovic, & Colvin, 2018). Additionally, international climate funders increasingly require that project proposals include context-specific science to justify the need for funding and the particular approaches taken to adapt (Carter & Roux, 2019). Thus, it is imperative that the practice of adaptation planning is supported by scientific research. Assessing academic literature using the adaptation planning cycle therefore allows for identification of strengths and gaps in scientific research that can be used to inform future research needed to support the practice of science-based adaptation planning.

From the literature review, it is clear that some steps in the adaptation planning cycle have received more attention than others. Assessment of vulnerability, impacts, and risk is by far the stage of the adaptation planning cycle with the most research. Studies that focus on this stage provide much-needed assessments of how Caribbean SIDS may be affected by climate change. While no studies were found that evaluate the process of conducting a specific vulnerability, impact, or risk assessment as part of the overall process of adaptation planning, the existing studies provide valuable input for practitioners that must provide scientific evidence of the implications of climate change for specific sectors, communities, or ecosystems.

There were also a number of studies found that focus on the adaptive space and that highlight the importance of the contextual environment in adaptation planning. From these studies, it is clear that institutional capacity, access to funding, perception and awareness, and availability of climate information are critical factors that affect the planning cycle. Regional organisations such as the CCCCC can provide much-needed support to national institutions that must act in the adaptive space to plan adaptation.

Few studies were found that focus on the other stages of the adaptation planning cycle. Research on identification and prioritisation of adaptation options is very limited. This highlights the need for additional studies that include evaluation of SIDS-specific adaptation measures as well as research on methods of prioritisation that take characteristics of SIDS into account. While monitoring and evaluation was identified as an area of critical importance, only one study was found that specifically focuses on this stage of the planning cycle. This underscores the need for studies on specific monitoring and evaluation methodologies and practices that are applicable in the Caribbean context and that can support increased monitoring and evaluation of adaptation strategies in the region.

Research on implementation of adaptation is also scarce. Existing research on this stage shows that while past adaptation measures have largely focused on public education and capacity building, there is a need for substantial scaling up of adap-

tation in the region and a shift from incremental to transformational adaptation. This is in line with the recent Intergovernmental Panel on Climate Change Special Report on 1.5 °C which stresses the need for transformational adaptation and mitigation to take place across all sectors (IPCC, 2018). Thus, there is a need for Caribbean-specific studies that focus on opportunities and challenges for transformational adaptation.

Noticeably, there were no studies found that focus on selection and elaboration of adaptation strategies. This may perhaps be due to the highly practical nature of this step which involves using the prior steps of assessing impacts, vulnerability, or risk and then identifying and prioritising adaptation options to select a specific adaptation strategy and elaborate on how the strategy will be implemented. However, while this is a practical step, there is opportunity for scientific research to provide inputs on ideal components of adaptation strategies and issues that should be included in strategies to ensure effective implementation. For example, the elaboration of a “theory of change” is increasingly required by funders to illustrate how particular adaptation strategies selected will achieve adaptation goals (Bours, McGinn, & Pringle, 2014). Research that is SIDS-specific and focused on particular tools, methodologies, or case studies of how adaptation strategies may be selected and elaborated would be useful.

The imbalance of research on specific stages of the adaptation planning cycle shows where additional scientific study is needed. SIDS are well recognised for their high vulnerability to climate change which is reflective of the many existing studies on vulnerability, impacts, and risks. While there is still a need for further research on vulnerability, impacts, and risks – particularly as climate science improves and global temperatures rise – there is also a need for research to support adaptation planning and action by SIDS. Now that SIDS must upscale adaptation efforts and shift to more transformational approaches to adaptation, scientific research to support the other stages of the adaptation planning cycle is required.

5 Conclusion

Assessment of peer-reviewed literature that includes discussion of components of the adaptation planning cycle reveals key insights that are specific to Caribbean SIDS. Much of the available literature focuses on the adaptive space and on assessing impacts, vulnerability, and risk. There is limited literature available on identifying and prioritising adaptation options, on implementing adaptation strategies, or on monitoring and evaluating adaptation. Notably, no studies were found that focus on the selection and elaboration of adaptation strategies.

This review highlights areas where additional research related to the adaptation planning cycle would be beneficial. First, targeted research on ways to improve institutional capacity would address this critical component of the adaptive space. Lack of institutional capacity is repeatedly identified as a barrier to adaptation

planning and implementation. However, with the exception of Tompkins (2005) there is little consideration of how such capacities can be improved.

Second, literature on adaptation options that are feasible in the Caribbean SIDS context would provide much needed information for identification of appropriate adaptation measures. While there has been limited study in this area, there is much room for expansion, particularly in light of increased risk as global temperatures rise. Research that goes beyond incremental adaptation options and considers transformational adaptation strategies that can address heightened impacts due to higher global temperatures would be helpful to assist practitioners in the practice of adaptation planning.

Third, studies on monitoring and evaluating adaptation strategies in the Caribbean SIDS context would be beneficial. As more Caribbean nations implement adaptation, it is critical that such strategies are assessed to determine how they affect vulnerability, risk, and impacts. As detailed in the adaptation planning cycle, each of the components of adaptation planning are related to and inform each other and so failure to include specific components affects the overall process. Monitoring and evaluation are also becoming increasingly important on a global scale, particularly as funders are requesting evidence of the effectiveness of adaptation (Lamhauge et al., 2013).

Last, there is a need for studies on selection and elaboration of adaptation strategies. Scientific research can provide valuable support for practitioners tasked with choosing adaptation measures and providing information on how such measures will be implemented effectively. This step is becoming increasingly important to climate funders and research on ideal components of adaptation strategies and issues that should be included to ensure effective implementation would be highly practical and practitioner-relevant.

As climate risks increase due to rising global temperatures, it is critical that Caribbean SIDS are able to effectively plan and implement adaptation strategies. As revealed by this review of the literature, there are many ways that the adaptation planning cycle in the region can be improved and further study of adaptation will assist in both understanding and strengthening adaptation in Caribbean SIDS.

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PART II: CULTURES, PERCEPTIONS, AND KNOWLEDGES

7

Comparing perceptions of climate-related environmental changes for Tuvalu, Samoa, and Tonga

Katharina Beyerl, Harald A. Mieg, and Eberhard H. Weber

Individual perceptions of climate-related environmental changes are essential to understand behavioural responses to such changes. Despite several studies on change-perception in single Pacific Small Island States (PSIS), the variance in these perceptions within and between different PSIS has so far largely been neglected. We, therefore, explored perceptions of climate-related environmental changes and attributed causes in Tuvalu, Samoa, and Tonga. Our survey (N=180) shows that perceptions of environmental changes vary considerably between the three island states and also within each country. A certain fraction of this variance can be explained by (i) geographical and climatic differences between the island states and (ii) selected socio-demographic variables. The socio-demographic factors that proved most relevant include (i) the size of the settlement in which respondents live, (ii) their distance to the sea, (iii) their interaction with nature, and (iv) their self-assessment of their own religiosity. Moreover, we found that people attribute reported changes to manifold irresponsible and unsustainable human behaviours, and to a lesser extent to natural processes and divine acts. By illustrating the variance of perceptions and also the awareness of anthropogenic causes, the study helps to communicate the diversity of local voices and offers ways for finding a basis for discussing and implementing more sustainable behaviour alternatives.

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1 Introduction

How people perceive their natural and social environment is key to how they behave in order to address the situations they are confronted with (Beyerl, Putz, & Breckwoldt, 2016). The experience of seasonal cycles, for instance, and the way humans have learned to adapt to them over time, shapes our behaviours not only with regard to clothing and indoor and outdoor activities for daily subsistence or leisure, but also with regard to how we maintain buildings that protect us from the elements. We have adapted our behavioural patterns and infrastructures to the familiar variability of environmental conditions, and to a certain degree we are prepared for occasional extreme weather events. Based on our experiences we also plan and lay the foundations for the future, trying to ensure our own wellbeing and that of our loved ones. As anywhere else in the world, people in tropical Pacific Small Island States (PSIS) have adapted to their environment. However, climate-related environmental changes are projected to alter familiar conditions and challenge the adaptive capacity of people and ecosystems (Nunn, 2009).

Many studies have investigated the vulnerability of PSIS to climate change from the perspective of the natural sciences and focused on potential implications for infrastructure, economy, and migration (e.g. Keener, Marra, Finucane, Spooner, & Smith, 2012; Nunn, 2013; Nurse et al., 2014; Australian Bureau of Meteorology & CSIRO 2011, 2014; SPREP, 2016). But apart from a few exceptions (e.g. Kuruppu & Liverman, 2011; Lata & Nunn, 2012; Roudiak-Gould, 2012, 2014; Nunn et al., 2016), reports that go beyond anecdotal evidence of how these changes are perceived by the affected populations are largely still missing in the peer-reviewed literature (Betzold, 2015). Even for Tuvalu, which is often described as one of the most prominent examples of a Small Island State facing climate change and the threat of becoming uninhabitable in the near future (Farbotko, 2010), peer-reviewed perception research is rare, and statistically usable data regarding people's perception of environmental changes is hardly available.

In order to better support the planning of adaptation strategies, awareness-raising programs, and the implementation of effective precautionary measures, it is crucial to be aware of how people perceive the situation that needs to be addressed (Beyerl, Mieg, & Weber, 2018). Simply put, if people do not notice adverse change, they might not see any need to do something about it. And even if they perceive certain changes, their attribution of the relevant causes can vary, and can lead to behaviours that are not necessarily optimal options for mitigation and adaptation (Beyerl et al., 2016; Grothmann & Patt, 2005).

Because of their relatively small land sizes, combined with political independence, the multitude of occurring and projected environmental changes, and the specific nature-dependency of their inhabitants, PSIS are a special region to study perceptions of climate-related changes. Moreover, the combination of a historically grown culture of long-term subsistence with the increasing prevalence of modern, unsustainable lifestyles makes PSIS particularly interesting examples of how envi-

ronmental change and its reasons are perceived in times of the global socio-ecological crisis.

For many PSIS, information about people's perceptions and interpretations is still missing, and systematic ways of recording and sharing local observations are required, so that results can be compared across locations to inform adaptive management (McMillen et al., 2014). As a contribution to closing this gap for three of these countries, this study reports survey results from Tuvalu, Samoa, and Tonga relating to the following research questions: (i) What kind of climate-related environmental changes do people perceive? (ii) What do respondents think are the causes of the reported changes? (iii) Are there overarching correlational patterns for environmental perceptions and selected socio-demographic variables that can help explain potential variance in perceptions?

2 Geographical characteristics and climate features of Tuvalu, Samoa, and Tonga

Tuvalu, Samoa, and Tonga are PSIS located in the tropics and are representative examples of the main geological formations of island types in the Pacific Island region (Barnett & Campbell, 2010). While they share certain characteristics as island states, they differ in their geographical and climatic features (Table 1). Whereas Tuvalu is comprised of nine narrow coral atolls with maximum heights above sea level of only 5 m, Tonga numbers 177 islands of which some are low-lying coral formations and others are of volcanic origin with maximum elevations above sea level of 1,033 m. The independent state of Samoa is comprised of two large main islands of volcanic origin with narrow coastal plains and interior mountains of up to 1,857 m height, and eight smaller islands, of which only two are inhabited. The island topography also affects weather patterns, with higher mountains fostering orographic rainfall, whereas coral atoll islands depend on convective rain (Terry, 2007).

Table 1: Geographical features, current climate characteristics, and climate projections until 2100 from Funafuti for Tuvalu, Apia for Samoa, and Nuku'alofa for Tonga (Australian Bureau of Meteorology & CSIRO, 2011, 2014; SPC, 2018; Barnett & Campbell, 2010).

Regional characteristics	Tuvalu	Samoa	Tonga
<i>Land area</i>	26 km ²	2,934 km ²	749 km ²
<i>Number of inhabitants</i>	10,200	196,700	100,300
<i>Topography</i>	Low-lying and narrow coral atolls	Narrow coastal plains, interior mountains	Coral formation, Volcanic
<i>Highest elevation</i>	5 m	1,857 m	1,033 m

Current climate			
Air temperature	Air temperatures are relatively constant throughout the year and closely related to sea-surface temperatures	Very small seasonal temperature differences	Seasonal variations in air temperature due to position close to subtropics, partly driven by sea-surface temperature of the oceans
Rainfall	<ul style="list-style-type: none"> - Wet season from November to April - Dry season from May to October - Strong seasonal cycle driven by the strength of SPCZ - High year-to-year variability due to the impact of ENSO 	<ul style="list-style-type: none"> - Wet season from November to April - Rainfall greatly influenced by the position and strength of SPCZ - Significant year-to-year variability influenced by ENSO 	<ul style="list-style-type: none"> - Wet season from November to April with two thirds of the annual rainfall; - High year-to-year variability due to ENSO
During El Niño	<ul style="list-style-type: none"> - Wet - Lower than normal sea level 	<ul style="list-style-type: none"> - Dry - Lower than normal sea level 	- Dry, in extreme years very dry
During La Niña	Dry	<ul style="list-style-type: none"> - No consistent impact on rainfall; - Higher than normal sea level 	Wet
Tropical cyclones	<p>On average 8 tropical cyclones per decade</p> <p>Most cyclones usually occur between November and April, with high inter-annual variability.</p>	<p>On average 10 tropical cyclones per decade</p>	<p>On average 17 tropical cyclones per decade</p>
Current trends	<p><i>Warming trends</i> in annual and seasonal mean air temperatures for the period 1950–2009;</p> <p>Annual and seasonal rainfall trends for the period 1950–2009 not statistically significant</p>		
Temperature	<ul style="list-style-type: none"> - Significant increases in warm nights - Significant decreases in cool nights 	<ul style="list-style-type: none"> - Annual number of cool days has decreased significantly 	(Insufficient daily temperature data)
Sea level rise	- about 5 mm/year near Tuvalu measured by satellite altimeters since 1993	- about 4 mm/year near Samoa measured by satellite altimeters since 1993	- over 6 mm/year near Tonga measured by satellite altimeters since 1993
Future projections			
El Niño and La Niña	El Niño and La Niña events will continue to occur in the future (very high confidence), but there is little consensus on whether these events will change in intensity or frequency.		
Air Temperature	Annual mean temperatures and extremely high daily temperatures will continue to rise (very high confidence).		

Rainfall	<ul style="list-style-type: none"> - Not clear whether mean annual rainfall will increase or decrease, model average indicating little change, with <i>more extreme rain events</i>. - Incidence of drought is projected to decrease slightly. 	<ul style="list-style-type: none"> - Little change in mean annual rainfall is projected (low confidence), with <i>more intense and frequent extreme rain events</i> (high confidence). - Incidence of drought is projected to decline or stay approximately the same (low confidence). 	<ul style="list-style-type: none"> - Not clear whether mean annual rainfall will increase or decrease and the model average indicates little change with <i>more extreme rain events</i>. - Drought frequency is projected to decrease slightly.
Sea level, wave heights, ocean acidification	Sea level will continue to rise. Ocean acidification is expected to continue. The risk of coral bleaching is expected to increase. (Very high confidence for all.)		
	December–March wave heights and periods are projected to decrease slightly	A reduction of wave period in December–March is projected with no change in wave height (low confidence), while no change is projected in June–September (low confidence).	December–March wave heights and periods are projected to decrease slightly.
Cyclones	<i>Tropical cyclones</i> are projected to be <i>less frequent but more intense</i> .		

The main climate features affecting the island groups are the El Niño–Southern Oscillation (ENSO), the West Pacific Monsoon, the South Pacific Convergence Zone (SPCZ), trade winds, sub-tropical highs, and tropical cyclones (Australian Bureau of Meteorology & CSIRO, 2011, 2014). In particular, ENSO causes great variability in yearly climate features. In El Niño years, the weather in Samoa and Tonga tends to be dryer with lower than average sea levels, whereas in Tuvalu the weather tends to be wetter. For La Niña years, the opposite is the case, with dryer conditions in Tuvalu, wetter weather in Tonga, and higher than normal sea levels in Samoa. In extreme years, ENSO conditions can lead to severe droughts (as in 2011) or to flooding respectively. In addition, tropical cyclones are common, whose strong and destructive winds accompanied by heavy rainfall and high waves frequently lead to flooding with rain water and sea water.

With regard to temperature, rain, and wind, the three countries differ slightly. Temperatures are relatively constant in Tuvalu and Samoa, but show some annual variation in Tonga. Similar for all three countries is the very high inter-annual variability of rainfall and the occurrence of tropical cyclones. In all three states, the wet(ter) season usually prevails from November until April, and the dry(er) season from May to October. According to reports of the Australian Bureau of Meteorology and CSIRO (2011, 2014), current climate trends indicate warming of the annual and seasonal mean air temperatures for the period of 1950 to 2009. The number of cool nights and days are decreasing, whereas warm nights and days show in-

creasing trends. Furthermore, satellite altimeters show increases in sea level of about 4–6 mm per year since 1993.

As reported by the Australian Bureau of Meteorology and CSIRO (2011, 2014), CMIP5 climate models project that annual mean temperatures and extremely high daily temperatures will continue to rise. Also, extreme precipitation events are expected to increase, whereas the occurrence of droughts is projected to decrease slightly. However, the models' confidence levels for drought events are rather low. With respect to storms, it is notable that tropical cyclones are projected to be less frequent but more intense. With very high confidence though, models agree in their projections that the sea level will continue to rise, oceans will get warmer and more acidic, and the risk of coral bleaching will increase.

Despite the relative smallness of the three island states, there are always local specificities that need to be considered in detail (Nunn & Kumar, 2018; Betzold & Magnan, 2019). Not only can extreme events affect some parts of an archipelago while leaving other parts without greater harm, but also vulnerabilities, resilience, and adaptive capacity can vary substantially between places. Therefore, the descriptions above should be seen as approximate characteristics. Moreover, specific climate data for remote places and communities is not always available.

3 Perception of climate-related environmental changes

In the context of the advancing debate on climate change, the perception of weather and environmental changes has received increased attention during the past years (Savo et al., 2016). Simultaneously, numerous studies have investigated the perception of global climate change or global warming (Wolf & Moser, 2011; Capstick, Whitmarsh, Poortinga, Pidgeon, & Upham, 2015). Although seemingly similar at first glance, the two branches of research differ in several aspects. In-depth research about the perception of weather anomalies and climate-related environmental changes often tries to find out what kind of changes people perceive, compares the results with scientific measurement data, and links perceptions to traditional ecological knowledge, societal change, cultural practice, and adaptation behaviour (Aswani, Vaccaro, Abernethy, Albert, & Fernandez, 2015; Green, Billy, & Tapim, 2010; West, Roncoli, & Ouattara, 2008; Vedwan & Rhoades, 2001). Surveys about public perception of climate change and global warming, however, focus more on capturing attitudes towards a relatively abstract statistical construct and consequent behavioural responses, and try to explain the inter-individual variance by investigating relations to socio-demographic, cognitive, experiential, and socio-cultural factors (Weber, 2016; van der Linden, 2015). Studies of the first kind have been conducted in many parts of the world, mainly in Africa and Asia (Savo et al., 2016). Studies of the latter kind are often based on large scale public opinion surveys carried out particularly in the United States, European countries, Canada, Australia, and New Zealand (Wolf & Moser, 2011; Capstick et

al., 2015; Leiserowitz, Maibach, Roser-Renouf, Feinberg, & Rosenthal, 2016; Reser, Bradley, Glendon, Ellul, & Callaghan, 2012; Pidgeon, 2012; Lorenzoni & Pidgeon, 2006; Milfont, Milojev, Greaves, & Sibley, 2015; Bord, Fisher, & O'Connor, 1998; for international comparisons see Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015; Brechin & Bhandari, 2011). Both approaches have their strengths. In-depth studies often put emphasis on the variety of potentially perceivable environmental changes and socio-environmental interdependencies, yet focus less on explaining inter-individual differences. Survey studies investigate a multitude of factors that affect the variance in perceptions, yet often reduce climate change experience to few specific climate-related features, such as air temperature anomalies, extreme events (floods, droughts, and storms), or general experience (Reser, Bradley, & Ellus, 2014).

Main results of both types of studies are summarised in Table 2. In order to grasp the different kinds of climate-related environmental changes that are found to be perceived, an extensive review of observations among subsistence-oriented communities around the world reveals that alterations have been reported for weather, as well as for components in the biotic and abiotic environment (Savo et al., 2016). Results of studies that try to explain the variance in climate change (risk) perception and awareness identify socio-demographic, cognitive, experiential, and socio-cultural factors (van der Linden, 2015; Milfont et al., 2015; Lee et al., 2015; Whitmarsh, 2011).

Table 2: Results of in-depth and survey studies around the world regarding the types of perceived climate-related environmental changes (A; Savo et al., 2016) and factors explaining the variance in such perceptions (B; van der Linden, 2015; Milfont et al., 2015).

(A) climate-related environmental changes observed around the world	(B) factors explaining variance in perceptions of climate change
<p>Weather and climate changes in rainfall; temperature; seasonality and predictability of weather; drought; extreme weather events incl. heavy rainfall; storms and hurricanes</p>	<p>Socio-demographic factors age; gender; education; socio-economic status</p>
<p>Abiotic environment reduction of freshwater availability; increases in the frequency and severity of floods and landslides; sea level rise</p>	<p>Socio-cultural factors culture; values (egoistic, socio-altruistic, biospheric); worldviews (egalitarianism, individualism, hierarchism, and fatalism); religious beliefs; social norms</p>
<p>Impacts on biological systems decreases in crop production; changes in species ranges; alterations in the timing and fruiting of wild and cultivated plants</p>	<p>Cognitive factors knowledge about causes, impacts, and responses; biases and heuristics; sense of control; psychological distance</p> <p>Experiential factors affect; personal experience (direct and mediated)</p>

In particular, there is a general effect of personal experience for the perception of changes in weather and nature (Marx et al., 2007; Reser et al., 2014; van der Linden, 2015; Weber, 2016). On the one hand, personal experience can be rather direct through personal observation – for instance, people living close to the sea show a different perception of sea level rise and climate change than those living further inland (Milfont, Evans, Sibley, Ries, & Cunningham, 2014). On the other hand, personal experience can be mediated through communication – here, the access to information and media is crucial and influences how people are informed about climate change science (Roudiak-Gould, 2013). Access to information varies around the world within and between countries, suggesting that people from rural areas with less access might perceive climate-related environmental change differently compared to those in larger settlements. In addition, the size of a settlement that someone lives in might impact their perception considerably due to different environmental pressures as well as other types of employment (e.g. service industries in cities vs. jobs in farming and fishing in rural communities). Moreover, perceptions of change are likely to be affected by property situations as people who own their house and land, for instance, bear not only responsibility for their property but also have a considerable interest in its intactness (Grothmann, 2005).

For PSIS, there have been several studies reporting environmental changes that people perceive, and more recent surveys also focus on university students' perceptions of climate change in a broader sense; however, the potential variance in these perceptions particularly for non-student samples has hardly been addressed (Lazrus, 2015; Kuruppu & Liverman, 2011; Roudiak-Gould, 2012, 2014; Aswani et al., 2015). In the present study, we therefore attempt to combine the two approaches and compare three Polynesian countries in order to answer the research questions about people's perceptions of climate-related environmental changes, views on potential causes for these changes, and correlational patterns that might help explain the variance in perceptions.

4 Method

In order to explore what kind of climate-related environmental changes people in Tuvalu, Samoa, and Tonga perceive and expect, a structured interview guideline with open and closed questions was designed to obtain qualitative as well as quantitative results. The distinction between current perceptions and expectations was made in order to learn which changes individuals consider most relevant for their current situation and for their future. Moreover, this approach helps to match the results with scientific observations and projections.

The survey started with questions regarding socio-demographic information. Then, the participants were asked to list all environmental changes they could remember, future environmental changes they expect, and the causes they consider relevant to these changes. Subsequent to this qualitative section, quantitative ques-

tions were asked to capture the perceptions of more specific environmental changes including changes of weather, seasons, plants, and the marine environment. The survey took place from February 2011 to February 2012. The survey templates were translated into Tuvaluan, Samoan, and Tongan languages, and the interviews were conducted by local research assistants. Answers were noted in the vernaculars and then translated into English by the research assistants.

The responses to the qualitative questions differ in the degree of detail they provide: while some participants just mentioned a keyword, others portrayed their perceptions in greater depth. The categories that were used for the analysis are therefore divided into main topics and more specific details (Table S1-S7 in the supplementary information available online). The quantitative, closed questions all had a similar structure of 7-point Likert scales. A first set of scales reached from -3 to +3, and depending on the wording of the question, the ends of the scales were 'less' – 'more', 'lower' – 'higher', or 'worse' – 'better'. Zero in the middle of these scales stood for 'no change'. A second set of scales reached from 0 to 6, and had the end points 'don't agree' – 'agree strongly', 'no changes' – 'big changes', or 'not at all' – 'severely'.

In order to investigate relations of perceptions with several socio-demographic characteristics, we conducted mainly correlation analyses for ordinal data (Spearman Rho). Here, we tested for age, gender, number of inhabitants of the settlements that people live in, distance to the sea, house and land ownership, interaction with nature, education, socio-economic status, and religiosity.¹ In preparation for the correlation analyses, factor analyses were performed for the dependent and independent variables. There were considerable overlaps in the factor structures of the three countries, yet they were not identical. Based on the information retrieved from the factor analyses, composite variables were calculated for rain, wind and storms, flooding with sea water, and marine life (Table S12). For the independent variables, factor analyses for religiosity showed a two-factor structure which can be interpreted as self-assessment of religiosity and the number of church-related activities.

4.1 Sample

For each country, the local research assistants were asked to conduct interviews with 60 individuals in different places close to the sea. As we did not aim for a representative sample because of economic restrictions, but for gaining comparative insights into perceptions of inhabitants of different island states, we decided

¹ The survey also contained a short scale about climate change knowledge consisting of ten yes/no questions which were planned to be summed up as a knowledge score. However, observed answer patterns led to the assumption that these questions were not differentiating enough to provide a sufficient measure. Although such scales are common (e.g. van der Linden, 2015; Leiserowitz et al., 2010), the answer format allows for a high chance of guessing right. We therefore refrained from using this scale for further analyses.

on an ad hoc sample and on leaving the selection of interviewees to the research assistants. The research assistants received the same instructions for selecting participants for the survey and were asked to interview participants living close to the sea in smaller and larger settlements, covering a broad range with regard to age, education, and income, as well as equal numbers of male and female participants.

Table 3: Summary of sample characteristics

Sample Characteristics	Tuvalu		Samoa		Tonga	
<i>Time of interview</i>	May–June 2011		February 2012		February–March 2011	
<i>Participants by Island</i>	47(79.7%) Funafuti 12 (20.3%) Vaitupu		58 (96.7%) Upolu 2 (3,3%) missing		20 (33.9%) Lifuka 39(65.0%) Tongatapu 1 (1.7%) missing	
<i>Gender</i>	<i>Female</i>	24 (40.7%)	<i>Female</i>	36 (60.0%)	<i>Female</i>	41 (68.3%)
	<i>Male</i>	33 (55.9%)	<i>Male</i>	24 (40.0%)	<i>Male</i>	19 (31.7%)
	<i>Missing</i>	2 (3.4%)	<i>Missing</i>	0 (0%)	<i>Missing</i>	0 (0%)
<i>Age (years)</i>	<i>M</i>	63.57	<i>M</i>	33.25	<i>M</i>	46.00
	<i>SD</i>	11.69	<i>SD</i>	17.50	<i>SD</i>	12.56
	<i>Min</i>	35	<i>Min</i>	16	<i>Min</i>	24
	<i>Max</i>	86	<i>Max</i>	84	<i>Max</i>	72
<i>Size of the settlement (Number of inhabitants)</i>	<i>M</i>	660.42	<i>M</i>	1802.29	<i>M</i>	572.50
	<i>SD</i>	441.26	<i>SD</i>	1608.12	<i>SD</i>	504.87
	<i>Min</i>	8	<i>Min</i>	10	<i>Min</i>	150
	<i>Max</i>	2000	<i>Max</i>	5000	<i>Max</i>	2000
<i>Distance from home to the sea (meters)</i>	<i>M</i>	112.29	<i>M</i>	542.34	<i>M</i>	19.12
	<i>SD</i>	175.4	<i>SD</i>	1136.65	<i>SD</i>	16.95
	<i>Min</i>	10	<i>Min</i>	2	<i>Min</i>	0
	<i>Max</i>	1250	<i>Max</i>	7000	<i>Max</i>	65
<i>House and land ownership</i>	<i>Yes</i>	45	<i>Yes</i>	52	<i>Yes</i>	29
	<i>No</i>	12	<i>No</i>	1	<i>No</i>	29
	<i>Missing</i>	2	<i>Missing</i>	7	<i>Missing</i>	2
<i>Plant for own daily consumption</i>	<i>Yes</i>	40	<i>Yes</i>	30	<i>Yes</i>	28
	<i>No</i>	19	<i>No</i>	28	<i>No</i>	32
	<i>Missing</i>	0	<i>Missing</i>	2	<i>Missing</i>	0
<i>Fish for own daily consumption</i>	<i>Yes</i>	35	<i>Yes</i>	10	<i>Yes</i>	43
	<i>No</i>	24	<i>No</i>	48	<i>No</i>	17
	<i>Missing</i>	0	<i>Missing</i>	2	<i>Missing</i>	0

* number of people who sell their farming produce or catch

For Tuvalu, the majority of interviews were held on Funafuti, while a smaller number were conducted on Vaitupu (Table S19). All participants from the Samoan sample were from Upolu (Table S20). And two thirds of the Tongan sample came

from the main island of Tongatapu, while one third was from Lifuka (Table S21). A comparison of perceptions of different communities within the three countries was not planned. Table 3 summarises the socio-demographic features and also highlights specific differences between the samples: for instance, whereas the Tuvaluan sample shows a mean value for age of 64 years, the Tongan and Samoan samples are relatively young with mean values of 46 years and 33 years respectively. Also, the size of settlements and distance to the sea show considerable variance; however, this can be attributed to the specific characteristics of islands and settlements. Questions about dependency on natural resources for daily life (i.e., if respondents grow their own food and catch fish for their daily consumption) received quite similar answers. Yet, for the Samoan participants, it is striking that only a few respondents engage in fishing activities. This might be explained by the fact that most individuals in the sample are rather young and comparatively highly educated university students. Despite these differences in the sample characteristics, the results provide valuable insights into how individuals from different island states perceive climate-related environmental changes and their causes.

4.2 Severe weather events occurring shortly before and during the time of the survey

In addition to long-term climatic changes, short-term variability and extreme events are likely to affect perceptions of climate related environmental changes as they can be seen as key events with the potential to convince individuals that something might be unusual about the climate that they have been familiar with so far (Howe, Markowitz, Ming-Lee, Ko, & Leiserowitz, 2012; Zaval, Keenan, Johnson, & Weber, 2014; Myers, Maibach, Roser-Renouf, Akerlof, & Leiserowitz, 2013). Extreme events also set people's awareness into a state of alarm and when they occur more frequently than usual, they might be seen as proof of climate change.

The studied regions have suffered from several extreme events. For example, during the time of the survey from February 2011 to February 2012, La Niña had a considerable effect on local weather patterns. On September 28, 2011, the government of Tuvalu declared a state of emergency because of severe water shortages, but Samoa and Tonga also suffered from a lack of rainfall during that time.

In addition, the following tropical cyclones have hit the region since the year 2000, and thereby might have had an effect on recent perceptions: Vaka in 2001; Heta at the turn of the year 2003–04; Tam, Urmil, and Vaianu in 2006; Lin in 2009; Wilma in 2011; and Jasmine in 2012. Heavy wind and rain affect not only the abiotic environment in terms of destruction and erosion, but also plants and plantations that need time to recover and to be replanted.

5 Results

5.1 Perceptions of climate-related environmental change

In general, based on the overview of mean values and standard deviations in Figure 1, each country shows a distinct profile.² In all three cases, most of the future environmental changes are expected to be more intense than present ones. Large standard deviations for most items indicate that perceptions are not homogenous but show considerable variance (see also Figure S1 in the supplementary information available online). In addition, most items turned out to be not normally distributed, but either bimodal or skewed to one direction. One more characteristic feature of the quantitative data includes the relatively high percentages of missing values which is particularly striking for the data of future expectations (Figure S1). The following paragraphs report the perceptions of climate-related environmental changes based on the analysis of the qualitative and quantitative data for weather and seasons, the abiotic environment, and impacts on biological systems.

Changes in weather and seasons

The most commonly perceived changes with regard to weather and seasonality include (i) increases in temperature in all three countries, (ii) changes in rainfall patterns, and (iii) changes in wind patterns and storm events. Furthermore, changes in seasons and predictability of weather were described by participants of all three island states.

Increases in temperature or “increased heat of the sun” were highlighted consistently by most participants in their replies to the open questions about environmental changes. Looking at the quantitative results, perceived temperature increases are particularly notable in Tuvalu and Samoa. Changes in temperature were also reported by most Tongan participants in the qualitative section and also reach high levels of agreement in the quantitative part.

Changes in rainfall are perceived differently in the three countries. Respondents from Tuvalu emphasised the lack of rain and severe drought conditions in their replies to the open questions. In Samoa, people described both extremes, i.e. too little and too much rain. And in Tonga, the experience and expectation of heavy rainfall were more prevalent than the experience and expectation of lack of rain. These results are reflected in the quantitative data. Drought was among the most prominently noted changes in Tuvalu and Samoa. With regard to rain frequency and intensity, Tongan respondents agreed strongly about increasing trends for each. Participants from Samoa only saw and expected increases in rain intensity, whereas there is no clear tendency to either direction in the quantitative data from Tuvalu.

² Additional figures and tables S1–21 are available in the supplementary information available online.

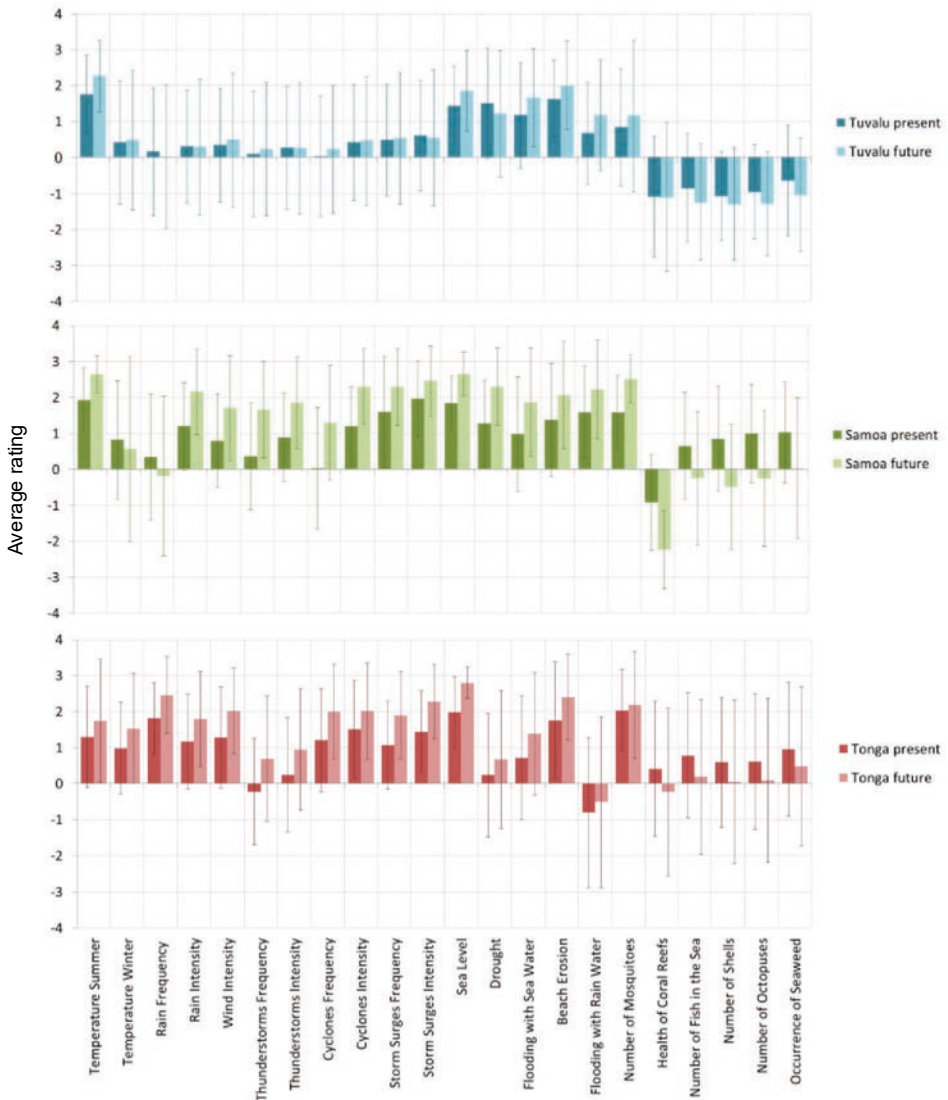


Figure 1: Country profiles for mean values and standard deviations of the perception of climate-related environmental changes (for details see S1)

With regard to *changes of wind*, replies reveal that in Samoa and Tonga the focus lies mainly on the occurrence of tropical cyclones. Although some respondents from Tuvalu reported winds to be stronger, more frequent, and more unpredictable in the open questions, the quantitative results did not capture these perceptions. However, the results for the Tongan and Samoan participants are consistent with the qualitative data. Participants from Tonga agreed strongly that cyclones have

become more frequent and intense, whereas Samoan respondents experienced cyclones as being more intense rather than being more frequent. For the future, Samoans and Tongans expect increases in both frequency and intensity of tropical cyclones.

Generally, respondents from all three countries reported that seasons and weather patterns are changing, have become irregular, and have become more unpredictable. Extended and warmer hot seasons were mainly described by the Tuvaluan and Tongan participants. Also, longer dry seasons and droughts were mentioned frequently, particularly by the Samoan sample. In addition, participants were asked to name the months of the beginnings and ends of wet and dry seasons, hot and cooler seasons, and the cyclone season for the past and for the present. Looking at the specific months for the beginnings and endings of seasons, two observations can be made (Figure S2): First, for the past, the participants had a pretty clear notion of when seasons used to begin and end. Second, perceptions of the beginnings and endings of seasons have shifted slightly.

Abiotic environment

Changes in the abiotic environment that are related to alterations in climate and weather include, on the one hand, sea level rise that is experienced and expected in all three countries, and on the other hand, the effects of too much and too little rain, namely flooding and droughts.

With regard to *sea level rise* as one of the most prominent changes noted in island contexts, qualitative and quantitative results are consistent. Only two respondents of the whole sample stated explicitly in the qualitative part that there is no sea level rise, and only 5% of the Tuvaluan sample and even less in the other two groups said in the quantitative section that they experience and expect slightly lower sea levels (Figure S1). According to the replies to the two specific quantitative questions about present and future height of the sea level, the overwhelming majority experiences and expects higher sea levels. This change is experienced as leading to increased flooding with sea water, erosion, and salt water intrusion. Beach erosion is perceived and expected as severe, with more than half of the respondents of each sample expecting medium and strong increases in beach erosion for the future. The experience and expectation of flooding with sea water is most prominent in Tuvalu though, where king tides are a known disruptive phenomenon. In Tonga, sea water flooding is related to storm surges and increased wave height associated with tropical cyclones.

In addition to the impacts of sea level rise, *flooding with rain water* is experienced particularly in Tonga and Samoa as leading to *soil erosion* and causing *landslides*. However, the quantitative data only reflects these experiences as being widespread in Samoa, and less so in the Tongan sample, where the majority said they experience and expect a decrease in rain water flooding. Whereas heavy precipitation is occasionally described as having positive effects of filling up water resources, the

Tuvaluan respondents focused mainly on the impacts of too little rainfall, i.e. dried up soils and water resources having crucial impacts on the biotic environment.

Biotic environment: plants and animals

The vast majority of participants from all three countries perceive and expect *changes in plants*. Respondents reported perceptions about less, unhealthy, or dying trees, impaired coastal vegetation, loss of medicinal and traditional plants, as well as effects of changing weather and seasons on fruits and vegetables. Specifically mentioned species are pulaka (giant swamp taro, *Cyrtosperma merkusii* or *Cyrtosperma chamissonis*), taro, yams, and cassava, which are all important root crops and staple foods. Furthermore, other locally relevant species were named, such as coconut, breadfruit, banana, mango, pandanus, potato, cucumber, and pawpaw. Most of the fruits and vegetables were described as being smaller or not growing in season. Occasionally, the occurrence of new grasses, invasive species, and more weeds was mentioned.

Results from the qualitative data show that in all three countries changes and *effects on terrestrial animals* are perceived and expected. These changes were mainly described on a general level, not naming specific species. Some Samoan participants mentioned the effects of deforestation on habitat loss and increased consumption of animals by humans. Sometimes, specific animal species were named, such as pigs, chickens, other birds, and bats. In Samoa and Tonga, the increase of mosquitoes was reported a few times, mostly as a result of heavy rain and flooding. The quantitative data did not cover the change of terrestrial animals except for the number of mosquitoes. Although mosquitoes were not mentioned explicitly in the qualitative responses, the mean values for the Samoan and Tongan samples are so high that they are even among the top five environmental changes noted within the quantitative data results.

Despite the proximity to and dependency on *marine environments*, these ecosystems received surprisingly little attention compared to effects on terrestrial plants and animals in the replies to the general open questions. However, in all three countries, changes of marine life were mentioned, mostly the decrease of fish and shellfish, and impacts on coral reefs. These changes were predominantly described in connection with increased temperatures, but also as results of human activities like pollution, coral and sand mining, land reclamation, as well as destructive fishing practices and overfishing. The quantitative data about marine life shows diverging patterns for each country. Particularly Tuvaluan respondents agreed that the health of coral reefs, the number of fish in the sea, the number of shellfish and octopuses, and also the occurrence of seaweed have decreased, and they expected them to further decrease in the future. For the Samoan sample, the perception and the future expectation of the health of coral reefs are rather sinister; and although perceived numbers of fish, shellfish, octopuses, and seaweed were described as having increased until the time of the interviews, decreases were expected for the

future. The Tongan participants varied in their replies, and expect little increase in marine organisms.

5.2 Attributed causes for change

According to the qualitative results (Tables S9-S11), most participants see *human activities* as the main cause of the changes they described. Looking closer at the details, these include pollution, mainly air pollution due to burning of rubbish and plastic, use of fossil fuels, and release of greenhouse gases (GHGs). Mentioned sources of GHGs (specifically carbon dioxide and methane) are the use of cars, motorbikes, motorboats, and trucks, burning in general – in particular wood, chemicals, steel, and aluminium – and cooking gas.³ Furthermore, modern technologies and machines, factories, and industries within the country and in “wealthy countries”, as well as the introduction of inorganic products were brought up as reasons by individuals from the Tuvaluan and Samoan samples. The use of chemicals and dumping of (toxic) wastes and litter were mentioned as additional causes for change.

