



Climate adaptation strategies in Fiji: The role of social norms and cultural values



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ABSTRACT

The Fiji Islands in the South Pacific are highly exposed to climate-induced hazards and have experienced several flood and cyclone events in recent years. Drawing on a series of field studies in the lower Ba River Catchment on Fiji's main island Viti Levu, the objective of this paper is to determine how climate adaptation strategies – employed by indigenous Fijian communities and households – are influenced by socio-cultural values and access to resources, information and power. Our multi-method approach has been conceptually informed by Agrawal and Perrin's (2008) climate adaptation framework and included semi-structured interviews at the household level, and participatory hazard mapping with diverse focus groups at the community level. Our study finds that due to diverse value-based assessments of livelihood opportunities and climate-related risks, communal and household adaptive strategies can differ widely, even in a very localized cultural context. We also show how decisions to relocate from 'risky environments' are influenced by a combination of local power relations, attachment to cultural and social space, and the provision of external assistance. Our findings comment on the need for disaster risk reduction strategies to recognize how different groups and households respond to climate-related events in distinct socially determined ways.

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1. Introduction

The Fiji Islands – like most tropical Pacific Island countries – are highly exposed to climate-induced hazards, such as cyclones, storm surges and floods, which are predicted to increase in frequency and intensity (Lough, Gupta, Power, Grose, & McGree, 2015; Chandra & Gaganis, 2016; Janif et al., 2016; Chand, Tory, Hua, & Walsh, 2017). Fiji's largest island, Viti Levu, has experienced a number of flood and cyclone events in recent years, with major disasters occurring in 2009 (floods triggered by Tropical Depression 04F), 2012 (two consecutive floods caused by Tropical Disturbance 06F and Tropical Depression TD17F in January and March respectively; Tropical Cyclone Evan in December) and 2016 (Tropical Cyclone Winston, the most powerful cyclone that hit the South Pacific Islands in recorded history). The Fijian government has identified 676 communities – most of them located in coastal areas

– as being at high risk of climate-related hazards and earmarked them for future relocation (Leckie, 2016). The focus on government-led relocation in the national policy discourse may reflect a lack of trust in local adaptive capacity. While relocation may be alternatively seen as adaptive strategy, failure to adapt, or measure of last resort, the need to better understand and strengthen adaptive capacity of Fijian households and communities is irrefutable.

This paper builds on research carried out from 2015 to 2016 examining adaptation strategies employed at community and household levels after two major flood events in 2012 affecting downstream communities of the Ba River Catchment in Western Viti Levu, Fiji Islands. Adopting a multidisciplinary approach, the objectives of this study were twofold: (1) identify the factors that enhance the resilience and adaptive capacity of flood-affected communities, and (2) examine the extent to which adaptation practices are contingent upon socio-cultural values and access to resources, information and power. Three years after an initial study conducted in the immediate aftermath of the 2012 floods (Yila, Weber, & Neef, 2013), this study examines how *iTaukei* (indigenous Fijian) communities have adapted their livelihoods in response to

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climate-induced events and whether these adaptation strategies have become effective tools for long-term disaster risk reduction.

While the earlier study in Ba district considered the immediate pre- and post-disaster actions of five flood-affected villages (Yila et al., 2013), this research determines the long-term implications of flooding on the livelihood strategies and social dynamics of three closely related communities demonstrating the need to contextually situate adaptation practices even in communities that are in close proximity to each other. We propose an understanding of ‘adaptation’ as a strategy that can both assist with long-term transformation and with the preservation of socio-cultural systems. In this way, we focus on presenting the diverse ways in which people respond to climate-induced hazards rather than making value judgements on the success of these strategies.

2. Situating climate adaptation in the South Pacific

2.1. Climate adaptation in post-disaster contexts: from short-term responses to long-term change

Adaptation to climate change tends to refer to long-term, permanent or ongoing changes made by groups in an attempt to mitigate the impact of both slow and sudden-onset disasters. Adaptive capacity has been described as the “ability to experiment, innovate and learn, to act on new information in response to change and disturbance”, while coping strategies refer more to the “short term responses that allow for survival” (Fernández-Giménez, Batkhisig, Batbuyan, & Ulambayan, 2015: 49). However, coping strategies often provide for transition into long-term adaptive change, and just as post-disaster moments blend into a new pre-disaster moment, relief efforts can merge into more long-term attempts at risk reduction (Agrawal & Perrin, 2008).

Long-term change in response to disaster events can support the preservation of particular socio-ecological systems, but also transform them at the same time. When adaptation works to preserve the functioning of a system, it is not dissimilar to ‘resilience’—allowing “existing functions and practices to persist” (Pelling, 2011: 50), and promoting “actions where the central aim is to maintain the essence and integrity of the existing technological, institutional, governance and value systems” (Noble et al., 2014: 5). This approach has been criticized, however, for perpetuating underlying power structures and inequities, leading policy makers to suggest that adaptation should be utilized not as a way of maintaining the status quo but as an opportunity for ‘transformation’ such as “changing livelihoods from cropping to livestock or [...] migrating to take up a livelihood elsewhere” (Noble et al., 2014: 5).

Both resilient and transformative forms of adaptation have the capacity to become maladaptive (cf. Magnan et al., 2016). While ‘resilient adaptation’ may promote the preservation of an inequitable status quo, ‘transformative adaptation’ (Pelling, O’Brien, & Matyas, 2015) can lead to changes that put particular beliefs, traditions, and cultures at risk. ‘Successful adaptation’ then, is dependent upon individual and community preference for preservation versus transformation.

2.2. The construction of ‘vulnerability’ and ‘resilience’: the power of discourse

The promotion of adaptation as a response to climate change and disaster events has the potential to reframe ‘vulnerable’ communities as ‘resilient’ agents of change (cf. Warrick, Aalbersberg, Dumar, McNaught, & Teperman, 2017). While enabling people to resist victimization, this discourse also has the capacity to promote adaptive actions as desired and autonomous rather than

acknowledging how adaptation may be coerced, resisted and sometimes come at the expense of mitigative action. Adaptation strategies, while demonstrating the ability of communities to deal with the impacts of climate change, should not be used as a way of justifying those changes as acceptable. While some theorists and policy makers have adopted the opinion that “climate change vulnerability and resilience is natural, inevitable and evolutionary”, others contend that “climate change vulnerability and resilience are socially and politically generated” (Kronlid, 2014: 15; see also Barnett & Campbell, 2010). Understanding climate change ‘vulnerability’ and ‘resilience’ as socio-political constructs involves recognizing how the meaning of climate change—as well as how it is acted upon—is defined in particular social settings and through particular power relations (Pettenger, 2007).