In general, respondents, particularly in Tuvalu and Samoa, referred to an over-use, abuse, or unwise use of resources. Irresponsible and selfish behaviour of not taking care of the environment were mentioned along with valuing money more than the consequences of such behaviours, economic activities, greed, and modernisation. Changed conservation and consumption patterns, societal changes, bad manners of the youth, and new religious denominations came up in the explanations as well. Furthermore, population growth, overpopulation, and migration were named in this context. With regard to modern technologies, people from Tuvalu sometimes pointed out the role of advancing knowledge and the work of scientists as reasons for change.

Several respondents of each country also referred to *natural processes* as reasons for the environmental changes. In addition, *other processes*, such as global warming, climate change, ozone depletion, UV radiation, melting ice of North and South Pole, as well as El Niño occurred in the explanations mostly in connection with increased amounts of (greenhouse) gases and deforestation. Moreover, higher temperatures, increased heat of the sun, drought, strong winds, sea level rise, and erosion appeared in the explanations of reasons, not always, but often put in connection with each other. However, compared to the answers which related directly to human activities described above, these phenomena were mentioned without naming a specific anthropogenic contribution.

A few respondents from all three countries also see *God as the main reason* for the environmental change they perceive, sometimes God alone, sometimes as pun-

³ Here, it becomes apparent that explanations were occasionally rather specific and do not necessarily meet standard scientific explanations – although in a wider sense, such activities could be seen as contributing to climate change. Also, gas of refrigerators was named, which probably refers to chlorofluorocarbon (CFC).

ishment for the irresponsible human behaviour, sometimes also in connection with natural processes.

These results are also reflected in the answers to the quantitative closed questions (Figure 2). Most respondents agreed that humans and air pollution caused by modern human lifestyle are the reasons for the changes of weather and seasons, and disagree that human activities have no significant impact or that God or other spirits cause these changes.

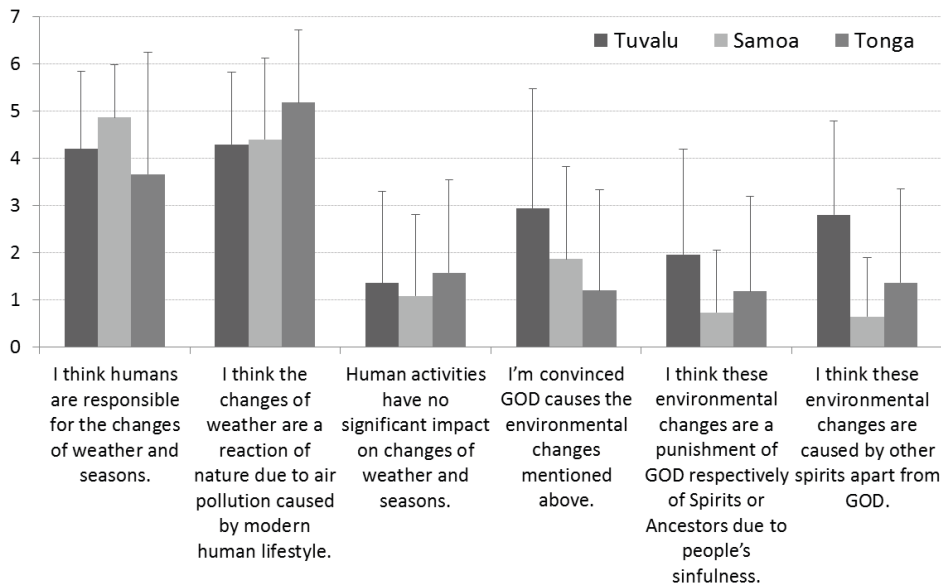


Figure 2: Mean values and standard deviations for the agreement to statements about causes for the perceived environmental change

5.3 Correlational analyses of the variance in perceptions

Reporting each correlation in detail here would go beyond the scope of this paper. Therefore, only significant ($p \leq 0.05$, two-sided) correlations and patterns will be highlighted and are illustrated in Figure 3 (for detailed information see also Tables S13-S18 and Figure S4 in the supplementary information available online). Several socio-demographic variables do not correlate significantly and consistently with the quantitative perception data over all three samples. These include age, years spent on the island, gender, house ownership, and education. However, four of the selected variables are more frequently significantly correlated with environmental perceptions: (i) the size of the settlement in which the respondents live, (ii) the distance to the sea, (iii) interaction with nature, and (iv) religiosity. Interesting here is that the perceived changes that are correlated with these variables differ between the three countries, so it is not possible to say, for instance, that people who farm

or garden for their own daily diet consistently perceive more changes in plants than those who do not plant, or those who fish perceive changes in marine life more uniformly.⁴

		Tuvalu	Samoa	Tonga
Size of settlements <i>(Number of inhabitants)</i>	<i>p</i>			
	<i>f</i>			
Distance to the sea <i>(in meters)</i>	<i>p</i>			
	<i>f</i>			-
Daily activities in nature	<i>p</i>			
	<i>f</i>	-		
Religiousness self-assessment	<i>p</i>			
	<i>f</i>			
Religiousness church activities	<i>p</i>			
	<i>f</i>			-
Key		Temperature summer	Temperature winter	Rain frequency and intensity
<i>p</i> present perception		Sea level rise		Flooding with seawater
<i>f</i> future expectation		Occurrence of drought		Seasons
Sig. positive correlation		Flooding with rainwater		Changes in plants
Sig. negative correlation		Marine life		Number of mosquitoes

Figure 3: Significant ordinal correlations (Spearman Rho, $p \leq 0.05$, two-sided) between socio-demographic variables and perceived climate-related environmental changes; red symbols illustrate significant positive correlations, blue symbols stand for significant negative correlations

Size of settlements

Although the patterns of correlations are not consistent, they show that the size of the settlement that people live in seems to play an important role when it comes to the perception of environmental changes. For example, Tuvaluan respondents living in smaller settlements perceive and expect significantly more changes in seasons, but less increase in temperature, rain, and wind compared to people in larger settlements. The Samoan sample shows a different pattern: people in smaller settlements perceive increases in temperature, rain, storms, sea level, and flooding,

⁴ The correlations of these four variables with the perception data are also rather small, supporting the assumption that other factors should be included and tested in order to determine potential reasons for the variance in perceptions. The current findings serve as anchor points for the generation and testing of more detailed hypotheses.

whereas individuals in larger agglomerations perceive more changes in seasonality. Tongan participants living in larger settlements perceive stronger increases in rain, drought, and flooding with rain water than those in rural areas.

Distance to the sea

The distance to the sea shows patterns that are in line with what could be expected, since the risk of sea water flooding is objectively lower inland: participants who live further away from the sea perceive less sea level rise, especially in Samoa, and less flooding with sea water in Samoa and Tonga. In Tonga, however, people living further away from the sea perceive increased flooding with rain water, and better conditions of marine resources compared to people living closer to the shore.

Interaction with nature

Several significant correlations reoccur for the variables regarding regular interaction with nature in terms of farming and fishing for subsistence, as well as for the self-assessment of the connectedness to nature of daily job activities (see also Figure S4). For instance, people in Samoa who reported selling their farming produce, fishing for their daily diet, or also selling the fish they catch perceive increased droughts, more winds and storms, as well as increased flooding with sea water. Tongan respondents who farm or garden for their daily diet perceive significantly fewer droughts, less flooding with rain water, fewer mosquitos, and greater decrease of marine resources compared to people who do not. Tongan participants who fish perceive an increase in changes of plants. Interestingly, fishing and farming activities are not related to significant correlations that would match the respective ecosystem that fishers (marine resources) or farmers (plants) interact with. We find similar results for the Tuvaluan respondents.

Religiosity

The self-assessment of religiosity and the amount of self-reported church-related activity are significantly correlated with several perceptions of environmental changes: respondents from Samoa who describe themselves as very religious perceive greater increases in temperature, sea level, and flooding with sea water than people who report being less religious. Tongan individuals who assess themselves as more religious than others perceive higher temperatures, as well as increases in rain, storms, and flooding with rain water. In Tuvalu, the opposite is the case: here people who score high in religious self-assessment perceive and expect less wind and more changes in seasons and plants compared to people who assess themselves as less religious. For the number of self-reported church-related activities, the picture is similar except for the Tongan sample. Tuvaluans who describe them-

selves as very active church members perceive and expect less rain, less wind, and greater changes of seasons compared to people who say they attend church and pray less often. Individuals from the Samoan sample with high scores on the church-related activity scale, however, perceive and expect more rain, wind, and flooding with sea water than people who go to church less often.⁵

6 Discussion

This study set out to explore the diversity of perceptions of climate-related environmental changes and attributed causes in samples from Tuvalu, Samoa, and Tonga. The results reveal that respondents from all three countries do perceive various changes, and expect that most of the observed trends will intensify in the future. Main causes for the reported changes are seen in irresponsible and unsustainable human behaviours. The results of our explorative study provide some indications of the underlying reasons for the variance in perceptions; however, further studies testing specific hypotheses with a more representative sample are recommended.

In this section, the results are discussed against the backdrop of natural science observations. Furthermore, we address attributed causes and the variance in perception of climate change. We close our discussion with methodological considerations.

6.1 Comparing perceptions and observations

Comparable to diverse in-depth studies about the perception of environmental changes from other countries, changes have been reported for weather and seasonality, sea level and flooding, as well as impacts on plants and animals for the three studied samples from Tuvalu, Samoa, and Tonga (see Savo et al., 2016). Among the changes which many respondents from all three samples perceived as most intense are higher temperatures, altered seasonal patterns, rising sea level, increases in beach erosion, and sea water flooding.

With regard to a comparison between the three countries, it is particularly interesting that the majority of participants in the Tuvaluan sample perceive the in-

⁵ Partial correlation analyses controlling for number of inhabitants, showed that for daily activities in nature and religious self-assessment the significant correlation patterns change slightly, but not fundamentally. However, for religious church-related activities, most of the significant correlations disappeared, indicating that people in smaller settlements take part in more church-related activities, so hardly any explanatory power was left to the variable with regard to the perception of environmental change. Religious self-assessment yet seems to maintain as a variable explaining some variance in the perception of climate-related environmental changes. The fundamental processes underlying this effect should still be investigated further for Pacific Island communities.

creased occurrence of drought to be among the greatest challenges, whereas most individuals in the Samoan and Tongan samples perceive and expect increases in rain and storms. Although sea level rise is often considered as the most prominent climate-related environmental change for small island states, this change is actually only one among many others that were reported. Changes with immediate impacts on daily life, such as tropical cyclones and extreme precipitation that lead to flooding on the one hand, or long periods with no rain that cause a lack of fresh water on the other hand, are equally if not even more relevant to people's daily lives. This result highlights the importance of a more holistic approach that focuses on sustainable development instead of adaptation to climate change only (Barnett & Campbell, 2010; McMillen et al., 2014; Barnett & Waters, 2016).

In addition, changes were described for plants, numbers of mosquitoes, and marine life. These findings reflect geographical and climatic differences as well as tendencies reported in previous studies from the region (e.g. Lazrus, 2015; Aswani et al., 2015). Although we are aware that there are always local specificities for each country and community, we base our comparison with natural science observations on data at the country level. This approach results from the distribution of the survey participants in different places of each country (Tables S19-S21) as well as the scarce availability of local natural science data at the community-level.

Comparing the perceptions with *meteorological measurements and future projections* from the Australian Bureau of Meteorology and CSIRO (2014, 2011) makes apparent that although the significant trends of climate-related changes are relatively small and hardly discernible with human sensation, the perceived alterations are consistent with regional trends for temperature and other climate parameters. With regard to meteorological data for precipitation, annual and seasonal rainfall trends for the period of 1950–2009 have not been statistically significant yet, although more intense and frequent extreme rain events are projected for the future. The perceived increases in rain intensity (in the case of the Samoan and the Tongan sample) and increased rain frequency (in the Tongan sample) can therefore probably be linked to short term observations – an effect that has similarly been found by Howe et al. (2012) and Zaval et al. (2014). Climate models also project a slight decrease of future drought events for the region, being consistent with the expectations of participants from Tuvalu, but not with those from Samoa. The projections that tropical cyclones will be less frequent but more intense in the future (see Meehl et al., 2007) is in accordance with the perceptions of Tongan and Samoan participants in the case of cyclone intensity; and although many respondents expect cyclone frequency to increase as well, the mean values for expected cyclone strength are still higher than those for expected frequency.

Concerning *abiotic changes*, perceptions of sea level rise and erosion are also in line with scientific observations (Australian Bureau of Meteorology & CSIRO, 2014, 2011; Becker et al., 2012). With regard to erosion, particularly data from Tuvalu shows that shorelines are dynamic by nature (Webb & Kench, 2010). Since coastal dynamics always need to be seen in connection with human activities, the

increase of erosion that has been described by the participants proves to be consistent with observations from other locations (Yamano et al., 2007; Webb & Kench, 2010; Lata & Nunn, 2012).

Also, the perceptions of *biotic changes of marine and terrestrial flora and fauna* can be related to scientific observations, although more detailed research would be desirable. The questions about the development of marine life were very simple in this study, following the intention to capture a general trend in perceptions rather than attempting to represent the biodiversity of the Pacific Ocean. Marine resources face several stressors, including over-harvesting of some fish stocks and invertebrates, pollution, sedimentation, and coastal development particularly in more densely populated areas (Chin et al., 2011; Morrison, Denton, Bale Tamata, & Grignon, 2013). This matches the perceptions of the Tuvaluan sample, especially those of participants living in larger settlements. In addition to such stressors, other phenomena that challenge Pacific reef stability include severe storms, tsunamis, volcanic activity, coral bleaching, ocean acidification, and outbreaks of crown-of-thorns sea stars. In the case of Samoa, the reefs were observed to have recovered after Cyclone Heta in 2004; therefore, perceptions of increases in marine resources match the scientific observations (Chin et al., 2011). For the future, rising water temperatures and acidification pose serious threats to marine resources, hence, the extent to which positive outlooks expressed by the Tongan sample match scientific projections is questionable. However, these expectations could possibly also refer to near future developments and reef recovery after cyclone Wilma that hit Tonga in 2011. Future studies might therefore investigate further how individuals expect specific marine resources to develop and what kind of parameters guide those expectations.

Impacts of climate-related and anthropogenic changes on plants match diverse regional scientific observations (Hartert et al., 2015). Such changes not only have consequences for food security, but also affect cultural practices (Wairiu, Lal, & Iese, 2012; Thaman, Gregory, & Takeda, 2011; Thaman, 2014). Although developments of plants were captured only by the qualitative questions regarding general environmental changes and two rather unspecific closed questions in this study, the results show that impacts on flora are perceived. Further studies could help to identify changes and their consequences more precisely for specific species and thereby help to inform strategies for adaptation.⁶

With regard to future expectations, the number of missing values (S1) can be interpreted in the sense that participants find it difficult to estimate and picture future developments. This information should not be neglected but taken seriously

⁶ Finally, the perceptions of increased numbers of mosquitoes in Samoa and Tonga can be related to the time of the survey in February and March following months with heavy rainfalls known to stimulate mosquito reproduction. Interestingly, Harding et al. (2007) found larval habitat to be more abundant in towns than in rural areas, matching the future expectations of mosquito developments at least for Samoa.

when it comes to the communication and planning of adaptation strategies. Often, scientists try to avoid missing values or ‘don’t know’ options in surveys because they make statistical analyses more difficult (Rubin, 2004). Therefore, it might be surprising that in comparison to other survey studies we highlight this ‘flaw’ which in our opinion contains valuable information: when people are not sure about what to expect, they might not be motivated to take specific precautionary measures. Hence, it is important to foster the dialogue about the potential consequences of current lifestyles that are likely to lead to hazardous environmental change.

6.2 Causes for environmental change

The explanations that people described as causing these changes also show that most respondents attribute them to human actions. Although God’s will, work, plans, and decisions were mentioned occasionally as causes as previously reported in other studies (Lata & Nunn, 2012; Mortreux & Barnett, 2009; Rudiak-Gould, 2014; Kuruppu & Liverman, 2011), replies often highlighted careless and unsustainable human behaviour and resulting pollution. Albeit not always correctly described from a scientific perspective, most respondents are generally aware of multiple causes for many environmental changes (see Hay, 2013). In order to receive more specific replies, it would be necessary to ask for each perceived environmental change individually to investigate mental models of causes and effects. Here, a comparison between public and expert views would be interesting. However, the results already generally highlight the awareness of an anthropogenic contribution to environmental change. This opens up ways for further dialogue about necessary transformations to more sustainable lifestyles.

For such a dialogue and awareness raising to occur it is crucial to consider local modes and means of communication. In our study we found that that observation and radio are important sources of information in all three samples (Figure S3). Church and talks in the community also reach high rankings in Tuvalu and Tonga. However, the rather young and comparatively well-educated people in the Samoan sample also said they get a lot of information from TV, school or university, and the internet. Here, traditional sources of information seem to become less relevant. Hence, in order to be as accessible and inclusive as possible, awareness campaigns and public dialogue about sustainable lifestyles and environmental change should be adapted to the preferred modes of communication.

6.3 Variance in perceptions

Perceptions of climate-related environmental changes vary both between and within island states. Although this statement seems trivial, the empirical foundation based on the same method for the comparison of different samples was still lacking. The current study, therefore, introduces a method to scan perceptions and provide an overview of the most relevant changes. Moreover, it helps to compare

perceptions and future expectations. This contrast is relevant for adaptation planning: people who do not expect the aggravation of a situation or a specific damage are likely to be less motivated to take proactive precautions. Also, individuals who overestimate certain issues might invest in adaptation measures that experts would not really consider high priority.

In addition to the described differences *between* the samples of the three countries (see section 6.1 above), perceptions of climate-related environmental changes also vary *within* the samples. Here, the selected socio-demographic variables account for a certain fraction of the total variance in the results. As in other studies from the region and elsewhere, factors like age, sources of information, size and location of settlements, interaction with nature, and religiosity correlate with perceptions of climate-related environmental changes (Nunn et al., 2016; Scott-Parker, Nunn, & Mulgrew, 2016; Lata & Nunn, 2012; Rudiak-Gould, 2014; Brody, Zahran, Vedlitz, & Grover, 2008; Milfont et al., 2014). In particular, we identified four variables that stand out in terms of showing more frequent significant correlations to the environmental perceptions, namely, (i) the size of the settlement that the respondents are living in, (ii) the distance to the sea, (iii) interaction with nature, and (iv) religiosity. The first three variables and their correlations with the perception of changes in weather and nature reflect an experiential factor: direct personal experience with environmental systems affects the perception of change (see Reser et al., 2014; van der Linden, 2015; Weber, 2016).

However, we have to be careful about interpreting such effects, as these variables might be indicators for other underlying factors that shape the perceptions of climate-related environmental change. (i) The size of the settlement that people live in is likely to be an indicator for the effect that individuals in more urban areas might be confronted with different sources of information, might perceive more pollution and environmental stress due to higher population densities, and lead less subsistence-oriented lifestyles than their rural counterparts. (ii) The observation that the distance to the sea affects the perception of maritime changes, sea level rise, and flooding with sea water corresponds with psychological distance (Milfont, 2014; McDonald, 2015). (iii) The effect of interaction with nature would need to be tested further, not only to distinguish who perceives changes more accurately, but also to determine the extent to which access to media or other factors might modulate the perceptions of climate-related environmental changes. In addition, the correlations of the socio-demographic variables with one another (inter-correlations) hamper a sound, integrative interpretation. Therefore, it would be advisable in addition to this explorative survey, to set up further studies that set out to test individual hypotheses either with small, specific samples or large, representative ones.

6.4 Methodological considerations

The perception of climate-related environmental changes might be equally – if not more – relevant for the planning of individual adaptation strategies than beliefs in climate change. In the survey, we asked explicitly about how people perceive weather features and their impacts, and how they think these will evolve in the future. We consciously did not use the terms ‘climate change’ or ‘global change’ in order to not reinforce the effect of motivated reasoning on weather perceptions, although it will be hardly possible to circumvent it completely (Reser et al., 2014; Taylor, Dessai, & Bruine de Bruin, 2014; Myers et al., 2013). We did so because perceptions of environmental changes and their causes are likely to shape people’s expectations about future developments to a certain degree, and might therefore inform specific adaptation behaviour more specifically than beliefs about the rather abstract concept of climate change (Leiserowitz et al., 2016; Spence Poortinga, & Pidgeon, 2012; Lorenzoni & Pidgeon, 2006). Even in the Pacific, it has been found that ‘climate change’ is considered as affecting others more severely than oneself (Nunn et al., 2016), and therefore, more specific environmental changes that are already experienced are likely to be more imaginable. In addition, vernacular translations for ‘climate’ have been found to relate to other meanings, for instance ‘weather’ (Dumar, 2010), or air, space, and the atmosphere (Rudiak-Gould, 2012) and would introduce extra biases.

7 Conclusion

Overall, the study explores, quantifies, and compares perceptions and expectations of climate-related environmental changes in three PSIS. Based on the overview of perceptions and factors that help explain the variance between individuals, this study provides an explorative basis of quantitative and qualitative data for the further development and testing of specific hypotheses in PSIS. In doing so, the study offers a report that goes beyond anecdotal evidence of how climate-related environmental changes are perceived by the affected populations in PSIS (Betzold, 2015). The survey instrument that has been developed can be used for follow-up studies and for gathering comparable data in other countries.

The most pronounced perceptions that we found for our three samples refer to rises in temperature, high levels of beach erosion, rising sea levels, an increase in storm activity, and changes in flora and fauna. The data from our study confirm that sea level rise, which is often seen as the most prominent climate-related environmental change, is only one change among many others that have been reported. In particular changes with immediate impacts on daily life, such as tropical cyclones, extreme precipitation, and drought are equally if not even more relevant to people’s daily lives.

Based on empirical evidence, we can show that perceptions of climate-related environmental changes vary within and between the samples of the three PSIS. To

a certain extent, this variation can be attributed to differences in local weather conditions and geographical specificities. Lee et al. (2015, p. 1014) found in a survey of 119 countries that “understanding the anthropogenic cause of climate change is the strongest predictor of climate change risk perceptions, particularly in Latin America and Europe, whereas perception of local temperature change is the strongest predictor in many African and Asian countries”. In our three samples, many respondents perceived a local temperature change, and were highly aware of anthropogenic causes for change. Levels of awareness of environmental change can thus be assumed to be relatively high not only among young, urban respondents, as reported, for instance, in the study by Scott-Parker et al. (2016) or Lata and Nunn (2012), but also within the broader population.

In addition to geographical specificities that explain a certain fraction of the variance in perceptions, the role of psychological factors deserves further investigation. In the current study, we explored to what extent the variance in perceptions can be related to socio-demographic factors and found several significant correlations. Based on these insights, we suggest investigating the role of additional factors, such as value orientations, social norms, affect, and past experience which proved to be relevant determinants for the perception of climate change risk and also local weather in other regions of the world (van der Linden, 2015; Goebbert, Jenkins-Smith, Klockow, Nowlin, & Silva, 2012).

One of the most practically relevant findings is that many respondents are generally aware of multiple causes of the reported alterations, and mainly attribute them to human behaviour. Although the survey results are rather general in this respect, they offer a basis for identifying prevailing modes of unsustainable behaviour that call for change. Here, it would be necessary to study specific cause-effect relationships and compare them to expert views. Such a comparison could help to set up a societal and transdisciplinary dialogue on the necessity of sustainable lifestyles and management decisions. As people witness the unintended consequences of behaviours and consumption patterns that have found their way to the islands in the course of modernisation, building on their perceptions can help to foster a dialogue on how to develop and mainstream alternative, sustainable behavioural options that would equally fulfil the intended purposes.

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8

From apathy to agency: Exploring religious responses to climate change in the Pacific Island region

Hannah Fair

Drawing on fieldwork conducted in Port Vila, Vanuatu and with the Pacific Climate Warriors, this chapter challenges dominant narratives concerning the Pacific Island region that marginalise religious understandings of climate change and that perpetuate visions of inevitable island inundation and helpless Islanders. Instead it argues that religious responses can form part of a more empowering, alternative framing of climate change and the Pacific Islands. It explores the roles of prayer, sin, and suffering, recognising that agency appears in unexpected places. Through emphasising the sin of carbon emissions, Islanders take on the burden of climate change causation. This approach both situates climate change discourses within the wider context of perceived moral decline, and, through emphasising local responsibility, facilitates Islander agency. By contrast narratives of divine accompaniment reject these accounts of local responsibility and retributive suffering, and instead emphasise the moral responsibility of industrial nations, whilst reframing climate activism as a form of spiritual devotion. These heterogeneous religious interpretations highlight the diverse possibilities for spiritually informed agency in the face of climate change impacts and the richness of locally meaningful and morally compelling counter-narratives of climate change.

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1 Introduction

March 12, 2015: as Cyclone Pam, a category five tropical storm bore down upon Oceania, the pan-Pacific climate activist group the Pacific Climate Warriors exhorted their Facebook and Twitter followers to #PrayforthePacific. Concentrating efforts on the threats posed to Vanuatu, simultaneous prayer circles were held across the Pacific Island region, and Vanuatu-oriented prayer memes circulated, written in languages from Niue, Fiji, Tonga, Tokelau, Samoa, Tuvalu, Papua New Guinea and the Marshall Islands. This event, largely overshadowed by the colossal impacts of the storm, highlights the place of religious responses to anthropogenic climate change: is it a help or a hindrance to climate adaptation in small island states if those at the forefront of climate justice struggles are encouraging their followers to “pray for the Pacific”?

Drawing on fieldwork conducted in Vanuatu and with the Pacific Climate Warriors, I contend it is the former. However, I begin by acknowledging cases I encountered where religious belief was concomitant with apathy in the face of climate change: prayer as a substitute for action, and climate change understood as a form of sanction. I then complicate these ideas of the role of prayer, sin, and suffering, recognising that agency appears in unexpected places. I argue that religious discourses can form part of a more empowering, alternate framing of climate change and the Pacific Islands. I conclude that through focusing on religious understandings one can still foreground Islander agency, highlighting the richness of locally meaningful and morally compelling counter-narratives of climate change in the Pacific Island region.

2 Religious marginalisation and inevitable inundation

In this chapter I build upon previous calls to spiritualise climate change (Hulme, 2009), acknowledging that religious perspectives can act as a “cultural resource” in movements for adaptation and mitigation, providing morally compelling narratives (Hulme 2017, p. 15). This is particularly pressing in the Pacific Island region, as some limitations of climate change adaptation efforts in Oceania can be attributed to the secularity of mainstream climate change messaging (Nunn, 2017). Yet this spiritualisation has been hindered by the marginalisation and undervaluation of religious understandings of climate change in the social science literature (Kempf, 2017) and in climate activist organising (Tiumalu, 2014). For instance, the relationship between religious belief and understandings of climate change in the Pacific has been framed in terms of “complacency about environmental change” (McAdam, 2011, p. 114), spiritual interpretations of extreme weather events condemned for being “inappropriate and anachronistic” (Taylor, 1999, n.p.), and religious faith characterised as “avoidant behaviour” (Kuruppu & Liverman, 2011, p. 666). This amounts to a social science literature that deems religious belief as “a barrier to awareness of and adaptation to climate change” (Mortreux & Barnett,

2009, p. 110). Kempf (2017) contends that this marginalisation of spiritual thought emerges from a misguided attempt to purify and hierarchise scientific and religious knowledges, with the former deemed epistemically superior, a purification I have previously tried to challenge through advocating a simultaneous balancing of multiple knowledges of climate change (Fair, 2018). In order to further counter this marginalisation and recognise the potential for spiritual understandings to contribute to climate change adaptation, and to address the shortage of social scientific accounts of religious engagements with climate change (Haluza-DeLay, 2014), here I centre on questions of the association of religious understandings with avoidance and complacency, and thus unpack questions of agency.

These questions of agency in relation to climate change and the Pacific Island region speak to a wider debate regarding the framing of climate change narratives. While fully acknowledging the enormous current and future material threats climate change poses to Pacific Island nations (Nurse et al., 2014), some scholars have challenged how these threats are commonly discursively framed. Hulme (2016, p. 101) highlights how images of “the Pacific island atoll and the stranded helpless island victim forced to migrate and in need of ‘saving’ by an enlightened world [...] function as attractive and ubiquitous representations of climate-change”. Documentary accounts of Tuvalu, replete with eschatological titles such as *Paradise Drowned* and *Before the Flood*, have emphasised the powerlessness of Tuvaluan communities and the imminence of Tuvalu’s demise (Chambers & Chambers, 2007). News coverage of Tuvalu has repeatedly constructed the island nation as helpless and inevitably endangered in comparison with portrayals of Australia as strong and unthreatened by climate change (Farbotko, 2005). Notably, these representations did not acknowledge the role of Australia’s fossil fuel industries in Tuvalu’s predicament. Meanwhile, other news accounts have treated island futures in an even more blasé way, such as in the flippant headline “Tuvalu Toodle-oo” (Barnett & Campbell, 2010, p. 169).

As Hulme (2016, p. 101) notes, these contemporary discourses of inevitable inundation “are deeply rooted in a particular western cultural imaginary and perpetuate colonial and Eurocentric constructions of Pacific islands”. For instance, principles of insularity, concretion and alterity underlie simplistic and alarmist popular scientific schemas of “disappearing” and “abandoned” islands, rendering the Pacific Islands isolated, graspable, and fundamentally Other (Kempf, 2015). These discourses reinforce representations of Oceania’s islands as “sites of backwardness [...] constraint, fragility and weakness” (Barnett & Campbell, 2010, p. 2).

Consequently, this inevitable inundation discourse, rather than ameliorating vulnerability, is reinforcing and even producing it, and thereby further marginalising Pacific Islanders (Webber, 2013). For instance, through the performance of climate vulnerability in Kiribati, other development concerns such as maternal health are sidelined, thereby further disadvantaging island communities (Webber, 2013). An excessive focus on climate change can occlude the other current social and economic challenges faced by Small Island Developing States (SIDS) (Kelman

& West, 2009). And due to the future orientation of the inevitable inundation narrative and the dramatic potency of sea level rise (Mortreux & Barnett, 2009), more immediate and less spectacular impacts of climate change are overlooked (Farbotko, 2005).

Ultimately, through its invocation of total inundation, this drowning islands discourse presents the Pacific as already lost. The proposed inevitability of relocation suggests mitigation efforts are hopelessly inadequate and thereby legitimises inaction by carbon-intensive countries (McNamara & Gibson, 2009), threatening to transform climate migration into a self-fulfilling prophecy. Atolls are made discursively valuable through their loss, a process that Farbotko (2010) describes as “wishful sinking”. She argues that the threat of island inundation and population displacement is required in order to legitimise and maintain a global climate change narrative. There is both a desire to avert sea level rise and a degree of impatience and expectancy as Tuvalu is deemed as expendable and thereby an acceptable price to pay for the global wake-up call that its devastation would produce.

These discourses of vulnerability also entail the “foreclosing [of] alternative and empowering political identities” (Webber, 2013, p. 2720). They disempower and deny affected communities their agency, instead confining individuals to a position of victimhood (McNamara & Gibson, 2009). Framings of Islander identities that incorporate strength and resourcefulness are marginalised (Farbotko, 2005). Thus, the inevitable inundation discourse can perpetuate existing notions of vulnerability, inhibit rather than encourage action on climate change, disempower communities, and unintentionally exacerbate existing ecological and socio-economic problems.

These two concerns – the marginalisation of religious understandings and the perpetuation of simplistic and disempowering narratives of climate change – have two major connections. Firstly, I contend that the association of religious belief with complacency mirrors this wider denial of Islander agency found within the inevitable inundation discourse. Secondly, looking to religious understandings can help counter this damaging dominant discourse. Rather than further relying on external and othering Eurocentric perceptions of the Pacific, foregrounding Islander understandings of climate change entails seriously grappling with the role of religious belief. Moreover, in offering locally meaningful and morally compelling counternarratives of climate change, religious perspectives suggest what a more empowering discourse of climate change and the Pacific Islands could look like, one that values local epistemologies and resists a future of inevitable total loss. Therefore, through exploring the relationships between agency, apathy, and religious belief this research speaks to the broader question of what it could mean – in the words of activist network the Pacific Climate Warriors – for Oceania to be “not drowning but fighting”.

3 Methodology

This chapter draws upon a month of participant observation conducted with the pan-Pacific activist group the Pacific Climate Warriors in 2014 during their Australian campaign tour across Sydney, Newcastle, and Melbourne, and four months of ethnography in Port Vila, Vanuatu in 2015, immediately after Cyclone Pam. During my fieldwork I conducted over sixty interviews in English or Bislama, audio-recording all but three and fully transcribing them (with the Bislama interviews transcribed by research assistants), and then coding and qualitatively thematically analysing them and my field notes using NVivo. I recruited interviewees through “purposive non-random sampling” (Davis, Hayes-Conroy, & Jones, 2007, p. 166), beginning with individuals involved with the Pacific Climate Warriors advocacy network and then snowballing to include a greater range of figures actively engaged with climate change adaptation, communication, and advocacy (see Table 1 for interviewee demographics), greatly aided by Vachette’s (2014) social network analysis, which mapped relations between different actors in the Vanuatu climate change adaptation and disaster risk reduction sectors prior to Cyclone Pam. While interview topics were wide-ranging, it is specifically participants’ views on and engagements with faith-based responses to climate change that form the substance for this chapter.

To complement climate-based expertise with religious expertise, I also solicited the wisdom and reflections of pastors from a wide range of denominations with regards to church responses to and biblical interpretations of climate change. I contend that the first category of interviewees constitutes the dominant voices within Vanuatu with regards to climate discourse, whilst the latter category, the pastors, represent figures of great significance and social influence who are in many ways still at the margins of climate discussion.

Table 1: Interviewee Demographics

Interviewee category	# of interviewees
Pacific Climate Warriors	14
Vanuatu-based youth climate advocates	8
Chiefly or governmental authority	7
Priests and religious authorities	10
Ni-Vanuatu NGO workers	14
Ex-patriate NGO workers	13
Total	66

Because of the near ubiquity of Christianity in Vanuatu, statistically in terms of the number of adherents and its cultural and social significance (Tomlinson & McDougall, 2013) I focus exclusively on Christian beliefs and understandings.¹

¹ For consideration of how these interact with scientific and *kastom* knowledges see Fair (2018). *Kastom* here refers to Ni-Vanuatu “indigenous knowledge and practice” (Taylor 2016a, p. 139)

According to the most recent census, 28% of Vanuatu's population is Presbyterian, 15% are Anglican, another 12% are Roman Catholic, and 12% are Seventh Day Adventist (SDA). The remaining 13% of the Christian population is spread across a number of different smaller denominations, including the Church of Christ, the Assemblies of God, the Neil Thomas Ministry, and the Mormon Church (VNSO, 2009). The pastors I spoke with all belonged to the four largest churches, as did the vast majority of my research participants. Thus, although this research cannot claim to speak to all Christian denominations currently present in Vanuatu, it does consider the beliefs of the four most popular, who collectively make up almost 84% of the country's Christian population.

4 Religiously informed climate apathy

I begin by exploring the extent to which faith can lead to apathy in the face of climate change. Firstly, some participants in Vanuatu did still legitimise climate inaction through their religious understandings. As one member of the Anglican Church explained to me,

The word of God says that it is not for you to worry about the weather [...] God is the boss of the clouds and all of the other things up there, he sends rain to come, he sends wind to come [...] nature is controlled by God. Then for us to try to solve climate change, we can't. Because only God will say what happens tomorrow [...] When people come and talk about climate change with us, we understand it as a natural disaster so there's no need to worry about it. Because if you worry about it, it's not your business. It's not my business. It's God's business. (Deborah, Anglican Church)²

This echoes Donner's (2007) argument that within a Pacific Islander context especially the weather and the climate are seen as part of the domain of the gods, in contrast to the land, which is under the dominion of humans, suggesting an inability to act in the face of climate change and even a denial of its anthropogenic nature. While this expression of unconcern was anomalous among my participants, the suggestion that climate change was in God's hands, and therefore beyond the purview of human action, did chime with the sentiment voiced by another participant that the only avenue open to those in Vanuatu was prayer. This was most notably in relation to the actions of neighbouring Australia, who was acknowledged to have caused the pollution that was affecting Vanuatu.

If after that, Australia doesn't want to do that [to change], then the people of Vanuatu will pray "Father God, you keep climate change as it has been for all time and you keep us safe". Because of all of the big countries we can't go to them and say you must stop. Only people of that country can go and say to their countries they must stop. (Gabrielle, Anglican Church)

²All interviewees are anonymised and unless otherwise specified are Ni-Vanuatu.

This approach stands in stark contrast to that of the Pacific Climate Warriors whose main action in 2014 involved doing just that which the previous participant deemed impossible: taking direct action against the Australian fossil fuel industry by blockading the world's largest coal export port in Newcastle, New South Wales, using hand crafted canoes (Fair, 2015). This suggests that the modes of agency enacted by the Warriors were at odds with some of those espoused by interlocutors in Vanuatu.

There are other ways in which faith-based apathy towards climate change could emerge. Understanding climate change as a divine rather than human matter, with prayer as the only recourse, could also result in a fatalistic apocalypticism. As a committed Ni-Vanuatu climate activist explained:

Most of the people are Christians and people believe in climate change, that climate change is happening and most of them believe that you know, it's just Jesus coming back again and it's the last days [...] And they keep on praying, praying, without doing something which is really actioning, like go plant something to stop coastal erosion and they just keep on praying. (Moses, youth climate activist)

Others also spoke of the threat apocalyptic interpretations presented to effective climate communication. Indeed, a number of participants referenced the Bible as a warning or foretelling of climate change, adopting an apocalyptic tenor. Interviewees mentioned the book of Revelations, the prophecy of the end times presented in Matthew 24, and the shocking time of Daniel 2 in relation to current and future impacts of climate change. One pastor postulated that climate change was the consequence of sin, springing from the disconnection of humanity and God, and thereby destined to end in Armageddon.

Climate change is a sign of catastrophe that has hit the world. Slowly it will increase in the sense that if we see it as a sign of the problem of sin which affects man and disconnects him from God so man becomes selfish [...] When man does not connect with God, man becomes wicked due to selfishness, then man creates a sign to show that God will be angry and destroy this world. This world will be destroyed. (Amos, SDA preacher)

Consequently, the potential links between religious understandings and failure to act due to a faith in divine intervention (or a sense of inevitable damnation) are present. Others also indicated that they suspected the Church was more preoccupied with otherworldly spiritual preparations rather than contemporary corporeal concerns, particularly in the case of certain evangelical denominations. So far, such an analysis could align with those scholars (such as Kuruppu & Liverman, 2011 or Taylor, 1999) who seem to suggest religious perspectives inhibit rather than enable proactive responses to climate change. This emphasis upon prayer rather than action, and upon spiritual futures rather than worldly presents suggests a limited political imaginary, with little room for Pacific Islanders to play an active role in the face of climate change. It seems to resonate with rather than challenge the inevitable inundation discourse.

Yet I contend that the relations between trust in the divine, prayer, and agency are far less straightforward than this. Firstly, Hereniko (2014) defends Islanders who in the face of climate change choose to place their faith in God rather than scientific research. He postulates that it is the most prudent and sensible option, given the greater dependability of God compared with the large industrialised nations who created the problem in the first place.

Secondly, denouncing prayer as a simple opposition to action does not reflect the experiences and understanding of many participants. For instance, one official from the Presbyterian Church insisted upon the importance of prayer, but also of taking responsibility for action in addition to it. He explained that for example when faced with a cyclone, one should pray to God for protection, but one must also take actions such as cutting down the trees nearest the house. One cannot simply pray, as one can depend on God excessively, and thereby fail to take responsibility for oneself. Meanwhile, in the *Pastors and Disasters* handbook, in circulation in Vanuatu at the time of my fieldwork, Archbishop Ntahoturi interprets prayer not as in opposition to or a complement to action, but as a precursor, as he recommends “praying for and receiving God’s inspiration so that people in the position of taking actions can understand what God wants them to do” (Episcopal Relief & Development, 2014, p. 13).

5 Divine warnings and the sin of carbon emissions

Turning to the second source of apathy – the idea of climate change as the fulfilment of apocalyptic prophecy – I will further unpack ideas of divine foretelling and punishment. Recognising the common understanding of climate change and Cyclone Pam as messages that encourage changes in behaviour, I consider the relationship between sin and carbon emissions. I explore the extent to which some Ni-Vanuatu take on the burden of climate change causation, and how this sense of climate sin can be situated in the wider context of perceived moral decline. I therefore highlight the generation of a political imaginary dominated by localised, individual action.

Perhaps unsurprisingly, given the timing of my fieldwork, discussion of warnings and prophetic signs often moved from the generality of climate change to the specificity of Cyclone Pam. Many I spoke with affirmed knowledge of the cyclone through means other than the broadcasts of the Meteorological Office. One preacher spoke of a vision of a saucepan over-boiling that she saw as a portent of a coming disaster, and another described many of the auguries witnessed in nature, from the way the clouds were flying and the appearance of unusual birds, to the rippling of the ocean, all of which he understood as God’s revelation through nature.

Linked to the recognition of these ominous signs was an emphasis on the importance of interpreting the divine significance of Pam's coming, recognising it as a holy lesson:

So, when the cyclone came and gave us a disaster, you can see that the people of Vanuatu are all over the place, because everyone understood that God had come to teach, or that God had given us a warning, that we must look at how we are living. So, we understand it that way. (Deborah, Anglican Church)

Others followed suit, interpreting the cyclone as an instruction for those in Vanuatu to change their lifestyles to be more in accordance with God's plan.

And creation being God's revelation, God is speaking to us through nature, so when Cyclone Pam strike people say, "What is God saying to us?". Maybe God is speaking to us through nature maybe because of the way we live so we need to change the way we live. (Peter, Presbyterian Church)

But what were the moral changes demanded by God, via the cyclone? This pastor proffered the examples of political corruption, homosexuality, and sex before marriage, drawing parallels between Vanuatu and Sodom and Gomorrah. Yet the same pastor also spoke of environmentally conscious behaviour changes that were required: "Don't cut down trees. Be careful with your plastics [...] carry a basket to go shopping rather than get plastics and bring pollution". Therefore, this idea of climate change and Cyclone Pam as divine imperatives for behaviour change highlights the importance of sin, particularly the sin of carbon emissions. This resonates with sermons by Fiji-based theologian Richard A. Davis. He postulates that "the rising waters causing this harm are not coming from God's hand, but through anthropogenic climate change that is the result of human sin" (Davis, 2015, p. 39) and argues that "in some ways, because humanity is implicated in the causes of climate change, it deserves the punishment of a worldwide flood [...] Some have more emissions than others do, but *all people have emissions* and many of us use beyond what is acceptable for a stable climate" (Davis, 2015, pp. 39–40; emphasis added). Thus, the language of "carbon indulgences" (Nerlich & Koteyko, 2009) with its religious connotations moves from the metaphorical to the literal.

Both this interpretation and the narrative emerging in Vanuatu, appear to align with what Rudiak-Gould (2013) has identified as a framing of "universal" climate blame. All are held equally responsible for causing and responding to climate change, while recognising that their contributions to the problem may be at different degrees of magnitude. This interpretation clearly aligned with the ethical stance of some participants:

If we say that "No, we don't make emissions", but think about when you're burning a tire how much poison is in the tire which will affect the environment [...] We all contribute to cause the climate change problem. Ah, even the human body produces heat, yes it produces heat and it is good heat that's coming out of the body. But otherwise we all con-

tribute one way or another, maybe in the islands small scale and in bigger countries bigger scale. (Amos, SDA preacher)

Linked to this was a refusal to direct accusations of blame at the larger industrialised countries, and thus a rejection of a model of “industrial blame” as Rudiak-Gould (2013) categorises it. There is a clear pragmatism to this argument – that apportioning blame solely to the Global North has been ineffective – yet it also stands in stark contrast to, for example, the antagonistic politics of blame enacted by the Pacific Climate Warriors with respect to Australia and its coal barges. Others sympathised with this position, with for instance one pastor explaining “we can point fingers at people, but four fingers will always come back to you”. These sentiments suggest that Vanuatu could be legitimately pointed at in terms of climate change responsibility, a notion that may be at odds with historic emissions records but not with the attitude of many participants.

And many of those spreading these messages of the absolution of carbon sin through sustainable actions clearly practised what they preached. For instance, one NGO worker spoke proudly of the changes she had made to her own lifestyle:

Using my own basket like when I go down to the shop or to the market, thinking “I have to take my own bag”, put in all the foods that I want, not taking too much plastic to go home [...] and also one another thing is sometimes I decide to walk, going back home, just for a short distance, don’t need bus, I have to walk and one other action that I have like growing my own food. (Abigail, NGO worker)

Meanwhile a public official spoke of how she had embraced green technologies at home in the form of solar power, and reframed many of the domestic features of her life that are common across Ni-Vanuatu households (such as not using a fridge or electric heater) as forms of sustainable living. However, some strongly disagreed with the emphasis upon Islander mitigation as a practical or ethical response to the climate crisis. One NGO worker criticised the hypocrisies present in climate change communication:

We have taken almost two times a plane to say that and then we will blame somebody that normally walks by foot, but he takes three times a year a truck. It’s kind of stupid [...] So, yeah, I’m not really comfortable to blame the people who have really small impact and this kind of stuff. (David, ex-patriate NGO worker)

This highlights questions raised by Agrawal and Narain (2012) about the failures to distinguish between “luxury emissions” compared with “survival emissions”: the emissions Pacific Island villagers produce in order to meet their basic needs are put on a par with high-carbon Western consumerist lifestyles. In this narrative of sin and universal responsibility it seems the wider injustices, the disproportionate nature of the causes and consequences of greenhouse gas emissions are at danger of being overlooked, as industrial nations are not held thoroughly to account for their actions.

While this religious-political imaginary may be incompatible with mainstream climate justice narratives of historic responsibility and colonial legacies, it still offers possibilities for rethinking notions of ethics and agency in response to climate change. This narrative of Islander responsibility centres Islander agency rather than the responsibility and capacities of distant and more heavily polluting nations. Hereniko shares this view, arguing that the damage that Islanders have caused to their island environments and the carbon dioxide emissions that Oceania is responsible for need to be considered. In doing so, Islanders are able to act, rather than action just being the prerogative of bigger continental states. He declares that “the sooner we realise that we are also contributors to our own demise, the sooner we will empower ourselves to be part of the solution and not part of the problem” (2014, p. 234). Rudiak-Gould (2015, p. 58) echoes the agentic potential of having carbon sin, as he argues that “innocence implies impotence”.

Indeed, as Rudiak-Gould (2014) has comparably highlighted with respect to understandings of universal climate blame in the Marshall Islands, there is a great sense of empowerment to be found with the solutions to climate change being in local rather than distant foreign hands. As one NGO worker who was taking positive sustainable steps in her own life and with her community explained:

It gives me strength like I'm not waiting, I'm not depending on [...] like individual people can do something to reduce their own emissions and everybody, it's everybody's business to adjust their own lifestyle and it gives me strength to influence [...] that strength can help me and my family and other people in my community that we can do something and we do something. (Abigail, NGO worker)

As Hulme (2009) has highlighted, climate change can be mobilised in support of a multitude of ideological projects. Consequently, this sense of collective responsibility for climate change becomes more comprehensible through a framework of wider moral decline, again a parallel with Rudiak-Gould's (2012) work in the Marshall Islands. In a process he refers to as “promiscuous corroboration”, explanations for socio-cultural changes are brought under the umbrella of anthropogenic climate change in locally meaningful ways. As one pastor explained, the failure to enact these more sustainable lifestyle practices, for example through littering, leads to a despoiling of creation and a failure of stewardship.

We see that many things are coming and before Vanuatu was just natural. When a leaf falls it rots, but plastic cannot rot, metal cannot rot. With good life, easy life it has implications as well. There are impacts that will hit us hard if we are not careful. We have to properly dispose plastics, tins that we use. Care for the environment because when we do, the environment will help us. Without that, the environment can become our enemy. That's probably why our world is changing, and climate change is happening. We will ask why? God has created it perfectly, but we humans maybe are not careful. (Amos, SDA preacher)

A thread that connects these concerns is that of a systematic movement away from both devout Christian practice and the maintenance of *kastom* traditions, and in its place the adoption of a Western selfish individualism.

In Vanuatu's context before, people lived together and shared things in common, everything is under the chief's authority but today different cultures have come, many different attitudes changing the mentality of man. It makes man more individualistic. So, man becomes more self-centred. He wants this and that. He wants a truck, a good house, he wants everything [...] So people are yes, compared to before, people nowadays only want things for themselves. (Amos, SDA preacher)

While this critique was levelled at Ni-Vanuatu society in general, accusations were particularly targeted at young people who were living in urban areas, rather than remaining on their islands of origin and contributing to the agricultural work of the family. This concern about moral decline in Vanuatu, including the loss of respect for elders and move away from *kastom* practices is well documented (Mitchell, 2011; Taylor, 2016b). At the centre of this repeated refrain, that chastises the population for letting go of their traditional knowledge and their resilience, and succumbing instead to the dependency and lethargy of Western lifestyles, was a yearning for a future past. One NGO worker put it bluntly:

It's the attitude of the people. I think it's just the people, they need to be trained to go back to the way our ancestors were living before. Make their own gardens. We have more and more youth in town. What are they doing here? Nothing [...] We are lazy, sorry to say that, but it's true. In fact, in the island I think people are sitting there crying "we have no food because of Pam". Pam just came in. Our attitude of making gardening and drinking kava and then during the day we sit, relax, we waste a lot of time, when we should be out there in the bush. Pam just came in and addressed the issue that yes, we are not working hard enough, like our ancestors. So, I think for me, I think, there needs to be a lot of awareness, for people to start going back to the garden to olden days. (Phoebe, NGO worker)

There is an undeniable romanticism to this vision of better times before. Moreover, climate change and extreme weather events have moved beyond a purely scientific domain of causation and consequence, and are made locally meaningful through being situated within this pre-existing moral framework. This moral dilemma between 'tradition' and 'modernity' played out throughout discussions of Cyclone Pam. As just one example, of the thankfully few deaths that happened during the cyclone, many were reportedly caused by flying iron sheeting, torn from the roofs. In many accounts I heard of those, responsibility was not centred on the relationship between excessive emissions in faraway countries and increases in extreme weather events, but the failure to keep *kastom*. *Kastom* thatched houses are not deadly if they collapse in high winds, whereas those who had perished in the cyclone had become literal victims of Westernisation and its dangerous and unstable concrete houses.

In this context religious perspectives have the potential to problematise the anthropogenic dimension of climate change, as while both Ni-Vanuatu and natural scientific accounts align regarding human responsibility for global warming, but disagree regarding *which* human actions have caused it (Chua & Fair, 2019). This raises the question of whether it is a case of religious infraction, cultural corruption, or excessive carbon emissions, and to what extent these different narratives of causation converge or diverge from each other.

It must be recognised that this discourse of local responsibility reflects a wider sentiment: Vanuatu becomes the centre not just of the problem but also the solution. Naomi Klein (2014) envisions climate change as an unrivalled opportunity for positive social transformation. Within Vanuatu it became evident that climate change was an opportunity to articulate the importance of indigenous knowledge, the practical and moral superiority of Ni-Vanuatu *kastom* practices, Christian forms of connection and care for nature and community, and potentially advocate for a renaissance of pre-capitalist values and forms of livelihood, in the face of increasing urbanisation and Westernisation. This mirrors Rudiak-Gould's argument that emphasising local responsibility for climate change as a means of reinforcing existing cultural narratives "carries postcolonial and counterhegemonic potentialities of its own" (Rudiak-Gould, 2014, p. 367), and highlights the potential for Islander agency at the heart of these religious perspectives.

6 Divine accompaniment and the rejection of retributive suffering

Finally, this relationship between climate change and sin can be approached from a different perspective, one that still emphasises agency and a focus on worldly actions in the present, but which geographically extends its concerns beyond Oceania's responsibility to adapt to and mitigate climate change, and local attempts to restore a former moral order. I highlight ideas of divine accompaniment (faith that God is always by one's side), and in doing so I problematise the retributive suffering implied by discourses of carbon sin. Instead, I emphasise injustice, and the moral responsibility of those nations historically and currently to blame for the greatest proportion of carbon emissions.

Upolu Vaai (2015), in his work on Samoan embodied theology, contends that a common misreading of the Noah story is that there will be no more floods. Instead, God is promising through his rainbow to be with humankind in their suffering, and it has pained Him to unleash such suffering upon his creation through the flood. This message of divine accompaniment, of God being beside Pacific Islanders in this time of trouble, resonated with the sentiments of many Ni-Vanuatu pastors. For instance, one Catholic priest spoke of using Luke 8, the story of Jesus and his disciples crossing a tumultuous lake, in order to help his parishioners understand climate change. He explained:

It's that at bad times or good times, He is still with you. He won't let you go. Because sometimes, we feel like He has abandoned us. But He is still there. Like in this boat, as it is going to sink, the disciples are leaving the boat, but He is still there. So whatever situation they are in, He is with them. (Joel, Catholic preacher)

Cyclone Pam was also addressed in a similar manner. One parishioner relayed the metaphor his preacher had used – that of a tree that stands – to recognise the place of God alongside those in struggle. It was the tree that had lost all its branches, yet still stood, that had felt the full force of the cyclone, compared to that which had been uprooted. Thus, in order to endure a cyclone one just needed to be firmly rooted in faith. With the lack of action and fatalism this could potentially engender, this reaffirms the tension between trust in the divine and action, as previously discussed.

And this sense that God was beside them during troubling times was something a number of participants shared in terms of their own experiences of the cyclone. The same parishioner described how his faith had kept him and his family safe during the height of the winds.

Right throughout the night I was walking around the room praying and everyone was sleeping. And I said, "I need you guys to join me in faith" and we were going to go through the cyclone with God. And we did not receive a scratch on the house. The roof, nothing. (Elijah, former government official)

Indeed, one preacher attributed her survival to direct divine intervention.

I said "God, you look for a small place like this, and you will protect me, give me a way out". When I said that, I saw that the word of God came to me then. He said, "You're going to be out". He opened the back door; the door was heavy because the wind was strong. The door came out, I fell down with it. It threw me down. When it threw me down I went under a small roof like that one and I said "God, you don't take out this one. You leave this one like it is". So, this place, like I said, it stands to this day, right there. (Gabrielle, Anglican Church)

This sentiment of recognising God's protective presence during struggle was also shared by many of the Pacific Climate Warriors in the run-up to their canoe flotilla, during which they blockaded coal ships in Newcastle Harbour, New South Wales, for eight hours. Their protest encompassed both the importance of prayer and trust in the divine but as tied to climate change belief, and emphasised worldly agency, yet laid moral responsibility at the feet of the industrialised nations, rather than Pacific Islanders themselves.

One Warrior spoke of her lack of fear due to the confidence that God was beside them, in their boats.

I believe that God will go with us, yeah. So, nothing will happen to me. (Priscilla, 350 Solomon Islands)

Situating the Pacific Climate Warriors' protest within wider social movement literature, the notion that God accompanies activists in their struggles resonates with Skrimshire's (2008) analysis of faith in environmental protest groups in the UK. He argues that direct action³ involves both practical risk, such as the possibility of arrest or injury (which the Warriors certainly faced), as well as epistemological risk, as participants are inevitably acting under a condition of uncertainty regarding the scale and timing of climate impacts. He contends that given this uncertainty direct action therefore requires faith: faith not in the security of religious salvation, but in the value of ongoing human life. Skrimshire's words are valuable here, as Pacific Islander activists face far greater climate uncertainty than their UK counterparts. However, I reject the secular binary Skrimshire presents: the Warriors demonstrate that one can act buoyed by faith both in the value of life and in salvation.

For many Warriors, the sense that God was on their side also dovetailed with an understanding that through their action they were doing God's work, recognising their climate activism as a form of spiritual devotion. One of the Warriors spoke of how through his involvement in 350 Pacific he felt certain that God had a plan for him that he was now able to fulfil, and another echoed similar thoughts, interpreting climate change as a righteous challenge that brought the Warriors together.

Fusi, a Tuvaluan theological scholar, also concurs with some dimensions of this. He suggests that the people of Tuvalu must begin "protesting against injustices in the governments of the world and the ways of the big and rich nations" (Fusi, 2005, pp. 31–32), but sees these acts of challenging injustice as a form of repentance and renewing of relations with God, and thereby living in a more godly way, again suggesting that climate activism can be a realisation of one's duty to God in the world.

As well as demonstrating how trust in God (via faith in divine accompaniment) can combine with action, and highlighting how climate activism can be interpreted as a form of spiritual devotion, this approach also challenges the narrative of sin presented in the previous section. Following Lusama (2007), I argue that this moves away from a retributive model of suffering (suffering as a deserved punishment) and instead attributes sin to those causing climate change on a global scale.

Lusama (2007) argues that those currently most affected by climate change, such as those in Tuvalu, are the poor and the marginalised, not the wrongdoers. This is thus at odds with a retributive theory of suffering (Lusama, 2004, p. 23). The reverend rejects the minimal emissions of the atoll state as justification of their predicament, in clear contradiction to the universal carbon sin narrative, contending that

³Direct action refers to political acts that attempt a direct intervention in the cause of a problem – such as through reducing emissions by blocking coal ships – rather than petitioning others to act on one's behalf.

the people of Tuvalu have no part at all in the sin that brought about global warming and its negative impacts. They are so innocent that to believe that they have been punished for being innocent is impossible to comprehend. (Lusama, 2007, p. 23)

Indeed, in a more extended piece, Lusama (2004, p. 6) articulates a systemic critique of capitalism, globalisation, and consumption as the root causes of climate change, arguing that “lying behind this problem of global warming and sea level rise are the major systems of injustice that serves only the good of a few powerful in the whole world”. This is mirrored by Davis (2015, p. 39), who despite emphasising the sin of Islanders, is also adamant that “capitalist greed, originally and primarily of the West but now extending its tentacles over the whole globe, with its continued and ever more aggressive violations of mother Earth is what lies behind climate change”. Returning to the previous emphasis upon moral decline in Vanuatu, these different moral outlooks have a clear point of convergence: both highlight the selfishness and greed of Western consumerist lifestyles. However, the previous perspective emphasises the impacts of these at their most marginal outposts – Pacific Islands – whereas this interpretation highlights the source.

Fusi (2005) argues that the innocence of the Pacific Islands with respect to carbon sin and the suffering they endure actually gives them a stronger voice. He contends:

We will never be silenced even if we sink. Our sinking itself will amplify our voice in urging the nations and peoples of the world as a whole to do something about the global warming before it is too late. (Fusi, 2005, p. 46)

Rethinking the Pacific Climate Warriors’ slogan “not drowning but fighting”, Fusi’s (2005) stance seems to be that “in our drowning, we are fighting”. His analysis also echoes yet inverts Farbotko’s (2010) concept of “wishful sinking”. Fusi (2005, p. 42) suggests that climate change is a holy message to the world that is articulated through the loss of Tuvalu, as it is “God’s will and purpose, making Tuvalu become landless so that the world may be saved from worse situations in the future caused by global warming”. Here, instead of a passive sacrifice that demonstrates the severity of climate change (“wishful sinking”), Tuvalu is presented as a martyr, acting for the sake of the globe and portraying Tuvalu in an almost Christ-like position.

Indeed, for Lusama it is the figure of Jesus, not Noah (see Fair, 2018), who sheds most light on the situation, as Jesus’s death epitomises the undeserved suffering, such as those in Tuvalu now face, and demonstrates that God is by the side of those who are so afflicted, reaffirming the emphasis upon divine accompaniment. Moreover, he invokes the figure of Christ as a rallying cry for Islander-led justice, arguing that “Tuvalu, though small in size and population, has the obligation to stand for justice, this is the lesson we learned from the Cross” (Lusama, 2007, p. 23). He suggests that blaming some humans, rather than God, for climate

change, enables us to fight with rather than against God, in opposition to systems of oppression and inequality.

Therefore, in this rejection of local blame and pinpointing of the sin of industrialised nations, this emphasis upon divine accompaniment provides a religious basis for political action that directly confronts those most responsible for carbon emissions, as is manifested in the case of the Pacific Climate Warriors. It returns to the question of trust in the divine raised at the opening of the chapter and incorporates that into a call to action: one can have faith in God's presence despite the unjust suffering caused by climate change.

7 Conclusion

This variety of religious perspectives on climate change from Vanuatu and the broader Pacific Island region suggests that we should reject the "purification" of religious and scientific perspectives (Kempf, 2017) and instead embrace the heterogeneity of religious understandings (Hulme, 2017). None of the perspectives explored are inimical to a focus upon Islander agency, yet they present relationships between trust in the divine and action in highly contrasting ways. They combine spiritual faith with a belief in scientific prediction, yet reach different conclusions regarding appropriate courses of action. While the emphasis upon divine accompaniment encourages political action oriented towards the major polluting nations, the narratives of universal carbon sin correspond with more local and self-directed efforts. Although an exclusive emphasis upon prayer or punishment does hold the potential for fatalism and apathy, these religious approaches are compatible with and in many cases actively enable proactive examples of climate change adaptation and mitigation, be it clearing nearby trees in preparation for a cyclone, minimising plastic waste, or demanding greater action on the part of carbon-intensive nations. Overall, I contend that religious perspectives are not antithetical to expressions of agency and that actors across the Pacific are showing considerable enthusiasm for combining religious thought and climate change messaging (Fair, 2018, p. 8). Consequently, the project of spiritualising climate change must be recognised as integral to both effective climate change communication in the Pacific (Nunn, 2017) and to articulating an alternative, more empowering framing of climate change and Oceania that resists the discourse of inevitable inundation.

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9

Climate change and livelihood practices in Vanuatu

Desirée Hetzel and Arno Pascht

As Vanuatu is classified as extremely vulnerable to adverse effects of climate change, adaptation measures are given high priority by the government, development organisations, and NGOs. Projects which combine food security and adaptation to climate change introduce new cultivation methods and techniques. They are intended to prepare people for adverse effects of climate change such as extreme weather events. Tropical Cyclone Pam in 2015 was declared as such an extreme weather event linked to climate change. This chapter investigates livelihood practices of people in two villages in Vanuatu (Siviri and Dixon Reef) during and after Pam and after inhabitants participated in an adaptation and food security project. People in these villages employ a wide range of livelihood practices in order to secure their living and try continuously to extend their possibilities. We argue that diversification, which is a fundamental principle found in Oceania in the context of cultivation, is additionally transferred in Vanuatu to other possibilities than to secure the cultivation of food crops, namely to obtain monetary income. Because this wider context is central for the people, as well as for research, we chose a perspective that focuses on practices of the people in Siviri and Dixon Reef.

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1 Introduction

In this chapter, we look at livelihood practices in two rural communities in Vanuatu and examine how daily practices are directly related to today's life of (environmental) changes. Interacting with these changes, people tend not to focus on one livelihood practice but follow the principle of diversification.

Since climate change is one of the prominent topics in political discourses in Vanuatu, various government and non-governmental organisations have implemented a bundle of measures in the form of projects for food security and climate change adaptation. Many of these measures concentrate on the practice of horticulture and want to provide farmers new tools for new challenges related to growing food in their gardens. Two of the longer-term projects¹ were conducted in the two village communities of Siviri on the main island Efate and Dixon Reef on Malekula, an island in the northeast of the country (see Figure 1). In both villages, programmes focus on innovative techniques and methods for cultivation designed for sustainable and effective agriculture. For about five years inhabitants attended numerous workshops and training sessions. These involved learning practices and new knowledge about environmental changes and information on predictions of increasingly adverse weather events. During the projects' lifetime, in March 2015, after two and three years respectively, Vanuatu was hit by Tropical Cyclone Pam. This event was followed by an extended dry period, which was identified as an El Niño phase by politicians, the media, and our interlocutors. In political and media discourse it was additionally referred to as proof of progressing challenges resulting from climate change.

In this chapter we concentrate on the time after this event when people engaged in a range of different activities in order to secure their livelihoods. Even though programs intended them to focus on the practices of gardening and apply new techniques, we experienced that cultivation of food crops was one among many practices women and men in Siviri and Dixon Reef followed.

For the last few years, social science scholars working on climate change have asked for actor-centred approaches to research on climate change in Oceania. Whereas the media mainly focuses on concepts like vulnerability and (lacking) resilience, these scholars demand avoiding a narrative of victimisation by showing islanders' agency on different levels (Barnett & Campbell, 2010; Farbotko, 2010; Lazrus, 2012; Crook & Rudiak-Gould, 2018a). This implies looking at practices of Pacific Islanders in political contexts as well as in their daily lives. Important questions are, in our view, how people encounter so-called adaptation strategies and what they actually do in their daily lives, which may or may not have anything to do with these encounters. We suggest that this perspective is crucial to achieve a

¹ Projects have been realised by governmental and non-governmental organisations, funded by mostly international organisations. All of them are supervised by the National Advisory Board for Climate Change and Disaster Risk Reduction.

better understanding of processes often subsumed under the concept of adaptation.

Whereas environmental discourses in political and media contexts often focus on impacts of climate change, irreversible future changes and challenges, and the question of resilience, we explore the wider context of recent livelihood practices of ni-Vanuatu during and after a period of events related to the phenomenon of climate change. We do this for two research sites: Siviri and Dixon Reef. Our research focuses on the period between 2016 and 2019 – after Tropical Cyclone Pam and during and after the El Niño event. By looking at livelihood practices we want to explore how people are making their living (see Ingold, 2002).

We use the expression of livelihood practices as an analytical tool for regular (but possibly not permanent) activities which contribute to acquiring food and other necessities of life. In the following, we deal with single practices as well as with bundles of practices. ‘Bundles of livelihood practices’ refer to subordinate labels like cultivation, fishing, wage labour (of a certain kind), etc. By ‘livelihood practices’ we mean not only ways in which people secure their livelihoods but equally ways in which they relate to and interact with and within their environment in a wider sense (Ingold, 2002, p. 5). Accordingly, we focus on those activities people mentioned when they tried to explain their approach to obtaining the necessities of life – this means mainly monetary income, cultivated food, and exchanged goods. Furthermore, ‘environment’ is used here in a broad sense, including all aspects of human and other-than-human life (see Pascht & Dürr, 2017) and its materialisation. Like people in Vanuatu and elsewhere in Melanesia we thus do not separate the ‘natural’ or ‘physical’ sphere from others, e.g. the social (Hviding, 2003).

This contribution engages with the following questions: What did people tell us are their most important activities in order to secure their livelihoods? How do people create and maintain (configurations of) livelihood practices that are meaningful for them? (How) do they thereby refer to or involve practices designed as adaptation strategies for climate change and demonstrated by staff of government and non-governmental organisations?

We show that diversification is a fundamental principle of Siviri and Dixon Reef villagers, which not only has existed for some decades but also is linked with other important ideas and praxis of the people. This suggests that it may be too restricted to confine the perspective on diversification as an adaptation² to environmental changes.

² As we want to broaden the perspective and make views of the people central to our research, we do not use adaptation in our analysis as a theoretical concept.

2 Climate change discourses and practices in Oceania

2.1 Encountering climate change in Oceania

Over the last two decades there have been numerous publications in the social sciences on climate change–related topics in Oceania. Many recent ones focus on either how people at the community level are involved in practices around climate change and their perspectives on ongoing climatic changes and discourses (for Vanuatu see, e.g., Warrick, 2009, 2011; McNamara & Prasad 2013; see also Flores Palacios, this volume; Moncada & Bambrick, this volume) or how people in Oceania deal with global climate change politics and knowledge in the region and in individual countries (Lazrus, 2012; Rudiak-Gould, 2013; Hermann & Kempf, 2014; Hetzel & Pascht, 2017, 2018; Farbotko, 2010; Crook & Rudiak-Gould, 2018b).

Studies in social science show that Pacific Islanders are active participants in global and national discourses (Rudiak-Gould, 2013; Lazrus, 2012). Furthermore, many focus on the community level in order to better understand how people on the ground perceive and deal with climate change–related implications (Granderson, 2014). Climate change topics are thus also part of the narratives that exist in the communities around Oceania, and the same applies to Vanuatu specifically, as we show in the next sections. It is furthermore important to look at how Pacific Islanders, and in our case people in Vanuatu, encounter ideas and practices related to climate change (Hetzel & Pascht, 2017). Equally, local activities should be recognised and Pacific Islanders should be seen as actors on both local and global scales (Lazrus, 2012).

Anthropological research in particular is often concerned with people's local experiences and different perspectives on the concept of climate change and on environmental changes and local responses (Rudiak-Gould, 2011; Crook & Rudiak-Gould, 2018b; Kempf & Hermann, 2014; Hofmann, 2014; Mondragón, 2014), as well as their perception and reception of social and political changes related to climatic change (Rudiak-Gould, 2011, 2013). Such research shows how climate change–related discourses are shaped by the perceptions and cultural concepts of people on the ground (Kempf & Hermann, 2014; Hermann & Kempf, this volume; Rudiak-Gould, 2013). This means that discourses and observations are framed by how people live in the world and can simultaneously have effects on their living (Hetzel & Pascht, 2017). As Klepp and Chavez-Rodriguez (2018) argue, it is important to uncover how practices of political programs connected to climate change could have influences on communities. In their view social scientists must mindfully consider political processes connected to policies and measures that aim to support and enable climate change adaptation. They show the political, social, and cultural influence of climate change policies and projects on community life. We aim to think even further and look at what people who have had experience with so-called adaptation programmes actually *do*. In Vanuatu, many programs target food security and agriculture. Focusing on people's practices during the

project's lifetime and how they experience new knowledge and activities might give new impulses for discussions on climate change adaptation measures in Oceania.

2.2 Perspectives on climate change in Vanuatu

A significant amount of climate change research in Vanuatu focuses mainly on adaptation to climate change and/or on the study of the effects of so-called community-based adaptation projects and the work being done in communities (McCarter & Gavin, 2014; Warrick, 2009, 2011). These research projects conclude that adaptation projects which are based on cooperation with the local population and incorporating so-called local knowledge are more successful. For example, Warrick (2011) answers her research question about the extent to which the established international discourse on 'adaptation' enables effective adaptation at the level of local communities by juxtaposing (science-based) approaches to adaptation with local concepts of vulnerability. Other studies focus on the practical level and the presentation of declarative and procedural knowledge (Richmond & Sovacool, 2012, pp. 843–845; McNamara & Prasad, 2013, 2014; Warrick, 2009, 2011). In addition to this, local knowledge on how to deal with risks is a major topic (McNamara & Prasad, 2014; McCarter & Gavin, 2013).

Mondragón's work concludes that the inhabitants of the Torres Islands in Vanuatu have a wealth of knowledge and practices that allow them to live with changing climatic conditions (Mondragón, 2018, p. 20). The author presents some important findings about human-environment relations of Torres Islanders: environmental changes that they considered as a confluence of spiritual forces, human agency, and other influences in the past, were seen as the result of global warming, which is perceived as a result of air pollution from foreign countries, after the arrival of science-based knowledge about climate change. He shows that local interpretive patterns can change when local actors appropriate external knowledge (Mondragón, 2018). Nevertheless, he also refers to practices of Torres Islanders engaging with their environment in a relational way between humans, spirits, and plants. In order to understand what adaptation could mean for the people of Torres Islands, Mondragón suggests that we look at the "human engagement" with the environment (Mondragón, 2018, p. 25).

2.3 Diversifying practices

Other research addresses the principle of diversification concerning livelihood strategies in the Pacific Islands. One example is the study by Reenberg and colleagues for Bellona on the Solomon Islands. They describe diversification of livelihood strategies as an adaptive strategy to climatic change. The authors argue that during the last decades, livelihood strategies' components have become more diverse, so that people were able to alter their activities and become less vulnerable

to external shocks (Reenberg et al., 2008, p. 11). In their interpretation, changes in livelihood strategies “can be seen as conscious adaptive processes” (p. 7).

Diversification has also been identified as important in other (related) contexts in Oceania. In her work on Pacific foodscapes Pollock describes the history of food security in the Pacific Islands as a history of diversification. She identifies three “tides of innovation” – the early settlers, mid-18th to mid-20th century, and the last 60 years – when people expanded the range of cultivated food crops (Pollock, 2017, p. 265). She stresses the importance of and their interest in innovating and introducing new food plants and varieties which visitors brought to the islands. She states that diversity contributes to food security as sustainable community support because it is a “moral imperative” (Pollock, 2017, p. 267). This means that diversification here is not only a technical strategy but is also connected with people’s social values.

3 Research approach

The results presented in this chapter are based on a team-based research design consisting in 15 months of anthropological fieldwork between 2016 and 2019 in the villages of Siviri on Efate and Dixon Reef on Malekula. During this time, we each divided our work between the two villages, so that one of us was in either village for most of the duration. Since domains for women and men are often separated in Vanuatu, this team-based approach was essential to allow us to interact with men and women in both villages. Our research methods included formal and informal interviews in combination with participant observation and structured observation, touching social, economic, and political aspects of community life. Additionally, we conducted 92 household surveys and used other methods such as drawing moving maps to learn about practices in and on the way to the gardens and going on guided walks, which allowed us to explore especially important places inside and outside the village and the gardens (see O’Neill & Hubbard, 2010; Pink, 2008). Since we stayed more than one year, we experienced the praxis of a full circle of gardening and other activities inside the communities. When we arrived at the end of 2016, the topic of El Niño which caused an extended dry period in 2015 was very present in the discourses and praxis of the people.

Siviri and Dixon Reef were mainly chosen as research sites because adaptation to climate change projects (in combination with food security) had been implemented in both communities for some years. We positioned ourselves as independent researchers from a German University vis-à-vis the community and the organisations running the adaptation workshops and trainings.

4 The ethnographic setting

Vanuatu, an island state in the South Pacific, is geographically part of Oceania. It is one of the states, together with Fiji, New Caledonia, Solomon Islands, and Papua New Guinea, grouped in the sub-region of Melanesia. The 83 islands of the Y-shaped archipelago stretch over an area of 12,190 km² (Mückler, 2010, p. 162). Our research sites were located on two of the bigger islands, Malekula and Efate (see Figure 1), which are volcanic islands with upraised tertiary limestone (Brookefield & Hart, 1971).

In general, the bigger islands of Melanesia are characterised by higher rainfall than low-lying atoll islands in other regions of Oceania. But there is a great variation of precipitation among places on the islands (see Bell et al., 2001). In the case of the two communities of Siviri and Dixon Reef, adaptation programmes were designed to face longer dry periods between May and October.

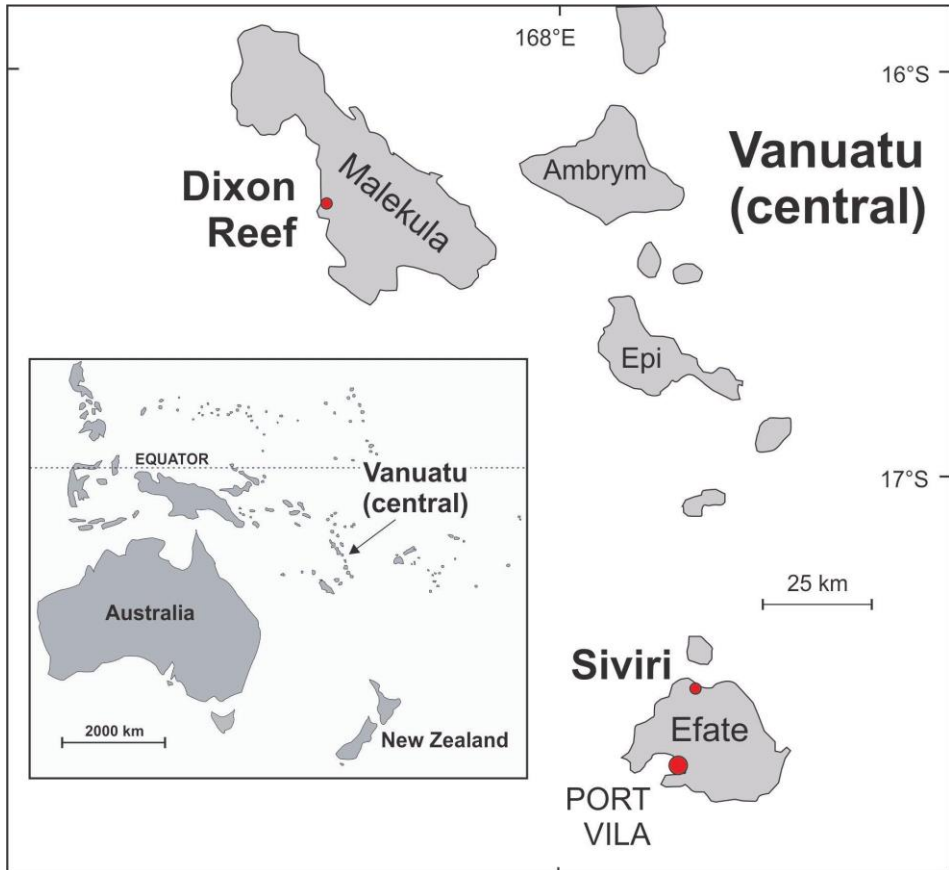


Figure 1: Location of Vanuatu in the Pacific, and of the two research sites in Vanuatu. Map: Patrick D. Nunn

Agriculture forms the economic basis of Vanuatu. Of the country's population of approximately 270,000 (VNSO, 2016, p. 1), more than 80 % live in rural areas and practise horticulture (Fallon, 1994, p. 37). Vanuatu is characterised by subsistence farming, supplemented with some cash crops, which are mainly sold at local markets or, in the case of North Efate, at the main market in the capital Port Vila (FAO, 2008, pp. 34–40). Members of the two communities we worked with predominantly practise horticulture (with some arboriculture) in the form of shifting cultivation, mostly for subsistence, but sometimes they engaged in cultivation to produce surplus for sale (see Manner & Thaman, 2013). In both villages we worked in, community members described their life as a village-based life, although, as we will discuss below, in both communities livelihood practices included more aspects than horticulture.

The village communities of Dixon Reef on Malekula and Siviri on Efate consist of approximately 200 to 250 inhabitants comprising 39 to 44 households each. People live in nuclear or extended families of up to three generations. These relatively small groups may (temporarily) be joined by other relatives or workers. Even though they might have different houses for sleeping, all household members share one kitchen house and cultivate family gardens. Commonly, sleeping, cooking, and 'storian'³ are carried out in a yard containing several separate houses or shelters. Villagers spend many hours of every day outside, circulating between different households, working places, and the gardens. Garden plots can be located either close to the dwelling houses or hours of walking distance away from the village. They can cover an area of between 20 m² and 1 ha (10,000 m²).

4.1 Siviri

The village of Siviri is located in North Efate, some 40 km from Port Vila. People have easy access to the town since the village is located close to the main road which circles the island. Transport of goods and people to the capital and to some of the more distant gardens is possible. During weekdays, humans, garden crops, and other foods travel in and out of the village. In many families at least one person works in town, mostly in the education sector, the service sector, or construction. 'Mekem karen', cultivating in Bislama⁴, is carried out at any time, but is especially scheduled for the weekends, when school children are at home and can join their parents. Especially during the planting season for yams (*Dioscorea*), which starts in the beginning of August, parents, grandparents, and children gather together and spend the whole day in the family gardens. For some years now, people have moved their gardens closer to their houses or at least installed one additional

³ Storian in Bislama means conversation and also the leisure time that is spent among families and friends.

⁴ Bislama, a pidgin language was declared the national language shortly before Vanuatu gained independence in 1980 (see Gundert-Hock 1984, p. 202)

garden next to their kitchens. During the time of our stay in 2017, many families and women grew island cabbage (*Abelmoschus manihot*) and other vegetables next to their houses. Although every family had a garden, they all bought a considerable part of their food supply from markets or shops in Port Vila and small road markets. The cash economy and wage labour have become increasingly important over the past decade and many people stated that they have less time for gardening than they did a few years ago. Nevertheless, every family member had access to crops coming out of their gardens. One elderly man described it as follows: “If you have a job in town it’s good, but still you have to have your garden, so that you do not depend on the food in the stores”.

4.2 Dixon Reef

Dixon Reef (or Tavendrua) is located on the southwest coast of the island of Malekula, the second largest island of Vanuatu which is part of the Malampa Province in the northern part of the country. At the time of our research, the village of Dixon Reef was reachable by small boats three times a week, and people only travelled for bigger shopping trips, ceremonies, or other visits. Malekula is a volcanic island and is densely forested with fertile soil inland (Barrau, 1958, p. 35). Missionaries were successful in resettling people closer to the sea. This also had consequences for cultivation – people had to deal with less fertile soil for horticulture and they were confronted with extended dry weather periods. Today villagers in Dixon Reef do not plant on the sandy soil along the village border and accept walking distances of about one hour following the route inland or uphill to reach their garden plots.

Village life is organised according to the seasons of yam cultivation and the tuber is used for both consumption and ceremonial purposes. Everyone in Dixon Reef practices horticulture from an early age, and families can have as many as 18 gardens. The main food resources originate from these gardens, while hunting wild pigs, practising onshore fishing, and/or keeping cattle and chickens help supplement the diet. In 2017, villagers additionally bought rice (especially after Tropical Cyclone Pam), but in 2019 the consumption of rice had already declined. In Dixon Reef, villagers also have cash income. As in many other places in Vanuatu, cash is derived mainly from selling copra, timber, cocoa, and kava (Rousseau & Taylor, 2012, p. 174; McCarter & Gavin, 2014). Once a month ships pass to transport or buy the dried fruits, and this has become an important source of income over the last years.

5 Climate change in Vanuatu

In an international context, Vanuatu is classified as a Small Island Developing State (SIDS) and accordingly regarded as highly vulnerable to climate change (Kelman & West, 2009, p. 3; Connell, 2013). Reports and prognoses show multiple challenges for Vanuatu: the country is extremely vulnerable to natural hazards such as hurricanes, floods, earthquakes, landslides, tsunamis, and so on (FAO, 2008, p. 32). It is likely that climate change and the related higher number of extreme weather events will mean additional stress for agriculture (*ibid.*, p. 39). This would mean that people in rural areas in particular have to deal with problems cultivating their crops because of augmented temperatures, more frequent dry periods, and higher variability of rainfall, intrusion of salt water, erosion, hurricanes, and other phenomena in connection with climate change. It is expected that these effects will have negative impacts on agriculture, and that water management will become more difficult and more crucial (*ibid.*, p. 50). Water shortage and the loss of planting material are two of the key problems mentioned in studies among farmers across Oceania (McNamara & Prasad, 2014).

For many years climate change has been one of the major topics in political discourse in Vanuatu. As one of the first states in Oceania to develop such a programme, Vanuatu submitted its National Adaptation Programme of Action (NAPA) in 2007 (NACCC, 2007). This document has identified agriculture and food security, as well as sustainable tourism development, community-based marine resource management, and sustainable forestry management as priorities (Bijay, Filho, & Schulte, 2013; NACCC, 2007). In particular, small-scale farming is one of the important topics when addressing climate change adaptation. Corresponding to the proposed climate change impacts listed above, the state has adopted a range of measures. Climate change policies and laws have been introduced, policies and legal regulation for various topics have undergone climate mainstreaming, and a ministry of climate change as well as a National Advisory Board on Climate Change and Disaster Risk Reduction have been established. Most importantly, a great number of projects for climate change adaptation have been, and are being, carried out targeting challenges in agriculture. Government and other organisations have designed measures for food security and climate change adaptation during the past few years – mostly for rural communities. These projects have been realised and financed almost exclusively by foreign organisations. In a great number of cases these organisations cooperate with Vanuatu state institutions like the agriculture or forestry ministry. Measures are implemented both by ni-Vanuatu and by international staff. A number of these measures aim to improve and support family farming for subsistence and the market. Staff of the agriculture department and of an NGO we talked with were convinced that techniques taught in the so-called climate change and food security workshops could prepare farmers for challenging times, like those expected in the future, giving them expertise to restore ground fertility and work their garden plots with different kinds of planting techniques

adapted to the dry weather conditions. The government and non-governmental programs have made climate change and successive consequences for the rural population one of the priorities over the past years.

After Tropical Cyclone Pam, members of the Vanuatu government as well as of non-governmental organisations declared the storm to be one of the predicted extreme weather events and a clear sign of progressing environmental damage caused by climate change. A younger employee at one of the NGOs pointed out: “This is a clear sign and this is what we have been preparing for over all these years”.

During the weeks after the cyclone, official statements of politicians were distributed countrywide via the local newspaper and the radio. For many of our interlocutors in Siviri, especially those in their twenties, it was the strongest storm they had ever experienced. There was far less damage on Malekula since Pam passed in the east of Vanuatu and moved south afterwards (Calandra, 2019). Most of our interlocutors in both locations explained that the main problems they faced began in the aftermath of Pam by the time of November 2015 when the rainy season brought no precipitation. They called this dry time *El Niño* and according to the villagers it lasted until the beginning of 2017. They considered this an even bigger challenge than the storm itself.

6 Dealing with climate change through new measures

In the two villages of Siviri and Dixon Reef, measures designed to improve food security in combination with climate change adaptation and sometimes mitigation were implemented. NGO representatives held workshops⁵ over a period of at least four years between 2012 and 2019. Over the runtime, our interlocutors told us that they attended workshops every two or three months, which provided scientific background knowledge in combination with practical exercises for implementation.

In both communities, people tried out newly learned techniques on village demonstration plots. One important goal was to change ways of cultivating food crops so that food security is ensured despite adverse impacts of climate change (and other constraints). This means that people should use those techniques and methods in order to secure the supply of food through their own gardens and preferably at the same time to produce surplus that they are able to sell. The objective was that small-scale farmers would “have access to knowledge on improved integrated, intensive, organic gardening methods” (NAB, 2018).