While acknowledging the material reality of ‘vulnerability’ to climate change, this paper is aware of how ‘vulnerability’ can be used alongside ‘resilience’ to justify standardized action upon climate change that may fail to recognize nuanced values, needs and desires within and between communities. While not attempting to “negate the power of material realities”, we look instead at how ‘vulnerability’, ‘resilience’ and ‘adaptation’ “gain meaning through social interaction ... [as well as how] interpretations of climate change are shaped by social and physical/material forces” (Pettenger, 2007: 6). Through an analysis of adaptive strategies in Fiji we are able to draw attention to the way in which adaptive actions are shaped through the interaction of physical events with social, political and cultural systems and how such adaptive strategies can in turn redefine those systems.

2.3. From science-based measurement of adaptation to a value-based approach

Science-based approaches see adaptation as a successful strategy of dealing with climate change so long as the immediate risks to physical wellbeing and livelihood security are addressed. This fails to account for the diverse socio-cultural risks that communities may face in the process of adaptation and “frequently disregards the subjective dimensions of climate change” (O’Brien & Wolf, 2010: 239). Adger et al. (2009) understand adaptation to be shaped by the goals, values, risks and social choices that emerge from within society, or in other words by the way in which adaptation is valued by different groups and individuals. The attempt to achieve an objective, standardized metric of successful adaptation may therefore fail to recognize nuanced ways of valuing and dealing with change.

O’Brien (2009) finds that there has been very little analysis in the literature on the relationship between values and adaptation. While the importance of canvassing and validating traditional knowledge to determine and enhance adaptive capacity in the South Pacific has been well recognized (e.g. Fletcher et al., 2013; Janif et al., 2016; Warrick et al., 2017), few studies have examined the role of social norms and cultural values in shaping adaptation strategies. A value-based approach to vulnerability and adaptation research helps to take into account the cultural and ethical dimensions of adaptation practice and “points to the role of power hierarchies and interests in prioritizing the values of some over those of others.” (O’Brien & Wolf, 2010: 239).

2.4. Theoretical-analytical framework

Agrawal and Perrin (2008: 4) argue in their working paper ‘Climate Adaptation, Local Institutions and Rural Livelihoods’ that climate change is “likely to manifest around increased risks to rural livelihoods”. These risks can be classified into four different types, including (1) risk across space, (2) risk over time, (3) risk across asset classes, and (4) risk across households (Agrawal & Perrin,

Table 1
Classes of adaptation practice, corresponding adaptation strategies and categories of alleviated risks.

| Class of Adaptation Practice | Corresponding Adaptation Strategies | Category of Alleviated Risks |
|------------------------------|---|------------------------------|
| Mobility | <ul style="list-style-type: none"> • agropastoral migration • wage labor migration • involuntary migration | Risks across space |
| Storage | <ul style="list-style-type: none"> • water storage • food storage • animal/livestock storage | Risks over time |
| Diversification | <ul style="list-style-type: none"> • asset portfolio diversification • occupational diversification • crop choices | Risks across asset classes |
| Communal Pooling | <ul style="list-style-type: none"> • community forestry • infrastructure development • information gathering | Risks across households |
| Market Exchange | <ul style="list-style-type: none"> • improved market access • insurance provision • new product sales | Diverse types of risks |

Source: Adapted from Agrawal and Perrin (2008).

Note: The left and middle columns are adopted from Table 2 in Agrawal and Perrin's working paper. The corresponding categories of alleviated risks in the right column are taken from Section 3 of their paper. The adaptation strategies listed serve as examples and do not cover the entire range of strategies available to individuals, households and communities.

2008). Agrawal and Perrin see such risks as alleviated through five classes of adaptation practice, including mobility, storage, diversification, communal pooling and market exchange, whereby the latter class is regarded as being able to address diverse types of risks (Table 1). These five core adaptation strategies provided the lens through which our study areas were examined.

Climate change adaptation, according to this framework, is defined by the ability to achieve a 'secure livelihood' in the post-disaster environment. A 'secure livelihood' is understood in our study as involving the interface of water, energy and food security (Biggs et al., 2015) as well as how security of basic needs intersects with the security of socio-cultural needs. While Agrawal and Perrin (2008) have proposed their framework as a tool for better understanding the role of local public, civil society and private institutions in shaping adaptation, we see additional value in employing the framework to explore how the different classes of adaptation practice interact with social norms and cultural values in a particular setting. This speaks to the need of including belief systems, worldviews and values as important determinants of adaptive capacity, as identified in the 'Pacific Adaptive Capacity Analysis Framework' developed by Warrick et al. (2017).

Through an expansion of Agrawal and Perrin's understanding of adaptation our analysis attempts to understand the link between livelihood security and cultural security. While examining how adaptation strategies help to ensure water, energy and food security, this paper also elicits how adaptation impacts upon a sense of place, cultural identity and community. This involves recognizing how secure access to water, energy and food may sometimes come at the expense of a more fundamental cultural wellbeing, particularly in circumstances where communities are forced to relocate to ensure their basic livelihood needs are met.

By recognizing 'risk across place' and the corresponding strategy of psychological or 'existential mobility' we add to Agrawal and Perrin's framework, highlighting the socio-cultural aspects of security and wellbeing. 'Risk across place' refers to the risks climate-related disaster events pose to identity, history and belonging, while 'risk across space' – as outlined in Agrawal and Perrin's framework – refers to risks facing the physical landscape. De Shalit (2011: 318) suggests that "place is vital to human identity because it bonds us to our values, history, personal and collective memory, language, natural surroundings, and to things we are familiar with and at ease with." Therefore, even if adaptation strategies can help achieve water, energy and food security, this does not guarantee 'security of place' nor justify its loss. A sense

of place, identity and tradition should not be seen as secondary to ensuring a secure livelihood, but rather as an integral part of that livelihood. This is particularly relevant to the Fijian context, where the concept of *Vanua* denotes complex interdependencies between people, their social and cultural systems, and the natural environment, particularly land, sea and river (Chandra & Gaganis, 2016; Warrick et al., 2017).