In the following paragraphs, we give an overview of the approaches and agricultural techniques that were part of the food security programme.

⁵ There was a variety in gender and age of the participants in both communities and every community member attended at least one workshop.

Moving vegetable gardens closer to the houses was intended to make nutritious food easily accessible, even during dry periods typically experienced in both villages every year, which can have an immense effect on agriculture. In Dixon Reef the installation of house gardens, mainly with island cabbage and legumes, was supposed to provide daily vitamin-rich nutrition. For these gardens, particular principles of permaculture were communicated in workshops and training sessions. Examples are the use of greywater for irrigation, the production and use of compost, and mulching. These principles and techniques were also practically introduced in the community of Siviri, and workshop leaders explained, for example, the use and benefits of liquid organic fertilisers.

Planting material multiplication with yam-minisett was demonstrated in both villages. This method is intended to multiply planting material for situations after an environmental hazard like a cyclone, drought, or flooding when many plants used for vegetative propagation are destroyed.

One of the few methods actually used by a number of farmers was also shown in both Siviri and Dixon: organic fertilising with nitrogen-feeding trees such as *Gliricidia* (*gliricidia sepium*), which are planted in rows inside or around garden areas. This is intended to prevent people from regularly burning down trees in order to clear new plots of planting land. Planting nitrogen-feeding plants should enable them to instead plant gardens repeatedly in the same spot – a goal all staff members of NGOs we talked with vehemently pursued. Staff from NGOs as well as from the agriculture department of Vanuatu decidedly discouraged the method of burning to prepare gardens for planting. One staff member of the NGO working in Dixon Reef explained that she encourages people not to destroy the forest further by burning, because this “disturbs the normal course of the weather pattern”. The staff member of the agriculture department working with people in Siviri stressed that burning “destroys the environment, because it makes the ground dry”. Because one possible impact of climate change is a higher frequency of dry periods, activities which result in drying out the soil should be avoided. Instead, project representatives highly valued caring for garden plots and using new agriculture techniques for sustainable gardening, including mulching to prevent drying and to fertilise the ground.

Additionally, staff of NGOs and the agriculture department explained to people in the villages that the *Gliricidia* trees used for fertilising additionally provide shade so that the soil will not dry off in times of drought and that they act as a windbreak during tropical storms and cyclones. In Dixon Reef they also presented some other minor techniques like using sticks instead of trees for the vines of yams to grow on. In Siviri an NGO demonstrated how to plant crops in a plastic bag which can be stored in a safe place during a cyclone. In Dixon Reef most of the new techniques were shown in a demonstration plot which was for the use of the whole village.

In both villages people were interested in the projects and participated in the workshops. According to our interlocutors in both places, they highly appreciated

new methods and techniques for subsistence (or commercial) agriculture presented by staff of NGOs and government institutions. In their view, the knowledge gained might become relevant in the future if weather or other conditions change. In Dixon Reef, women and men subsequently installed a number of house gardens, using techniques demonstrated during the workshops. In Siviri, *Gliricidia* was planted and one of our interlocutors told us that he used the yam planting multiplication material. People thus were seen by staff of NGOs and government as well prepared to supply themselves with food from their gardens during times of environmental challenges such as cyclones or droughts. In the long run, however, the people responsible for the programmes were surprised that, after showing enthusiasm in the first place, many participants did not implement most of the new methods and techniques. Since they were eager to teach people in rural areas to help them to be secure and prepared for future events some found it frustrating to see that there was no continuity in the practices of participants. However, as we learned from a number of people we spoke with, they indeed did not abandon the newly learned techniques, but rather combined livelihood practices synchronously and diachronically.

7 People's livelihood practices: combining and expanding networks

Statements and practices of men and women in Siviri and Dixon Reef revealed that they did not concentrate on gardening alone, but combined established livelihood practices, innovative possibilities derived from diverse sources, and practices of maintaining food security presented during workshops and training sessions. Additionally, they not only drew on suggestions made during these events, but also chose various (other) ways of making their living. As one middle-aged man in Siviri explained: "You have to do different things. You cannot just do one thing or stay at home. Man Vanuatu has to move".

In the following paragraphs we explain people's livelihood practices and the continuous diversification of these practices, and show the different characteristics of cultivation and wage labour.

7.1 Siviri: combining practices

In Siviri, Tropical Cyclone Pam caused severe damage to houses and gardens. Although people were able to rebuild their houses quickly, we were told that the cyclone destroyed recently planted yam and vegetable gardens. Immediately after the storm, the inhabitants of Siviri received food supplies for a few months, which the government and aid organisations disseminated. The Vanuatu Agriculture Department provided planting material to replace lost fruits and root crops (such as cassava (*manihot esculenta*), white cabbage, tomato, lettuce, and pumpkin) so that

villagers would be able to replant food plants. Additionally, people in Siviri immediately contacted family members living on other islands across Vanuatu, which had been less affected by the storm, requesting crops or seedlings. Asking family members for planting material and buying crops to plant them in one's own garden is a strategy we could observe during the whole time of our research.

Some difficulties only became clear months after the cyclone. Many of our interlocutors explained that although they had planted considerable amounts of food plants during the months after the cyclone, the yield was significantly lower than the years before. They referred not only to a reduction of subsistence crops but also to a decline of food production for the market. Before the cyclone took place, growing crops for the market in Port Vila was one of the main sources of income for many of the households in Siviri, whereas during our stay only a few women went regularly to the market in the capital to sell their agricultural produce.

In order to pursue their living, our interlocutors told us that in many households members combined several livelihood practices, most simultaneously. With a few exceptions they continued planting food crops. They resumed cultivating their gardens as soon as possible – though many in considerably smaller capacity than during the time before the cyclone, and in a number of cases in different places, using different techniques. Irrigation was one strategy that was used when rainfall was exceptionally low.

Several people who continued commercial or subsistence planting used some of the techniques that were communicated during adaptation workshops. This included mostly the planting of *Gliricidia* and other organic fertilisers. Nearly everyone used the new cassava planting technique and a few the new method of multiplying planting material for yams. Many of the villagers who did not use the new techniques explained them in detail to us and assured us that they could use them at any time.

During our work in Siviri, we observed villagers gardening next to their houses, and conversations revealed that people had reduced the number of gardens in areas more distant from their houses. Some even shifted their planting activities completely to their home gardens.

In addition to gardening, even more villagers found employment in the capital Port Vila or elsewhere on the island of Efate. There is a great variety of different kinds of wage labour being practised. Our interlocutors explained furthermore that a new development in Siviri was the increase of cutting firewood and selling it at the market in Port Vila, and they also mentioned an increase in cutting and selling fence posts and timber. Mostly people used these options as a supplement to others.

One couple explained how they manage to combine different activities by sharing the work and distributing the work throughout the day. The man did his job in the city on weekdays. The woman, because her husband was often absent, moved one of the gardens next to their home so that she could do the work alone. In their spare time, for example on Saturdays, they planted food crops in gardens

that are more distant. In the evenings they ran a kava bar where they also sold some prepared food.

Some of the inhabitants of Siviri continued to make use of several other possibilities – for example the commercial breeding of pigs and fowl or fishing. Good opportunities exist to sell pigs or fish to hotels or in the markets in Port Vila and elsewhere, or informally locally. Recently a number of women in the village began to engage in producing pieces of handicraft to sell at the recently built handicraft market in Port Vila. A future-oriented option is the planting of precious wood such as mahogany or sandalwood for the benefit of their children rather than for income for themselves, but others hope to make a profit during their lifetime.

7.2 Dixon Reef: garden networks

Tropical Cyclone Pam did not affect Dixon Reef directly, but our interlocutors complained about their problems cultivating yam and banana plants during the following dry period. They told us that the yield in many gardens was lower due to little rain.

After the cyclone, villagers were focused on their gardening practices, but tried to make sure that multiple options of livelihood practices were available. In fact, cultivation was important for creating (new) options of livelihood practices for people in Dixon Reef. While earlier gardening practices were kept, some new ones were added and integrated into the existing network, and some were temporarily introduced.

One longstanding practice of gardening in Dixon Reef is that gardens are located in different locations, which provide appropriate conditions throughout the seasons. Daily routines consist in walking within the wider environment, visiting several gardens in a day, harvesting in one, carrying planting material to the next, and returning to the house with bundles of coconuts collected from the plantation along the road leading to the village. Over time, many families have extended this network of gardening and established additional new gardens in areas where they found humid soil, for example along the river, directly in the dry river bed, or in a swamp. During wet periods they move their gardening further up the steep hills or shift to the ground further inland or closer to neighbouring villages. Our interlocutors identified seasonal planting in different places as a long-established method to ensure sufficient supply of staple crops such as yam, cassava, and island cabbage.

Villagers additionally follow routine experimental practices, which includes trying out new methods. In line with this agricultural approach of trial and error, people were eager to involve new techniques learned during the workshops into their existing practices. For example, a number tried nitrogen fertilising with Gliricidia and protecting the ground by mulching. The small house gardens, a food security strategy intensely promoted by one of the NGOs, were managed in different phases. Whereas directly after workshops one could find these gardens in a high number of households, in the further course, and in 2017 as well, we could

only record a small number of house gardens. In interviews, various reasons for this were mentioned: some of our interlocutors explained that the chickens, which are mostly not fenced in Dixon Reef, destroyed the harvest. They argued that it would be a lot of work or money to install a proper fence so that chickens are not able to enter the gardens. Others mentioned that the water supply in the village is not constant so that it is not possible to irrigate the gardens sufficiently. One woman continued a house garden and a few new ones were installed during our stay. One woman put it this way: “I tried to do it and it worked – maybe I try it again”.

In addition to gardening, we observed that some people supplemented their livelihoods through other activities, mainly catching and selling fish. During our stay, three people also began to build a chicken pen in order to be able to sell chicken and eggs.

People explained that buying rice and other food is an important supplement for their daily diet. In order to obtain the necessary money, people spent a considerable amount of time in the plantations in order to harvest coconuts, remove the flesh from the shell, and dry it in order to obtain copra, which is then sold to regularly visiting copra buyers. Another important activity in order to earn cash is the production of cocoa, which is even more labour-intensive. With very few exceptions, inhabitants of Dixon Reef did not plant kava themselves, but imported it mainly from the Southwest Bay region of Malekula. However, during the time we spent in the village, a group of people set out for a place further inland where they stayed for some days and planted large amounts of kava. This is, we were told, because the price of kava had risen considerably during the previous couple of years.

8 Conclusion

In this chapter we explored livelihood practices of people in Siviri and Dixon Reef during and after Tropical Cyclone Pam, the drought, and the food security and climate change adaptation workshops. This revealed that the villagers performed a great variety of activities in order to secure their food supply from their gardens and their monetary income.

In Siviri, cultivation was still practiced in order to obtain food directly or to sell it, but in lower quantity than before the cyclone. Here some of the newly learned practices were used sporadically. Additionally, the villagers engaged in a wide variety of different kinds of wage labour. Furthermore, self-employment, such as selling firewood, fenceposts, timber, or charcoal were important practices for many to earn money. Most households combined cultivation with one or two other kinds of livelihood practices so that they were able to buy food and other necessities in stores and at markets. This means that residents found or created and realised various ways of maintaining their livelihoods.

During and after the drought, the most important livelihood practices in Dixon Reef were related to cultivation of food crops. Characteristically, people planted a range of different crops and a relatively high number of crop varieties in various places. People continued to use already known gardening practices, but they also (at least temporarily) made use of a few new techniques. They also employed a variety of other options to pursue their livelihoods, turning to possibilities which enabled them to buy food – especially to the production of copra. This means that instead of concentrating on just a few practices, people established new ways of extending possibilities of ensuring a good life for their families and continuously circulated these in the community.

Working out ways of making a living, people engaged with and in their respective environments (Hetzl & Pascht, 2017), including not only infrastructure, places, and people, but also ideas and knowledge. Our interlocutors created specific kinds of diversification when they engaged with local environments and conditions. Every household followed more than one possibility. In both places, the result was a combination of diverse possibilities. People in Siviri combined cultivation of their gardens, which they partly shifted closer to their houses, with a great variety of options to earn money, so that they were able to buy food and other necessities at markets and stores. People in Dixon Reef continued to concentrate on cultivating a range of different varieties of food crops. They planted their gardens in different places, some in places especially appropriate for dry weather conditions. But they also engaged in some possibilities for monetary income in order to buy food, especially rice. Thus in both places people did not concentrate on one livelihood option, but engaged in a broad variety of possibilities.

As we stated above, our interlocutors in Siviri and Dixon Reef, irrespective of their age and social position, were eager to find out about innovative techniques and methods for gardening or horticulture. At the same time, they were similarly interested in both old and new ideas about other options to pursue their livelihoods. Additionally, they were very open to replacing practices, adding new ones, or resuming practices that seemed to have been abandoned when they thought them to be appropriate. They told us that they quite often switched to alternative possibilities in the past. This resulted in a very changeable sequence of more than one livelihood practice being used at the same time, without recognisable permanence of practices, and without linearity in implementing knowledge into practice. People actively decided for or against particular options out of the many possibilities they engaged in according to the specific conditions of the current context.

Now, is this specific process of diversification related to the drought after the cyclone or to people's encounter with new ideas about cultivation through workshops on climate change? The initial interest of villagers in new cultivation techniques and methods presented during workshops and training sessions of the food security and adaptation projects did not lead to a continuity of following new practices; only a few participants put them into practice for longer periods or at all. Yet, regardless of this, people we talked with were still interested and knowledgeable

about them. During the drought, while people continued planting gardens for food supply, they slightly shifted the focus of their livelihood practices to other options like selling firewood or copra, but at the same time maintained other activities and thus broadened the diversity of their livelihood practices.

Looking at the main Melanesian livelihood practice, namely horticulture, the practice of diversification can be found in numerous places in the region. People in these places do not specialise in the cultivation of one main staple crop but plant a great variety of crops. Barrau (1958, pp. 61–63) shows that during his research in the 1950s in various places in Melanesia people did not rely on one staple, but planted five or more species. We observed this phenomenon in Vanuatu during our recent fieldwork where people mostly plant at least yam, taro, banana, manioc, and sweet potato as staple foods. An even greater diversification can be observed regarding the varieties of one species of food plant. William Clarke stresses that planting a high number of named varieties within many species is of great significance in the Pacific Islands. He reports the example of Pohnpei in Micronesia, where 150 varieties of breadfruit existed (Clarke, 1994, p. 21). As stated above, Pollock shows that during the history of Pacific Islanders a continuous process of diversification of the cultivation of food crops took place and she stresses that this is linked to social values.

Our interlocutors told us that their ancestors planted numerous varieties of their cultivated species. Although they stressed that they are planting fewer varieties of yam and other food plants today, we observed that people are still cultivating a relatively great diversity of varieties. This suggests that creating diversity in the realm of cultivation is an established practice in Vanuatu.

In our interpretation, people of Siviri and Dixon Reef transfer this practice of creating diversity from cultivation to other realms of livelihood practices. As in Pollock's interpretation, diversification here contributes to food security, albeit with various options outside the realm of cultivation as well (Pollock, 2017). In the process of active engagement with their environments, villagers constantly aspire to expand their options for livelihood security, also, but not exclusively, in times of environmental challenges. At the same time, they extend their knowledge of (new) people, things, places, and practices, creating and re-creating networks of known humans, other-than-humans, and activities. Livelihood practices in Siviri and Dixon Reef did not become significantly more diverse and do not provide a significantly wider range of options after the adaptation projects. People in both villages continued with their praxis of engaging in multiple activities of different kinds and multiple places with multiple materials. Rather than specialising in one kind of activity, one place, one kind and variety of plants, they specialised in diversifying. Whereas people in Siviri were engaging in a variety of wage labour options – besides other activities like cultivation – people in Dixon Reef were engaging in various places – but also in other possibilities like copra and cocoa cultivation. This means that by referring to established and new practices they constantly generated (new) diversified practices.

Looking at the practices and the agency of people, as we show in this chapter, opens the perspective to a wide range of aspects superficially not connected to ‘adaptation to climate change’. People did refer to the drought after Tropical Cyclone Pam and to the new (practical) knowledge they came to know in workshops and demonstrations. They employed it for their practice of diversifying which they apply, among others, in the realm we call livelihood practices.

It may be apt to explain this process as a creation of a knowledge space which is “made up of linked sites, people and activities” (Turnbull, 2003, p. 19) and where people are open to integrating and assembling knowledge from different sources (Hastrup, 2015, p. 150; Hetzel & Pascht, 2018).

By interpreting diversification and changes in livelihood strategies as established practices in the two villages we aim to expand the view from adaptation as an isolated process to a more holistic approach where environment is not confined to the physical sphere but where there is no separation between the social, the physical, and the other-than-human spheres. Looking at the active engagement and interaction of people with the material and non-material conditions they encounter in their daily life praxis enables in our opinion a meaningful dialogue with them. ‘Climate change’ in this dialogue is not yet defined, but a concept which is generated by researchers and interlocutors in the encounters.

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10

Extreme weather events in Small Island Developing States: Barriers to climate change adaptation among coastal communities in a remote island of Fiji

Stefano Moncada and Hilary Bambrick

Small Island Developing States (SIDS) are heavily affected by climate change, challenging their economic development as a result. Although research on SIDS under climate change is gaining momentum, lack of data and research capacity remains a major problem. Similarly, little is known about the interactions between poverty and responses to climate change.

In this chapter, we conduct a case study exploring how coastal communities on Rabi Island, Fiji, are affected by climate change. We identify reactive coping strategies to climate variability and change, and explore the extent to which these responses are conducive to climate change adaptation, adopting the Sustainable Livelihoods Framework and using the CRiSTAL tool. We find that the majority of shocks are of a climatic or weather-related nature. We also find that the communities tend to adopt sustainable coping strategies in response to climatic shocks. However, the increased frequency of such events, and the disproportionate burden on lower-income households, can act as barriers for the effective uptake of adaptation measures. This study can potentially inform local and regional policy as it pinpoints possible areas of intervention where strategic activities could support adaptation strategies to address climate change vulnerabilities.

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1 Introduction

The evidence is increasing that Small Island Developing States (SIDS) are heavily affected by climate change, and that the challenge of economic development will be more difficult as a result (Nurse et al., 2014). Extreme weather events are detrimental to the livelihoods of many communities in SIDS (Cashman & Nagdee, 2017; McCubbin, Smit, & Pearce, 2015), and may push households to adopt unsustainable coping strategies in response, such as selling farm animals or working tools, thereby eroding assets and compromising future wellbeing (Takasaki, 2017). Although research on SIDS under climate change is gaining momentum, lack of data and research capacity remains a major problem, especially in poorer and more vulnerable island communities. Information on the effects on livelihoods, short-term coping strategies, and long-term climate change adaptation (CCA) measures that are being implemented is scarce (Moncada, Briguglio, Bambrick, & Kelman, 2018). Furthermore, existing poverty may delay uptake of effective CCA measures.

In this research the term ‘coping strategy’ is understood as the short-term reaction to shocks (Adger, Huq, Brown, Conway, & Hulme, 2003), the immediate response to risks and stresses (Lashley & Jonathan, 2013), and the ability to “just survive” (Smit & Wandel, 2006). These coping strategies can be classified as sustainable when responses to hazards do not compromise present and future assets (Adger et al., 2011). On the other hand, unsustainable coping strategies can result in immediate responses that, by usually depriving households of key assets in an effort to cope, often fuelled by already low standards of living and higher deprivation levels (Porter, 2008), can affect future wellbeing (Brown, 2011).

Conversely, ‘climate change adaptation’ implies more long-term changes (Vogel, 1998). These changes can also be classified as sustainable, such as those actions that contribute to socially and environmentally sustainable development pathways, including social justice and environmental integrity (Eriksen et al., 2011), and tackle the drivers of vulnerability, for example by investing in improved education or better infrastructure (Lemos et al., 2013; Schipper, 2007). Unsustainable climate change adaptation, which can also be referred to as ‘maladaptation’, can happen when the actions undertaken do not address climate vulnerabilities, and where these actions impact adversely on, or increase, the vulnerability of other systems, sectors, or social groups (Barnett & O’Neill, 2010, p. 211). Specific examples of unsustainable adaptation, among others, can be increasing emissions, vulnerability, or opportunity costs and reducing incentives or limiting choices for future generations (Juhola, Glaas, Linnér, & Neset, 2016).

In this research we identify reactive coping strategies to climate variability and change, and explore the extent to which these responses are conducive to long-term CCA, adopting the Sustainable Livelihoods Framework (SLF) through the CRiSTAL tool. The SLF can be utilised to assess how livelihoods are diversified as part of a strategy to cope with shocks (Ellis, 1998). Examples of livelihood diversification include variation of income sources from farm to non-farm income

(Paavola, 2008), agricultural diversification such as improved crop variety (Deressa, Hassan, & Ringler, 2009), as well as migration by means of providing remittances (Konseiga, 2006).

We conduct a case study exploring how coastal communities on remote Rabi Island, situated off the east coast of Fiji's second largest island Vanua Levu, are affected by climate change. We aim to assess and better understand to what extent climatic or weather-related events may affect coastal communities, adding to a body of published case study/place-based knowledge on coastal communities of SIDS, which, although recognised as highly vulnerable, are frequently neglected in research on development and CCA.

This study can potentially inform local and regional policy as it pinpoints possible areas of intervention where strategic activities could support both short-term coping strategies and long-term CCA to address climate change vulnerabilities.

The next section critically reviews the literature on climate change impacts in SIDS, focusing on extreme events and their impacts on livelihoods, including investigating existing knowledge on coping strategies adopted by coastal communities of SIDS. Section three describes the research methods and section four presents the results. Section five contextualises these results, highlighting knowledge gaps and likely barriers to the uptake of effective adaptation measures. Section six discusses the implications for policy and notes areas for further research.

2 Background

This chapter builds on the growing body of literature that explores how the destabilising climate is affecting coastal communities of SIDS (Kelman, 2018; Nurse et al., 2014), and the coping strategies being adopted by communities in reaction to those impacts.

Coping strategies are generally considered to be impromptu responses, often drawing on existing capital assets, such as livestock or savings, to absorb the impacts of sudden shocks (Ellis, 1998). These short-term coping strategies can be looked at in isolation as simple responses to the hazard (drought, flood, etc.), or by also considering the long-term impacts of climate change (Agrawal, 2008). A recent trend is to link the two concepts of coping strategies and climate change adaptation with an understanding that there is a strong connection between how short-term coping strategies draw on existing assets and the capacity to ensure a more long-term adaptation to climate change (Berman, Quinn, & Paavola, 2014). By way of an example, selling livestock or machinery as a strategy employed by households to cope with the immediate impacts of droughts can be juxtaposed to another strategy that instead reduces family expenses or shifts to different food types for a short period, while switching to more drought resistant crops, in order to respond to the threat of prolonged droughts (Birkmann, 2011).

Furthermore, in recent years there has been a focus on understanding the ‘root causes’ of hazard vulnerability, and how the severity of climate change impacts is also the result of ‘structural deficits’ and ‘poor’ human developments (Pelling, 2003). Therefore, different social, political, and economic systems may determine the capacity of households to respond in the short term, irrespective of the characteristics of the specific hazards (Berman, Quinn, & Paavola, 2014), and poverty levels within households also create different responses based on stocks of assets (Carter & Lybbert, 2012).

Useful lessons for many communities in SIDS come from the isolated Indigenous communities in Canada’s Western Arctic, who have used traditional knowledge of the environment and past experiences to adopt coping mechanisms capable of dealing with climate change impacts (Mercer, Dominey-Howes, Kelman, & Lloyd, 2007). Similarly, coastal cities can benefit from community-based adaptation where there is weak infrastructure and few resources, as communities themselves can offer a diverse set of tools and solutions, such as supporting the mapping and enumeration of informal settlements and providing tailor-made coping strategies to respond to immediate and future risks (Mycoo & Donovan, 2017). It is increasingly recognised that coastal communities in SIDS tend to be aware of and employ effective strategies to cope with climate change impacts (Aswani & Lauer, 2014; Magee, Verdon-Kidd, Kiem, & Royle, 2016) while recognising the challenges of low-income and limited financial resources (Beyerl, Mieg, & Weber, 2018). It is well understood that the characteristics of poverty, such as low-income and poor infrastructure, can act as barriers to the uptake of effective adaptation measures (Klein et al., 2005; Schipper, 2007), even with the presence of development investments in CCA (Ayers & Huq, 2009).

Considerable attention has been given to investigating the sustainability of coping strategies by households in the face of shocks (Dercon, 2002a), with greater poverty generally associated with a tendency to erode household assets in an effort to cope, for example by selling farm animals or working tools (Dreze & Sen, 1991; Hoddinott, 2006). Although the flow of assets, which can be taken as a measure of wealth, cannot be understood only using utilitarian approaches (Ferguson, 1985), reduced assets can compromise the coping capacity of households in the face of shocks. Recent developments in the literature have looked for a synthesis between the two concepts (coping *and* adaptation), with a general understanding that a sustainable short-term coping capacity can also assist the transition to long-term sustainable CCA (Berman, Quinn, & Paavola, 2012). In fact, it is very likely that the most successful changes in household behaviours will be those that occur gradually over time, stretching the boundaries of previous extremes and building on earlier sustainable coping experiences; the opposite of asset degradation (Engle, 2011).

The relatively scarce literature that examines coping strategies in the face of climate shocks and stressors in the Pacific finds that households, in Fiji for example, only rarely resort to adopting ‘unsustainable’ coping strategies, like selling as-

sets, while the majority tend to adopt more sustainable coping mechanisms, such as shifting to different food types and reducing family expenses (Béné et al., 2016).

While there is an understanding that SIDS are diverse, and that not all are affected equally by climate change due to biogeographic and socio-economic differences (Kelman, 2018), there is growing and consistent evidence that anthropogenic climate change is especially hazardous to SIDS populations (Nurse et al., 2014; Walsh et al., 2016), via (for example) loss of land (Albert et al., 2016) and associated displacement and resettlement (Charan, Kaur, & Singh, 2017) and loss of assets, including valuable crops, due to extreme events (Lashley & Warner, 2015). Also, the specific characteristics of SIDS, such as socio-economic activities located mostly on the coast, the fragility of generally small markets, and the relatively high reliance on ocean resources, among other factors, make SIDS inherently more vulnerable than other countries to extreme weather and climatic events (Briguglio, 2010). Furthermore, while the heavy reliance of many SIDS on imported goods might offer some temporary protection when local produce is destroyed, this may also cause a change of diet to one that may be nutritionally poorer (Barnett, 2011).

Many islands, notwithstanding these vulnerabilities, have a long history of responding to environmental stressors, resulting in cultural practices, knowledge, and skills to respond (Nunn & Mimura, 1997), promoting resilience especially in the face of the slow onset of sea-level rise (Nunn, 2007). However, low income, lack of quality education, and poor infrastructure can act as barriers to the effective uptake of CCA (Lemos et al., 2013; Schipper, 2007), including exacerbating exposure to climate change impacts and pushing households to erode their assets in an effort to cope (Carter, Little, Mogues, & Negatu, 2007). This can be especially significant for remote island communities, where legacies of colonialism (Barnett, Jon, & Campbell, 2010), demographic dynamics involving both out-migration and high-population density (Roberts & Ibitoye, 2012), and market failures can combine to seriously undermine current and future livelihoods, as well as challenging CCA under the increased recurrence and intensity of environmental and climatic stressors (Nurse et al., 2014). Furthermore, some of the coping strategies that rely on Indigenous knowledge and that are believed to enhance long-term sustainable adaptation are progressively threatened by modernisation, and the reliance upon Western-led development assistance (Mercer et al., 2007).

While research in SIDS progresses, there remains little research on how these climate change impacts are affecting the livelihoods of coastal communities in SIDS (Nunn & Kumar, 2018), especially given that much of the literature is focused more on urban areas, and less on rural communities, or on those living on remote islands (Nunn, Aalbersberg, Lata, & Gwilliam, 2014). Furthermore, there is still uncertainty over the extent to which poverty, coupled with island vulnerabilities, affects the capacity of island communities to cope with climate variability and change. Filling these gaps would help inform policy in designing development interventions that could eventually capture context-specific island features to support CCA.

3 Context and methods

3.1 Context

Rabi Island is a small, remote Fiji island with a land area of 66.3 km² and 46 km of shoreline, located off the east coast of Fiji's second largest island, Vanua Levu. There are four villages: the administrative centre, Tabwewa in the far north, and Uma, Tabiang, and Buakonikai, as shown by Figure 1.

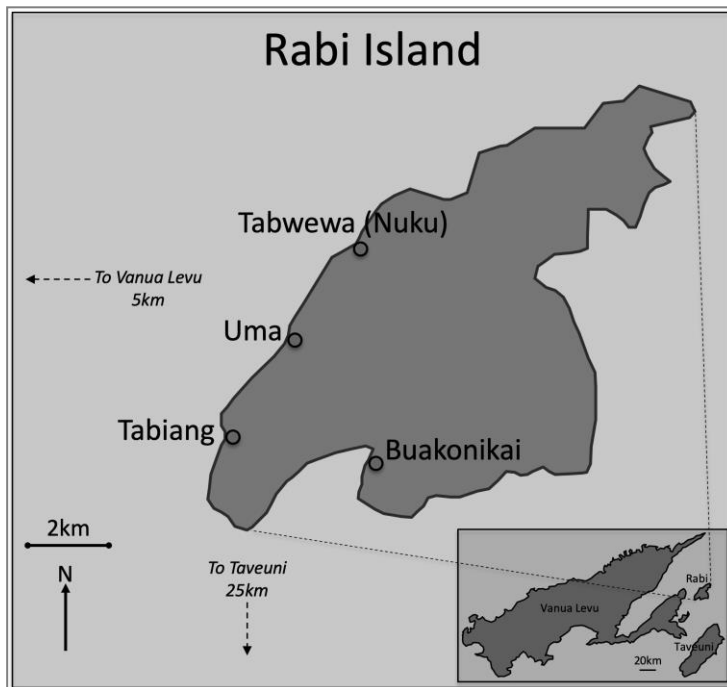


Figure 1: Map showing Rabi Island, off the east coast of Vanua Levu, Fiji.

Rabi is home to around 5,000 Banaba people, descendants of those who were forcibly migrated in 1945 from Banaba Island, Kiribati, as their island was degraded by colonial phosphate mining (Meller, 1997). The islanders retain their Banaba culture and language. The Rabi Council of Leaders and Elders is the municipal statutory body that administers Rabi Island, and has oversight for all operational and development issues of the Banaban Community. The eight-member council has two representatives from each of Rabi's four villages. The council chooses a chairperson, and also selects one of its own members to represent the community in the Kiribati parliament.

There are high levels of poor health, relatively low income, and climate change-related hydrometeorological hazards. Rabi Island was hit, directly or indi-

rectly, by a series of cyclones that from 2010 have affected the Fijian islands, most recently Cyclone Tomas in 2010, Evan in 2012, Ula in 2015, and the unprecedented Category 5 Cyclone Winston in 2016.

Income is very low and houses are crowded. Communicable diseases such as tuberculosis, as well as diarrhoeal and various mosquito-borne diseases are prevalent, as are non-communicable diseases such as Type 2 diabetes. While there is growing evidence regarding climate change impacts in Fiji at the national level (McIver et al., 2016), little is known about the extent and types of the damages occurring at the local level – or how best to manage them (Bambrick & Hales, 2013; Nunn et al., 2014) – in specific contexts, and even less is known about more remote communities such as Rabi.

3.2 Methods

This chapter presents a case study of the island of Rabi, to focus more specifically on remote communities that are often neglected in research about SIDS, development, and adaptation.

The research employs a mixed methodology. To identify key risks faced by coastal communities, as well as responses to any extreme weather event, and to assess how coping strategies are conducive to long-term sustainable CCA, we conducted Participatory Rural Appraisals (PRAs). The PRAs guided the design of a household survey delivered to a random sample of households (N=40) living in the coastal areas of the four villages of Rabi and selected with a snowball technique. The survey had the intention of examining the links between poverty levels, measured by households' income, and climate change impacts. Households' income and availability of assets have been used extensively as measures of poverty in the context of developing countries (Grosh & Glewwe, 1996). We link the variables of interest, households' income, and availability of assets to key climate change impacts, such as flooding, droughts, and cyclones, which are considered appropriate to capture the extent of damage that can affect development (Noy, 2016).

To explore the extent to which coping strategies are conducive to long-term CCA, we adopted the Sustainable Livelihoods Framework which uses categories of livelihood capitals to combine information on climate and development (Dalal-Clayton, & Sadler, 2014). The SLF, was originally developed by Scoones (1998) to investigate all those causes that make households vulnerable to shocks, and the set of policies and processes that can enhance their resilience following a disaster (Ellis & Biggs, 2001). We then build on theoretical and applied work advanced by Klein and colleagues (2005), and Schipper (2007), to examine how existing poverty levels are acting as barriers to effective CCA measures.

Participatory Focus Groups

The PRAs were conducted using the community-based risks screening tool for adaptation and livelihoods, called CRiSTAL (IISD, IUCN, SEI, & Intercooperation, 2012), which draws on the SLF approach, by using categories of livelihood capitals to combine information on climate and development (Dalal-Clayton & Sadler, 2014). The SLF was developed to investigate all those causes that make households vulnerable to risks/shocks, and the set of policies and processes that can enhance their resilience following a disaster (Scoones, 1998; Ellis & Biggs, 2001). The SLF is an asset-based poverty and vulnerability analytical framework (Carter & Barrett, 2006). It aims at placing people at the centre of development efforts, and interprets people as deploying assets to reach their objectives in a context of vulnerability (Kemp-Benedict, Bharwani, de la Rosa, Krittasudthacheewa, & Matin, 2009). Among the advantages of deploying an asset-based livelihoods approach is its capacity to develop effective poverty-reduction interventions (Bebbington, 1999; DFID, 1999).

The CRiSTAL tool was originally introduced as a response to the understanding that sustainable livelihoods projects and ecosystem management could positively contribute to risk reduction and climate change adaptation (IISD & SEI, 2003), specifically because there was the need for a tool that could systematically identify livelihood resources, or capitals, and the risks/shocks affecting them. These findings would be key to eventually sustaining adaptation strategies that could, in turn, be supported in any development project and used to inform policy (IISD et al., 2012).

PRAs have been used in development, and climate, research for a relatively long time (Chambers, 1994; Labbé et al., 2015), especially to identify context-specific resources and challenges to overcoming poverty. However, applications of the CRiSTAL tool are more common in continental rural (González, Keller, Tineo, & Julia, 2011; Stejskal & Fernandes, 2006), pastoral (Riché & Hammill, 2009), and forested areas (Robledo, Clot, Hammill, & Riché, 2012), rather than in island settings. This research therefore extends the application of the CRiSTAL tool to island contexts, including findings related to livelihood resources, risks/shocks, and coping strategies on a remote Pacific island.

The participatory focus groups were conducted by following theoretical (Chambers, 1994) as well as applied work on PRAs, with a focus on the Pacific region (McNaught, Warrick, & Cooper, 2014; Mercer, Kelman, Taranis, & Suchet-Pearson, 2010; Warrick, Aalbersberg, Dumar, McNaught, & Teperman, 2017). When selecting participants for the focus groups, we paid particular attention to maximising diversity within the groups (Chambers, 2008; IISD et al., 2012). Separate focus groups were conducted for men and women, to more effectively capture the opinions and perceptions of each group by minimising any potential biases arising from patterns of gender relations, and to address the division of labour within the community (IISD et al., 2012). This also allowed for a more objective

investigation of the risks (Aboud, 2011), given, for example, a potential inclination for women in mixed groups to talk about the activities and priorities of their husbands rather than their own, as has been found in other settings (Cornwall, 2003). Although some differences between men and women were found, consistent with consolidated norms in reporting PRAs in an aggregated manner there is no need to undertake a gender analysis (Elasha, Elhassan, Ahmed, & Zakiieldin, 2005; Heath, Parker, & Weatherhead, 2012) but rather to focus on the community as a whole; any specific gender-related research would require further study. The identification, and prioritisation, of the livelihood resources was guided by literature dealing with coding and grouping themes emerging from data analysis (Ritchie, Lewis, Nicholls, & Ormston, 2013; Strauss & Corbin, 1990), and by applied research in developing countries (Hargreaves et al., 2007; Sultana & Thompson, 2004). For each risk or shock and its correspondent impacts, participants identified their current coping strategies, assessed the extent of sustainability of these practices, and then through group discussion proposed alternative strategies, on the assumption that any necessary resources could potentially be employed.

To avoid the perception that categorising behaviours and patterns by using livelihood capitals is too deterministic, and to recognise that local perceptions and realities are complex and at times difficult to categorise, we conducted participatory methods that allowed local communities to inform the content of those pre-selected categories. As a result of the importance given to religion and religiously based traditions within the communities, we added a specific category, that of cultural capital, within the SLF. Through the use of visual maps, participants were able to identify key livelihood resources, which were then prioritised by participants, with risks and coping mechanisms identified. The drawing of community maps is considered an effective tool to start off discussions on livelihood resources (Cramb, Purcell, & Ho, 2004; Sheil et al., 2006), with the additional intention of assisting participants who might have barriers to verbal communication (Hart, 1997). The process for selection and prioritisation of livelihood resources was consistent with previous studies of key livelihood resources in developing countries (Neef et al., 2018; Sheuya, 2009), confirming the importance of both tangible and non-tangible capitals (Devereux et al., 2013; Tacoli, 1999).

The two PRAs were conducted during the month of June 2015, and involved coastal communities from two of the four island villages, Uma and Buakonikai. A total of nine participants attended the men's focus group, with age ranging from 19 to 54 (mean age at 34). Seven participants were farmers, one of whom was also an occasional fisherman, while two were religious pastors. A total of seven participants attended the women's focus group, with age ranging from 24 to 60 (mean age at 39). All seven participants declared themselves to be farmers, with one occasionally fishing with her husband.

The focus groups were undertaken with the assistance of a skilled facilitator (Kitzinger & Barbour, 1999), particularly important in terms of language and cultural specifics in the Pacific setting (Laverack & Brown, 2003). Attention was given

to the monitoring of proceedings so as to avoid individual participants ‘dominating’ the discussion (Laws, Harper, Jones, & Marcus, 2013).

Surveys

Surveys were conducted to quantify the relation between extreme events and income. The aim of this part of the study was to assess whether there is an association between poverty levels and relevant climate change hazards, specifically to investigate to what extent lower-income households perceive impacts from extreme events. This part of the research builds on the conceptual framework presented in the previous section, developed by Klein and colleagues (2005) and Schipper (2007), to examine how existing poverty levels are acting as barriers to effective CCA measures. While it is understood that such metrics might have some flaws, especially in areas like the Pacific where measuring wealth from deterministic approaches can run the risk of not capturing cultural and place-based specifics, results from such analysis have the benefits of comparing outcomes from similar research and can lay the groundwork for identifying more appropriate measuring techniques in future research. Furthermore, this specific quantitative investigation complements well the participatory focus groups, by assessing whether, even in the presence of sustainable coping practices following extreme events, financial poverty delays the transition from coping to long-term CCA. This is a preliminary step towards a more sophisticated study using various specialised methodologies, such as community intervention trials, and regression analysis, in order to ascertain causality, which could not be undertaken within the timeframe of this specific research, and given the small sample available. The statistical analysis was performed with the statistical software STATA 13.

The preparation of the survey instrument was also guided by similar studies in developing countries (Crona, Wutich, Brewis, & Gartin, 2013; Grosh & Glewwe, 1996), and by relevant research on poverty and climate change (Brown, Daigneault, & Gawith, 2017), including specific lessons from Fiji (Dumar, 2010). The survey included questions on household characteristics, public health, including access to and use of sanitation facilities, water and management of environmental resources, prevalence of certain health outcomes, employment, assets, and attitudes and perceptions of environmental changes. The questions included in the final survey were informed by the results of the participatory groups, following the broad categories of capital as identified by the community. The questions in the surveys also attempted to capture data comparable with key national or regional statistics wherever available, such as national censuses of Fiji, and World Bank and World Health Organization Regional and National surveys.¹

To improve accuracy of response and avoid misinterpretation, multiple-choice responses for frequency ranges were used wherever possible, scales were kept simi-

¹ Full survey can be made available upon request.

lar, and time periods were clearly specified (Tourangeau, Rips, & Rasinski, 2000). The surveys were translated into the most widely understood local languages, Gilbertese and English, and piloted (n=10).² We acknowledge that there exists a body of social science research that suggests that closed-ended surveys, where participants are not involved in the creation of the questions or answers, might perpetuate biases and only scratch the surface of issues (Budd, Sigelman, & Sigelman, 1981), particularly in complex cultural settings like Fiji (Léopold, Cakacaka, Meo, Sikolia, & Lecchini, 2009). However, we believe that the use of mixed methods in this research where focus group discussions informed the survey questions mitigated the risks of perpetuating such possible biases.

The survey data suffers from some limitations, mostly due to the small sample size (N=40), and the constraints faced when applying snowballing sampling techniques, such as finding respondents and starting the referral chains, verifying the eligibility of potential respondents, pacing, and monitoring referral chains and data quality (Biemacki & Waldorf, 1981). There was no formal map or list of households on Rabi Island and so reliable random sampling techniques were less available.

4 Results

Both the men's and women's focus groups started their discussions by plotting the boundaries of their community, supported by the facilitators, as shown in Figure 2 and Figure 3 below. The use of visual maps helped participants to clearly pinpoint the key resources available, and important, to them, as well as detecting the exact space in the community where risks are occurring and resources are adversely impacted.

² These 10 pilot household surveys do not form part of the other 40 surveys considered for the analysis.