Adaptation strategies that respond to 'risk across place' include strategies of 'existential' or 'psychological' mobility—referring to the internal capacity of individuals to adapt or adjust to new ways of life, to create new identities and forms of belonging. Kronlid (2014: 73) suggests that existential mobility works as an adaptive strategy by improving the ability of people to "deal with the longing of family, friends, and places lost or transformed through socio-environmental change, while still maintaining a sense of coherence." This leads to questions of how people can be existentially mobile when climate events mean that both physical spaces and symbolic places are at risk.

3. Methodology

3.1. Study area

The study area is the lower Ba River Catchment (Fig. 1), which was chosen for this research as it is one of the few areas that was severely affected by a series of flood events (the 2009 Flood, the 2012 Floods) that hit the Fiji Islands in recent years. The area was also struck by two major cyclones, Cyclone Evan in 2012 and Cyclone Winston in 2016. We purposively selected three *iTaukei* (indigenous Fijian) communities whose history, culture and land relations are closely intertwined. The major characteristics of the study communities are summarized in Table 2.

The oldest and largest community in the lower Ba Catchment is *Votua*, whose current location dates back approximately 200 years. Three *yavusa* (tribal) chiefs hold customary authority over land, with land ownership being further attributed to several *mataqali* (clans). A large portion of the land is leased to Fijians of Indian origin who have established extensive sugarcane plantations in the area.¹

¹ The ancestors of Fijians of Indian origin were brought to the islands by the British colonizers from the beginning of the 19th century as indentured labourers on sugarcane plantations. After their contracts had ended, many of them chose to stay and leased land from indigenous Fijians.

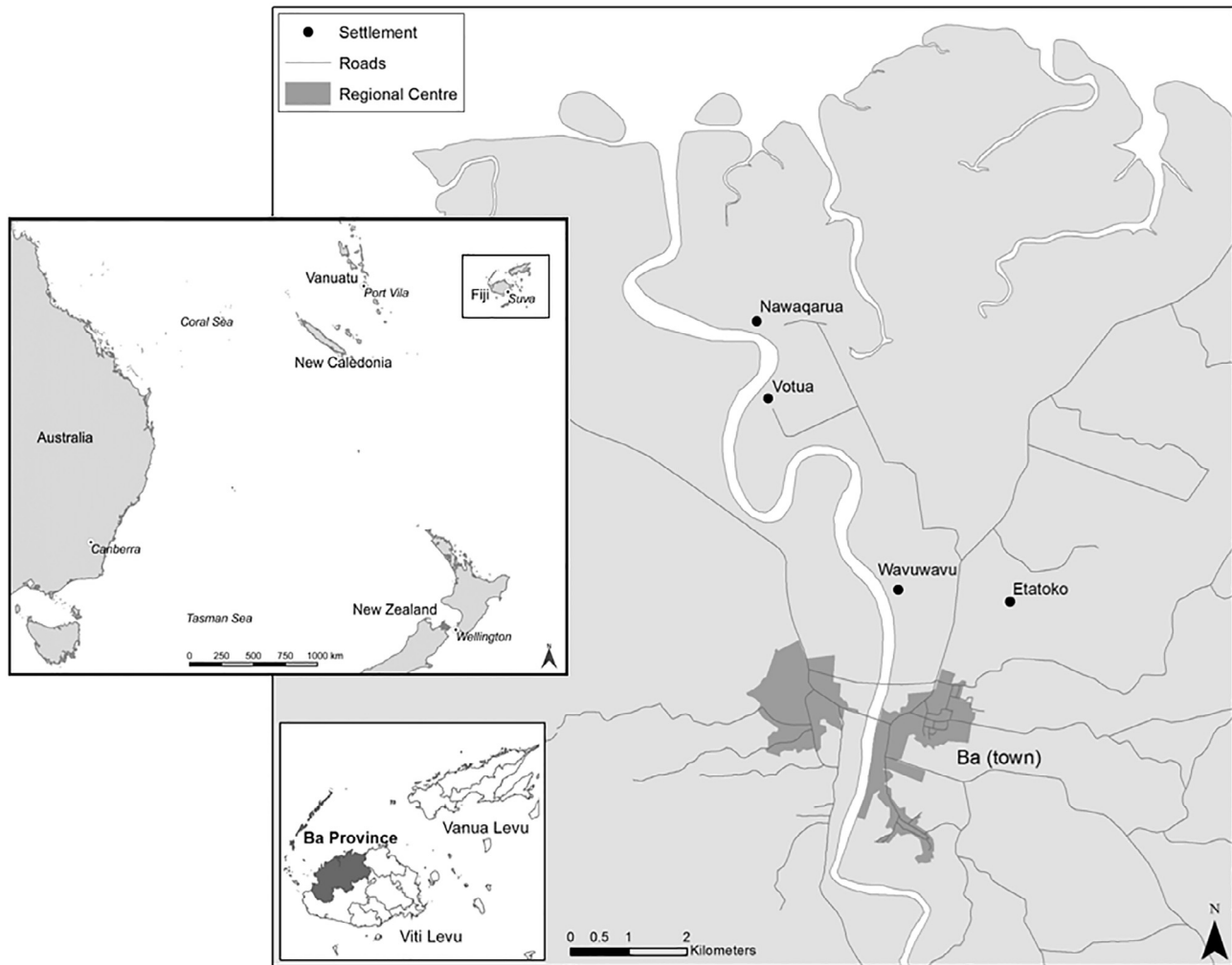


Fig. 1. Map of the study area on Fiji's main island Viti Levu.

Table 2
Characteristics of study villages.

| Community | Location | No. of households | Population | Land ownership | Major livelihood sources |
|-----------|----------------------|-------------------|------------|--|--|
| Votua | Bank of Ba River | 155 | ~650 | Customary ownership controlled by three <i>yavusa</i> (tribal) chiefs | Agriculture; fishing (fish, prawns, crabs and mussels); land lease to Fijians of Indian origin; wage labor on sugarcane plantations; non-farm work in town |
| Nawaqarua | Bank of Ba River | 56 | 237 | Customary ownership controlled by chiefs based in Votua | Agriculture; fishing (fish, prawns, crabs and mussels); livestock raising |
| Etatoko | Inland, exposed hill | 17 | ~100 | Customary ownership (land formerly leased to Fijian farmer of Indian origin) | Subsistence cropping; fishing with leased boats; wage labor on sugarcane plantations; social welfare |

Nawaqarua was founded in 1920, initially by six families, to ease the growing population density in Votua. All agricultural and residential land in Nawaqarua remains under the control of the Votua *yavusa* chiefs. Since its foundation, the settlement has been moved several times due to riverbank erosion. The community was one of the target villages of a development project funded by the Japan International Cooperation Agency (JICA) from 2010 to 2013 that aimed to enhance community-based disaster risk management. One of the legacies of the project is a community hall built on higher ground that also serves as a disaster evacuation center.

Etatoko is a relocated community that was founded after the 2012 floods completely destroyed their original settlement Wavuwavu, which had only been established in 1998 as a satellite of Votua to ease population pressure. The soil at the old settlement of Wavuwavu is very fertile, and crops can be irrigated with freshwater from the Ba River. Both the old settlement and the new location belong to the *Vanua Votua*, hence are under the customary authority of Votua's *yavusa* chiefs. Financial and technical assistance for the resettlement was provided by the Australian government, Habitat for Humanity and the Fijian government, making it

one of the first villages in Fiji to undergo a planned, government-assisted resettlement process.

Etatoko is elevated above the flood plain of the Ba River with houses safe from future flooding events, although the new site is more exposed to strong winds. While the movement of the community to Etatoko has protected their homes from future flood damage, their agricultural lands remain by the side of the river at Wavuwavu and are still susceptible to damage from flooding and continual bank erosion. The community composition of Etatoko is not identical to Wavuwavu, with some families having moved to Etatoko from Votua. New families may apply for permission to join the settlement, but they will not have access to the same external assistance provided to those who moved in 2013.

Village administration in Votua and Nawaqarua is the task of elected headmen (*turaga ni koro*), whereas a respected community elder is in charge of internal affairs in Etatoko. Seniority rather than gender is increasingly the basis of decision-making at the household level. Women engage in agriculture and fishing alongside men and play an increasingly important part in the market economy, with many of them selling highly priced crabs and shellfish in the markets of Ba Town.

3.2. Data collection and analysis

Access to the communities was facilitated through earlier research work conducted in Votua by the first author and negotiated through the Ba Provincial Council, the *yavusa* chiefs and the *turaga ni koro* (village headmen). The multiethnic research team observed the cultural protocols, which includes the presentation of a *sevusevu* (ceremonial gift) to the village authorities in the form of a bundle of dried roots of *yaqona* (*Piper methysticum*), a relative of the pepper plant, as well as formal presentations of the research purpose to the community, oftentimes followed by a prayer.

Fieldwork was conducted in two phases. In the first phase, drawing on Agrawal and Perrin's (2008) framework of adaptation strategies, qualitative semi-structured interviews were conducted in both English and Fijian in November 2015 to document household- and community-based approaches to flood adaptation. In Votua, 28 households were selected and interviews conducted with a total of 38 respondents—20 female and 18 male. In Nawaqarua, 16 households were selected with 37 respondents, 24 female and 13 male. Interviews were conducted with individual household members or in mixed groups of up to four family members.

Questions were standardized across all interviews, but left open-ended to allow the direction of interviews to be shaped by respondents. They were administered temporally, asking participants to describe their experience during the most recent floods, the longer-term problems they faced and the steps taken to address these issues since the floods. These questions were categorized relative to the individual, the household and community, in an attempt to understand how households' adaptation strategies relate to community-based strategies. Interviews were deductively coded using a broad preliminary list of codes determined by Agrawal and Perrin's strategies of adaptation (Table 3). These included 'mobility', 'storage', 'diversification', 'communal pooling' and 'market exchange'. Codes were then broken into sub-codes as they emerged, and compared within and between study sites. This comparison attempted to determine the extent to which adaptive strategies were linked to "social and economic endowments, networks of relationships and access to resources and power" (Agrawal & Perrin, 2008: 5).

During the second fieldwork phase, conducted in November 2016, all three communities were visited. In each village, a number of group participatory mapping sessions were conducted (Fig. 2), following approaches outlined by the International Fund for

Agricultural Development (IFAD, 2009) and National Oceanic and Atmospheric Administration (NOAA, 2009).² Sessions were held with small groups of community members (women, men, mixed and youth groups) in a mix of English and Fijian, using a 1:10,000 printed satellite image as a prompt for discussions around livelihoods, impacts of natural hazards, and adaptation strategies. One research team member led the conversation using a series of open-ended questions. Questions were administered (as necessary) in Fijian by local research assistants. Answers to questions were translated back to English and captured by two to three notetakers. Map-based discussions lasted between one and two hours depending on the level of engagement by participants. After each session, notes were compiled and checked by the translator for consistency and omissions.

Two sessions were conducted in Nawaqarua (one with women, and one with men), one mixed session in Etatoko, and five sessions in Votua (two each with women and men, and one mixed youth group). Notes from these sessions augmented interviews using the same coding framework identified above (Table 3) and provided further detail on local adaptation strategies.

4. Results: strategies of adaptation

This section describes the patterns of adaptive strategies which emerged in Votua, Nawaqarua and Etatoko in an attempt to understand how socio-cultural context plays a part in long-term adaptation to climate change. Our approach tries to avoid the privileging of science-based knowledge over local adaptation strategies, recognizing instead how local adaptations have developed in socially and culturally relevant ways that may not be captured by standardized science-based measures of 'successful' adaptation.

4.1. Mobility

Mobility as a form of adaptation is described by Agrawal and Perrin as "the most common and seemingly natural responses to environmental risk" (2008: 4). Mobility includes the movement of livestock and fields, as well as the relocation of individual households and entire communities to new land, either on a temporary or permanent basis.