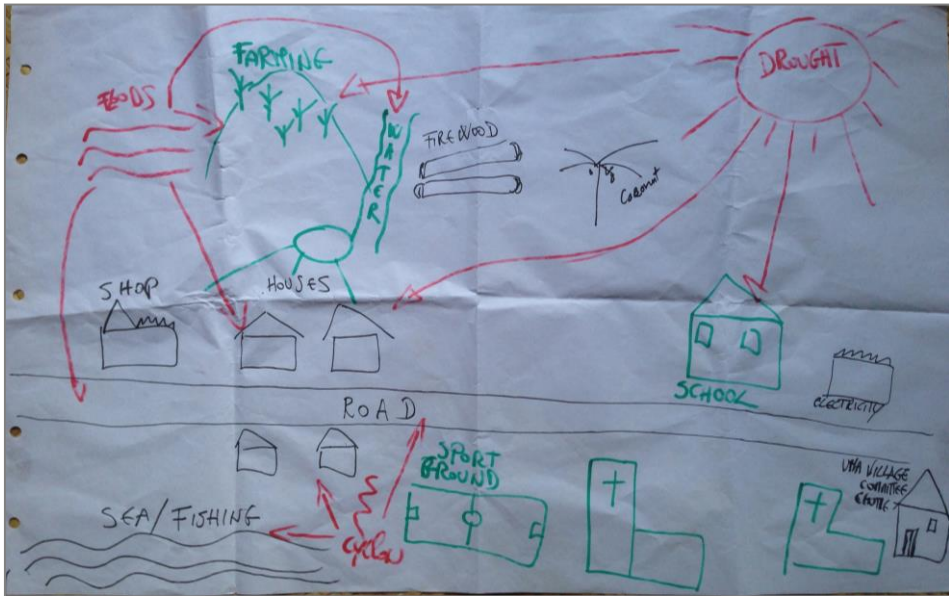


Figure 2: Visual resource map of the men's focus group

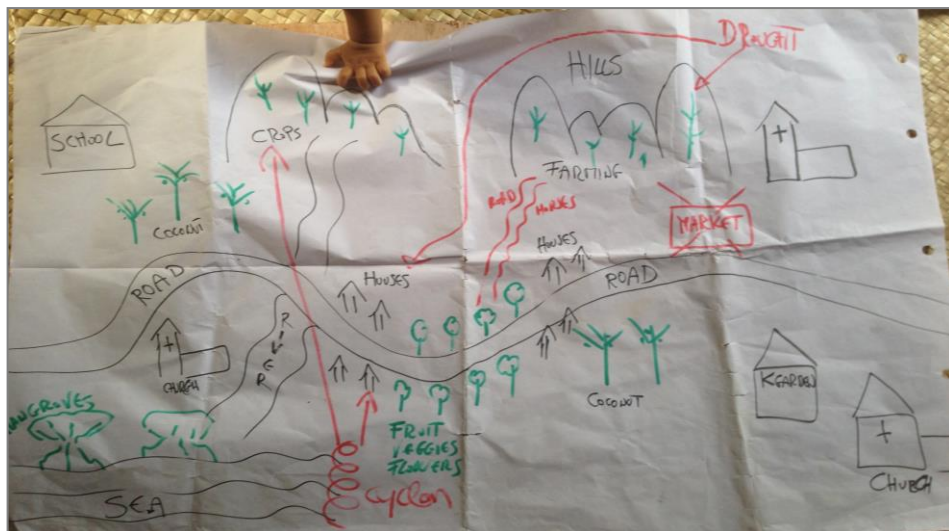


Figure 3: Visual resource map of the women's focus group

4.1 Livelihood resources

Participants identified key livelihood resources according to the categories of the Sustainable Livelihoods Framework, as discussed in the methods section above, and shown in Table 1 below.

Table 1: Identification by men's and women's focus groups of key livelihood resources in Rabi

Livelihood resource categories	Livelihood resources
Human	Education
Social	Networks Reciprocity and exchange
Natural	Water Sea Flowers/trees/firewood Soil
Physical	Roads Electricity Water infrastructure Schools
Financial	Regular inflow of money/income
Political	Functioning of the institutions
Cultural	Religion Sport

The discussion on livelihood resources focused especially on natural, physical, social, and human capitals. Water, and ecosystem services more generally, were central, while electricity, social support and reciprocity among community members, and health were listed as priority livelihood resources by participants.

Both the men's and women's groups reported that the water supply system is very poor, running for only two hours in the morning and two hours again in the evening. During the dry season (May to August/September) water availability is especially limited, and participants expressed their concern over what they perceived as a lengthening dry season, when compared to past years, having increasingly frequent detrimental effects on water availability. The main water source was defined as a 'creek', rather than a river, as it only flows with rain. In the wet season (October to April) there is no water shortage, but the colour of the water changes to darker brown given the presence of soil in the water. Not all households filter their water and the filtering that is done is rudimentary, through scraps of fabric tied to the outlet.

All participants recognised the importance of ecosystem services such as flowers, fruit trees, and plants, which provide food for daily consumption and for stor-

age. The majority of participants were farmers, growing crops such as *yagona* (kava),³ cassava (tapioca), *dalo* (taro), and yams. The only products that are sold to local markets are kava and coconut, notwithstanding the availability of other agricultural products that could be sold, but that do not seem to be reaching markets.

Electricity generation is provided by one gallon of diesel per house per month, which translates into two hours of electricity power per day. Participants recognised that their villages are rather small when compared to more populous settlements on other larger islands, or urban areas, and that they have fewer financial resources to generate electricity for longer periods. Households usually buy the diesel to fund 'local electricity committees', which are in charge of the production of electricity through generators. Participants widely agreed that two hours of electricity per day was not enough to satisfy basic livelihood needs, but also stated that it was what they could afford for the time being. All participants agreed that they would be willing to convert to solar but the initial investment was too high. The cost of monthly production of electricity borne by households is approximately 20 Fijian dollars.⁴ A solar alternative, following the installation of photovoltaic panels, would be to pay the Fijian government 18 Fijian dollars per month for an unlimited amount of use time. Participants believed the price to be unfair, given that there are no 'refuelling' costs to be sustained and maintenance expenses for solar are lower than those for generators. In order to increase the adoption of solar energy, the government could consider supporting the initial monetary investment, especially in isolated and more remote communities, such as Rabi, and explore gathering returns only through small monthly fees.

Participants mentioned both networking and reciprocity as key resources, confirming the role played by social capital among community members, especially in the face of stressful events, or generally when families are in need. However, participants agreed that there might be constraints in accessing social capital when stressful events affect everyone, such as when cyclones strike, as opposed to when only individuals or individual households are affected, in which instances the support network is more available and accessible.

In terms of health, participants mentioned the importance of improved provision of health services, with some communities being far away from the existing health centres. In case of emergencies they have no means of transport to the hospital, and they risk 'dying in their own villages'.

³ Kava is a soporific drink, traditionally consumed both socially and during ceremonies in Fiji (and other western Pacific Island groups), made from the roots of native pepper plants (most commonly, *Piper methysticum*).

⁴ At the time of writing, US\$1 = FJ\$1.83

4.2 Risks/shocks

Following the identification of livelihood resources, the focus groups identified and discussed key risks and shocks, their direct and indirect impacts, current coping strategies for dealing with those risk and shocks, as well as any alternative responses that could be put into place, assuming the availability of resources. Table 2 below shows the aggregated results of both the men’s and the women’s focus groups.

Table 2: Aggregated results for risks, shocks, and coping strategies for focus groups

Risks/Shocks	Direct/Indirect impacts	Current responses	Alternative responses
Droughts	Drinking water	Increase storage (=)	Proper water management
	Soil fertility/ Income loss	Reduce food consumption/Shift to other food (>)	Market to sell crops not affected by drought
		Keep weeds to maintain moisture (>)	Change cropping behavior
		Let plants die (<)	-
	School attendance	Report and wait for flow to be restored (=)	Seek advice from agricultural services
Floods	Infrastructural damage to roads	Stay at home (<)	Community getting together to fix problems
	Infrastructural damage to water pipes	Increase storage (=)	Create diverting channels
	Schools close	Kids at home (<)	Proper water management
Cyclones	Damage to house	Look for smaller houses to get temporary shelter (=)	Proper building management
	Damage to crops	Replanting after event (>)	Build with stronger material
		Shift food (>)	Change cropping behavior
		Wait for aid (<)	Not identified
		Not identified	

Note: the symbol ‘>’ denotes sustainable coping strategy; ‘<’ denotes unsustainable coping strategy; and ‘=’ denotes neither sustainable nor unsustainable coping strategy.

Droughts

Participants from both focus groups mentioned that from 1997 onwards there has been a severe drought every year, and that in each of the past five consecutive years there has been an unusually long dry season, which lasted for more than eight months. They also mentioned that the quality of the soil has been profoundly af-

ected by unusually prolonged droughts, negatively impacting farming practices and yields. During the previous farming season, one specific farmer declared he had more than 700 plants die from lack of sufficient water. There are currently no means of irrigation in the fields. When droughts happen, young crops die, and if the drought is especially long, even well-established plants are affected. During droughts, coconuts stay on the trees rather than fall to the ground, making it more difficult to collect them. Kava gives a smaller yield during droughts, hence income from this important cash crop is also reduced. The schools close down when there is no water, with these closures continuing for up to a whole week, potentially affecting women's work and activities given their traditional role as caretakers, and overall leading to the loss of education that is perceived as important by the community.

During the dry season the density of pest insects increases, damaging green leafy edible plants. Food security on the island is tenuous. With the lengthening dry season and frequent prolonged droughts, households shift to different food types, when available and when income is sufficient to purchase them, or resort to reduced food intakes.

Both focus groups independently raised the point that a recent 'massive' logging operation by an international company cut many trees in the central part of the island and 'intensified' the droughts, as well as damaging the nearby fields.

Floods

In the wet season floods are seldom, but very damaging when they occur. Those households close to the rivers/creeks are highly affected. Floods damage houses, soil, farming, road transportation, and employment. Floods can contaminate water and cut supply as they burst pipes. During heavy floods the school is closed as water supply and sanitation cannot be guaranteed.

Crops are planted in the wet season (October to May), before the dry season arrives, but flooding can be a risk, washing away the seeds, or uprooting small plants.

Cyclones

The cyclone season is from November to April. There was a general agreement among participants that particularly heavy cyclones have become more likely to hit Rabi Island in recent years. Participants especially remember the damages inflicted by the 2003 Cyclone Amy, and the 2010 Cyclone Tomas. (Data collection took place shortly before the record-breaking Category 5 Cyclone Winston in 2016.)

The damage wreaked by cyclones can be extreme, destroying houses and crops. Crops most affected are those that grow above the soil, such as banana and papaya. Crops such as *dalo*, cassava, and yams do better, since they grow below the soil. As well as cyclones, other extreme weather events were cited as happening

more frequently, once or twice every season, especially wind storms. Participants reported that stronger winds started to happen from the 1980s, making it more difficult to plan farming and fishing activities.

Participants mentioned the lack of larger, functional markets and somewhere to sell excess yields as a chronic problem that prevents many community members from increasing their income, and from recovering faster from shocks arising from climate change. Participants mentioned that they would be happy to sell more agricultural products, but that there is simply no market where they can do so, either locally or on other islands (transport to the nearest islands is by small boat over distances of 5 km to 25 km, which can be treacherous in poor weather, and then several hours by road to the nearest town). Another problem that participants highlighted was the lack of roads on Rabi Island itself to and from the fields, as well as lack of vehicles, which also limits how much produce can be transported, and negatively affects its quality and price.

The absence of a market also places limits on the choice of items available for households to purchase, including tools that could be used to improve their productivity, and food items, leading to poorer nutritional intake from a limited range of highly processed foods that are brought to the island in bulk and infrequently.

4.3 Coping strategies

For each risk and its correspondent impacts, participants identified their current coping strategies, assessed the extent of sustainability of these practices, and then through discussion proposed alternative strategies on the assumption that any necessary resources could be employed.

Coping with droughts

To cope with the lack of water during the dry season participants reported that they collect more water using bigger buckets, therefore trying to increase storage; however, this comes at an extra cost given the need to acquire, or borrow, further water containers. The alternative, more sustainable strategy proposed by participants was to have a bigger reservoir, or to be connected to a well. They also recognised that a better long-term solution would be to have a more efficient water management system (i.e. not just more water, but also distributing and using it more efficiently), while noting that because of a lack of financial resources on the island this is unrealistic in the near future. By way of confirming the lack of funding available to the council, participants referred to the fact that the Rabi council recently had to reduce by half the number of employees, from 70 to 35.

To cope with droughts in farming, many participants noted the usual practice of not clearing the grass near young plants, increasing the soil moisture to protect the plants from dying, even if it produces a lower yield overall as the grass com-

petes for nutrients. Many also mentioned early harvesting as a way to ensure some, albeit again limited, produce before extended drought kills the plants.

During the dry season participants reported having a lower income, causing them to change what they eat to more readily available or less expensive items, and to even eat less overall.

Coping with floods

When floods hit the island's infrastructure, especially roads, participants noted they would be unable to go to work, although they said their income would be rarely impacted, with the exception of floods lasting for more than two or three days, in which case, especially for farmers and small traders, income can be affected. This is probably why to avoid floods constraining their everyday activities, participants described how channels alongside the roads should be dug and other infrastructural work should be undertaken by the local council, and that they would be willing to assist such activities by investing their own time and energy into these sorts of improvements.

Coping with cyclones

Following a severe cyclone, participants described how overseas aid, usually through the Red Cross, arrives on Rabi as well as supplies food, clothes, and tools. During cyclones, the farmers go to the fields to check on crops or stay in their houses, or, if the cyclone is particularly severe, seek shelter in the church or other strong buildings.

Participants also reported that following damage to houses from a cyclone they will sometimes build a small temporary hut where they can sleep, then build a small house as an interim solution, waiting to build, eventually, a bigger house when further resources are collected, or external assistance is provided. Among the food crops less likely to be damaged by cyclones are the roots of a plant called '*papaʻ*', as well as yam, cassava, and *dalo*; otherwise, the vast majority of the other crops need to be replaced by farmers following cyclones. Interestingly, notwithstanding the importance of kava, which besides having cultural and recreational values is also used as a cash crop, participants did not mention any loss of this crop when hit by cyclones, contrary to findings in other Pacific Islands (Le Dé, Rey, Leone, & Gilbert, 2018).

Participants clearly understood that the lack of functional markets on the island directly affects their capacity to produce an income, and limits their investment in increasing their own standards of living. They believed that the Rabi council should help establish a market for them to be able to sell their produce, as well as lobby the Fiji government to provide suitable transport and infrastructure to directly link production to markets on neighbouring islands. Participants also stat-

ed that they would be willing to plant more crops and to diversify their production in order to increase their market share in nearby markets.

4.4 Key community characteristics and statistical analysis

The socio-demographic data collected in the survey is fairly representative of key characteristics in the national and provincial population (specifically that of the Cakaudrove Province) (Table 3), including household size, marital status, religious affiliation, literacy levels, and health behaviours, such as tobacco use. However, means for household income are significantly lower and unemployment rates higher for households residing in the communities when compared to national and provincial means. This is not unexpected, as more remote islands tend to have higher poverty levels (Fiji Bureau of Statistics, 2017).

Table 3: Community vs. provincial/national characteristics

Key variables	Household means	Provincial/national means
Number of people per household	6.6	5.2 ¹
Married	38%	39% ¹
Christians	87.5%	85% ¹
Literacy rate	92%	98.7% ¹
Tobacco use	30%	31% ³
Household income (USD per day)	1.33	13.52 ²
Unemployment rate	27%	8.6% ¹

Notes: ¹ Fijian Bureau of Statistics, 2017; ² World Bank Indicators, 2017; ³ WHO, 2016.

We examined whether, and to what extent, poverty levels measured by households income, are interacting with climate change impacts in coastal island communities. Here we run pairwise correlations⁵ between households’ income and level of agreement on a number of proxies for climate change. These proxies were informed by discussion in the participatory focus groups and include, namely:

- Flooding has been increasing in recent years.
- Drought has been increasing in recent years.
- Cyclones are happening more often in recent years.
- It is becoming more difficult to catch fish in recent years.⁶

The correlation coefficients⁷ reported in Table 4 send a clear message; that there is a negative correlation between households’ income and level of agreement

⁵ Pairwise correlation was preferred to regression as a technique given the relatively small sample. Furthermore, the study is an initial exploration with no intention, for the time being, to infer any causation or construct any model.

⁶ These four variables are measured by a Likert scale ranging between 1 and 5, with 1 being ‘strongly disagree’ and 5 representing ‘strongly agree’.

⁷ Correlation matrix available upon request.

with the three variables used to measure climate change impacts. More specifically, the lower the income levels, the higher the perception that floods, droughts, and cyclones are happening more frequently in recent years. Interestingly, if we repeat the exercise by substituting income for variables measuring assets, such as number of chickens owned, or measures of deprivation, such as going without electricity or food, the same statistically significant association holds.⁸ On the other hand, results from the variable measuring fish catches, does not seem to be correlated with any of the variables measuring poverty levels.

Table 4: Pairwise correlation between key climate change impacts and household income

Variables	Correlation coefficient	Households sampled
Flooding has been increasing in the recent years	-0.276*	40
Drought has been increasing in recent years	-0.301**	40
Cyclones are happening more often in recent years	-0.266*	40
It is becoming more difficult to catch fish in recent years	0.120	40

Note: * statistically significant at the 95% level; ** statistically significant at the 99% level.

5 Discussion

We found that the majority of the shocks identified by coastal communities on Rabi Island are related to climate, adding weight to prior understanding of coastal SIDS communities (Nunn et al., 2014), and providing a new level of important detail, especially on the negative impacts among local fishers and farmers (Cinner et al., 2012). Of particular importance is the confirmation that droughts and floods represent a serious threat to local livelihoods, as demonstrated by previous studies in the Pacific, where household crops and local businesses are highly monetarily vulnerable to floods, especially areas with inadequate infrastructure (Brown et al., 2017). Rabi Island as a case study confirms existing understanding in relation to communities living on remote islands, and perceptions of the changing frequency and intensity of such events in recent times.

Interestingly, community members mentioned logging operations on the island as a possible factor that intensified the negative effects of droughts, reducing the capacity of the nearby soil to keep moisture and unduly exposing plantations, as well as creating erosion and loss of soil, including a reduced transpiration from the (now diminished) forests leading to less rainfall. While such effects of deforestation are well established (Myers, 1988), including in Fiji (Stephens, Lowry, & Ram, 2018), there appears to be little previous evidence from remote islands. This could

⁸ These further results are not reported in this paper but are available upon request. The variable of income, as well as the additional variables used to measure poverty such as food deprivation and number of chickens owned, are all normally distributed.

be a valuable focus of future research, including on the broader and long-term costs of such economic operations, such as the impacts on local farming activities, any local benefits of payments received by the logging company, and the potential indirect damage that deforestation causes to infrastructure, such as through flooding, and even, as suggested here by participants, an impact on island rainfall patterns. Such economic choices, occurring even within cash poor small island economies (Chand Satish, 2003; Feeny, 2016), could potentially erode existing assets, and be costlier and more unsustainable in the long term (Myers, 1988).

This study finds that participants tend to adopt sustainable short-term coping strategies when hit by shocks. Shifting to lower food consumption, or to other types of food, in the face of decreased income or availability of farmed products, has been consistently considered an appropriate way of coping with such shocks (Davies, 1993; Dercon, 2002b; Drysdale, Moshabela, & Bob, 2019). This is also the case for farming practices that keep weeds around the farmed crops, keeping crop plants alive but with decreased yield. This sustainable coping practice is also well known elsewhere (McGregor, Fink, & Dawson, 2016). The existence of sustainable short-term coping strategies can nourish fertile ground for long-term CCA, especially when institutions, including the family and supportive cultural institutions, can support this transition (Berman et al., 2012). Further important elements for an effective transition from short-term coping strategies to long-term CCA is the integration of traditional knowledge and cultural practices into responses to shocks (Eriksen et al., 2011), which feature in the coping strategies adopted by communities on Rabi Island. Our findings support those of studies conducted elsewhere in Fiji (Béné et al., 2016), but with evidence from isolated rural communities.

Participants appeared to be aware of long-term solutions that could address the direct and indirect impacts of climate shocks hitting their communities. This is in line with a large body of literature showing communities that are highly attuned to long-term changes, and that understand and appreciate longer-term potential solutions using local culture and knowledge (Barnett & Campbell, 2010; Kelman, 2010; Lata & Nunn, 2012; Mortreux & Barnett, 2009). This includes the need to build a better water management system, comprising drip irrigation in the fields to cope with extended periods of drought and more robust pipes and better drainage to cope with floods. Furthermore, there is a clear understanding that schools and other community buildings, as well as private homes, should be built to improved standards that better withstand the impact of cyclones and floods, thus decreasing the long-term costs associated with disrupted education and recurrent reconstruction.

A further issue that the communities seem to face is the lack of suitable markets to sell their products. Farmers and fishers reported that, notwithstanding ongoing surplus in the production, the local market is not sufficient to absorb even their usual harvest and this keeps prices too low. There is also no organised form of transport that could allow participation in other markets on nearby islands.

Although many participants were aware of the importance of adopting sustainable coping strategies, inherent vulnerabilities and existing poverty levels do act as barriers to the adoption of long-term adaptation measures, threatening current coping strategies and future livelihoods.

We found that income is associated with the perceived frequency of climate change impacts. There is a negative correlation between income – or assets – and frequency of climate change–related events. While measuring such impacts with proxy variables that capture *perceptions* rather than using some objective measure of events (e.g. an analysis of rainfall patterns over several decades using rainfall observations) might suffer from some limitations (Bird, 2009), the observed data and climate projections in the Pacific Region (Brown et al., 2017; Nurse et al., 2014), as well as the results of the qualitative focus groups conducted here, support these findings.

6 Conclusion

This study's objective was to investigate how coastal communities on the island of Rabi are affected by climate change, and in particular to better understand the coping strategies that are employed in response to hazards associated with climate variability and change. We also explored whether these responses are conducive to long-term and more sustainable climate change adaptation. In addition, we investigated the extent to which characteristics of poverty (low income and few assets) interact with climate impacts, potentially affecting the successful uptake of both short-term coping strategies and long-term climate change adaptation measures.

Our findings show that the majority of the shocks faced by communities on Rabi are related to climate, contributing to a growing body of literature showing how communities are highly attuned to variability and even long-term changes, and understand and appreciate potential longer-term strategies using local culture and knowledge, especially in coastal communities of SIDS (McCubbin et al., 2015; Nunn et al., 2014), on the negative impacts on local fishers (Cinner et al., 2012) and farmers (Harmer & Rahman, 2014; Iese, Maeke, Holland, Wairiu, & Naidu, 2017). The chapter adds to the evidence on existing awareness in local communities about the adoption of sustainable coping strategies in the face of climatic shocks (Raymond et al., 2010), where empirical research has been scarce (Costella & Ivaschenko, 2015), including on remote islands in the Pacific. Our findings may be applicable to other islands which are similarly isolated, low-income, and reliant on subsistence agriculture and fisheries exposed to climate risks.

Our findings also suggest that sustainable short-term coping strategies, likely to lead to long-term CCA, are threatened by already apparent impacts of climate change, such as prolonged dry seasons and frequent drought, and that this may be especially the case for low-income households. Results from the surveys show that the perception of the frequency of floods, droughts, and cyclones and associated

risks was stronger among low-income households. Remoteness and the higher costs of production and access to markets may act as insurmountable barriers to the adoption of long-term adaptation measures among low-income households. This threatens contemporary livelihoods and undermines potential future gains in standards of living and in health and wellbeing. Such results seem to support the understanding that the removal of ‘development barriers’, such as poverty and lack of functioning infrastructure and institutions (Schipper, 2007), could be tackled first, especially in the presence of limited resources to invest, in order to create fertile ground for sustainable and long-lasting CCA (Eakin, Lemos, & Nelson, 2014).

These findings can potentially inform more effective strategies and adaptation policy for Rabi Island, especially by providing detailed information on the specific climate shocks and likely barriers to adaptation, and highlight the areas where further actions are needed to promote transition from short-term coping strategies to longer-term climate change adaptation.

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PART III: MIGRATION AND (IM-)MOBILITY

11

Climate change displacement: Towards ontological security

Carol Farbotko

Climate change displacement is often described as an existential threat, a term that attempts to capture the social, physical, political, and cultural gravity of inhabited areas becoming uninhabitable from impacts of climate change. This paper considers narratives of existential threat as a call for more research into ontological security. Ontological security need not be considered a concept separate from adaptation policy and practice, although currently it is not recognised as a risk that can be reduced or managed. Indeed, a policy gap looms when ‘existential threats’ of climate change displacement are presumed to be unsolvable. Furthermore, there is very little understanding of what might advance ontological security among already displaced people, and the many more who are at risk of displacement and are aware of the risk. This paper discusses ontological insecurity and ontological security, through an exploration of voluntary immobility in Pacific Island communities grappling with climate change impacts to territory. It explores how voluntary immobility may advance ontological security in the Pacific Islands in the face of these impacts. The paper concludes that ‘existential threats’ associated with climate change displacement can and should be more widely addressed by policies and planning processes that recognise and advance ontological security.

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1 Introduction

This chapter is a call for more research into, and policy addressing, ontological shifts taking place in the low-lying Pacific Islands and other climate-impacted places around the world – anywhere where a future marked by potential climate change displacement might be described as an existential threat. ‘Existential threat’ is a concept that is currently being deployed to attempt to capture the social, physical, political, economic, and cultural gravity of inhabited coastal areas and low-lying islands becoming uninhabitable from sea level rise associated with climate change. Existential threat narratives are most commonly associated with the low-lying atoll states of Tuvalu, Kiribati, and Marshall Islands, describing the possibility that entire populations will eventually be displaced from their sovereign territory. Existential threat is also used by leaders of the Pacific Islands more generally to highlight these coastal climate change impacts on the international stage (Ourbak & Magnan, 2018). For example, the Prime Minister of Samoa stated in a speech in Australia in 2018:

We are building a collective voice amidst the geopolitical din on the existential threat of climate change that looms for all of our Pacific family. (Hon. Tuilaepa Sailele Malielegaoi, 2018, n.p.)

Existential threat has become a common trope in (often non-Pacific) journalism coverage of the Pacific Islands, for example, in reporting on Pacific issues associated with international climate change negotiations (e.g. Wyeth, 2017; Young, 2017). Existential threat, additionally, is far from confined to the Pacific Islands or to sea level rise, being a concept equally applicable to the threat of climate change at the global level. It has been used, for instance by the United Nations Secretary-General to describe the “disastrous consequences for people and the natural systems that sustain us” (Guterres as cited in Ghosh, 2018, n.p.).

‘Ontology’ can be defined as the study of being, so ‘ontological security’ is concerned with security of being. Scholars of the Anthropocene (e.g. Beck, 2016; Weinstein & Colebrook, 2017) consider the threat of climate change as ontological. Central to this task is the question of whether the very experience of being secure as a human changes in the context of catastrophic altering of global systems by humans. Climate change, it is frequently argued in Anthropocene studies, is fundamentally a shift in what it means to be human. Beck (2016, p.1) writes:

Climate change is an agent of metamorphosis. It has already altered our way of being in the world – the way we live in the world, think about the world, and seek to act upon the world through social action and politics.

Beck is not referring specifically to climate change and displacement, but his idea of metamorphosis suggests the importance of exploring more deeply how

the physical impacts of climate change are related to ontological change. This seems particularly important in contexts where knowledge of displacement risk is high and where populations have been living with knowledge of such risk for many years. Such is the case in many small, low-lying Pacific Islands. This paper thus takes as its point of departure the proposition that narratives of existential threat point to a need for research into potentially profound shifts in the ontological worlds of people living with the threat of their homes becoming uninhabitable. Are they experiencing ontological insecurity? Addressing this question means considering populations at risk of displacement first and foremost as political subjects (Kinnvall & Mitzen, 2017). Thus, further questions include: how does knowledge of the risk of climate change to territory change the way in which a stable sense of a political self is maintained? Are profound ontological shifts being experienced by people in the low-lying and coastal areas of the Pacific Islands facing this threat?

Societies, their cultures, and sub-cultures are defined and shaped (although not determined) by place. It is reasonable to hypothesise that knowledge of climate change risks to territory might result in a state of profound uncertainty and anxiety, as ontological worlds become challenged, before physical risks have become manifest (see Crook & Rudiak-Gould, 2018; Kempf & Hermann, 2014). On the other hand, Pacific indigeneity and spirituality are beginning to be recognised as important cultural-political resources for those at risk of displacement and other climate change impacts (Havea, Hemstock, Des Combes, & Luetz, 2018; Teaiwa, 2018). Multiple accounts and narratives, deeper understanding of beliefs and spiritualities, and greater recognition of shifting ontologies are needed, particularly where science reaches its limits. For example, religion plays a complex role in Pacific Island worlds where pre-Christian and Christian beliefs, already sometimes intermingling, also combine with climate change narratives in ways that do not necessarily accord with science-based decision-making (Fair, 2018; Kempf, 2017; Fair, this volume).

Ontological security is a concept that has been useful in international relations research to articulate relationships between identity and security, and between identity and political outcomes. Its foundation is in the idea of political subjectivity as socially constituted, and it has observable effects (Kinnvall & Mitzen, 2017). Ontological security has been described as follows, drawing on the work of Giddens (1991):

The premise of ontological security, as discussed by Giddens, is that the formation of the subject is fraught with an underlying, ineradicable anxiety. Since all social actors need a stable sense of self in order to realise a sense of agency, managing that fundamental anxiety is an ongoing project. Actors are viewed as ontologically secure when they feel they have a sense of biographical continuity and wholeness that is supported and recognised in and through their relations with others. When the relationships and understandings that actors rely on become destabilised, on the other hand, ontological

security is threatened, and the result may be anxiety, paralysis or violence. (Kinnvall & Mitzen, 2017, p. 4)

Thus this paper considers international relations ideas on ontological security to begin to examine questions of continuity and disruption of political subjectivity in the context of climate change impacts. It should be noted that approaches to ontological security are plural in scope and method, offering multiple accounts of changing political subjectivities, across and between not only individuals, but also communities and states as the referent object (Kinnvall & Mitzen, 2017). Thus, it would be possible and indeed desirable to consider if and how ontological security is threatened in various and possibly conflicting ways among different social groups and scales in the context of climate change impacts on territory. For example, a hypothetical sub-national community may produce different narratives about its (changing) sense of being as sea-level rise impacts compound, compared with those of the nation-state. Within sub-national communities there may be variations again between and among different smaller sub-groups.

Ontological shifts might be detected by considering ways in which populations facing significant climate change impacts are questioning their worlds and their futures. Research is needed to investigate the type of questions being posed: these might include: Are we still who we were? Will we still be 'us' in the future? What is our future identity going to be? How will we know what our culture and identity is and should be? While such questions can be and are alluded to in formal international climate change politics, as well as in activism and the arts, there is currently very little space for these to be aired or addressed, in the rather technocratic world of climate change adaptation projects, or in relocation and migration governance. Ontological security is currently a concept effectively absent from adaptation policy and practice, broadly defined. Moreover, ontological *in*security – which can be defined as the absence of ontological security – may be problematic to the extent that it is not recognised as a risk that can be reduced or managed (Sterett, 2018). Indeed, a policy gap looms when the 'existential threat' of climate change displacement is presumed to be unsolvable (see also Barnett, 2017).

However, precisely because there is little recognition of ontological insecurity and yet 'existential threat' is a trope with staying power in politics and the media, more research is needed. It is certainly important to understand if ontological insecurity arises from anticipation of being forced to leave territory that is historically and culturally significant. To explore how to advance ontological security, significantly more work is needed that bridges gaps between political narratives, population experiences, and international and national policies. This chapter itself sits at an uneasy juncture between two very disparate realms, and only begins to flag such an agenda. It attempts to speak to both ontological security, as discussed mainly by international relations scholars, and adaptation

policy and practice, where there is typically little scope for anything ontological. Weinstein and Colebrook's (2017, n.p.) approach to the study of the Anthropocene is to ask "what questions would a being who arrives after humans have wanted us to pose?", and with this ontological challenge in mind, arguably there should be more focus on ontological issues in adaptation. Adaptation, after all, has as its ultimate aim preventing humans, and other living things, from disappearing or becoming harmed in the Anthropocene. However, the disappearance of political identity, and an ongoing sense of ontological security, need not necessarily disappear with territory becoming uninhabitable. Ultimately, it is necessary to raise recognition of the importance of political subjectivity of being, especially if disappearing islands or low-lying coasts no longer exist, in the sense of being no longer habitable in the eyes of their inhabitants. 'Ontological security' perhaps should be considered a useful conceptual tool when existential threat descriptors are being applied. In short, the question of changing ontologies and political subjectivities needs to be recognised as an important one in climate change adaptation research and practice.

The remainder of this chapter offers some preliminary exploration of ontological security issues through a case study of voluntary immobility, and a discussion of how ontological security might be more deeply explored in the context of communities in low-lying and coastal areas of the Pacific Islands facing displacement risk. I do not present empirical findings arising from primary data, but rather craft an initial call for more research using a conceptual case study. I also draw upon secondary data, mainly from anthropological and indigenous knowledges in and of the Pacific Islands. The lack of primary data on ontological security and ontological insecurity is hereby flagged as a priority research need.

2 Case study: voluntary immobility, an 'existential threat' in a policy vacuum

In climate change adaptation theory and practice, physical retreat from highly vulnerable places is generally assumed to be inevitable in certain circumstances – when in situ adaptation, including accommodation and protection measures, have been exhausted (Hino, Field, & Mach, 2017). Currently, in the Pacific Islands, many communities at risk from coastal climate change impacts are focusing on on-site accommodation and protection adaptation measures; these include building sea walls and planting mangroves (Nunn & McNamara, this volume). However, there is increasing governmental recognition that such adaptation measures are not going to be sufficient and hence planning for local relocations – retreat – is being instituted in some countries such as Fiji (e.g. Charan, Kaur, & Singh, 2017). For low-lying atolls, retreat may at some point become impossible, and migration may become necessary.

However, the questions of eventual retreat and migration, while important, are far from the whole story. Some communities may not be prepared to retreat or migrate following attempts to ‘accommodate’ and ‘protect’. Households and communities that choose not to retreat or migrate, when in situ adaptation options have been exhausted, are different to ‘trapped populations’, who wish to leave but cannot. These are the voluntarily immobile (Zickgraf, 2018). While migration and relocation are often assumed to be inevitable at some unknown future point for some groups, voluntary immobility, which challenges this assumption, is far less anticipated, understood, or planned for (Farbotko & McMichael, 2019). The question of communities or households choosing to stay in areas that are becoming technically uninhabitable, often for cultural, emotional, and spiritual reasons, is an important one (Charan et al., 2017; Farbotko, 2018b). Complex subjectivities are at stake, such as self-determination, political agency, religion, ancestral ties to place, and cultural identity. Some households and communities in the Pacific are expressing an intention to be voluntarily immobile, but little is known about how they can be best supported (Farbotko & McMichael, 2019; Farbotko, 2018b). ‘Technically uninhabitable’ in this paper refers to decision-making following assessment of environmentally vulnerable areas by planners, engineers, and other expert outsiders, as part of a formal governance process that identifies particular material assets such as housing to be considered too high risk and hence candidates for relocation. The technical assessment, possibly implicitly, makes a pronouncement on habitability, and may be understood as a ‘limit’ to adaptation (Dow et al., 2013). However, this technical knowledge may not accord with local knowledges, which again may differ on what conditions render an area uninhabitable.

Voluntary immobility is an underdeveloped branch of climate change adaptation (Farbotko & McMichael, 2019). While there is increased recognition among policy-makers and scholars of the importance of community participation in adaptation planning that involves the identification of areas as potentially technically uninhabitable (Koslov, 2016), what is less well recognised is that voluntary immobility is a possible outcome of such planning, and is thus itself a valid policy problematic (Farbotko, 2018a). Indeed, there is little recognition of the possibility of voluntary immobility in adaptation practice, since it seems to be generally assumed that inhabitants will conform to the planning processes for relocation following technical assessment of areas of high risk, with forced relocation occurring in the few instances where such conformation is not forthcoming.

However, there are some calls for better planning and support for people who choose not to leave their homes or ancestral lands, even when considered unsuitable for human habitation by adaptation experts and planners (Zickgraf, 2018; Farbotko, 2018a; Farbotko & McMichael, 2019). It is important to point out that voluntary immobility may not be particularly useful in addressing physical or livelihood risk, and in fact in some cases may increase these risks. How-

ever, if voluntary immobility decisions are made, national and international institutions arguably have important responsibilities (Zickgraf, 2018; Farbotko & McMichael, 2019). These include developing formal processes to confirm that all in situ adaptation options have been exhausted; ongoing engagement in culturally sensitive dialogue with communities about their future; and implementation of measures to protect human rights and human dignity. For those who choose voluntary immobility, it may be a cultural, spiritual, and philosophical impossibility to countenance the possibility of life without a homeland to live in or return to. In this sense, any persistence of voluntary immobility despite known physical risks indicates that voluntary immobility may be an ontological response to the existential threat of climate change. Forced relocation, on the other hand, is known to produce cultural and emotional upheaval. The Banabans, for example, experienced being forcibly relocated from their sub-national island of Kiribati, and their territory was literally used as a tool for agricultural colonialism. Their island decimated by phosphate mining for use in farms in Australia and New Zealand, the Banaban people have an enduring strong sense of political identity, even when people and land itself have been removed from indigenous sites. This suggests that resilient, adaptive political subjectivity is paramount when a society faces dislocation of body and land (Teiawa, 2005).

However, very little is known about ontological security in cases of climate change displacement. This is one research and policy vacuum where a deeper understanding of ontological security may prove useful.

3 Towards understanding ontological security in the Pacific Islands

In the Pacific Islands, the risk of coastal climate change impacts is often simplified, in dominant external agendas, to accord with non-Oceanic logics; reduced to a binary of staying or going (see Methmann & Oels, 2015). A ‘rational’, non-Oceanic response is to go on any terms, not, as is sometimes expressed, to stay and die (Farbotko, Stratford, & Lazrus, 2016; Methmann & Oels, 2015). Pacific Island populations have also expressed determination to retain their identities and cultures, given these seemingly intractable challenges in the “roots and routes” of their “sea of islands” (Clifford, 2001; Hau’ofa, 1993, 1998; Teaiwa, 2018). The issue of voluntary immobility, discussed above, can be interpreted as a refusal to go, or perhaps a refusal to engage in binary thinking about displacement risk, or both (Farbotko, 2018b).

To understand if and how voluntary immobility contributes to ontological security, however, it is necessary to understand the context in which ontological security in the smaller islands of the Pacific has been challenged and maintained over time. In this, I draw on previous work on **banna* I developed with col-

leagues (Suliman et al., 2019), which in turn draws heavily on various Pacific studies and archaeology scholars, here applying an ontological lens. Crucial to ontological security in small islands in the Pacific, arguably, is the concept of connected people and place, variations on the common root word **banua*, found throughout many parts of the Pacific Islands where Austronesian languages exist. **Banua* referred to “an inhabited territory which included the village and its population together with everything that contributed to the life support system of that community” (Blust, 1987, p. 100). **Banua* has been described as “the ground of belonging, the locus of being [indigenous in the Pacific], the means of livelihood and the nurturer of life” (Havea, 2007, p. 51). Indeed, in some parts of Polynesia, **banua* refers also to placenta, which in turn needs to be understood in terms of the psycho-socio-ecological practice of burying a newborn’s placenta in family land, where it belongs, entailing a lifetime of care of people in, of, and for the land (Māhina, 2008; Falefou, 2017). For instance, in Tuvalu, a coconut tree under which a baby’s placenta is buried is nurtured by the placenta. It cannot be cut by another, ensuring all its sustaining qualities are available to the newborn throughout their life. In times of hardship, return to the coconut tree ensures sustenance. The tree, the land, and the placenta together bring people together with their world in a harmonious web, a reference point of spiritual, environmental, and bodily nourishment, a way of ensuring a holistic sustainability.

In terms of ontological security, it seems crucial to try and pinpoint moments of ontological change, challenge, and transformation in the worlds defined by **banua*, following Suliman et al. (2019). The ancestors of many Pacific Islanders, the Austronesians, were, it is believed, the first in the world to navigate out of sight of land. A pivotal moment in Austronesian ontologies arguably occurred when the first double-hulled voyaging canoes navigated by the stars across the expanses of the Pacific Ocean. This happened, according to archaeologists, when they first canoed out of the Solomon Islands towards Fiji, Samoa, and Tonga more than 3,000 years ago (Diaz, 2011). It is now widely accepted that this, the first migration to and settlement of the previously uninhabited islands of the Pacific, was willing and deliberate. The ancestors of today’s Micronesians and Polynesians were, it seems, the first humans – globally – to experience the ocean out of sight of land, without losing themselves (Suliman et al., 2019). This incredible feat was possible with a thorough knowledge of wind, tides, ocean creatures, astronomy, and their interconnectedness (Diaz, 2011). A way of being part of the ocean had been discovered, an ontology was born that was defined as much by island absence as watery presence. It was both masterful and humble.

The astronomical-oceanic map and compass of the settlers of the Pacific was arguably central to the ontological transformation, becoming a way for a people to define their identity and their destiny in their sea of islands (Hau’ofa, 1993). This is mobility not as Western ontologies might understand it, but as

conceptualised by the navigators themselves in terms of stillness of the navigator's canoe in a moving, changing cosmos, with home equally an oceanic as a terrestrial concept (Diaz, 2011; Kyselka, 1987; Lewis, 2004; Jolly, 2001). This ontological stillness is known from accounts of revivalists, who have sought out disappearing navigational knowledge and rediscovered the ontological world of their ancestors (e.g. the Polynesian Voyaging Society) (Finney, 2003; Diaz, 2011). So the navigating self is still. It is the ocean and stars that are mobile. Even land moves from its absence towards the canoe (Diaz, 2011).

The first navigation out of sight of land was thus a profound moment in social and technological history globally, and it was an equally important moment ontologically. A new way of being had been discovered. Ontological security, in a very profound, transformative sense, was arguably achieved in the act of navigating into a new world of being, the new world that emerged when out of sight of land. This ontological security was itself dependent on the mobility of the ancient Austronesian concept of **banua*. **Banua* predated settlement of the Pacific Islands by the first ocean-going canoes; it has both endured and transformed over thousands of years as the speakers of Austronesian languages travelled from Taiwan, through South East Asia and only later out into the Pacific Islands, navigating, exploring, sometimes drifting, invading, getting exiled, crisscrossing the ocean until most of the islands were inhabited, arrivals and departures frequent until Western colonisation. According to Taiwanese anthropologist of Fiji Hao-Li Lin, “to the Austronesian settlers the “land” is where societies are made, where identities are rooted, and where the pasts can be remembered. However, it cannot be understood separately as natural environment outside the human realm passively waiting to be occupied and utilized. Instead, it is active and encompassing with a life of its own” (Lin, 2015, p. 28).

Importantly, **banua* is, in part, mobile (Suliman et al., 2019). As **banua* took on particularities and uniqueness across the Pacific, becoming *vanua* in Fiji and Vanuatu, *fonua* in Tonga, *whenua* in New Zealand, *fenua* in Tuvalu, and so on, the distribution of **banua* across the Pacific was also interconnected and hybrid. The Pacific Islands region was never a static realm of sedentary people (at least outside some parts of Melanesia, especially Papua New Guinea, where non-Austronesian languages also exist); it was always about oceanic voyaging and hence about movement and change of the world itself, while people were centred and still. From this stillness, the unique forms of **banua*, even though currently seen as distinctly Fijian or Tongan or Maori or Tuvaluan, for instance, viewed from a deeper temporal perspective, are always in a process of repositioning place and identity. A sense of being defined in terms of human stillness within a moving cosmos thus may be crucial to ontological security in the newest case of ontological challenge in the small islands of the Pacific, namely climate change (see Suliman et al., 2019). According to Lin:

*For the Austronesian travelers, land can be seen as an environment in its totality that involves the constant movements and activities of objects and beings beyond a given boundary. [...] The notion of *banua thus became their guiding framework to orient themselves in the new social and physical environment and to mediate these changes. (Lin, 2015, p. 29)*

Even prior to that pivotal moment when first navigating out of sight of land, becoming sure of themselves, their place, where they came from and their destiny, stillness of self and *banua were the cornerstones of a unique ontology, and thus this may also be the foundation of pursuing ontological security in a changing climate. Diaz (2011, p. 28) explains, for example, that from a Pacific sea-faring vantage point islands have never been islands and never will be, but are expanding, contracting, mobile entities, their “coordinates in space and time [...] emplotted via the farthest reaches of their indigenous creatures”.