4.1.1. Votua

Out of the 28 households surveyed in Votua, 20 mentioned the idea of post-flood household migration. Post-flood migration was analyzed on a scale ranging from those who were against relocation, those that were neutral, those that would consider moving and those that have moved or would move in the near future. Out of the 20 households who referred to migration, nine were against relocation largely due to cultural ties with the land, history and livelihood needs. One elderly male respondent stated that he "thought about moving to another village but our whole history is in Votua and there are plenty of fish here, so we won't move". Similarly, the *turanga ni koro* (elected village headman) suggested that it would be too hard to resettle because of having to leave behind culture and history. This speaks to the inseparability of people and land in the Fijian concept of *Vanua*³ (cf. Chandra & Gaganis, 2016).

² These approaches are internationally recognized as best practice in developing and developed country contexts, and emphasize the importance of respecting the wishes of community members with regard to their decision to participate, and how the information provided is used.

³ See Campbell (2010) for a more comprehensive discussion of the cultural meaning and importance of land in the Pacific. For a historic view on how population resettlement in the Pacific has intersected with land tenure issues, see Connell (2012).

Table 3
List of Codes (in bold font) and Sub-Codes.

| | | | | | |
|-------------------------|------------------------------|----------------------------|---------------------------------|-----------------------------------|-------------------|
| Mobility | Post-Flood Migration | Moving Fields or Livestock | Existential Mobility | Household Items | Financial Savings |
| Storage | Water | Food | Firewood | Housing and Infrastructure | |
| Diversification | Agricultural Diversification | Consumption Choices | Asset and Skill Diversification | Diversification | |
| Communal Pooling | Labor Pooling | Infrastructural Pooling | Resource Pooling | Information and Knowledge Pooling | |
| Market Exchange | New Product Exchange | | | | |



Fig. 2. Participatory mapping sessions in a) Nawaqarua and b) Votua.

A similar proportion of households considered relocation but were restricted by a lack of land, the decision of elders, housing, finance, lack of job opportunities, and a sense of belonging in Votua. It is noteworthy that although these households would consider moving, none of them were compelled by positive opportunities. This suggests a lack of genuine autonomy in decisions to relocate. Despite the challenges of leaving Votua, several respondents did suggest that they would be inclined to relocate if the government provided them with land, housing and jobs. A group of three youth suggested that they would move if they had the choice, but the older generation of leaders wanted them to stay due to familial connections to the land. One respondent suggested that in 2012 the government discussed supplying land so the village could relocate, but that many elders did not want to go—“I personally think the headman should have considered that, but their ancestors have grown up here and the main source of livelihood is the river, so it is hard to relocate”.

During participatory mapping sessions, a similar sentiment was communicated to researchers. One participant mentioned the possibility of relocating to Etatoko but later acknowledged that this was problematic as their entire livelihood system was tied to Votua. Values seem to be changing with the younger generation, as a shift is occurring away from the less desired practice of subsistence farming to wage labor. This shifting attitude was at least partly related to observed changes in the climate, particularly impacts on agricultural practices from increased temperatures and decreased precipitation, as well as the high value placed on education as a means to gain employment outside of subsistence agriculture.

4.1.2. Nawaqarua

Only four of the 16 households surveyed in Nawaqarua mentioned the possibility of post-flood relocation. Of those four households only one referred to the difficulty of moving due to elders and familial connections to the land, while the other three suggested that moving to higher land had been considered but financing the move was an issue. One mapping session participant mentioned that if anyone from the village was to migrate it would be the educated professionals who are already working in Ba town.

Despite the limited mention of relocation, it was suggested that, following the 2009 flood, elders had discussed purchasing land outside of Nawaqarua for which money had been collected and invested.

Despite little mention of household or community relocation, a large share of both interview respondents and mapping session participants discussed shifting fields and livestock to more secure locations as a strategy of adaptation and preparation. This reflects the fact that most damage caused by flooding in Nawaqarua was to crops and livestock rather than to homes and infrastructure. Six households out of 16 suggested that they had plans to move crops and livestock to new land, while only two households indicated that they had moved their plantations to higher ground. Moving fields and livestock in Nawaqarua corresponds with a diversification in land use—in particular the use of spoil piles dredged from the river provided areas of raised land for planting. Alternative land for planting was regarded as a form of food security especially during disasters when farms on higher land could become a source of food. One respondent described how her husband planned to plant taro on land near the town which is higher and could be used in the event of a flood.

These results demonstrate how decisions over migration of households, livestock and crops, are closely tied to issues of food and income security as well as questions of belonging, tradition, history and culture. It is interesting that while households in Nawaqarua were concerned with finding new land for planting and farming, there was little discussion of moving fields or livestock in Votua. Apart from the temporary evacuation of animals to higher ground, only two households in Votua mentioned any permanent plans to move crops and livestock to new land within the village. This can be explained by what one respondent described as very limited land available for farming in the village and by the fact that most households have decided to abandon raising pigs and cattle, as most perished in the 2012 floods.

4.1.3. Etatoko

The small riverside village of Wavuwavu was entirely destroyed through severe riverbank erosion, with 17 homes lost during the 2012 floods. The community was flooded in the early hours of

the morning, and community members had to evacuate. Temporary tent accommodation was provided by external aid agencies on high ground away from the river, while a more permanent solution was developed. As a result, the new settlement of Etatoko was created on former sugarcane land two kilometers from Wavuvavu; the lease on the land to a Fijian of Indian descent was cut short to accommodate the community at the new site of Etatoko. 17 homes were constructed, one for each home lost. The construction cost of FJD\$30,000 for each timber-framed, metal-clad and metal-roofed house was entirely provided through external aid. Community members highlighted that if the old site floods, they will have limited sources of income, with most of the land surrounding the new site leased for sugarcane cultivation by Fijians of Indian origin and unavailable as alternative agricultural land.

Etatoko residents have moved to a site that is physically safer, but they miss their old location and retain a strong connection to Wavuvavu. The new site is seen as hot, shadeless and infertile, with difficult conditions for growing crops and home gardens. Tree crops including banana and coconut have been planted at Etatoko, but these have been established some distance from the houses due to perceived danger from flying debris during cyclones and are unlikely to provide enough shade to alter the microclimate surrounding the new houses. The journey to Wavuvavu takes around half an hour on foot; during crop harvests tractors are needed to transport heavy crops such as pumpkins back to the settlement. The community would like to build temporary or 'day' shelters at this location (essentially going back to Etatoko just to sleep); this will be permitted by government authorities, but there is a prohibition in place for constructing permanent housing.

While the community has embraced relocation with varying degrees of acceptance, there was recognition that whilst relatively safe from flooding, relocation has brought a new set of challenges that did not affect the village previously. This includes dislocation from where livelihoods are still derived, the increased burden of travel, and exposure to new hazards such as drought and cyclones. The community is also now restricted by external regulations from moving permanently back to their old location, indicative of decreased local agency in the ultimate decision of where to live.

4.2. Storage

Agrawal and Perrin describe 'storage' as an adaptive strategy which reduces risks experienced over time: "when combined with well-constructed infrastructure, low levels of perishability and high levels of coordination across households and social groups, it is an effective measure against even complete livelihood failures" (2008: 4). Storage refers to the capacity to store water, food, fuel, livestock and household items in preparation for disaster.

4.2.1. Votua

In Votua all interview respondents and a number of participants in the mapping sessions referred to some form of storage in the pre-disaster context, but usually only after a flood warning had been given or after periods of heavy rain indicated the likelihood of flooding. The most common form of storage involved the storing of clothing, valuables, electrical and other household items in high places often by hanging them from the roof, storing them in the ceiling or by putting furniture on blocks. Twenty-one out of 28 households indicated this as a pre-flood action, but only one of those had the ability to store household items in any permanent capacity. This respondent lived in a two-story house and was able to move all belongings to the second floor in preparation. Similarly, one respondent indicated that his son owned a two-story house where they could move and store valuables during a flood. This

suggests a low occurrence of inter-household coordination or communal pooling in terms of storage capacity. Despite limited collective storage capacity, the *turaga ni koro* indicated a desire to construct a community storage room for food, fuel and water.

Seventeen households mentioned the storage of water as a form of flood preparation and adaptation. Thirteen of those referred to the storage of water in pots, gallon jugs and buckets when they knew that a flood was imminent, while only four households had the capacity to store water on a permanent basis through ownership of private water tanks—giving those households more secure access to safe drinking water during flood periods. The main limitation to permanent water storage was the lack of financial capital. Similarly, 17 households indicated food storage (mostly canned goods) as a technique of preparation, but only five of those reported having the capacity to store food on a permanent basis with a large majority of households waiting for flood warnings before stocking up on food. Several respondents indicated that having more food stored, or a food safe for long-term food storage, would be good, but that they could not afford it. Of those five households that did have the capacity to store excess food in preparation for flooding, two owned a canteen and one had a family member who owned a canteen—this comments on the link between access to capital and the capacity for long-term storage and food security.

4.2.2. Nawaqarua

Storage capacity in Nawaqarua suggests a similar trend to Votua, with the majority of households indicating some pre-flood capacity for storage but a limited number with the capacity to store food and water on a more permanent basis. Twelve out of 16 households indicated that they store water when they know a flood is coming but only one household indicated ownership of a private water tank. However, unlike Votua, households in Nawaqarua suggested a greater capacity for communal storage of water, food and animals. Several interview respondents talked about how people took their animals to the community hall, built by the Japan International Cooperation Agency (JICA) in 2011, where the ground is higher. This was also discussed extensively by participants in the mapping sessions, as the community hall was described as a refuge for animals and humans alike, but also a place where valuables could be brought to escape the flood.

Similarly, several respondents reported that a faith-based organization (ANDRA) provided the village with communal water tanks located at the *turaga ni koro's* house and the community center. There was also mention of three water tanks that had been provided by the government, but were not in use at the time of the survey.

These data indicate links between different forms of adaptive capacity, in particular between communal pooling and the capacity for long-term storage. While one mapping participant stated that it was uncommon for residents to have bank accounts, strong social networks and community cooperatives allow for more successful preventative mechanisms and post-flood security. However, the information gathered from participants also suggests that this particular adaptive capacity has been enabled in part by the external provision of resources such as water tanks and a community hall. This is an indication of the role that external actors can play if local-level social networks, relationships and power structures are recognized and worked with.

4.2.3. Etatoko

This resettled community has become self-sufficient in water supply, financed by Australian Aid in cooperation with Habitat for Humanity's Community Water Program. A groundwater bore-

hole and solar-powered pump provide potable water to the community which appears relatively safe from both flood and cyclone hazards. Each of the 17 original houses has been connected to the communal scheme, and provided with a 1000-litre tank for home storage, which has resulted in consistent household access to water and some storage capacity. Any new households established in Etatoko can apply to access the communal store, but must do so via one of the original 17 piped connections and must supply their own tank. As with Nawaqarua, this example highlights the role of external actors in the provision of resources to enhance storage capacity.

4.3. Diversification

Diversification is described by Agrawal and Perrin as highly varied in form, occurring in relation to “productive and non-productive assets, consumption strategies and employment opportunities” (2008: 4). Diversification broadly refers to a change in practices, behaviors and beliefs which help to ensure resilience to ongoing disaster events.

4.3.1. Diversification of agriculture and fisheries in Votua

The most common form of pre- and post-flood diversification in Votua was agricultural, involving changes in crop type, land use and fishing practices. Eight out of 28 households discussed diversification of agriculture involving a move toward seasonal crops with a shorter harvest time such as sweet potato (over cassava) and the planting of fruit-bearing trees such as breadfruit, bananas, papaya and coconuts in preparation for post-flood food shortages. One respondent described how they “plant more breadfruit trees now because they still provide food during the flood, and we plant sweet potatoes after the flood too because they only take three months to grow”.⁴ These changes came about due to a heavily decreased yield of cassava after the 2012 floods and the need to transition to crops that could survive future weather events including cyclones and extended dry periods. In fact, two households suggested that there had been a reduction in agricultural practice due to soil infertility, limited water supply and fear of crops being washed away, and that compared to 10 years ago people rely more on buying food than growing it, particularly in the direct aftermath of an event. This indicates a possible reduction in agriculture for subsistence needs.