Central to ontological security then, may be the ontological act of maintaining awareness of and relating to others through one’s position in the world, through the stories and other cultural relations through which identities are built, reaching out far beyond what ‘home’ may have become in the Anthropocene. In Pacific Islands, a dynamic and mobile oceanic environment also involves a centred stillness in a vastness of time and space. In the *banua ontology, it would seem that the inhabitants of the Pacific could never lose themselves, once they had experienced themselves as masterful navigators in this environment (Suliman et al., 2019). Navigators understood their place: ontologically in terms of a constant repositioning of the self with reference to a moving cosmos, and physically in an ongoing act of keeping track of one’s position on the ocean when out of sight of land. What must be remembered, of course, is that for the last two hundred years and more, there have been experiences of profound ontological insecurity in the Pacific Islands. The effects of colonialism, globalisation, and now climate change have interacted in extremely complex and sometimes unexpected ways, such as through the rise of non-indigenous, particularly Christian, religions (Lumā Vaai & Casimira, 2017). Taking this complexity into account, it nevertheless seems that *prima facie* non-adaptive phenomena, such as voluntary immobility, can be fruitfully explored with reference to the advancement of ontological security, achievable by bringing now hybrid concepts such as *banua and Christianity simultaneously to the fore.

Ontological security in a changing climate may be understood better through ontologically oriented study of different Pacific Island cultural movements, such as navigational revivals (eg. Polynesian Voyaging Society), activism (eg. Pacific Climate Warriors), and faith-based organisations (eg. Pacific Theological College and Pacific Conference of Churches), many of which also may be understood in terms of a broad decolonisation movement. This is a question for more research. Ontologically sensitive research seems timely given that

Pacific scholars are calling for new balms for the ‘raw grief’ being experienced about land reclamation as a response to displacement risk, an adaptive strategy being vigorously pursued in the Marshall Islands and Funafuti, capital of Tuvalu but not necessarily welcomed by all of the population. The artificiality of such new land does not appear to address in any ontologically secure way the emotions wrought by climate change, as shared by Marshallese activist Kathy Jetñil-Kijiner in a reflection subtitled “Rituals for Artificial Islands” (Jetñil-Kijiner, 2019).

4 Ontological security

Loss of indigenous territory due to climate change is potentially being experienced by many Pacific Islanders as ontological insecurity. However, expansive, open, and shared across the multiple indigeneities of the Pacific Islands since original settlement, **banua* may nevertheless endure beyond the Anthropocene through ongoing, changing, and yet also eternal mutual custodianship of life with ancestors and descendants, at least as long as land is above water (Suliman et al., 2019). This is because **banua* is people and land and a way of reorienting life in a changing world. **Banua* may continue to nurture ontological security in a changing climate, even in the face of individual, family, community, or national despair arising from loss of some territory and damage to some territory in the **banua*. This possibility does not diminish any social, environmental, or economic loss associated with loss of territory. What it does, however, is offer a possible conceptual toolkit to begin to advance ontological security.

Ontological security, for example, may be enabled through voluntary immobility in some cases. It may be a way for households or communities or even nations to attempt to ensure that their political subjectivities remain somewhat stable; a way for their changing sense of what it is to be human to be a little less unnavigable. Local knowledge, for example, which likely supports ontological security, can expand and transform more readily if the place which shapes its meanings is still inhabited. Being in place and pursuing local knowledge-based adaptation, even if the place is damaged and risky, can thus be considered part of ontological adaptation. Supporting voluntary immobility among those facing the prospect of a lost homeland thus, in some cases, may advance ontological security. In Kiribati, for instance, the “Migration with Dignity” policy, with its sensitivity to migrant livelihoods and rights for those faced with displacement, was nevertheless perhaps insufficient to advance ontological security (see Hermann & Kempf, this volume). Now, large-scale land reclamation projects are being prioritised, yet without any understanding of whether or not ontological security might thereby be advanced (Walters, 2019). On the other hand, governments and other organisations who are rightly concerned about risks to life and health bound up in voluntary immobility can sensitively explore long-term,

gradual, and diversified relocation options for younger generations and/or for some community activities by focusing on ontological issues in addition to more observable infrastructural and livelihood needs in relocation consultations. For instance, a village might together with government planners decide to build new housing in safer areas while some subsistence agriculture, community meeting areas, burial grounds, and other culturally important landmarks remain in their original sites, with access to such sites prioritised (see Charan et al., 2017). Community leaders can also formulate with cultural planners how to work with their community, to help them express and come to terms with ontological insecurity associated with loss of ancestral lands. This also may involve the arts, as well as dialogue between different communities facing similar challenges, sharing emerging knowledge within, across, and beyond the Pacific Islands (see Weber, 2015). When it comes to culturally valued land at risk, adaptation needs to be flexible to advance ontological security.

Further research with communities is needed, to inform policy frameworks to support not only technical, economic, and social aspects of adaptation, but also the ontological challenges, and perhaps opportunities, of displacement risk. Recognising ontological security, and from there communicating and planning with Pacific people in ethically and culturally appropriate ways, presents international and national policy challenges. New conceptual frameworks are needed in which ontological security is taken seriously in adaptation planning and relocation planning in particular. Ontological security, like material and physical security, needs explicit recognition and action in relocation efforts, for instance (Gharbaoui & Blocher, 2016). As a matter of climate justice, the onus is on development organisations, donors, national governments, and other external actors to engage with ontological issues among people at risk of displacement, or perhaps already displaced, which are often expressed but not ‘heard’. Finding the appropriate balance between ontological security and material wellbeing of people and place is crucial. This is no easy task. It is likely that ontological security in the Anthropocene is elusive and constrained by entrenched institutional relations all of which are (or should be) ripe for Anthropocenic reimagining, but often act as a constraint to – rather than an enabler of – any type of human security, let alone ontological security. In this context, the confines of the nation-state system and colonial histories loom large:

*Many Pacific people feel that mobility is no longer available on their terms. Colonialism curtailed their navigation and exploration of the ocean, confining Pacific Island people to villages, and hence many may have lost sight of the mobile possibilities of *banna which their ancestors were free to explore. The confines of the nation-state, with its rigid border controls, sedentarism, and ultimately poor support of mobile people who do not fit the criteria of wealthy, industrialised-world passport holder work strongly against Pacific Island people finding their own mobile destinies in a changing climate. Thus there are many utterances of “we will stay here and die”, which is not a*

passive fatalism, but [...] an active choice and a political resistance to non-indigenous 'solutions' such as international relocations. (Suliman et al., 2019, p. 15)

Ontological security, may offer new forms of practical and political engagement among Pacific Island people who currently see no other option to advance their ontological security but through pronouncing an intention to “stay here and die”. (Farbotko et al., 2016)

5 Conclusion

A perplexing feature of existential threat narratives in the context of climate change is that they are accompanied by very little debate, discussion, or reflection on addressing existential threat. This paper has attempted to shed light on this problem by considering ontological insecurity. I have argued that there is very little research and policy attention being given to what might advance ontological security among the many who are at risk of displacement. Intentions to be voluntarily immobile, for example, may be interpreted as a grassroots attempt to regain ontological security in a changing world. In adaptation research and practice, voluntary immobility may not be considered a rational outcome when physical risk is assessed as significant. But perhaps rationality is not so important in the Anthropocene, given that humanity has probably already commenced metamorphosis, and ontologies are changing (Beck, 2016). According to Kinnvall and Mitzen (2017, p. 4) ontological security is observable when people “feel they have a sense of biographical continuity and wholeness that is supported and recognised in and through their relations with others”. Understanding ‘biographical’ here more broadly in terms of shared and perhaps contested narratives of people at risk of displacement, the notion of ontological security deserves more adaptation research and policy attention.

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12

Moving to dangerous places

Eberhard H. Weber, Priya Kissoon, and Camari Koto

Mobility is an important part of the discourses around climate change. Many argue that mobility in connection to climate change, natural hazards, or similar is about bringing people to safety, supporting them in their own efforts to reach safe grounds, or as McAdam (2015) puts it: taking people away from “danger zones”.

This chapter investigates mobility of people living in informal settlements in Suva, the capital of Fiji, which are exposed to hazards. This chapter, hence concentrates on people moving *to* highly exposed areas. How can we explain when people move to ‘danger zones’ like is happening in many informal settlements in the Pacific Islands (and surely elsewhere)? Are people not aware that the locations are dangerous, do they not bother to find out, or do they consciously choose such ‘danger zones’?

For our study, we undertook interviews and observations in two informal settlements in Suva. Our research suggests that the two locations where people established informal settlements were chosen at least in part because of their unfavourable environmental conditions. Whether this occurred consciously or more in a reflexive learning process that directed people to locations where they did not face evictions needs to be established in future research. It is becoming evident, however, that in Suva space is becoming scarce. Locations that nobody was interested in several decades ago are now in high demand. This also puts people who live in informal settlements at risk of being evicted by governments’ plans of relocation and/or by market forces, which can be seen as a special form of gentrification.

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1 Introduction

For a long time, research on the impacts of and adaptation to climate change in the Pacific Islands region excluded urban areas almost entirely. This is surprising since in many Small Island Developing States (SIDS) in the Pacific a considerable share of the population lives in urban areas (Mycoo & Donovan, 2017). Urban growth rates are among the highest in the world, particularly in the SIDS of Melanesia (Butcher-Gollach, 2015, 2018; Kiddle, McEvoy, Mitchell, Jones, & Mecartney, 2017; Mecartney & Connell, 2017).

Urban spaces in the Pacific Islands have grown significantly over the past few decades. Many migrants arriving from rural peripheries in urban centres have taken up residence in informal settlements that are often characterised by very poor environmental conditions (Kiddle, 2010a, 2010b, 2011; Kiddle & Hay, 2017; Jones, 2016a).

While much research has been done on the drivers of rural–urban migration (see for more recent examples Duda, Fasse, & Grote, 2018; Friend et al., 2015; Yalaw, Hirte, Lotze-Campen, & Tsharaktschiew, 2018), relatively little is known about the considerations people undertake in choosing where exactly to settle in urban areas (Augustijn-Beckers, Flacke, & Retsios, 2011; Babere, 2015; Fleischer, 2007; Loibl, & Tötzer, 2003). It is assumed that the distance to places of employment plays a role (Reza, 2017), but systematic research on this and other aspects is minimal (Huang, Parker, Filatova, & Sun, 2014).

With climate change adaptation becoming a major concern, the question of human mobility and its relevance to climate change adaptation is becoming increasingly important. Already today many islands in the Pacific are exposed to the impacts of climate change. In a number of cases where states consist only of atolls and/or low-lying coral islands, entire states might disappear since there are no places within these countries' territories where people can safely resettle (Weber, 2015, 2016; see also Duvat & Magnan, this volume).

With these arguments in mind, it appears contradictory and is difficult to explain when people move *to* 'danger zones' like is happening in informal settlements in the Pacific Island region (and certainly elsewhere). Are people not aware that these locations are dangerous, do they not bother to find out, or do they consciously choose such 'danger zones'?

This chapter reflects on the causes of mobility from a livelihood and risk mitigation perspective. It looks at two informal settlements in a part of Suva, which a couple of decades ago were at the very periphery of Suva city. Over the past 30 years, however, this area has become a place of sustained investment. When people moved to Suva some decades ago, they found protection from eviction in these environmentally disadvantaged locations. Today this part of Suva has become a prime location for high-cost residential and commercial development. People in informal settlements more and more frequently face challenges to be able to stay in this part of Suva. Some settlements have been identified for relocation, and aspects of gentrification are visible in others.

2 Migration and mobility

2.1 Climate change and human mobility

Social scientists who study the causes and motivations of migration have produced various explanations over time. Ravenstein's seminal contributions (1885, 1889) later led to concepts of push/pull factors, which have a very long tradition in migration studies (Van Hear, Bakewell, & Long, 2018). Scientists investigate the economic, ecological, or social properties of space (Adger & Fortnam, 2018; Dorigo & Tobler, 1983; Lee, 1966; Marino, 2018). They conclude that migration happens from locations endowed with (relatively) lesser qualities to locations where the qualities are higher.

In climate change discourses, a particular push factor is added: people leave places where they have been living because climate change makes these places 'dangerous'. Publications on people's mobility as a response to and result of climate change often argue that the impacts of a changing climate can be considered as a force that drives people away from their homes, looking for safety and security elsewhere (McAdams, 2015). The argument is that migration happens because climate change puts people's lives and livelihoods at risk. From such a perspective mobility becomes an action to adapt to or cope with adverse situations, to secure livelihoods or strengthen resilience (Weber, 2014).

Push/pull dynamics, however, are obviously not sufficient to explain migration comprehensively: if only spatial properties/qualities are used to explain migration then it becomes difficult to explain why some migrate and others don't when they live in the same location. Investigations that consider actors and their agency are urgently needed to close this gap (Bohle & Fünfgeld, 2007; Long, 2001; Otsuki, Jasaw, & Lolig, 2018). Agency refers to individuals' capacity "to act independently and to make their own free choices" (Fazey et al., 2015, p. 200): not all people have the same goals and aspirations and the same opportunities to accomplish them. Aspirations, wishes, and fears lead to different perceptions of space and differing opportunities and constraints allow or disallow people to achieve what they aspire to (Carling & Collins, 2018).

2.2 The search for wellbeing and security

In addition to hunger, war, violations of human rights, and poverty, the degradation, pollution, and destruction of the physical environment have been named by social scientists as reasons for forced migration (Weber, 2014). It is often assumed that environmental change (including climate change) has become a reason for people to involuntarily leave the places they live in (Biermann, 2001; Lonergan, 1998). Declining environmental quality, including impacts of natural hazards, is putting people's lives and livelihoods at risk. Many social scientists agree that migration and the quality of the environment are related in many cases. Details of how such a relationship can be conceptualised, however, remain heavily disputed.

It often remains unclear if in these cases environmental change is the only driver of migration or if the decision to move is the result of (more) complex processes and deliberations (UK Government Office for Science, Foresight Report, 2011).

Migration serves many purposes. The migration of poor, insecure, and under-employed people from rural areas often follows the rationale of aiming to enhance wellbeing and – even more important – to minimise risk and gain security (Adger & Fortnam, 2018; Tian & Lemos, 2018). Rural areas often do not provide full employment for everyone of working age (Singh, Singh, & Singh, 2015; Yeboah & Jayne, 2018). People’s capacities and capabilities are under-utilised (Mukhtar et al., 2018). Employment in these areas is also often limited to one or a few sectors. The advantage of having employment in various sectors, from subsistence production to international capitalist production, which more often occurs in cities, enhances security since dependency on one particular mode of production constitutes a huge risk.

In many cases, migration supports people in their efforts to diversify their livelihoods and to reduce the risks that they face (Friedman, Hirons, & Boyd, 2018; Woodhouse & McCabe, 2018; for research that is critical of this perspective: Cochrane & Cafer, 2018; Ebenezer & Abbyssinia, 2018). The importance of livelihood diversification to reducing vulnerability figures very prominently in the concept of resilience to the impacts of climate change and natural hazards (Ajak, 2018; Jurjonas & Seekamp, 2018), as well as in the “Sustainable Livelihood Approaches”, which are, however, often lacking theoretical depth (De Haan & Zoomers, 2005). In one way or another all of the approaches mentioned above take up the notion of ‘translocality’ and relate it to people’s search for wellbeing and security (Carmo & Hedberg, 2018; Etzold & Sakdapolrak, 2016; Islam & Herbeck, 2013; Keck & Sakdapolrak, 2013; Rockenbauch & Sakdapolrak, 2017; Sakdapolrak et al., 2016; Steinbrink, 2009; Weber, 2017). To reach common ground across many disciplines and details, translocality can be seen as referring to the structures and processes in which mobile people “are locally grounded and where transnational ties are regulated and institutionalized” (Stephan-Emmrich & Schröder, 2018, p. 28).

De Haan (2000) similarly argues that *geographical differentiation* (e.g. rural versus urban, national versus international) does not show the proper space in which translocal social units are operating. What the *Migration Remittances, Aid, Bureaucracy* (MIRAB) model calls the “transnational corporation of kin” (Bertram & Watters, 1985, 1986) indicates that social units operate across space. They forge rural–urban relationships, where exchange of goods, money, and people is perpetuated for the purpose of optimising economic and social wellbeing. Linking rural and urban spaces creates hybrid households which operate in different places (translocal) and also have considerable circulation of their members (being one day here and the other day there). Households constitute coherent social units that operate across distances (Lohnert & Steinbrink, 2005; see also Schiller, Basch, & Szanton Blanc, 1995). All these are crucial elements of translocality.

Additionally, much information is available on why people move to informal settlements within the Pacific region, and Fiji in particular (Bryant, 1992, 1993;

Bryant-Tokalau 1995, 2010; Jones, 2012a, 2012b; Mohanty, 2006a, 2006b). The debate on ‘affordable housing’ in urban areas has been a long-lasting one, but so far no solutions are visible regarding how to provide affordable urban housing to poorer strata of Suva’s population (Bryant-Tokalau, 2014). Already in 1992 Bryant-Tokalau focused her study of poverty in Fiji on urban informal settlements, where the conflict between high costs for formal accommodation and low incomes is very meaningful (Bryant, 1992; see also Bryant-Tokalau, 1995 for Fiji and Vanuatu). Jones (2012b, p. 327) remarks that “both rural and urban poverty cannot be divorced from squatter and informal settlements and vice versa, as it is now well accepted that the majority of the Pacific urban poor gravitate to and live in squatter and informal settlements.”

To summarise: People use migration as a strategy to secure and strengthen their livelihoods, to minimise risk through livelihood diversification. This is a response to insecurity because of under-employment, seasonal employment, low wages, high dependence on primary production, and high vulnerability to disturbances of ecosystems, among other reasons (see, among many, Carney, 1998; Ellis, 2000; Scoones, 1998).

The parallels to push/pull considerations are striking, but only at the places of destination (such as in the informal settlements in Suva). During our fieldwork, of course, only those who had migrated were considered. Others, who stayed back in the villages do not figure here. Another element becomes essential: people’s reflexivity, their autonomy to make history (Archer, 2007), the ways in which they follow their aspirations. Reflexivity, however, also means that actors learn by doing. It is not that people evaluate their situation in advance and reach logical conclusions that govern their actions. Instead they respond to situations, seize opportunities that open up, and learn along the way how to improve outcomes (Archer, 2007, 2010; Davidson, 2012; Prowse, 2010; Schilling 2012). People “cannot know everything that is going on” (Archer, 2007, p. 17), and as a result they have to improvise and learn step-by-step through their experience and their reflection on it. This is particularly important with regard to migration because moving elsewhere is filled with ‘unknowns’ and people are unfit to consider and evaluate all possibilities for action and make rational decisions (see also Otsuki, Jasaw, & Lolig, 2018).

3 Urban space in the Pacific Islands

Urban settlements in the Pacific Islands are tiny compared to global standards (Cocklin & Keen, 2000; Jones, 2016). They are young by any standard. The oldest hardly reach 200 years in age. All are the result of European arrival and intervention in the Pacific Islands region, which started in the 18th century when whaling vessels were looking for places to restock provisions and water. At the whaling stations a few Europeans settled, but these conglomerations of a few Europeans’ houses lacked what today we would consider *urban functionality*. Around the same time beachcomber communities were established where individual Europeans

integrated into local communities, and “went native” (Bargatzky, 1980; Campbell, 1998; Milcairns, 2006; Ralston, 1977).

Urbanisation in a more comprehensive way stepped up when more and more Europeans, many of them coming through Australia and New Zealand, settled in the Pacific Islands to establish trade relationships (Weber, 2017). Individuals, first living with indigenous inhabitants and later operating from port towns, started trading with the extraction of sandalwood, bêche-de-mer, turtle shells, pearls, and other exotic commodities (Ralston, 1971). Later companies such as Burns, Philp & Co Limited, Goddefroy and Sons, and Hennings concentrated on agricultural commodities: first coconuts to produce copra and coconut oil, then cotton, and finally sugar cane.

Urban areas in the Pacific Islands were miniscule until the 1960s, which marked the beginning of independence for most Pacific Island countries. In 1911 the urban population of Fiji had been around 4% of the overall population (Chandra, 1985). In 1966 a third of Fiji’s population lived in urban areas (Chandra, 1985) and by 2004 the 50% mark had been crossed (ADB, 2012). In the census of 2017 around 57% of Fiji’s population was listed as urban (Fiji Bureau of Statistics, 2018).

When the first Pacific states achieved independence, modernisation optimism prevailed, which considered urban areas as the centres of economic and social innovation and development. Not much later it became evident that a fast-growing urban population entails unresolvable social, ecological, cultural, and planning challenges. In particular, urban development lagged behind in the provision of infrastructure, including low-cost housing for a rapidly increasing urban population. In the capitals of many Pacific Island countries, informal settlements mushroomed; biggest in terms of population and size are the informal settlements of Greater Suva, but informal settlements burgeoned also in Honiara, Solomon Islands (Foukona, 2015; Keen, Barbara, Carpenter, Evans, & Foukona, 2017; Moore, 2015), Port Moresby, Papua New Guinea (Jones, 2012), and Port Vila, Vanuatu (Trundle, 2017). Many of these informal settlements were established at locations that have adverse environmental conditions. Often these conditions are severe and detrimental to human habitation; by any means these places are ‘dangerous places’.

4 Reflection on the case study in Suva

The case study on which this chapter is based investigates people living in informal settlements in Suva, the capital of Fiji. The investigation concentrates on people’s actions in space, especially their mobility. The case study takes up climate change as a possible driver of migration only indirectly: when it is argued that spatial characteristics are less relevant to people’s mobility than their agency, their opportunities and constraints to be mobile, then *all causes* of mobility that relate to spatial characteristics become of secondary importance. What counts is not that people want to migrate because conditions in the places they live have become too pressing. Far more important is whether people are able to move, or whether con-

straints are so huge that they have to remain where they are, even if their desire to leave is overwhelming.

Research to obtain information was conducted in mid-2016 in the informal settlements of Muanivatu and Veidogo in the eastern outskirts of Suva. In each of the two settlements semi-structured interviews with a mix of open and closed questions were conducted. Mainly questions that relate to people's agency supporting or preventing mobility, processes of reflexivity, and underlying socio-political aspects of urban change in the eastern rim of Suva city are addressed in this chapter. Interviews were conducted with one adult person in 50 households, which were randomly chosen for the study. The purpose of the overall fieldwork was to look into people's livelihoods, their mobility backgrounds and histories, their connections to households elsewhere, as well as issues of environmental health arising from adverse properties of the settlements under investigation.

Perspectives are presented in this chapter that relate to people's selection of places to settle. By applying such a spatial dimension to people's aspirations, the overarching aim is to investigate the dynamic properties of space and its consequences for vulnerable people's actions in space. The objectives to gain more knowledge concentrate on three issues. The first relates to the question, "What role did security/insecurity play when people selected a particular informal settlement?" This question had to be slightly modified because in interviews it turned out that quite a number of people did not find a suitable place right from the beginning. Many had to shift residence after their arrival in Suva. At this point the notion of *reflexivity* was introduced as a process that guided people in improving selection criteria. The second issue relates to the question, "Why were people willing to settle in locations that expose them to severe health risks?", and the third relates to the question, "How did people's action in space become constrained through economic dynamics when places once in Suva's periphery became attractive investment objects?"

This chapter reports on an activity in progress: two months of empirical work were completed in 2016. Some results from then were analysed for the presentation at the conference in Hannover and the preparation of this chapter. In addition, all qualitative information provided by people during fieldwork in 2016 has been assessed to provide deeper insights than a quantitative analysis could have achieved. A second round of investigation is planned, concentrating exclusively on people's criteria used when selecting a place to settle.

The settlements of Muanivatu and Veidogo are in the eastern part of the Suva peninsula along Fletcher Road, which starts at the Marine Campus of the University of the South Pacific (USP) and ends at Nabua, a part of Suva town (see Figure 1).

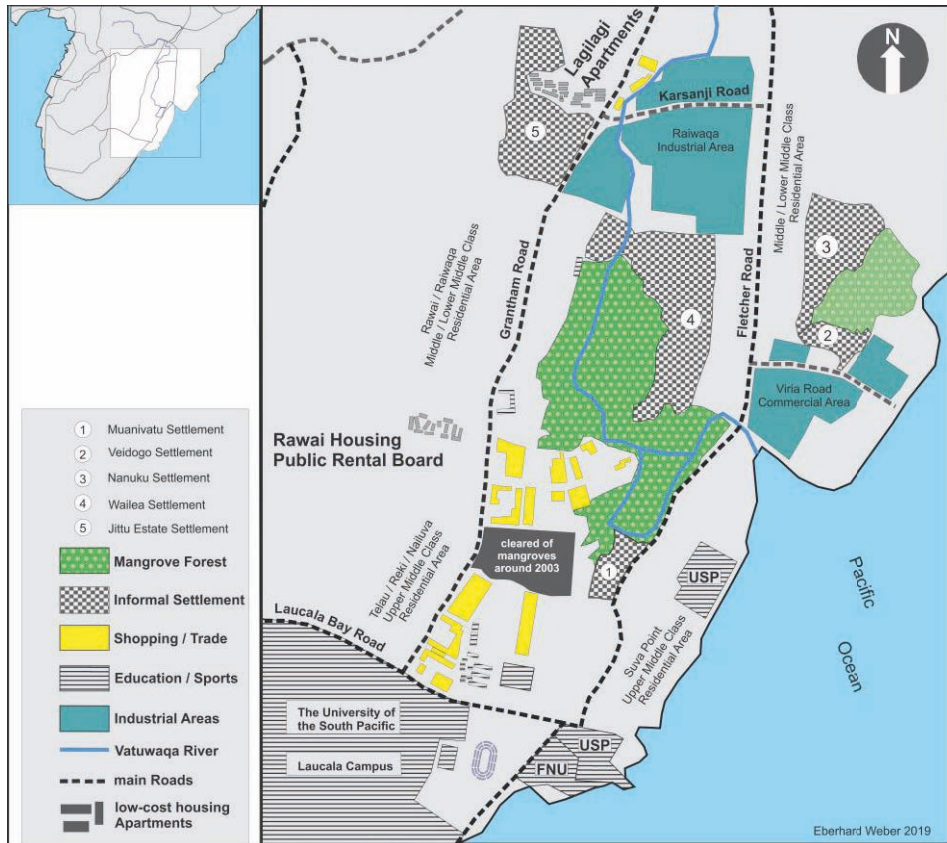


Figure 1: The Eastern Rim of Suva City. Source: E. Weber.

Today both settlements are located on prime real estate properties in an area of Suva City, which has been quickly expanding in the past three decades (see also Bryant-Tokalau, 2014). When the first informal settlements in this part of Suva were established they were at the periphery of the city in an area without much development interest.

Muanivatu and Veidogo are not the only informal settlements in this part of Suva: close to middle-class formal residential areas, often in third line to the main road, Suva's largest informal settlements are located here (Jittu Estate, 639 households with 2,910 residents, and Wailea, 402 households with 1,922 residents). Muanivatu with 70 households and 324 residents and Veidogo with 130 households and 650 residents, as well as Nanuku with 215 households and 927 residents, are smaller settlements (all figures according to Government of Fiji, 2006).

Muanivatu and Veidogo are mixed in their ethnic composition. Native Fijians (*iTaukei*) form a majority in both settlements. In Muanivatu around 60% of the peo-

ple are of iTaukei ethnicity and in Veidogo 70%. The rest in both settlements are predominately Fijians with Indian ancestry and less than 5% are other ethnicities.

Both settlements have been built into the mangrove forests of the area. Indeed, the Fijian word 'Veidogo' means 'Mangrove Swamp'. Especially in Muanivatu's case, much of the mangroves that were once west and south of the settlement have been cleared for development activities in the past three decades (see also about the clearing of the *tiri* (mangroves) (Bryant-Tokalau, 2014).

In the past 60 years the Vatuwaqa River has lost much of its catchment area. Earlier, excess water during heavy rainfall could spread, mitigating floods. Today the drainage situation in Muanivatu has deteriorated. Flooding occurs more often and is more severe. The latest destructions of a huge area of mangrove forest west of Muanivatu happened around 2013 when mangroves were cleared for the construction of a huge shopping complex. Six years later construction has not even started.

Muanivatu was established rather recently. The settlement increased from 7 houses shown on aerial images in 2002 to almost 100 houses in 2019. In its rather short existence, people in the settlement have been served with five eviction notices from the Suva City Council. In one case they were given only 24 hours to leave. Support from local NGOs allowed the community to stay (Asian Coalition for Housing Rights in Suva, Fiji [n.d.]). In 2018 Muanivatu was included among 11 other informal settlements that are earmarked to be upgraded by RISE (Revitalising Informal Settlements and their Environments), a project led by Monash-University, Melbourne (RISE 2018).

Veidogo has existed much longer than Muanivatu. During interviews, some people mentioned that their families have lived in the settlement for more than 70 years. If this is correct it would mean that some houses in the settlement existed already in the 1940s and 1950s.

5 Results

5.1 In search of security: moving to the city

Most residents of Muanivatu and Veidogo who participated in the research are not native to Suva. Many households had complex migration histories before they settled in the places where they live now. In quite a number of cases the first family members arrived in Suva a couple of decades ago. About half of the members of the iTaukei community had migrated from rural areas directly to one of the two settlements; the remaining had earlier lived in other parts of Suva.

iTaukei households are often fragmented in the sense that parts of the families continued to live in the location of their origin in rural areas. Movements between rural and urban areas have been rather dynamic and the composition of households as a result has been changing considerably over time.

Households of Fijians with Indian ancestry differ in a number of characteristics from iTaukei households: What is similar are the complex migration histories of many. With a few exceptions, however, Fijians of Indian origin arrived with their entire family leaving nobody behind in the rural areas they had come from. They often arrived from sugar cane growing areas of Vanua Levu around Labasa and Sequaqa. They had to abandon their homes when the leases were not renewed starting in 1997. Expiring sugar cane leases forced a large number of Fijian farmers of Indian ancestry to migrate to urban areas, the majority of them to Suva. By 2018 some 12,000 sugar cane leases were expected to expire (Naidu & Reddy, 2002). Many of them were not renewed, especially in the years up to 2006 (Weber, 2005, 2007a, 2007b). This deprived farmers not only of access to land to earn a livelihood, but also of housing, since in most cases the farm houses had been built on leased land. The expiration of sugar cane leases uprooted people from the areas they had lived for generations. Unlike iTaukei they usually could not continue a family presence in the places they came from, but had little choice other than to move with the entire family to urban areas where most of them ended up in informal settlements. Here agency, meaning the capacity of individuals to act independently and to make their own free choices, found a limitation: structural violence (Galtung, 1975; Weber, 2012) forced families to leave where they had lived for decades.

When asked for the reasons why their household had come to Suva, people's answers concentrated on aspects of employment (almost half of the participants in both settlements). Family reunion, family conflicts, and marriage were also mentioned rather frequently. None of the participants in the interviews mentioned climate change or related difficulties in their home villages as a reason for coming to Suva. For the participants of Indian ancestry, a few noted that the reason they came to Suva was the expiration of their land leases. Most Fijians of Indian ancestry who participated in the study, however, had come to Suva already before the land lease problems started in 1997. It appears that Fijians with Indian ancestry rarely visit relatives in the places they lived before coming to Suva. The prevalence of this is much higher in iTaukei communities where people from around 60% of the households visit their native village at least once a year. In most cases, such visits happen more frequently and often there is frequent movement to and from native places, which coincides with the movement of goods and money.

As mentioned above, none of the people interviewed mentioned climate change as a consideration for why they had come to Suva and/or settled in a particular location. Still, many mentioned that climate change is important in their lives. Issues that people brought forward include: (i) Many settlements are built into mangrove forests. As a result, they are flooded twice a day during high tide. Many conversations with people indicated that they are aware that this exposure to floods intensifies with climate change. (ii) Housing construction in informal settlements is usually sub-standard. Most of the houses in Suva's informal settlements won't be able to withstand the forces of strong tropical cyclones. In February 2016, Tropical Cyclone Winston devastated many parts of Fiji, killing 45 people its path (EM-Dat Database, Brussels). Just a few hours

before Tropical Cyclone Winston made landfall, its path was directed straight towards Suva. If Suva is directly hit by a category 5 cyclone, the damages and death toll will surely be much higher than in 2016.

Rural to urban migration continues to play a considerable role in Fiji. Today climate change might play a bigger role in people's decisions to leave their villages although there is very little evidence that rural communities are more exposed to impacts of climate change than urban ones. It is also unreasonable to assume that people leave the security of the villages and indeed move to 'safer' places when migrating to informal settlements in urban areas. Most cannot afford to live anywhere else than in these settlements where they are exposed to considerable health risks and other dangers. As long as migration can help them to diversify their livelihoods and contribute to the resources of people living in their native places, they shall continue to come to Suva.

Our understanding of this last aspect has been deepened through the interviews: participants were asked how they perceive their family in their native places, and how they consider exchange of goods and money. Among the iTaukei an overwhelming share in both settlements perceived the family "back home" as part of their household with which they frequently exchange goods and money. Mobility is much more dynamic than the word 'migration' is usually understood. People are members of the same household, who live and work in at least two, but often more, places. Movements occur between these sections of the same households in a rather unpredictable and asymmetric way: some household members have migrated in the way it is usually understood. They have established permanent residence, have taken up jobs, which at least they hope are permanent (which is often not the case), and intend to stay in Suva at least until retirement.

5.2 To move to Muanivatu or Veidogo

People from rural areas who come to Suva are usually unable to pay high rents or purchase properties in the formal housing market. Many participants in interviews explained that they depend on informal arrangements to have access to cheap accommodation. To have no such access is a huge constraint, which often prevents mobility from happening since many people do not have the resources to live anywhere else than in an informal settlement.

Still it is interesting that almost 20% of the people interviewed in Veidogo and close to 10% in the case of Muanivatu stated that they had purchased the house to which they moved in the respective settlement. Publications on informal settlements in Suva often neglect this aspect of internal consolidation which can lead to considerable dynamics in a settlement without adding much to its size.

In contrast to research on why people move to informal settlements (see section 2), knowledge about the selection of a particular settlement is extremely scarce. There are 85 informal settlements in Greater Suva. Migrants thus can choose from a large number of locations where they can establish residence.

Social capital, the benefits of being part of networks that provide support in issues of migration, finding employment, and so on, plays an important role when people make choice about where exactly to move. The majority of participants in the survey (about 70% in the case of Muanivatu and almost 60% for Veidogo) knew people in the settlement before they moved in. This is especially interesting in the case of Muanivatu, which is a rather young settlement. In the past 15 years, the settlement increased considerably in size and population. Quite a number of people moved there as kin groups establishing several houses at the same time. As Veidogo is much, much older it has been impossible to get a clearer answer whether people arrived as individual households or several related households at one time.

5.3 Trading health security for security from eviction

When discussing the environmental situation in both settlements, a great majority of people (for both settlements more than 70%) admitted that they do not bother too much about detrimental environmental conditions. Already in the preparation for the study some people highlighted that indeed the difficult environmental situation protects them from being evicted. During interviews, when this issue came up again and again, it was addressed more systematically: many participants reported that they or their parents or grandparents have experienced a couple of times being evicted from places where they had settled before. This was very obvious particularly for Veidogo: out of those who moved to Suva more than two decades ago slightly less than half reported that people in their family had the experience of being evicted. For Muanivatu, the share with such experience is less than half of this figure, but still significant.

It often took households some time before they found a place that appeared would make them safe from eviction. People indeed made decisions based on the experience that particularly unfavorable environmental conditions provided the best security from eviction. According to participants in interviews, for example, there is a relatively large number of residents of Veidogo (and Nanuku, which is not part of this study) who had been evicted from land in Raiwaqa when Raiwaqa Industrial Area was established in the 1980s.

Veidogo, as well as Nanuku, being built into the mangrove forest, became the ideal locations to establish residence. Nobody other than the settlers were interested in living in these locations or in using the mangrove land for other purposes. In other places, people were asked to remove their houses soon after they had established them. When land was needed to establish Raiwaqa Industrial Area, many residents there had to move because the land belonged to a wealthy family, who had migrated to the United States but still owns much land in this part of Suva.

Around 80% of participants in the study in both settlements indicated that they are aware of the adverse environmental conditions they are exposed to. Nobody denied this, but a rather high percentage of participants (20%) had chosen 'do not know' as a response when asked about this. Issues around water (in the range of 50% of reported

environmental concerns) are by far the most prevalently reported. Although people differed slightly in expression (flooding, high tide, waterlogging) they all meant essentially the same thing: twice a day, the settlements are flooded as a result of tidal activities. Houses are rarely flooded, but the ground becomes very muddy even during low tides and causes severe inconvenience for people walking between the houses. The situation worsens especially in Muanivatu when heavy rainfall makes the Vatawaqa River rise. As most mangrove forests west of the settlement have been removed recently, flooding has significantly increased. During extreme flooding, septic tanks overflow and surface water mixes with sewage, causing severe health hazards.



Figure 2: Coping with flooding in Veidogo settlement, June 16, 2017. Source: E. Weber

About 10-15% of the participants (more participants in Muanivatu than in Veidogo) see issues around sanitation as a serious environmental concern. Since flooding and the situation around sanitation are closely related it is likely that many participants alluded to the combination of water and sanitation when they gave their responses.

Many participants are also concerned about rubbish and the dirty appearance of the settlements. People express that little care is given to the disposal of rubbish. Between 10 and 15% of responses referring to environmental challenges in the two settlements mention this issue.

People are aware that the situation they live in can have severe consequences for their and their children's health. Almost three quarters of participants in the study agree or strongly agree that flooding and/or waterlogging threaten their health. Expressions of concern were slightly higher in Veidogo (74%) compared to Muanivatu (69%).

Overall, it is evident that the adverse environmental situation in the informal settlements constitutes extreme health risks to the people of Muanivatu and Veidogo. People don't consider this as an unwelcome 'side-effect' of living in an informal settlement, but a precondition to enable them to live in an urban area, close to their places of employment without constant fears of being evicted. "We know that it is not good for our children to live here being exposed to all the mud and dirty water. However we cannot afford to live in a better place. At least nobody else wants to live here and therefore we are not asked to move away" (Jones, 35, Muanivatu). The importance of protection from mud, water, and human and animal feces is shown in the efforts people exert to create walkways that keep them away from the filthy and unhealthy ground, littered with such things as car tires, as illustrated in Figure 2. In Veidogo settlement, residents have created a wooden walkway that allows them and their children to walk comfortably above the ground. In addition, the RISE Project (see below) aims in the first place to improve sanitation in informal settlements to make the environment healthier.

5.4 Human security and urban expansion

The notion of enhancing security by settling in 'dangerous places' finds its limitation in the rapid expansion of Suva City. Land, which earlier nobody wanted to occupy except the informal settlers, is now in high demand. Because of land scarcity for expansion of industries, trade, and apartment blocks for high income earners, second and third grade land is being used. Although development costs are considerably higher in such areas than elsewhere, investment is occurring.

The area between Grantham Road in the west and Fletcher Road to the east is such a location (see Figure 1). In the past 40 years, development activities in the area have been very dynamic. Aerial images over the past 40 years give a good idea of these development dynamics. Along Grantham Road there had been little development by the end of the 1970s. At this time the area was still in the very periphery of Suva. Extended mangrove forests occupied about half of the area. The big Raiwaqa Industrial Area did not yet exist. Today, Karsanji Road is the northern connection between Grantham and Fletcher Road. In aerial images of the mid-1980s neither Raiwaqa Industrial Area nor Karsanji Road exist.

The higher middle-class residential area of Suva Point, in the very southeastern part of the area, east of Fletcher Road, did already exist. North of the Vatuwaqa Bridge, to the eastern side of Fletcher Road, there was already in the mid-1970s Viria Road Commercial Area, the biggest commercial area in this part of Suva. To the left and right of Fletcher Road, lower middle-class houses were lined up all the

way to Nabua. At that time, in a third row away from Fletcher Road, just north of the Viria Road Commercial Area, there were some 30-40 houses in the location that today comprises the Veidogo and Nanuku informal settlements. East of Fletcher Road there were some 40 small houses in the area which today is known as Wailea informal settlement.

5.5 Challenges to human security in informal settlements

In such dynamic environments, informal settlers face increasing difficulties to co-exist with commercial and real estate interests. It comes as little surprise that over the past 20 years repeated attempts have been made to relocate informal settlements to areas further into the periphery of Greater Suva. The locations between Grantham and Fletcher Road are slated to receive a 'social uplift', a special version of gentrification, a process of uplifting sub-standard urban neighbourhoods and exacerbating social differentiation and exclusion that comes along with such development.

Attempts to give the whole location a social face-lift have started with the imminent resettlement of people living in informal settlements. Already in 2009 and then again in 2016 the Fiji government announced plans to resettle the residents of Nanuku and Veidogo. In 2016, the Attorney General met with residents of these two settlements to inform them of this decision (Pratibha, 2016; Rainima, 2016; Shanal, 2016; Vakasukawaqa, 2016). Land in Makoi, some 10 km away has been identified as the site to where they will be resettled. By mid-2019, the resettlement had not yet started, but in October 2018 announcements in the public media suggested that the resettlement will be carried out within the next 9 to 12 months (Begum, 2018).

The land in Makoi has been identified and sub-divided, and utilities such as water, electricity, and sewerage have been established. The people will receive a 99-year lease on the land on which they are supposed to build their new homes. Each family will also receive an amount of FJD 1,000. Discussions with families have also revealed that they expect that banks will provide mortgage loans of up to FJD 10,000 which they can use to build their houses. This is a very dangerous point and NGOs need to enhance people's financial literacy to assure that loans are repaid according to schedule. Otherwise it can easily happen that houses will come to belong to the banks after a while.

It appears that the people of Muanivatu settlement will be able to stay. Over the next few years, until 2023, the settlement is earmarked to be upgraded under the RISE project. RISE aims to revitalise informal settlements through water sensitive approaches that are cost-effective and improve environmental conditions. Muanivatu is an ideal location for such efforts. The mangroves of Vatuwaqa River have been degraded over decades. To restore this ecosystem it is essential to keep one of the last extended mangrove forests within the boundary of Suva City. It is unclear whether this can succeed as the mangroves and several informal settlements are on prime real estate. It is also uncertain whether after the successful completion of the RISE project the people of Muanivatu will be able to remain

there, or whether after a while they will be replaced by people who are financially better off.