Livelihood diversification, despite being largely a form of food and subsistence security, can also be coupled with new opportunities for market exchange. This combination of adaptation strategies – diversification and exchange – occurred in Votua through a shift in fishing practices. Five households referred to the collection and exchange of small black mangrove crabs (*kuka* or *Metapograpsus messor*) in the absence of the highly prized green mangrove crab (*qari* or *Scylla paramamosain*), large fish and shellfish following flooding. One mapping session participant described a shift to crab fishing as there were no freshwater mussels for 18 months after the floods. Several interview respondents observed an increase in small crabs after the floods which could be caught and sold to buy food from town—“they sell for less, only \$2–3 for a bag compared to \$20 per kilo for normal crabs, but we get by and have enough food”. This suggests that adaptation practices may not be entirely chosen or beneficial, but adopted in many cases as a way of maintaining a basic level of food and income security. This demonstrates how the discourse of ‘adaptation’ may conceal the way in which adaptation occurs within contexts of limited or very little choice.

⁴ The planting of breadfruit (*Artocarpus altilis*) and sweet potato (*Ipomoea batatas*) has been described as viable climate change adaptation strategies in the Pacific by McGregor et al. (2016) and Janif et al. (2016).

4.3.2. Diversification of agriculture and fisheries in Nawaqarua

Similar shifts in agricultural practice were observed in Nawaqarua, with a larger proportion of households indicating a change in crop type and a shift in land use. Ten out of 16 households surveyed indicated a shift towards the planting of crops which are likely to survive flooding, a much higher share than in Votua. This disparity can perhaps be explained by more external support for diversification in Nawaqarua, such as government provision of seeds for yam, eggplant, sweet potato, corn and banana in the post-flood period. Yet, an increase in drought conditions has meant that many of these new crops could not be grown or failed. This indicates the need to understand adaptive practices within the context of diverse risks and to look for strategies which address multiple hazards.

Nawaqarua also saw a higher incidence of land use diversification with five households referring to the planting of crops on higher ground. Interviews and discussions during mapping sessions confirmed that dredging spoil piles have provided new spaces for planting—“the fields where they put the dredge mud are good for planting because they are on high ground”. Consequently, the government dredging of the river bed, in an effort to improve river flow and mitigate flooding, was used as an opportunity for land diversification in Nawaqarua, while in Votua the dumping of dredge mud on mangrove areas caused the mangroves to die and affected the ability of people to hunt for crabs. This disparity indicates the contextually specific nature of adaptive strategies and the need for disaster risk reduction strategies to account for these place-specific differences.

Similar to the case of Votua, participants in the mapping sessions indicated several strategies to spatially diversify fishing catches following floods. After the 2012 floods, the mangroves were devoid of the lucrative *qari* crabs, and the water in the estuary and nearshore zones was very murky, making it difficult to dive for crabs. Women – who take *qari* in the mangroves, while men dive for crabs – explained that this situation is similar to what happens during the rainy season, when they must instead switch to collecting the smaller *kuka*, as *qari* cannot be found in the mangroves during this time. Following flooding, men had to go further offshore to catch fish as they could not be found in the sediment-laden nearshore zone.

4.3.3. Diversification of agriculture and fisheries in Etatoko

As the settlement of Etatoko was established on a former sugarcane plantation, all crops grown around the settlement were first planted in 2013. Cassava is the main crop, as it is able to survive the harsh edaphic conditions of the site. Around households, there are limited plantings of crops for household consumption but those that are include eggplant, *bele* (*Hibiscus manihot*, sometimes referred to as ‘island spinach’), long bean, chili and taro (the latter is grown opportunistically in areas around taps/sinks that receive spillover water). Crops at Wavuwavu are often irrigated with river water using a system of buckets, as this section of the Ba River is generally freshwater – as opposed to Votua and Nawaqarua further downstream. The land here is considered highly fertile due to the sediments laid down during past flood events; a variety of crops are grown in close rotation including pumpkin, beans, corn, cabbage, watermelon, cucumber, taro, sweet potato and more, with tree crops including banana, plantain and Tahitian chestnut. Pastures near the river are also used for grazing livestock. Although much of their natural resource base is riverine, the community has no boats but they do harvest freshwater mussels from the Ba River and are able to negotiate access to fishing through Votua. Etatoko has limited land and water resources; however, within these confines community members have practiced diverse agriculture making use of all available areas of land.

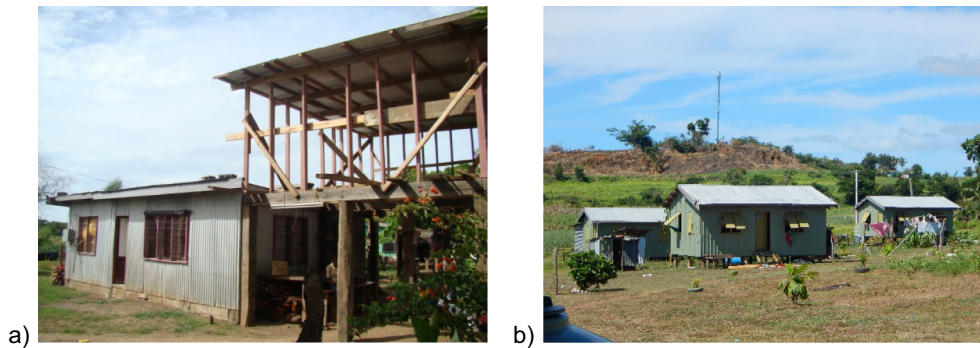


Fig. 3. a) Two-story house under construction in Votua; b) externally provided, storm-resilient housing in the resettled community Etatoko.

4.3.4. Housing and infrastructural diversification: Votua, Nawaqarua and Etatoko

This form of diversification refers to changes made to housing and infrastructure as a means of mitigating the impact of disaster. In Votua and Nawaqarua the most common form of housing diversification involved the building of two-story houses to be used as sites of evacuation and storage (Fig. 3a).

In Votua, 26 out of 28 households mentioned housing diversification as a way of addressing the impact of flooding. However, out of these households only two had built new houses since 2012 while six were in the process of building a new house or making adjustments to their current housing. Out of those households in the process of building or having completed building, five had formal sector employment, two owned canteens, one received help from overseas relatives and one held a position of relatively high social status (the pastor of the Catholic church). This suggests a strong correlation between financial capital, social capital (including social networks) and the capacity for housing adaptation. As Agrawal and Perrin (2008) highlight, adoption of adaptive strategies is largely dependent upon social and economic endowments including networks of relationships.