Around 2008, the apartment blocks of the Public Rental Board (PRB) at Raiwai and Raiwaqa were demolished. On September 1, 2014, Fiji's Prime Minister Bainimarama opened new apartment housing of the PRB not far from where the old PRB apartments at Raiwai had been. This was less than three weeks before Fiji's first general elections since 2006.¹ Towards the northern end of Grantham Road another apartment complex for low-income groups was established around the same time. The Lagilagi Housing Project was inaugurated in April 2015 to provide affordable housing to low-income groups. The Lagilagi Housing Project is carried out by a local NGO, the People's Community Network (PCN), with support from the government of Fiji and international funding from a German Catholic development agency. Apartments provided by the PCN are for poorer families, especially those who have lived in nearby informal settlements. Waiting lists are long, and once given an apartment people need to pay one third of the cost over a period of 12-15 years. Occupants receive a title which keeps the property under the care of the PCN. An apartment cannot be sold to illegitimate persons. If people wish to move away, they sell back their unit to the PCN (personal interview with PCN Director; see also Bryant-Tokalau, 2014). In November 2018, newspapers and TV stations in Fiji reported that a large number of occupants of Lagilagi apartments have never lived in informal settlements. It is alleged that they stay illegally in the flats. There are also reports about delays in the completion of the project and possible fraud (Bia, 2018; Chand, 2019b). At the end of May 2019, the Lagilagi Housing Project was taken over by the Fiji government. The PCN director as well as the members of the PCN Board face legal investigation (Chand 2019a; see also Walsh, 2019). Similar allegations exist for the Raiwai apartments of the PRB. In September 2019 the PRB announced that two thirds of the Raiwai apartment tenants (140 out of 210) had received eviction notices as their incomes are higher than allowed to be eligible to occupy a flat (Chand 2019c).

Apartments built for poorer sections of Suva's population are more and more often occupied by people who are financially better off. Those for whom the apartments were ostensibly built have to move further away, to the rim of the city, to areas others are not much interested in. Today, such places are difficult to find.

The dynamics that exist in the Lagilagi apartments and the PRB apartments in Raiwai might give an indication of what will happen to Mu'anivatu once water and insufficient sanitation no longer make this settlement a 'dangerous place'. Then poor and vulnerable settlers might have to leave.

A similar situation has been observed in the Namadai informal settlement in the high-value residential area of Namadi Heights in Tamavua, which was upgrad-

¹ Fiji had a military coup in December 2006 and elections were postponed until September 2014. In the 2014 election campaign and election manifestos of various parties the issues of informal settlements played an important role.

ed in 1993 by the Methodist Church of Fiji though the government's Poverty Alleviation Fund. Land tenure is freehold. At that time, residents were allocated a block of land. In a recent estimation of home ownership in Namadai, around 30% who live there now and own houses or land are not original residents. In the meantime, higher-income earners and owners of real estate businesses have moved to the area, crowding out poorer residents. Most of the poorer families settle now squatting along a highway unable to improve their lives (Koto, 2008).

6 Conclusion

More research needs to be done to get better insights into the reasons why people moved for the first time to a particular place. The beginning of an informal settlement plays a central role in this question as later people move to places that have been established: it has then become a place that has demonstrated that it is 'safe' from eviction. Results of our initial research indicate that living in challenging environmental locations enhances people's security from being evicted.

Reflexivity appears to play an important role: people's moves to urban areas are usually not planned in every detail. They are often more trial-and-error approaches, with people learning from success and failure. Through such mechanisms, informal settlements in relatively safe locations emerge, while less safe locations are easily rejected or abandoned, often by force of the relevant authorities.

It has been established that there are different forms of security: in the cases observed in this study, 'security of a healthy environment' is traded in for 'security from eviction'. This mechanism is well understood by people who make these decisions. In their search for security, people are even willing to live in environments that are harmful to their health. Notions of forced migration do not really apply to such situations as a "forced migration concept" assumes that dangers that make people move exist in the places of origin. Climate change-related impacts are often constructed as such dangers from which people try to escape through their movements. What is happening in the cases of the informal settlements investigated in Suva turns the entire concept on its head: people leave their relatively safe homes in rural areas and move to environmentally dangerous places in urban areas. This is done to enhance overall security by diversifying sources of livelihood. In such strategies, the notion of translocality plays a crucial role: the diversification of livelihood sources only works when households split up and work in different locations and different modes of production, from subsistence/semi-subsistence production in the villages to (in some cases) international capitalist modes of production in urban centres.

Security – which people are looking for – has many risks and uncertainties, especially in dynamic economic environments such as the one of Suva. A couple of decades ago nobody showed much interest in the land the settlements have been built on. Today the area is prime real estate property. The fear is not unjustified

that it won't take long before those who now live in informal settlements will find themselves further marginalised. It is not unrealistic to assume that, over the years, residents will be required to move out of the apartments built by the PRB and the PCN, apartments first built for those living in informal settlements. People who are financially better off will replace them. The same fate might also await those residents of informal settlements who participate in the RISE project: as soon as the environmental conditions in these settlements improve considerably, the locations will become vulnerable to the greed of people who are better off.

For climate change considerations, the first lesson to learn is to avoid the need for migration as much as possible by making the places where migrants come from, the rural areas, not only 'safe', but also places where people can achieve their material aspirations. If mobility is part of a strategy of livelihood diversification and risk minimisation, then people don't need to migrate if they can achieve this in the places they are living. Here some insights might be provided by Kadavu Island in the very south of Fiji. Because of the destruction of Tropical Cyclone Winston, prices for kava, the national drink of Fiji, increased by the factor of 4-5. Kava plants of farmers in Kadavu were not destroyed. Today, farmers on Kadavu benefit greatly from the huge price increase. There is much visible evidence that this gave a strong push to material development on Kadavu. There is even anecdotal evidence that people returned to the island to start businesses there.

In Suva's informal settlements it is urgent to upgrade housing structures. As mentioned earlier, material damages and death tolls will be huge if a high intensity tropical cyclone hits these settlements. At the same time, it is essential to mitigate environmental health challenges in these settlements and to include safeguards so that people are not crowded out by better-off sections of Suva's society, when these locations are upgraded and look neat and clean. The experience of the PCN's Lagilagi apartments shows that there are limitations to preventing this special form of gentrification from happening. It appears that safeguards that were installed did not work well.

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Adaptation and the question of migration: Directions in dealing with climate change in Kiribati

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In this chapter, we look at the central Pacific atoll state of Kiribati, which is considered particularly vulnerable to the consequences of climate change but is also characterized by its citizens' emphasis of their potential for resilience. We argue that the inhabitants' cultural conception of land and imaginations of the future influence how citizens and policymakers deal with adaptation and the question of migration. We show that in the past two decades, when Kiribati was confronted with scientific projections on the likely effects of climate change, two successive governments pursued different politics of hope. In turning to discourses of Kiribati's citizens, we trace their express will to adapt and their responses to the question of migration. Most of Kiribati's citizens have articulated this will by staying on the land, while a minority have considered the option of future collective relocation when the former Kiribati government bought a large piece of land in the state of Fiji. We conclude that the cultural conception of land and imaginations of the future significantly influence the directions that adaptation and/or migration might take, whether government policies and local discourses envisage staying in Kiribati or seeking a home outside the state territory.

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1 Introduction

Atoll countries stand out from other Small Island Developing States (SIDS) because they are considered particularly vulnerable to the consequences of climate change due to the low and small land areas of their islands, the resulting limited resources of drinking water and cultivation opportunities, and the relatively high population density and low income of their populations (Barnett & Adger, 2003, p. 322; Nunn, 2009, pp. 227–228; Barnett & Campbell, 2010; Nurse et al., 2014; Barnett, 2017, p. 4). Vulnerability, however, is countered by the adaptive abilities and social resilience of atoll inhabitants. A lot more empirical research is needed on the potentials that inhabitants of atolls and other SIDS possess (e.g. Barnett & Adger, 2003, p. 328; Mortreux & Barnett, 2009, p. 105; Barnett & Campbell, 2010; Lazrus, 2012; Barnett, 2017, pp. 10–11). In view of scientific projections about the future impacts of climate change, governments and citizens in atoll countries face the challenge of deciding which adaptation measures to take. Essentially, measures of *in situ* adaptation have to be distinguished from migration as adaptation. On the one hand, technological and management options are available for *in situ* adaptation (Nunn, 2009, pp. 221–227). On the other hand, politicians, media, scientists, and citizens have discussed different types of migration (e.g. Kempf, 2009; Betzold, 2015). One type of migration as adaptation to climate change is voluntary labour migration (Barnett & Chamberlain, 2010; Barnett & Webber, 2010; Barnett & O’Neill, 2012). Another type is relocation (Nunn, 2009, pp. 227–228), and a distinction is made here between internal versus international relocation (Campbell, 2010a, 2010b; Campbell & Bedford, 2014). Which adaptation measures can be taken always depends on the possibilities of financing, not only through national funds but also through external donors (Betzold, 2015, 2016). Moreover, limitations on adaptation result from the structural problem of power asymmetry between international donors and recipients in the small island states (Barnett & Campbell, 2010; Betzold, 2015, 2016; Barnett, 2017, p. 7).

Kiribati is one of five atoll countries in the world, four of which are sovereign states (e.g. Barnett & Adger, 2003, p. 322). It became the Republic of Kiribati in 1979 and comprises 33 islands located in the central Pacific region. Of these islands, 32 are low-lying atolls or reef islands, which rise to only about 3 m above sea level; the other, Banaba, is a raised limestone island, on which phosphate was mined (Neemia & Thaman, 1993, p. 288; Storey & Hunter, 2010, p. 168). Discourses on global warming that have reached Kiribati have drawn attention to rising sea levels, the increase in extreme weather events, and other threatening consequences (Neemia & Thaman, 1993, p. 295). Such discourses circulated on the islands of Kiribati with varying intensity during the first two decades of the 21st century. Representatives of the state, the internationally financed adaptation programmes, international and national non-governmental organizations (NGOs) and initiatives, churches and media, and committed individuals contributed to the dissemination of these discourses. Subsequently, some citizens of Kiribati, the

I-Kiribati, began to perceive changes as the effects of climate change, as Neemia Mackenzie (2004) observed. On the whole, the spectrum of reception ranges from a rejection of climate change discourses to intensive discussion of the relevant knowledge (Kempf, 2017; Hermann & Kempf, 2018, pp. 21–22).

In this chapter, we explore which adaptation measures – including migration as adaptation – have been discussed, targeted, and taken in Kiribati over the past two decades. From a cultural and social anthropological perspective, we try particularly to understand the cultural logics that guide the I-Kiribati in their efforts to adapt to the consequences of climate change. We argue that the cultural conception of land and imaginations of the future influence how citizens and policymakers deal with adaptation and the question of migration. In cultural terms, land – especially because of the understanding that people belong to land – is the basis of the existence of interrelated human and non-human entities throughout time (Hermann, 2017). In Kiribati, land is the basis for an existential security in the world that has been established in the past, is perceptible in the present, and is presupposed for the future. With the components of people belonging to the land and the identification that goes with it, the Kiribati concept of land resembles the meanings of land in other Pacific Island societies (Campbell, 2010b, pp. 60–64). Carol Farbotko (this volume), also looking at communities in Oceania, explains that land is crucial to Pacific Islanders’ ontological security. She adopts the concept of ontological security from Kinnvall and Mitzen (2017), who call it a sense of security that political subjects have when they can presuppose biographical continuity and wholeness recognised by others (Kinnvall & Mitzen, 2017, p. 4). If we see ‘ontological’ here in a very comprehensive sense as being in connection with the environment and cosmos and the spiritual powers invigorating them, then it can also be said for Kiribati that land contributes to such security. In combination with land concepts, discourses on the future play an important role in adaptation planning and action. “Adaptation is about changes to secure futures and so carries with it a precondition that there is a future to be secured,” as Barnett (2017, p. 7) very aptly wrote. With Appadurai (2013), we would like to add that the future is culturally made. We, therefore, see adaptation measures in relation to cultural discourses that actors have adopted as their own. Atoll states follow specific “justifiable logics” (Barnett, 2017, p. 9) in their approaches to adaptation. From our point of view, these logics are culturally shaped. Concepts of land – with their component of people belonging to land – and ideas of the future play a significant role in these cultural logics.

A variety of adaptation strategies is pursued in Kiribati: both *in situ* adaptation and migration as adaptation. Depending on the respective political context, one or the other type is emphasised more strongly, but both types are often addressed in the sense of “transformational adaptation” (see Nunn and McNamara, this volume), i.e. as a response that is transformational in the longer term. Regarding *in situ* adaptation, the Kiribati Adaptation Program (KAP) has to be especially mentioned since it was a large-scale aid-driven adaptation program and the first to be launched in the atoll state (e.g. Government of the Republic of Kiribati, 2013; Storey &

Hunter, 2010; Kempf & Hermann, 2014, p. 201; Prance, 2016; Barnett, 2017, p. 7). In the course of the KAP that began in 2003 and came to an end in 2018, measures have been taken for coastal protection, securing fresh water resources, and fortifying infrastructure. In addition, further options, such as the elevation of some areas, have been and are being explored. If migration is discussed as an adaptation strategy in Kiribati, then it is, on the one hand, about labour mobility with the option of return but, on the other hand, also about resettlement as a last resort.

In our efforts to analyse discourses and measures of adaptation, we devise the concept of ‘direction’. We use the term direction as an organising principle that captures and coordinates spatial and temporal orientations of ideas and actions connected with power relations. Inherent in the concept is a reference to actors who direct, thereby exercising agency, that is, the culturally constituted capacity to act effectively and intentionally within webs of power relations (Ortner, 2006, pp. 152–153). Thus, the concept of direction signals that ideas and actions are aimed at something specific. Furthermore, following Appadurai (2013, p. 293), we are focusing on various “politics of hope.” Appadurai sees the politics of hope in connection with the cultural “capacity to aspire” and wrote that “it is only through some sort of politics of hope that any society or group can envisage a journey to desirable change in the state of things” (Appadurai, 2013, p. 293). Transferred to the context of climate change discourses in Kiribati, the politics of hope point the way from the extreme vulnerability of the atoll state to suitable measures of transformation that promise a secure future based on adaptation and resilience. From this perspective, we will show which politics of hope two successive Kiribati governments have pursued in dealing with the consequences of climate change and which directions I-Kiribati envisage based on their concept of land and imaginations of the future.

The period of time we look at is mainly the one from 2003, when the Kiribati Adaptation Program was launched in the atoll state, to 2017. Between 2009 and 2017, we conducted an annual anthropological field study in Kiribati for about a month each year and, in November 2017, were able to participate in the side event of the Kiribati government at the 23rd Conference of the Parties (COP23) to the United Nations Framework Convention on Climate Change (UNFCCC) in Bonn. In Kiribati we engaged in research with representatives of the state and I-Kiribati citizens of various walks of life on the main atoll of Tarawa and the two outer islands of Nonouti and Onotoa. On these atolls we were also able to talk with people from yet other Kiribati islands. Our field research methods included qualitative interviews in which we gave our interlocutors the opportunity to lead the conversation on a topic we had previously agreed on, so that we could first listen carefully to what they found important. Usually we turned to semi-structured interviewing during the further course of our conversation, when we asked questions we had prepared. We also made use of questionnaires with open-ended questions, to which our respondents were invited to give their answers either in Kiribati language or in English. Additionally, we requested school students to respond to our

questions in essays. Our partial participation in discourses, participant observation, and analysis of written, audio, and visual sources complemented our methods of data collection.

On the basis of the data we were able to assemble in cooperation with our research participants and the analysis of these and other sources, we will trace the main lines of the policies of two successive governments and discourses of Kiribati's citizens relating to both *in situ* measures and migration as adaptation strategies.

2 Cultural concepts of land and the future

Since climate change news has intruded into their country, I-Kiribati have become even more aware of the fact that their land is precious and vulnerable. In a territorial sense, land for them can mean a piece of land and property, an island, and the whole country. In the context of discourses about climate change consequences, they often describe their land in the Kiribati language as flat or low and small, implicating that it will be threatened by sea-level rise. Importantly, land, *te aba*, for I-Kiribati also includes social dimensions: of relatives, some of whom are living on the property, of the community inhabiting an island, and of the whole nation. Thus, *te aba*, with its dual meaning of land/people, has enabled existence on the islands by securing subsistence and conferring political status to owners in the past (cf. Tito et al., 1979, p. 21) and to island communities and the nation in the present. I-Kiribati have always felt closely attached to land/people (cf. Teaiwa, 2015), but in the context of climate change, they emphasise their connection, love, and worries for the land even more (Kempf & Hermann, 2014, p. 197; Hermann, 2017).

Moreover, the cultural concept of land does not only have a socio-spatial capacity but a temporal dimension as well. In fact, land has historical depth. Pointing to the recent pre-colonial past, I-Kiribati report that their ancestors frequently fought for their pieces of land. Referring to the deeper past and the chain of the Gilbert Islands, some cite myths, according to which the islands were created by Nareau who was considered a god (see Beibure, Teraku, & Uriam, 1979; Uriam, 1995). Today, many subscribe to the Christian belief that God created the land. Relating to one or the other (or a combination of these versions), I-Kiribati frequently emphasise that the land was given to them by the creator (cf. Autio, 2010; Camus, 2014). This truth is at times accompanied by the cultural belief that the divine power invested the land with protection that would extend from the past through the present to the future.

Imaginations of the future are shaped nowadays by many discourses. Among them is a culturally specific line of reasoning to the effect that what the future will bring was set in the past. Thinking about the time to come, therefore, necessitates looking at the time past, for it was then that powers set things going which will be realised in the future. In this connection, the Christian God and/or Nareau the

god (together with spirits) may be cited as powers which determined the course of events. However, the cultural concept of the future does not only include temporal dimensions but also a spatial component. The anticipation of what will come is usually linked to the expectation that land will be there for the collectivity and Kiribati culture. Therefore, land plays a crucial role in imaginations of the future. As the foundation of Kiribati people in ancestral times, it has always been known to secure life for the next generations. Thus, the cultural concepts of land and the future are closely linked in Kiribati. Additional discourses influencing I-Kiribati's imaginations of the future comprise not only formations of statements about the continuation of life, society, culture, and development, but also talk about likely impacts of climate change and sea-level rise.

Discourses about projections by the climate sciences regarding the risks to which land and people will be exposed by climate change consequences have exerted a powerful influence on I-Kiribati's outlook as they claim to represent truths about the country's future (Hermann & Kempf, 2018, pp. 21–23). Formations of statements to the effect that Kiribati's low-lying atolls will be exposed more often to inundation and might become uninhabitable for the majority of the population in only a few decades have especially caused Kiribati's political decision-makers and many of its citizens to take a stand. Depending on the extent to which representatives of Kiribati's governments and people have accepted the climate sciences' truths, they have included respective projections in their imaginations of the country's future to varying degrees and devised their short-, medium-, and long-term plans for *in situ* adaptation and migration accordingly.

3 Government policies on adaptation

Since the 1990s, when the various Kiribati governments began to be increasingly confronted with discourses on the possible negative consequences of climate change, they have striven to protect land, inhabitants, and nation through adaptation measures. The development and application of appropriate forms of adaptation in the sense of reducing vulnerability and increasing resilience (Finan, 2009, p. 177) present local institutions with complex tasks that include political, social, and cultural dimensions, in addition to technical and economic challenges (Fiske et al., 2014, pp. 41–50). In Kiribati, measures to adapt to the possible impacts of climate change have been associated with different spatial and temporal orientations, focal points, discourses, and projects. A brief genealogy of the political praxis of various Kiribati governments that were confronted with the challenges of climate change will provide information about the directions taken with regard to adaptation.

Teburoro Tito was Kiribati's first president to develop policy responses to global warming, climate change, and sea-level rise. During his term in office (1994–2003), Kiribati ratified the UNFCCC and established a National Climate Change Study Team. In 1999, Kiribati presented its Initial Communication under the

UNFCCC (Kiribati Government Ministry of Environment and Social Development, 1999). The report outlined the vulnerability of the atoll state and specified the need for adaptation measures in the areas of coastal infrastructure, water resources, agricultural systems, health, and fisheries. In subsequent years, the World Bank implemented the KAP, a million-dollar, country-specific pilot project on adaptation to climate change with funding from the Global Environmental Facility, the Government of Australia, the Japan Policy and Human Resources Development Fund, NZAID, other development partners, and the Government of Kiribati (see e.g. Storey & Hunter, 2010; Prance, 2016).

In 2003 Anote Tong took over the presidency. From the perspective of the government under President Anote Tong, who was in office until 2016, global warming and climate change impacts posed existential threats to the future of Kiribati. Tong underscored the will of his government to preserve homeland and sovereignty under all circumstances in his speeches on the international political stage (see e.g. Tong, 2008). He linked his appeals for mitigation of greenhouse gas emissions worldwide with the request to support particularly vulnerable atoll states such as Kiribati in the adaptation measures necessary. During his presidency, Tong gave high priority to adaptation. The implementation of the various phases of KAP¹ was intended to facilitate the mainstreaming of adaptation into national economic planning and was designed for the long term. The priorities included raising awareness among the population, protecting drinking water resources and coastal areas, and securing local infrastructure (see Ministry of Environment, Lands and Agricultural Development, 2013). Coastal protection measures included, for example, the construction of seawalls and the planting of mangroves. As a supplement to the KAP, the Tong government initiated the Kiribati National Adaptation Program of Action (NAPA) in 2004, which was tailored to urgent adaptation needs (Government of Kiribati, 2007). Finally, in 2014, the Tong government took the step of purchasing a large piece of land in Fiji, the Natoavatu Estate, thereby securing resources outside Kiribati in order to ensure the economic development and future food security of the atoll state (see Hermann & Kempf, 2017).

The current government under President Taneti Maamau, which has been in office since March 2016, aims to improve prosperity, infrastructure, security, and governance. The vulnerability of the atoll state to the effects of climate change is seen as a serious constraint on the way to achieving the intended upswing. The Maamau government, therefore, emphasises the need to include adaptation and mitigation measures to minimise risks and achieve the desired development goals. With its two-decade development plan “Kiribati Vision 20” (KV20), it seeks to combine economic and social progress with adaptation to climate change to preserve land, culture, and identity for the future. A building block of the development program is land reclamation on South Tarawa (Temaiku, Bikenibeu, Bairiki,

¹ The KAP comprised three phases: Phase I: Preparation (2003–2005), Phase II: Pilot Implementation (2006–2011), Phase III: Expansion (2012–2018) (see Republic of Kiribati, n.d., and The World Bank, 2019).

Betio, and areas in the lagoon) and on Kiritimati. The aim is to counter population growth, land scarcity, and climate change impacts (Government of the Republic of Kiribati, 2016, p. 20). The so-called Temaiku Adaptation Project is presented in a video clip which the Kiribati government produced for a side event at the UN Climate Change Conference (COP23) in Bonn in November 2017:

*Temaiku is a large, low-lying, uninhabitable government land and this initiative aims to elevate the land and make it habitable. The plan is to have up to 35,000 people reside on this piece of land and essential facilities, such as schools, clinics and shops, will also be built. The town planning of this area will be designed in a way that is resilient to the impacts of climate change.*²

With this policy of *in situ* adaptation, which promises the long-term expansion and preservation of land, the government associates a politics of hope. The extent to which this policy is interwoven with Christian convictions can be seen in President Maamau's response to scientific projections that large parts of the atoll state will be flooded in the future by the progressive rise in sea levels. He is of the opinion that God will protect the land and will not give it up in any way:

*Climate change is indeed a serious problem to Kiribati, but we don't believe that Kiribati will sink like a Titanic ship. The Titanic ship is different. It is built by human hands while our country, our beautiful islands, are created by the hands of God.*³

This politics of hope is based on the confidence that the country and the future are stable. And although the current Kiribati government is thus explicitly trying to distinguish itself from the previous government under Anote Tong and its plans for the future, which are perceived as too pessimistic, there are at the same time a whole series of political continuities. The former Tong government had already considered elevating Temaiku and developing it as a new settlement area but had to postpone the project because of a lack of financial support (Uan & Anderson, 2014, p. 243). The current Kiribati government has also taken up and pursued key elements of climate change policy from the Tong era.⁴ These include the extension of the final phase of the KAP III project until the end of 2018 as well as looking after the land in Fiji, which is primarily regarded as an investment and continues to be earmarked for the cultivation of food (see *Te Uekeru*, 2019, p. 3).

The brief historical outline shows a sequence of governments in the atoll state of Kiribati that, over a period of more than two decades, have been focusing on *in situ* adaptation in dealing with climate change issues. Each new government resort-

² Transcript from the video clip "Kiribati Vision 20 in the face of Climate Change," Government of the Republic of Kiribati, COP23 Side-Event, November 16, 2017. See also Jacobs (2018).

³ Transcript from the video clip "Kiribati Vision 20 in the face of Climate Change," Government of the Republic of Kiribati, COP23 Side-Event, November 16, 2017.

⁴ These include the "Kiribati Joint Implementation Plan for Climate Change and Disaster Risk Management" (2014), the "Whole of Island Approach" (2016), the "Integrated Vulnerability Assessment Framework for Atoll Islands" (2016), and the "Kiribati Adaptation Program (KAP) III." See also Government of the Republic of Kiribati (2016, p. 45).

ed to political guidelines, projects, and programs of the previous government, continued these projects, and sought to set its own course within the framework of the adopted directions. The political concern to link land and future with the hope of preservation and continuation is foregrounded in this prioritisation of adaptation.

4 Government policies on migration

Two contrary directions of climate change policy discourses and practices can be discerned in Kiribati regarding the question of migration as a form of adaptation to climate change. This divergence is based essentially on the political orientations of the governments under Tong and Maamau. The current Maamau government attaches great importance to staying in Kiribati. Since the majority of the I-Kiribati are also in favour of remaining in the country, the government knows the greater part of the population is behind it when it focuses on the territory of Kiribati. The Maamau government rules out a complete loss of the country in the long term as well as climate-induced collective relocation. By contrast, in view of the scientific projections of the future consequences of climate change, the previous government under Tong saw itself as responsible for preparing the population for the worst case of a largely uninhabitable atoll state in the long term.

The government under Aote Tong had a clear political orientation. Measures to adapt to climate change in the Kiribati islands were very important from their point of view and were implemented wherever possible. However, the then government also made it clear that *in situ* adaptation measures on narrow, low-lying atolls without alternative possibilities quickly reached their natural limits. At no time did the Tong government move away from the demands on the industrialised countries to make greater efforts in the area of mitigation. At the same time, it assumed that even a rapid and significant reduction in greenhouse gases could no longer reverse the process of climate change already underway and the resulting threat to Kiribati. In this respect, mitigation and *in situ* adaptation in the Tong era were only seen as short- to medium-term responses to the challenges posed by climate change. In the long term, the Tong government felt it had a duty to prepare the country's inhabitants to migrate voluntarily and with dignity. Vocational qualification measures were, therefore, the central prerequisite for this strategy. Well-trained I-Kiribati should help to cover the need for labour in certain areas, such as the nursing professions, in order to be accepted in the metropolitan states of the region and to be able to bring family members from Kiribati to their new country of residence if possible (cf. Farbotko, Stratford, & Lazrus, 2016; Klepp & Herbeck, 2016).

The politics of hope under the Tong government aimed to ensure that the people could remain in the atoll state for as long as possible. For the future – beyond the envisaged period of 50–60 years – Tong prudently envisaged emigration and the survival of I-Kiribati in the diaspora. Under the present Maamau govern-

ment, this political strategy of ‘migration with dignity’ as a forward-looking form of adaptation to the negative consequences of climate change no longer plays a significant role. President Maamau and his government are currently focusing on the need to improve general living conditions: “The core themes are increasing the wealth, the health and the education of our people so that they can look after themselves in a dignified manner” (HE Taneti Maamau, Interview, November 17, 2017). Here, the aspect of dignity is above all linked to upswing and progress. Both should benefit the broad population in the country. The associated politics of hope points particularly in one direction:

[I-Kiribati] don't believe in their islands sinking. It is an insult to them. They say: "We have been here for ages and ages and now you are telling us [he pauses]. No!" It's all about that. ... But anyway. It is quite a difficult prediction to be sure about, but we hope – myself, my God and my people are working towards a common destination: Staying in Kiribati. (HE Taneti Maamau, Interview November 17, 2017)

The general direction that the Maamau government seeks to give to the mobility of its citizens is that of returning to their land or their own country. On the one hand, this concerns the political plan to counter the rural exodus to and population growth on South Tarawa.⁵ The background for this is the fact that almost half of the island state's population, estimated at about 110,000 people, currently live on the main atoll Tarawa (see The World Factbook, 2019). For this reason, the Maamau government is using economic incentives to encourage a larger number of people to return to the outer islands. The orientation to one's own land gives the direction here. On the other hand, the current government promotes temporary international labour mobility in order to improve the economic situation of the population in Kiribati in general. The political-economic calculation is based on remittances but, above all, on returning migrant workers who invest their money earned abroad in Kiribati. The return to the home country of Kiribati is a decisive factor here.

The Maamau government generally distinguishes international ‘mobility’ in the sense of labour and return mobility from international ‘migration’, a term used more in the sense of emigration. An international migration of I-Kiribati is considered pragmatically by the Maamau government against the background of a growing indigenous population. No one should be prevented from emigrating. Nevertheless, the current government does not formulate a political strategy that establishes a necessary link between migration, climate change, and the future. Rather, the politics of hope is aimed at enabling people to stay in the country in the long term.

There are both similarities and differences regarding migration policy under the Tong and Maamau governments. Both governments wanted to ensure that the

⁵ On rural–urban migration see Uan and Anderson (2014, p. 242) and Van Trease (1993, pp. 138–141).

population remains in the country in the short and medium term. In view of the future uninhabitability of the atolls caused by the consequences of climate change, the Tong government viewed migration and resettlement as the only viable way out in the long term. By contrast, the Maamau government established a new policy of remaining in Kiribati and seeks to de-emphasise the discourse on migration that was dominant under its predecessor. With this policy, it ties in with cultural conceptualisations of land and the future, on the basis of which it follows the way towards adaptation, continuity, and security in the context of future threats from climate change impacts.

5 Local discourses on adaptation

Government policies on adaptation to climate change and accompanying campaigns have left an imprint on Kiribati's citizens' awareness of projections for the future and possibilities to act. In addition, I-Kiribati have learned about climate change issues from discourses of transnationally outreaching overseas churches and their own churches (Kempf, 2012) as well as from representatives of NGOs and I-Kiribati activists. As I-Kiribati have interwoven strands of these discourses with discursive formations about their land and the future, they have developed a heterogeneity of attitudes towards adaptation. There are those who do not see the need for adaptation because they do not believe that climate change will affect their home country in the immediate future. Among those who would deal with the consequences, there are some who would not consider adaptation measures because they claim they have not enough know-how and resources at their disposal. Others would doubt the effectiveness of these measures. By contrast, there are experts, activists, and a number of people who have been involved in activities such as building coastal protection or planting mangroves and are keen to promote adaptation measures. There are also many I-Kiribati who, when questioned, express their will to do whatever they can to protect their beloved land and home country from the severe impacts of climate change. One measure that is often mentioned is the construction of sea walls (*te bono*).⁶ A quote from a 17-year-old woman from the atoll of Arorae illustrates this view:

If Kiribati is affected by climate change, I think that I will seek ways that will affect Kiribati [in a positive way]. And we will stay on our land and will not leave our land, but we will try to face the problem of climate change. And we should build sea walls at the edge of the sea. Like our ancestors said: "The place where we are born, we are happy to die there as well." (September 14, 2010; translated from the Kiribati language)

I-Kiribati also frequently point to the planting of mangroves (*te tongo*) as a measure of coastal protection. As a girl from Nikunau Island, aged 15, explained:

⁶ For an assessment of coastal protection structures on Kiribati's main atoll Tarawa, see Duvat (2013).

*It will be necessary for us to plant plants and not to cut them, just like the mangrove which is the tree in the sea. Te tongo means mangrove in our own language. This prevents the erosion. (October 8, 2013)*⁷

The numerous statements I-Kiribati have made during the past decade on their will to take adaptation measures largely resemble each other. While many of Kiribati's citizens emphasise the building of sea walls and planting of mangroves, some people know that mangroves are to be preferred to sea walls since the latter may even contribute to coastal erosion. In addition, some people also draw attention to the need to take measures of environmental protection, such as cleaning the coast of rubbish that may obstruct coastal vegetation and not taking sand from the beach for construction purposes. What local discourses have so far not picked up to a significant extent are plans by the successive governments of elevating a certain area and developing it – a fact that suggests these plans are predominantly discussed in government circles. But with respect to the other adaptation measures I-Kiribati mention, it is obvious that they put into practice what they are talking about. This can be seen especially on urban South Tarawa, part of the main atoll, and also here and there on the outer atolls. In some places, stones have been piled up to form sea walls. At a few places people also erected *te bwibwi*, constructions for coastal protection that consist basically of vertical sticks and coconut leaves plus other organic material put between them horizontally.⁸ At other places, people have begun to plant mangroves, following the example and encouragement of government, NGOs, and other initiatives.

Local discourses on the preparedness and the implementation of adaptation measures shine a light on a majority of Kiribati's citizens' sense of direction: They orient themselves in socio-spatial and socio-temporal terms towards their beloved land of Kiribati. Statements of their refusal to leave their country, their will to stay and adapt are clearly based on their cultural concept of land, promising the continuation of collectivity and culture. Based on this concept, many say their future lies here, in Kiribati. A few, however, add that this may only hold for the immediate years to come.

6 Local discourses on migration

Whereas a broad consensus exists in the atoll state regarding the need for *in situ* adaptation to climate-related changes of the environment, there is disagreement about international migration as a response to climate change consequences and the need for international relocation in the future. As the I-Kiribati feel deeply attached to their land, the dominant discourse in this context has the effect of

⁷ This and the following quotations that were given in English, were slightly edited to aid readability.

⁸ Neemia Mackenzie listed *te bwibwi* as among the "traditional methods of creating accretions" and wrote that people thought *te bwibwi* are no longer working (Neemia Mackenzie, 2004, p. 36).

them staying in the country and refusing to emigrate. I-Kiribati author Linda Uan and John Anderson found in a national survey they conducted in 2011 that the “majority of I-Kiribati (65 per cent) have no wish to live in another country” (Uan & Anderson, 2014, p. 247). Staying on their land does not exclude internal mobility between the islands of Kiribati, since this kind of movement enables them to keep their relationships to the land alive. By contrast, international emigration for I-Kiribati carries the risk of weakening their connections to their land, culture, and identity, which is why it is debated controversially.

International temporary mobility for the purpose of education and labour (particularly seasonal work) is looked on favourably by many citizens of Kiribati, because both types of migration have the advantage of securing return to their home country. But people rarely express any thoughts about labour mobility as a way out from the climate change consequences in their home country. Many among the minority that does consider international migration with a view to climate projections insist that all other measures of mitigating or adapting to climate change need to be considered first before they would leave for overseas. A number of such measures were detailed by a 17-year-old woman from the atoll of Nikunau who explained what she would do if Kiribati was affected by climate change:

- 1) *Ask for assistance from overseas countries to provide means/ ways to help the people of Kiribati; for example, foreign aid.*
- 2) *Educate more young people about the changing climate so that they can be aware of the consequences that might be faced by the I-Kiribati.*
- 3) *If the government sends its people to places where they can find jobs and become citizens in that particular country, for example, New Zealand and Australia.*
- 4) *The government should encourage local people to get their children educated so that they know what our island is going through, for example, rising sea levels. (September 14, 2010)*

Tellingly, she talked about international migration only as the third option, using a conditional clause with reference to the need of the government making it possible. Her expectation that the government will lay the groundwork for labour mobility and immigration to one of the metropolitan states in the South Pacific resembles other statements of I-Kiribati that resonate well with the migration policy of the Tong government. However, similar voices have sometimes been heard, especially among the youth, since the government under President Maamau has come to power. In addition, there have been I-Kiribati then and now who apply for work overseas. But again, the reasons for this are of an economic nature and only in very rare cases because of the threat from climate change.

International migration and even relocation with a view to projected consequences from climate change came to be imaginable by some I-Kiribati when news arrived in 2012 that the Kiribati government under President Tong was conducting negotiations on the purchase of a large freehold estate in Fiji. A few people were aware of their government’s statements making it clear that the land was meant to provide future food security. But others concluded that the Tong government must be interested in the estate with climate change-induced migration in mind.

While they too emphasised their close attachment to their land, they thought that, when the worse came to the worst, migration and even relocation to this estate in Fiji would be the option to choose. As one middle-aged interlocutor from the southern atoll of Nonouti told us, referring to some of his compatriots' opinions:

Now when they heard that the Kiribati Government had land in Fiji, some people said: "So it's better we go and live there!" But not all agreed. Some [said]: "Ab! We can't go, we must stay!" (September 23, 2012)

As for himself, he said that when the rising sea threatened atoll life, he would want to immigrate with his family to Fiji. Others equally began imagining migration to what became known as Kiribati's land in Fiji in the run-up to and after the purchase. A couple of years later, a few I-Kiribati still mention it as a safe haven with a view to a worst-case scenario. And even when interlocutors insist, nowadays, that they would stay in Kiribati even though their former government had bought this estate, their statements suggest that they associate this land with migration.

When international migration is brought up by a minority of Kiribati's citizens as a last resort in the face of climate change, it is often imagined in connection with a place the I-Kiribati would need for themselves. This is evident in the response of a young I-Kiribati from Tarawa when responding to the question of how she sees her future:

In my future, I would like all the people in Kiribati to find their places overseas or be sent overseas to live there because of coastal erosion that happened due to climate change. (September 13, 2017)

Her voice joins those who say that they would prefer a collective relocation rather than an individual one when forced by the adverse effects of climate change. Even if it seems otherwise at first glance, such a thought of collective relocation is firmly built on the cultural concept of land. Since land and people are conceived of culturally as forming an entity, it is only logical that the collective would have to move and merge with the new land if one day the atolls were no longer able to hold their ground in the face of climate change. Culturally shaped imaginations of the future similarly play an important role in weighing the pros and cons of emigration. As the future harbours a spatial component, there should be land for the people of Kiribati somewhere.

7 Conclusion

Since the scientific discourse on anthropogenic climate change found its way to Kiribati, governments and citizens of the atoll state have been negotiating the possibilities of adaptation within the framework of their historical and cultural conceptualisations of land and their specific imaginations of the future. With the dominant narratives about climate change, the negative effects of which are said to be of

long-term existential significance for the particularly vulnerable Kiribati, the question arose as to which direction to take in order to regain and maintain the ontological security that had long been common in this part of the Pacific region. The concept of direction helps us to understand the local notions of land and the future as spatial and temporal modalities of orientation, which can be discerned in I-Kiribati discourses on adaptation to the consequences of climate change. We also include in our perspective the directions of hope as part of the political practice of both grassroots I-Kiribati and the political elites of the atoll state. Here, the ability to set priorities with regard to adaptation and migration forms the basis of a politics of hope that claims to outline the directions in relation to land and the future. It becomes apparent that local views, practices, and policies regarding adaptation as a form of making the links between land and people resilient and, thus, sustainable diverge, in that both continuities and breaks are promised. The question of migration plays a central role in this discursive field of divergent horizons of hope.

A genealogy of projects on *in situ* adaptation in Kiribati makes it clear how much successive governments depended on the political preparatory work of their predecessors. Under the current Maamau government, as under the previous governments, the preservation of drinking water reserves and food security as well as the fortification, consolidation, and development of land are aimed at adapting to the future impacts of climate change. The politics of hope shows its continuity above all in the political will of both the Tong and the Maamau governments to guarantee the continuity of land, people, and the future as the spatial and temporal foundation of ontological security for the local population. Dissonance and divergence arise in terms of long-term perspectives when the current government contrasts its vision of resilience, integrity, and continuity of land and people with the previous political discourse of loss, rupture, displacement, and migration from the Tong era. Thus, the cultural conception of land and imaginations of the future contribute to that current politics of hope, which de-emphasises migration and diaspora especially as a means of adaptation to climate change and, instead, reclaims land, belonging, and the future in Kiribati.

The majority of local discourses on adaptation and migration also point in a direction that locates land, community, and the future in Kiribati. The unbroken will of many I-Kiribati to remain in the country and their willingness to actively support adaptation measures are closely related to the cultural conviction that the land and its people have always been blessed with a future. And even when a minority of I-Kiribati associate the purchase of land in Fiji with migration, indigenous preferences towards collective relocation, national refuge, and attributions of a forward-looking politics of hope to policy makers suggest that these imaginations are guided by cultural notions of land and the future.

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14

Climate-induced migration in Lotofaga village in Samoa

Ximena Flores-Palacios

Climate-induced migration has received increasing attention in both research and policy. However, the voices of people affected by climate change are in most cases neglected. People's voices and perspectives are important, not only because affected people should have a right to be listened to and to participate in decision-making, but also because they have considerable knowledge (traditional and other), which must be taken into account and which can provide valuable input to future initiatives.

This chapter explores people's experiences and understandings of climate change, including whether and how climate-related factors have influenced internal and international population movements in Lotofaga, a village located on the south coast of Upolu Island in Samoa. The main finding of the study is that even though climate change is affecting people's lives, families are demonstrating great strength and resilience. They are using a mix of traditional and Western modern technical knowledge, drawing on their family and village social support systems, utilising their customary land tenure entitlements, and using population movements to enhance their adaptive capacity.

1 Introduction

Environmental factors have always had an impact on migration flows; throughout history, people have left places with harsh or deteriorating conditions. However, the accelerated and combined impacts of climate change have become so serious that the scale of movement is increasing and has unprecedented impacts on people's lives and livelihoods (International Organization for Migration, 2016).

Over the past decades, human mobility associated with climate change and extreme weather events has been gaining increasing attention in academic and policy arenas. However, this relatively new topic presents challenges because the reasons people migrate are multi-faceted and so disentangling climate from other migration drivers is difficult.

Moreover, contemporary research on climate change has tended to give prominence to physical phenomena and technological interventions, and less attention to economic, social, and cultural implications. For instance, there is a paucity of literature on people's experiences of the effects of climate change on their lives, livelihoods, social systems, and decision-making processes that include population movements.

The knowledge and experience people bring to the debate is hardly considered either. Moreover, in the literature, Pacific peoples are represented as vulnerable, with limited recognition being given to their resilience in the face of external pressures and forces (McNamara & Gibson, 2009; Paton & Fairbairn-Dunlop, 2010). I therefore saw the need to explore Pacific people's explaining their experiences to add meaning to the many technical reports and political discourses on environmental migration.

Research on environmental migration that takes people's experiences into account is necessary to be able to design better policies and practices in order to address internal and international movements. Such research can also highlight lessons that need to be learned from existing government responses and local initiatives to reduce people's vulnerability, as well as help increase understanding of how human mobility might be used as part of adaptation strategies.

The aim of the research discussed in this chapter was to explore and understand how climate-related factors influence people's mobility patterns in Lotofaga, a village located on the south coast of Upolu Island in Samoa.

The research questions were:

- How do people perceive and manage the impacts of climate change?
- How have climate change impacts played a role in people's decisions to move internally and internationally?

Another aim was to inform policy design and practices related to climate-induced mobility, through recognising the unique natural and cultural assets of Samoan communities, their close ties to their customary land tenure systems, the role of

extended families as a mechanism for resilience, and the decision-making processes of local communities.

The chapter is organised into five sections. Following this introduction, Section 2 reviews the literature. Section 3 describes the methodological approach, which is underpinned by a Samoan perspective and a Western one. Section 4 presents the village study findings. Section 5 concludes by highlighting the necessity of working in collaboration with affected communities in order to ensure effective policy decisions.

2 Literature review

2.1 Migration associated with climate change

Climate-induced migration is a cross-cutting development issue that requires an interdisciplinary understanding. My standpoint for this study is that advancing discussions and developing a comprehensive theoretical framework and policy response requires reviewing these phenomena from a range of different knowledge systems.

Over the last decades, there has been a growing recognition that environmental and climate changes are important drivers of migration. However, understanding the linkages between climate change and population movements presents many challenges (Campbell, 2010). While environmental and climate change can exacerbate population movements, and while weather events very likely contribute to an increased level of mobility and changing migration patterns, disentangling climate change from other migration drivers is not easy. Usually, a complex combination of causes determines whether or not people move. Therefore, given the multiple causes of migration, it is not straightforward to draw a clear line between voluntary and forced movements (Hugo, 1996; Laczko & Pigué, 2014). Stephenson, Newman, and Mayhew (2010, p. 153) state that the reasons for which people migrate or seek refuge are multi-faceted, making it hard to forecast how climate change will affect the future of migration. However, climate change seems likely to become a major force for future population movements, probably mostly through internal displacement but also to some extent through international migration, particularly for small island states.

Dun and Gemenne (2008, p. 10) write that

aside from clear cases where sudden-onset environmental changes such as those resulting from tsunamis, earthquakes or floods lead to forced displacement, the problem is that environmental migration frequently presents itself where there is a slow-onset environmental change or degradation processes such as desertification or increasing sea level.

Views are that the complexity of current migration patterns and the challenges of isolating environmental factors from other migration drivers have inhibited the

development of robust theoretical frameworks (IOM, 2016). Burson (2010, p. v) argues that “while it might be tempting to characterize climate change [in the context of human mobility] as a new and self-standing phenomenon, it is more correct that it be seen as a set of interrelated factors affecting human security and development.” Therefore, migration is better characterised as having multiple causal factors, and climate change as an additional factor driving migration in an array of existing drivers.

2.2 Research on environmental migration in the Pacific Island countries and territories (PICTs)

Over the last decades there has been a growing interest in the relationship between climate change and population movements in the Pacific. The perception that large numbers of people may be forced to migrate because of the effects of climate change and sudden-onset weather events has fuelled interest in this topic, particularly the study of atoll countries (Bedford & Hugo, 2012; Connell, 2011; Hugo, 1996, 2008; see also Hermann & Kempf, this volume). Researchers from different disciplines have been working on conceptual and empirical studies of environmental migration, and also on policy frameworks (UNU-EHS & UNESCAP, 2015). Empirical research has found that environmental factors can play a role in migration (Barnett & O’Neill, 2012). In some cases, there might be a direct correlation, particularly between a sudden-onset event and displacement, while the relationship might be more indirect in cases of slow-onset events. In terms of migration as adaptation to climate change, the scholarly literature has examined a number of climatic stressors and locations, making it difficult to explain whether migration is a form of adaptation or an indicator of the limits to adaptation (Barnett & O’Neill, 2010). Although there have been remarkable efforts to address the topic of climate-induced migration in the Pacific region, theoretical frameworks and methodologies used across studies differ from one another, and they have not been linked to policy interventions. In most cases, theoretical and methodological underpinnings to climate-induced migration have been developed *ad hoc* to meet specific research needs. Additionally, in the Pacific, there is no reliable data on population movements, and limited information on the projected effects of climate change regarding how much and whether such effects will reduce land, livelihood, and habitat security to the point of inducing or forcing mobility (Campbell & Bedford, 2014).

Research on environmental migration in PICTs presents additional gaps. Climate change discussions have largely been the domain of scientists, academics, politicians, and development practitioners. The voices of the people directly exposed to climate change have, in most cases, been neglected (Paton & Fairbairn-Dunlop, 2010). There is an urgent need to emphasise the human face of climate change and population movements.

There is also a need to consider the largely unexplored application of indigenous theoretical and methodological frameworks in the area of environmental migration. Many scholars in various parts of the world have questioned the uncontextualised application of approaches and methodological frameworks originated in Western countries to different regions of the world (Battiste, 2000; Chilisa, 2012; Smith, 1999). Pacific researchers are calling for more authentic and grounded research practices that promote the capacity of Pacific people not only to theorise their own lives, but also to reconnect with past and future generations (Ana'e, Coxon, Mara, Wendt-Samu, & Finau, 2001; Gegeo & Watson-Gegeo, 2001; Nabobo-Baba, 2008; Thaman, 2007).

While Western research and practice dominate climate change debates, traditional knowledge, values, and beliefs are essential elements of navigating the way forward for affected communities. Therefore, this study is underpinned by both a Samoan perspective and a Western one.

3 Methodological approach

3.1 Country selection

Climate change is a challenge for all PICTs. However, I saw the importance of carrying out an in-depth study in a single country. I decided to make Samoa my study focus because while more research has been conducted in highly vulnerable atoll territories, there has been little empirical research on the influences of climate change on middle-sized Pacific nations such as Samoa. The Samoan context offered the opportunity to isolate the research topic from other external factors. The country presents political stability, steady economic growth, and good social development (Government of Samoa, 2014).

Samoa has a total land area of 2,830 km², and the estimated population in 2016 was 195,979. 20% of the population live in Apia, the capital, and 80% live in rural areas, in small villages dotted mainly around the coastlines of the larger islands of Upolu and Savai'i. Between 70 and 80% of the population live beside or within a kilometre of the coast, and approximately 70% of the infrastructure is located in low-lying coastal areas (Samoa Bureau of Statistics, 2016).

3.2 Lotofaga – Particularities of the village case study

While climate change affects all the coastal villages in Samoa, it was necessary to explore and understand patterns and dynamics of population movements (internal and international) associated with climate change in one selected village. Two criteria were established to select the village study: (i) The location should be a rural village with lowland coastal areas and sites ranked highly vulnerable to extreme weather events and adverse impacts of climate change; and (ii) it should show evi-

dence of internal movements and migration to New Zealand associated in some way with climate change. After analysing various options, I selected the village of Lotofaga on the south coast of Upolu (see Figure 1).

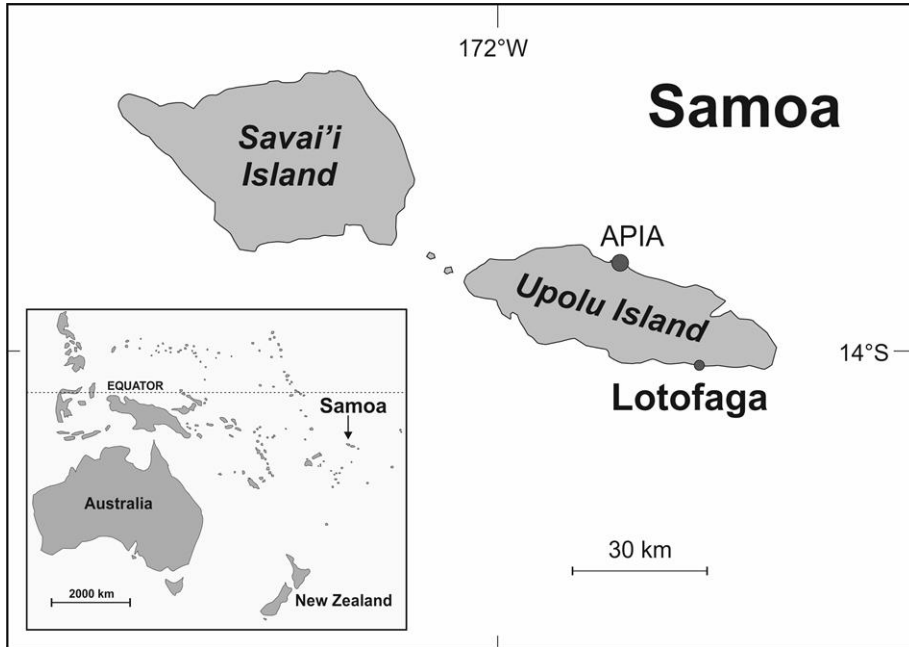


Figure 1: Geographical location of Lotofaga in Samoa. Map: Patrick D. Nunn.

Socio-economic aspects

The village of Lotofaga has a population of almost 1,000, which has been decreasing because of significant levels of out-migration (Samoa Bureau of Statistics, 2016). Three patterns of mobility have been identified in Lotofaga, namely movements inland within the village, migration to Apia, the capital, and migration abroad (mainly to New Zealand). Furthermore, displacement has occurred after sudden-onset weather events.

As in many rural areas, people are engaged in semi-subsistence activities, a combination of farming, keeping livestock, fishing, and using other natural resources. With respect to village livelihoods, all families have plantations and vegetable gardens. Almost all households raise poultry and pigs, and a small percentage own cattle (Samoa Bureau of Statistics, 2011). Traditional coping mechanisms in times of hardship include customary safety nets, where remittances undoubtedly play a key role, and migration to diversify family income.

Life in the village is largely guided by *fa'a Samoa*, the Samoan way of life, that has remained strong, despite long exposure to Western influences. *Fa'a Samoa* sets

the cultural, social, and economic guiding principles for life within Samoan society. It provides the ideological platform of relationships between God, family systems, and natural resources endowment 'for the use of those to come'. Thus, *fa'a Samoa* revolves around the *'aiga*, (extended family), *nu'u* (village), and *lotu* (church) (Fairbairn-Dunlop, 1991; Lay, Tamua, Murrow, & Meleisea, 2000; Meleisea, 1987; Va'a, 2007).

The importance of land

Customary land is fundamental to Samoan society and its value cannot be assessed only in economic terms because of its symbolic and cultural significance. Land and sea are the major resources in every Samoan village as the source of food security and livelihoods. Less well documented is that the family land represents identity, belonging, family history, culture, community, family prestige, and pride even for migrant communities where names and titles signify location and identity (Fairbairn-Dunlop, 2000). All family members have entitlement to family lands; however, customary land cannot be sold, but is passed from generation to generation.

Land in Lotofaga is held in accordance with Samoan custom and usage. The customary land tenure is held under the stewardship of the family *matai* (chief), who has the duty of ensuring that family members have equitable access to land so as to meet their basic needs. As regards sea resources, Samoa has a system of property rights on reef and lagoon areas. This system is characterised by legal ownership by the state, combined with customary ownership of fishing rights by community village groups (Fairbairn-Dunlop, 1991).

The relationships that people have with their land, sea, and the environment, and the spirituality that binds them together, are the basis for the wellbeing and resilience of people in Lotofaga and their culture. This holistic approach to life and the complex yet harmonious relationships have sustained people's way of life over generations.

In earlier times, Lotofaga followed a common configuration and land use pattern of a Samoan coastal village, with its main coastline settlement around the *malae* (meeting place) with a belt of inland coconut and other plantations. The village *malae* for the *fono o matai* (chief council) is still at the coastal site. However, over the last three decades much of the village settlement has extended into the hills largely as a result of the introduction of cash cropping, supported in turn by government economic development schemes, which have promoted projects to build roads inland to the plantations, and, more recently, responses to climate change and sudden-onset weather events.

Vulnerability to climate change and extreme events

Lotofaga, like many rural villages in Samoa, is particularly vulnerable to the effects of climate change and extreme weather events because of its coastal location and families' reliance on natural resource-based livelihoods. Impacts range from sea-level rise, inundation, and coastal erosion, to more frequent and intense tropical storms, and higher temperatures. The adverse impacts of climate change and disasters are a continuing threat to social and economic development, and future projections indicate that these impacts will get worse (Ministry of Natural Resources and Environment of Samoa, 2005, 2017).

The coastal area of Lotofaga has been classified as a Coastal Erosion Hazard Zone (CEHZ) and a Coastal Flood Hazard Zone (CFHZ). The government has made concrete recommendations to relocate village assets outside CEHZ and CFHZ when buildings require replacement, or to ensure investment within the hazard zones to prevent and mitigate damage from coastal erosion and flooding. Other recommendations include continuing to plant trees and other vegetation in coastal areas, and identifying alternative sources of sand for domestic use, since the practice of removing sand from coastal areas has contributed to coastal erosion. Furthermore, Lotofaga could be threatened by inappropriate land use practices such as deforestation, cattle farming, and agriculture. These activities have increased the rate of inland erosion and the supply of silt to the coast (MNRE, 2007).

Notably, the village does not have a comprehensive development plan. Implemented initiatives are, in general, stand-alone projects or *ad hoc* initiatives not connected to one another, and the majority of them are donor-oriented.

3.3 Research design

For this study, I developed a culturally sensitive research design that combined two worldviews and knowledge systems – Western and Samoan. While it was necessary to combine different knowledge systems, the voices of the participants were at the centre of the research design.

As discussed in this study, the extremely challenging task of disentangling climate change from other migration drivers reinforces the need to contextualise and understand migration drivers from the point of view of the people in their own social and geographical contexts. The use of a research design that combined three complementary approaches – exploratory, qualitative, and interdisciplinary – opened up many new and previously under researched areas for study. The exploratory approach enabled an understanding of the multi-faceted interactions between climate change and population movements on a small scale. The qualitative approach allowed me to listen to the people's voices and to understand that the individuals' and families' holistic wellbeing is rooted in worldviews, values, beliefs, knowledge, and experiences. Mobility within this context has to be understood in a

holistic way as it involves extended families, those living in the villages, and those who have moved to Apia and abroad. The interdisciplinary approach, grounded in Samoan worldviews, drew on both the voices of people affected by climate change and forced to move and selected insights of modern technical knowledge. Both sources of knowledge were integrated to create an interdisciplinary understanding. Although this new understanding is limited in time, and to a particular context, it was used as a lens to identify critical issues at the national level.

3.4 Data collection

Information for this study was collected between 2012 and 2014 in Samoa and New Zealand. Two types of research methods were considered.

First, I used Western methods, namely semi-structured interviews and a comprehensive document review to contextualise the research. Twelve key informants were interviewed in Samoa and New Zealand. Participants were selected purposively, in view of their knowledge of and expertise in climate change and population movements. Seven interviews took place in Samoa and five in Auckland. Respondents in Samoa included local leaders, government staff, and representatives from international organisations and research centres. In Auckland, respondents included representatives of New Zealand governmental and non-governmental organisations, and Samoan leaders in New Zealand. The comprehensive document review, covering a 30-year period (1985–2015), was an on-going process that included collecting published and unpublished records.

Second, the conversational Pacific method called *talanoa* was employed to interview people affected by climate change. Although the study was family- and village-based, it was necessary also to include the extended Lotofaga community, namely family members who have migrated to Apia and Auckland. Twenty-nine *talanoa* were conducted with groups and individuals. Participants were villagers and migrants living in Apia and Auckland. With *talanoa* it was possible to capture the essence of the holistic Samoan worldviews, intrinsically attached to ancestral lands. Using *talanoa* meant that conversations with the participants were more meaningful when Samoan protocols were followed and when Samoan language was used. In Lotofaga, individual and group *talanoa* were conducted in the Samoan language, with the support of two research assistants.

When using *talanoa*, an open technique can be used. In some cases, the precise nature of questions is not determined in advance. In other instances, guiding questions can be helpful. The researcher's decision will depend on the way in which the *talanoa* develops (Vaiotele, 2006). For the purpose of this study, I prepared a number of guiding questions and a list of topics to be covered during the *talanoa* with participants in Samoa and Auckland, bearing in mind that there was room for flexibility and inclusion of new issues.

3.5 Data analysis

All semi-structured interviews and *talanoa* were audio-recorded, transcribed, and translated. After that, a thematic analysis was used as a method for identifying, analysing, and reporting patterns (themes) within the data.

Understanding the theoretical underpinnings of the research is a crucial stage before starting any thematic analysis involving Pacific data collection. As Farrelly and Nabobo-Baba (2012, p. 4) write:

If we want to understand our participants' hopes and struggles, we need to holistically contextualise the words they share with us as we move with them through the course of their daily lives. But this movement is not only physical. When our participants talk, they carry us on a cognitive journey, imaginatively moving us from past to present to future so that we can better understand how they live and feel their world.

In the data analysis phase, the integrity and validity of the data was ensured through discussions with the research assistants, the village High Chief, and key informants. It was a sort of triangulation where I asked for clarification of relevant concepts, metaphors, and descriptions that allowed me to understand the profound meaning of the narratives and its nuances. I had plenty of three-way discussions aimed at ensuring that the voices of participants were heard and truly reflected in the research findings.

The same considerations were taken when analysing the semi-structured interviews with key informants. In addition, secondary data collected in parallel with the village study was used to contextualise the participants' voices.

In this study, the integration of different knowledge layers was undertaken by evaluating ways in which the collected materials were in agreement or conflict. The purpose was to discover or identify common ground concepts, theory, or assumptions through which the insights might be reconciled. The interdisciplinary approach provided a means for understanding various sources of information, while situating the village in the broader Samoan context. With this understanding and contextualization, two primary implications of the research design emerged. First, the approach validated the importance of traditional knowledge as expressed by participants in the village study. Second, the secondary information and results of the interviews with key informants reinforced the village-level study.

Interdisciplinary understanding means that eventually a new knowledge is generated, and new methods may become available to different knowledge cultures. In this study, an understanding of the environmental migration dynamics in Lotofaga has been generated.

4 Findings

4.1 Climate change understandings

While familiar with the term, people in Lotofaga have different understandings of what climate change means for them and of how the technical information about climate change they receive can apply to their daily lives. Furthermore, the memories of disasters, such as the 2009 tsunami and the 2012 cyclone, were woven into and influenced participants' perceptions of climate change. The 2009 tsunami destroyed large stretches of the south and southeast coasts of Upolu, including villages neighbouring Lotofaga.

Although the technical underpinnings of the term 'climate change' might be unclear, participants were aware of the changes in their environment, and the effects these have had on their lives and livelihoods. A number of participants associated climate change with changes in temperature and precipitation: noting that weather patterns have become unpredictable and extreme all year round.

One interesting finding was the number of participants who framed their responses in terms of issues of climate justice and political concerns. They emphasised that climate change is caused elsewhere, and vulnerable areas like Lotofaga are disproportionately affected. A key informant said:

It's quite unfair to start talking about climate change, how you adapt to climate change or how much contribution you have to make towards a global responsibility, when we have contributed negligibly or even nothing to the problem. (Key informant who lives in Apia)

A woman who lives in Auckland was more constructive when she said that climate change is a common responsibility:

Climate change is about all the happenings and the challenges surrounding people's lives. It needs demonstration of leadership, policies to be set at national, regional and global levels to benefit people. (Female matai in her 60s who lives in Auckland)

4.2 Impacts of climate change and extreme weather events

Participants showed great awareness of larger scale impacts of changes as seen in the following examples:

I know there are lots of changes nowadays... cyclones are happening more these days in our lifetime, but in the old days there was never any, or rarely any, occurrences in Samoa. (Woman villager in her 50s)

The change of the weather is huge. Cyclones... I think when I was young I never saw anything like that... I can also see the sea level rise. If you go there, you can see the difference [between] when you were young and now. When you go back there is a big difference, like you've seen before on the coast. (Male matai in his 50s who lives in Auckland)

In terms of climate change, because I go back frequently, and I visit Lotofaga, I see a lot more erosion... sea erosion of the beaches and the shores; there's a lot more of that. When I was young, the beach was much further into the lagoon; now it's much further inland. Our family land, as part of the lower part of Lotofaga, has been eroded gradually. (Male matai in his 60s who lives in Auckland)

Regarding changes in marine and terrestrial environments, most participants' comments about changes in the marine environment resulting from climate change and disasters focused on the decline of and changes in fish species in reefs and the lagoon, coral bleaching, sea-level rise, high waves, and changes in the currents. A number of people noted that today there are fewer fish and far fewer shellfish, and that fishing is more difficult. For instance:

These days, almost no fish. If there are any, you get small ones, not like in the past, when the fish were big. I also noted that after the tsunami our coral is bleaching rapidly. (Woman villager in her 60s)

Less was said about the impact of climate change on terrestrial ecosystems. Lotofaga's natural forests are highly vulnerable to climate change and also to unsustainable land use practices. A key informant, representing an NGO in Samoa explained these issues:

In Samoa, climate change is affecting our forests. There are forest fires as result of droughts. There's clear interference in the normal cycles of rainfall patterns. Then, the cyclones have caused serious damages in our forests. (Key informant in Samoa)

Participants also highlighted the impacts of climate change and disasters on their quality of life. All participants saw a direct link between changing weather patterns, water availability, and health and disease. Some examples:

There are lots of diseases within our country because of the changes in the weather, rapid changes... it's hot. These days, lots of diseases have arisen due to the differences in the weather. (Woman villager in her 40s)

The change of climate these days is huge. Have you seen our children's bodies? Lots are suffering from different types of diseases. Lots of diseases have arisen from the dirt, because of the change we see now. When the sun beats down hard, you burn. When it's fiercely hot, it's similar to the red-hot heat of a fire. That's how I know there are huge changes. (Woman villager in her 50s)

It was also said that high temperatures affected work and productivity:

The weather has put some people down; they feel tired; they feel sick sometimes. That's why people stay in their houses; nobody likes to go to [work] the maumaga [taro-patch] because they feel... it's like burning inside. Before you worked hard, but now only small things [make] you feel tired. (Man villager in his 50s)

I'm tired because of the weather. It's really hot these days for me. As a consequence of the hot weather, there is an increase in diseases. Our bodies feel weak; we don't know who will do the [work] when weakness and laziness set upon us, when you can't be bothered because of the rapid changes in weather. (Woman villager in her 50s)

These reflections on the linkages between variable weather patterns and human health are in line with external documentary evidence. According to the World Health Organization (WHO) (2015), human health is already affected by both climate variability and climate change, and the overall impact for most populations is negative. The impacts are expected to grow as climate change continues, exacerbating existing threats and undermining progress in development and health.

Participants also mentioned the impacts of climate change on food security. Discussions confirmed my observations that families in Lotofaga produce a range of agricultural, livestock, and marine goods for food. Participants said that most families achieve food security through a combination of factors of food availability and accessibility, cash income (informal sales), and support from family members living in Apia and abroad. Few families face periods of food insecurity derived from the lack of labour force or low income. However, for all families, climate change and natural hazards represent a threat to food security because their primary livelihoods, such as semi-subsistence agriculture and fishing, are sensitive to climate-related impacts.

Another important finding is that climate change has differentiated effects and thus tends to exacerbate differences among groups. While most families in Lotofaga appeared to be resilient to the impacts of climate change, a group of vulnerable families is emerging because of labour shortages, poor access to remittances, and insufficient support. Families and groups with limited access to resources and support systems have fewer adaptation options, are more vulnerable to the impacts of climate change, and are less able to use mobility as an adaptive mechanism. However, I propose that these families cannot be classified as “trapped populations” (Warner et al., 2012), because the *fa'a Samoa*, extended families, and village support system play a major role in buffering socio-economic and environmental risks with practices of solidarity and obligations.

For most families, the injection of remittances usually helped address some basic needs and also enabled families to generate further livelihood options such as purchasing livestock, agricultural inputs, and fishing equipment. Clearly migration and, in turn, migrant remittances now play a key role in diversifying families' income generation, enabling them to meet their needs, contribute to the church, fulfil the cultural obligation of *fa'alavelave* (family assistance in the form of labour or goods), and adapt to climate change.

Gender-differentiated impacts resulting from gender inequalities that limit access to information and resources for women deserve further research as well as climate change impacts on youth, elders, and other vulnerable groups.

4.3 Traditional knowledge and community resilience

Traditional knowledge is a major factor in families' resilience in dealing with climate change, all the while adapting to changing times and conditions. An overwhelming finding was that, as in the past, villagers, and particularly elders, draw on centuries of traditional knowledge and oral history, as a base from which they observe, monitor changes, make predictions, and act accordingly. The knowledge and practices are generated, stored, accumulated, and shared among *'aiga* family members who live in the village, in urban Apia, and abroad. Elders are especially well respected for their knowledge and wisdom.

The Samoan seasonal calendar is still used as a valuable early-warning system, particularly in the case of extreme events (Lefale, 2003). Traditional knowledge associated with climate change and disasters is applied in different facets of life, such as farming, fishing practices, forestry, housing, and traditional social support systems. For instance, semi-subsistence livelihood activities have been adapted to the natural variability of the climate and other external shocks. A number of safety mechanisms established for sustainable agriculture are evident, such as the production of surpluses, crop diversification, produce storage, and control of food consumption. As in the past, these methods have enabled families to mitigate the risks and effects of climate variability and to ensure food security.

In fishing, traditional practices have been implemented, such as limiting access to certain areas, establishing no-catch zones, and enacting species-specific prohibition during certain seasons. These practices not only contribute to sustainable resource management and ecosystem protection; they also help guarantee food reserves in times of necessity. In forestry, traditional practices are still in use, and are valued not only for their part in the conservation of natural resources, but also in activities associated with cultural identity. People know the ecological, economic, and socio-cultural significance of different plants used for food, fuel, medicine, clothing, ornaments, and ceremonies (UNESCO, 2013).

Another area of knowledge found in this study relates to traditional housing. While Western-style home construction has been gradually replacing the traditional *fale* in Lotofaga, some families are keenly aware of the importance of preserving their traditional architectural knowledge to mitigate the impacts of climate change and extreme events. The *fale* is an example of a disaster-resilient house, as its open structure allows strong winds to pass straight through, and the complex system of lashing offers flexible movement and strength to confront the changing winds (Wilson, 2014).

Some elders raised concerns about the erosion of traditional knowledge among the younger generation, especially as a result of an increase in the cash economy, changes in consumption, migration, and the lack of recognition of traditional knowledge in formal education (Fa'asau, 2011). In their view, these influences have made village youth less resilient. This finding is consistent with other research that indicates that erosion of traditional knowledge and skills may increase vulnerability

and risk for younger generations (Nakashima, Galloway McLean, Thulstrup, Ramos Castillo, & Rubis, 2012).

4.4 Climate change adaptation

One of the main findings of this research is that although climate change and extreme weather events affect people's lives, families in Lotofaga demonstrate great strength and resilience in ameliorating the impacts of climate-related events. Over generations, families have adopted different strategies to respond to climate variability and disasters. Today, they are using a mix of traditional and Western modern technical knowledge, drawing on their family and village social support systems, using their customary land tenure entitlements, and using population movements to enhance their adaptive capacity.

There is evidence that families' traditional knowledge, values, and beliefs continue to guide their interactions with their land, sea, and natural resources and that their responses to climate change are framed around the *fa'a Samoa*.

Participants showed great pride, as seen in the following comment:

We have learnt to adapt for generations. People in Samoa can actually survive so well with very limited resources because that's their nature, that's how they live. This may be limited in the concept of how Westerners see it but it's rich. There are rich resources in the rivers, in the sea, in the land, and the people have lived very happily. And a lot of the practices they have actually adapted to, [like] issues of climate change, when they conserve their mangroves, when they harvest their marine resources or even harvest agricultural produce and some of their crops. Actually, crops are a measure of adaptation. (Key informant in Samoa)

Today, families not only rely on their traditional knowledge to adapt to climate change, but also have some access to modern technical information, mainly from climate change adaptation projects and disaster risk reduction initiatives.

Moreover, in order to respond to the impacts of climate change and disasters, families rely on their village organisations such as the *fono o matai*, the *women's komiti* (women's committees), and the churches because they can contribute to disseminating information on climate change and disaster preparedness among villagers and, most importantly, they can help in aid coordination.

In our community, there's a whole range [of organisations] and we have our men, our fono, and a women's group, like the committee and even the church. The women have their own group and the younger generation also help, the boys who are not the chiefs yet. (Male matai in his 70s who lives in Lotofaga)

The endurance of the customary land tenure system provides the platform for families' responses to the impacts of climate change and disasters. Whilst the use of this resource – customary land – is feasible in Lotofaga, it would likely be differ-

ent in other contexts. In any case, the importance of customary land as a buffer against climate change cannot be underestimated.

With regard to remittances, even if migrants do not directly experience the impacts of climate change, they support extended families after disasters, and in times of water scarcity, drought, and other events associated with climate change. Participants in Apia provide immediate support, which is easier considering that the village is not far from the capital. In the case of family members living in Auckland, participants send remittances, organise fundraising events, and even travel back to Lotofaga to help in the reconstruction of houses and village infrastructure, and to contribute to the recovery of crops and plantations.

Although families in Lotofaga have relied on remittances to recover from the effects of climate change and disasters, the costs of adaptation to climate in the village and the costs of migration may increase financial pressure on migrants already settled in both Apia and New Zealand. Therefore, the reliance on remittances to finance climate change adaptation initiatives in the village might be uncertain in the future.

4.5 Human mobility as an adaptation strategy

Another major finding of this research is that climate-related factors have become prominent in discussions about mobility. While economic, social, and cultural drivers, such as the desire for more land for cash cropping or the benefits of education and employment associated with moving to Apia or overseas are undeniably the priority concern, climate change impacts are factored in and have a place in family decision-making.

Identifying and defining different types of human mobility associated with climate change is not an easy task because there are several overlapping concepts, terms, and categories (Ferris, 2015). The findings of this study are in agreement with Hugo (1996), who proposed that mobility in the context of climate change must be examined along a continuum, ranging from totally voluntary migration to totally forced migration. Very few decisions are entirely forced or voluntary, as seen in the case of Lotofaga. Mobility has not occurred in the extremes, but along a continuum, and it has been linked to the extent of slow- and rapid-onset events related to climate change.

The Lotofaga village study showed that mobility is not a new phenomenon; people have always moved internally and abroad (Macpherson & Macpherson, 2009). However, population movements now play an integral part of people's adaptation strategies to climate change, as seen in cases of displacement and relocation from coastal areas to inland customary lands or temporary and permanent migration to Apia. Further, overseas migration is becoming more prominent. Families might be engaged in all or some of these types of movement at any point in time. The circular movement is present within each of the patterns of mobility – a coming and going both actual and in the mind.

In the case of Lotofaga, the movements inland have responded not only to improvements in infrastructure and expansion of agriculture, but also to climate-related factors – slow- and sudden-onset events – which have influenced people’s decisions to move inland to their customary lands. Some participants said they had moved voluntarily to higher ground after assessing the risks associated with living in the coastal areas. Other participants said they had been temporarily displaced and had sought refuge on higher ground within their customary lands.

One participant explained the process of relocation inland with these words:

A lot of new inland roads have been built in the country. And this is something that is necessary in terms of reacting to what is happening on the coastline. The most dangerous things, and the most concerning for us, are sea-level rise and natural disasters. Many villages have been actually moving where the road has been placed and people move inland where the road is. (Woman participant in her 50s who lives in Apia)

Two participants, who are now living in Apia, reflected on how sea-level rise had been a consideration in their own family patterns of movement:

Our family have land [in the coastal area], and my great-grandparents used to live on the beach before they moved [inland]. They moved even when my father was young, and he is about 60 plus now. It was a sort of relocation inland. If you've been to Lotofaga you can see that the sea has moved inland a bit more. It's slowly coming in. I remember when I was younger we used to have a wider beach from where our land is, but now our land is here and the sea is right about there [showing how the beach has shrunk]. So, I think it's been affected by climate change. We don't have any sea walls or anything to prevent the erosion of the sand, so in the next ten years it will be very different. We'll keep moving inland. (Woman in her 40s who lives in Apia)

There have been internal movements, maybe because of climate change. Thirty, forty years ago, Lotofaga had a beautiful beach, a long, wide, sandy beach. It used to be the most beautiful village. As I'm recalling the olden days, ten, fifteen years ago, maybe more, the malae [central gathering place of the village] was close to the beach, close to the High Chief's residencies. It was a nice village. Climate change can be a reason for movements, with strong waves and high tides that hit the village. The village is different now; no more houses in the coastal area; people have moved inland. (Man in his 60s who lives in Apia)

In a similar vein, a male participant who lives in Auckland noted:

When we go back to the 1940s and 1950s, part of our family was mostly down in the lower part of the village. Then they moved up to high land. Now they are safe. The beach was much wider, out into the lagoon. Now it seems it's gone. You can tell that the sea has moved inland; it's much closer now than it was before. (Man in his 60s who lives in Auckland)

Voluntary relocation is likely to continue in the future, and this is mainly associated with climate-related problems. A common view is that population movements inland are inevitable because they are triggered by climate change and disasters.

In the case of Lotofaga, the relocation inland cannot be considered 'planned relocation'. Instead, I see this as a voluntary process that has also been induced by public policies. Even though families have voluntarily decided to move inland, a process that started at least three decades ago, the government has also been encouraging relocation to higher grounds. For instance, the Coastal Infrastructure Management Plan (CIM Plan) for Lotofaga identified coastal erosion and flash flooding along the river as the main factors that have pushed families to relocate inland. The CIM Plan recommended continuing to relocate houses beyond the coastal area (MNRE, 2007).

Regarding migration to urban areas, the main finding was that although climate change and disasters were not yet considered to be a significant driver of migration to the capital Apia, the externalities of climate change might become push factors for both temporary and permanent movements. Families' livelihoods have been affected by cyclones, flash floods, high rainfall, high temperatures, and dry periods. The effects on agriculture, for instance, are linked to the loss of quality and quantity of production. Moreover, unstable and inconsistent food production caused by climate variability has affected farmers' capacity for self-sufficiency and also their capacity to generate income from their crops.

An issue that has emerged from the study is the migration of young people to Apia. In Samoa, youngsters are increasingly abandoning agriculture and rural areas in search of better livelihoods in urban areas. Findings suggest that climate change and disasters will increasingly become push factors in the move to the capital in search of protection, food, and shelter. The extent of any climatic event will determine the duration and the type of migration.

A young male villager referred to the challenges of agricultural adaptation to climate change. He said that he was forced to move to Apia when food security became an issue:

I work in Apia for short periods of time. Farming is not very good now [in Lotofaga], so [there's] not enough food. The plan, so far, is for me to live back here [in Lotofaga], and go to Apia for work and then come back. (Male villager in his 30s)

Other participants associated the move to Apia with fear and also a loss of land as a result of slow- and sudden-onset events:

Sea-level rise and coastal erosion are affecting us. Families cannot cultivate their crops because of these problems. That's why people want to live in Apia. (Woman villager in her 60s)

There are lots of families that have gone to Apia. They've gone to look for land to live on in Apia because they are very frightened about staying here. As time passes, and if it [an

extreme event] suddenly happens again they would be extremely frightened. So, they've all gone away. (Woman villager in her 40s)

Although the majority of the Auckland-based participants said climate change had not been their main reason for migrating overseas, they agreed that this is an issue that is starting to be considered as a cause of migration. A female participant living in Apia noted some links between climate change and overseas migration:

People have migrated overseas, mainly to New Zealand and Australia. It might not be to do with climate change but it's a lot to do with economics. But economics rests on the environment and natural resources. And if people find that their natural resources are not supplying them adequately for the church needs and for their cultural needs, and for family needs, that might be one reason why they move. (Woman in her 50s who lives in Apia)

Interestingly, some participants saw a closer association between migration and the effects of disasters as seen in these comments:

What worries us are the disasters... some people have gone to New Zealand with their children; they've gone because they no longer want to stay in Samoa. (Woman villager in her 20s)

Some people are lucky with the [New Zealand migration] quotas; they can go to New Zealand... Some people say that it's hard to work on plantations; they don't get any money from that. And then disasters hit the country, so people decide to have a new life. Some [people] move to New Zealand to make a better living. (Woman villager in her 30s)

As seen in the previous comments, climate change and disasters are increasingly being considered in discussions about migration abroad. However, in the short term, migration overseas is, and will continue to be, conditioned by different natural and financial barriers as well as immigration regulations, quotas, and other factors that set limits on the number of people entering a country. If migration opportunities arise, it is likely that there will be significant increases in out-migration. Presently, people who can cross borders may be relatively well off, compared with those who do not have the means to move overseas, especially young people (individuals and families) for whom migration overseas is an option.

Although a number of people may want to move to Apia or overseas, others want to stay in Lotofaga, particularly the elders. A common sentiment among elder participants was their desire to stay in their village and country, regardless of climate-associated problems. They said that they are prepared for future changes, adding that they have been adapting to environmental changes for generations.

Clearly, it is difficult for people of Lotofaga, especially the elderly, to imagine leaving or abandoning their family lands because of climate change. Participants associated their land with culture, identity, and traditions (see also Farbotko, this volume). The sense of belonging is so strong that it embraces the extended Lotofaga community, those who live in the village and those widespread communities

in Apia and abroad. For all of them, the village represents home. Responses here were so strongly put that they are listed in full:

Climate change? No. We will never go away from Lotofaga for that reason. We never think about it; we never have a second thought whatsoever about moving away. We were born and raised in Lotofaga. So why should we leave if we have a beautiful place? We are so lucky. We love each other; we help each other; that is what [it is] all about. That is what the fa'a Samoa is all about, respecting one another. That's right from the top, from the matai of the 'aiga to the younger generation, to the youngest person of our family; we help each other. (Male matai in his 70s who lives in Lotofaga)

Nothing [referring to climate change and disasters], even the tsunami, the cyclones that came two or three times, changed our minds to run away to Apia or abroad. The only reason why our people went abroad is to help their families, and to create whatever they want. (Woman villager in her 60s)

Cyclones hit the country and even worse events. There was a tsunami in Samoa but you've seen Lotofaga now. We have a bit of higher land away from the sea, where we can evacuate [to]. We'll go and settle there. Because of the tsunami we lost our house, and my dad's house. But that doesn't make us leave, because I am Samoan; it [the land] is so precious to me. (Woman in her 60s who lives in Apia)

As mentioned previously, migration prospects appeared to be more uncertain for the youth. They need viable prospects, such as work opportunities, to remain in the village, otherwise, migration to Apia or abroad is considered one of the best options. Apart from the economic benefits, migration overseas entails a social and cultural element of prestige, and it can be linked with the desire of many men to acquire *matai* titles; the money earned overseas may contribute to acquiring a title in Samoa.

Interestingly and overarching all, Lotofaga people stressed very compellingly that no matter how far they go or for how long, their village is their home, their place of identity and belonging. This finding aligns with Lilomaiava-Doktor's (2009) use of the Samoan concept of *malaga* (short-term movements or circular mobility) to explain people's *vā* or relationship with the land. Connectedness to land is so strong that migration does not signal a severance of ties or being uprooted but "in the eyes of those involved," migration is a continual "going back and forth". People's mobility has a profound impact on the extended family (*'aiga*) as a whole because mobility is not only an individual affair but also a family effort.

5 Conclusions

As in the rest of the country, climate change in Lotofaga is increasingly seen as an urgent issue affecting all aspects of people's lives from families' livelihood security through to health, traditional knowledge, social structures, and culture. Further-

more, sudden-onset events, such as cyclones, storm surges, and floods, and slow-onset events associated with climate change, such as sea-level rise, affect terrestrial and marine ecosystems, infrastructure, and water supply.

Lotofaga participants highlighted responses to climate change as largely family-based, as opposed to individual, and also the extreme resilience of families. For instance, participants emphasised their capacity to anticipate climatic events, absorb external changes and stresses, and recover from the effects of climate change and disasters without compromising their long-term prospects. It is clear that resilience in Lotofaga cannot be seen as a fixed end state, but rather as a dynamic set of conditions and processes.

Furthermore, this group of families, far from regarding the impacts of climate change in a fatalistic way, has continuously sought solutions aimed at adapting to changing environmental conditions. Moreover, they have applied holistic solutions to increase their family and community resilience to a wide range of challenges. In times of distress, people prioritise not only their own safety and needs, but also their *'aiga's* and the village's wellbeing.

Lotofaga families use a mix of at least four strategies to develop resilience to climate change. First, people engage in internally driven responses by using their traditional knowledge and combining it with modern technical information. Second, they draw on and nurture strong family and village social support systems. Third, they utilise their customary land tenure entitlements. Fourth, they use population movements. Notably, not all the families had access to all of these strategies; therefore, vulnerability factors need to be further researched.

Regarding environmental migration, climate change and disasters are drivers of population movements in Lotofaga as in the rest of the coastal villages in Samoa, and this trend is likely to continue in the medium and longer term. Indeed, research findings indicate that climate-related impacts are affecting and will continue to affect mobility in different ways. Even though I have used conventional typologies to explain climate-induced mobility – i.e. displacement, relocation, and migration to urban areas and abroad – I have taken into account the cultural underpinnings of these movements. In Lotofaga, mobility has usually been induced by a wide variety of drivers, amongst which climate-related factors now play an increasingly important role. Even so, factors cannot be isolated from their socio-economic and cultural context. Climate-induced mobility must be studied in an interdisciplinary way and, as the findings confirm, environmental migration cannot be considered as a separate category of mobility. In view of the projected increase of slow- and sudden-onset events associated with climate change, it is anticipated that the number of people induced or forced to move will rise. Among the urgent issues that must be addressed at the policy level are the relocation of at-risk families, the need for adaptation to the effects of climate change *in situ*, the need to provide support to those who migrate, and the legal challenges around people displaced by climate-related threats. Furthermore, both scientific technical information and traditional knowledge have to inform and influence policy design and

practices. Two implications for policy design have been identified in this study. First, the voices of people affected by climate change must be incorporated in both research and policy. Not only are they the ones affected by changes, but also their knowledge and aspirations have a central place in understanding and addressing climate change challenges. Second, climate-induced mobility must be studied within specific social and cultural contexts (place and time) so that tailored interventions can be put in place. In sum, the design of any climate change adaptation initiative must be conducted in consultation with communities to ensure that their priorities are considered.

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Small islands have received growing attention in the context of climate change. Rising sea-levels, intensifying storms, changing rainfall patterns and increasing temperatures force islanders to deal with and adapt to a changing climate. How do they respond to the challenge? What works, what doesn't – and why?

The present volume addresses these questions by exploring adaptation experiences in small islands across the world's oceans from various perspectives and disciplines, including geography, anthropology, political science, psychology, and philosophy. The contributions to the volume focus on political and financial difficulties of climate change governance; highlight the importance of cultural values, local knowledge and perceptions in and for adaptation; and question to what extent mobility and migration constitute sustainable adaptation. Overall, the contributions highlight the diversity of island contexts, but also their specific challenges; they present valuable lessons for both adaptation success and failure, and emphasise island resilience and agency in the face of climate change.



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