These same patterns were observed in Nawaqarua with all 16 households mentioning housing diversification as a potential strategy of adaptation, but with only six of those households being in the process of making structural adjustments to their homes and only one having completed building. Despite similar trends, two households in Nawaqarua mentioned receiving help from the government following 2012 Cyclone Evan to rebuild new homes on higher land. This support from the government was provided on the basis that houses would be rebuilt in safer areas. This indicates the likelihood of future inequity, whereby communities without access to higher land for reconstruction may feel pressured to relocate outside the village in order to receive support from the government. Discussion in the mapping sessions in Nawaqarua highlighted how in the past dredging spoil had been used to raise the height of some houses in the community. The extent to which this had occurred was not confirmed; however, it does highlight the community's ability to opportunistically adapt if financial capital is not a barrier.

The 17 new, essentially identical houses in Etatoko were externally funded and were built to cyclone-resistant specifications (Fig. 3b). Indeed, community members sheltered in the new houses through the terrifying experience of the Category 5 Cyclone Winston in 2016 – boarding up windows and doors – and all houses remained intact. However, self-constructed outdoor kitchens and five 'temporary' houses that had been built on the settlement site were destroyed (no-one was sheltering in these dwellings at the time). Newcomers are able to permanently settle in Etatoko; however, they must build their own houses, which are likely to be less resilient to extreme events such as cyclones, to which the site is

more exposed than their old location of Wavuwavu. Building houses that could resist cyclones is out of reach for most families, making this adaptation strategy dependent on external funding.

4.4. Communal pooling

Communal pooling involves adaptation responses that include “joint ownership of assets and resources; sharing of wealth, labor, or income from particular activities across households or mobilization and use of resources that are held collectively during times of scarcity” (Agrawal & Perrin, 2008: 5). Communal pooling was analyzed in this study along four measures including the pooling of labor, infrastructural sharing, knowledge and information pooling, and the sharing of resources including water, food, housing and transport during flood periods.

4.4.1. Votua

The prevalence of all measures of communal pooling was largely commensurate. Twenty-three out of 28 households and discussion in mapping sessions mentioned some form of community pooling as an adaptive strategy. Of those households, nine referred to the communal pooling of labor—this included efforts at reforestation, the replanting of mangroves by youth to prevent landslides and river bank erosion, and the building of drains pre- and post-flood to channel flood waters. Eleven households referred to sharing of infrastructure as a short-term strategy to manage risk during flood periods. This involved the use of the village school as an evacuation center and the sharing of two-story homes as a site for storage and shelter. Similarly, 10 households mentioned the pooling of resources between neighbors during flood times, including the sharing of food and water especially from those with access to private water tanks, and the use of community boats for evacuation. Women in one mapping session also identified a women's financial cooperative that – through collecting monthly fees – was able to provide microfinance to its members. It was noted, however, that after Cyclone Winston, a number of the cooperative members had to suspend their membership due to an inability to meet monthly payments.

Thirteen households referred to the sharing of knowledge and information mostly in the form of long-term prevention and preparedness. This included flood warnings communicated through the *turaga ni koro*, community evacuation drills, workshops led by external organizations, and the formation of a disaster management committee. Despite this, several respondents suggested that although workshops had taken place, little progress had been made towards establishing long-term preventative strategies and that the disaster committee had stopped meeting due to the withdrawal of external support. Similarly, there was mention of low attendance at workshops and information sessions with few respondents knowing what workshops were about. The village

spokesman described how they have had meetings to inform villagers about preparations for future disasters, but that it is the responsibility of each household to take action, suggesting that villagers need to “change their mind sets and [...] think practically”. Another respondent mentioned the need for better disaster education and awareness creation in order to prepare for future events.⁵

The prevalence of communal pooling is strongly linked to other adaptive strategies. For example, decisions surrounding mobility and migration are often determined communally by village elders and may rely on the pooling of village funds in order to secure new land for agriculture and housing. Similarly, the ability of community members to store goods during flood periods or to rebuild more resilient housing is often dependent on the strength of the ties that connect people within a social network (cf. Yila et al., 2013). This suggests that adaptive capacity must be understood within the context of social networks in order to determine how adaptive action works through pre-existing networks of trust, communication and support.

4.4.2. Nawaqarua

The centrality of community pooling as a technique of adaptation, preparation and recovery is also evident in Nawaqarua—which indicated similar patterns to Votua. Thirteen households mentioned some form of community pooling such as the sharing of resources, labor, assets and knowledge. Four households in Nawaqarua spoke about the sharing of resources between households during floods, with one household describing how Fijian families of Indian descent from neighboring villages brought food and basic supplies. This indicates how the bridging of social capital—through the creation of social ties *between* groups—can help transform the network of social relations and power structures by creating connections among previously separate groups (cf. Yila et al., 2013; Wood et al., 2013).

Utilizing community pooling as an adaptation strategy can also be limited by the difficulty of bridging and linking social capital, especially of creating connections between communities and external institutions, organizations or government. One respondent in Nawaqarua suggested that community pooling and the benefits of social capital were limited due to people coming to live in Nawaqarua from different areas of Fiji, leading to a failure to work together and prepare as a village. A lack of a close social network has, according to this respondent, led people to depend on the government for support. Despite this, Nawaqarua still demonstrates several forms of communal pooling especially surrounding the pooling of labor and the allocation of tasks. This includes the role of the *turaga ni koro* in informing villagers about floods and the role of youth in ensuring that children, elderly and disabled are evacuated safely. Nawaqarua also owns two community boats which villagers can lease for fishing trips. This capacity for shared labor and the pooling of resources pre- and post-disaster is partially facilitated by external support, such as JICA’s funding of the community evacuation center and government provision of communal water tanks. Consequently, although communal pooling is dependent on the strength of social networks, it can also be supported through the external provision of resources which can enable better functioning of pre-existing social support systems.

4.4.3. Etatoko

Mapping session participants in Etatoko were quick to identify the hardships associated with migration from their traditional lands. With an influx of new community members, well-established communal pooling strategies were not as evident as

in Votua and Nawaqarua. However, Etatoko’s water supply is communally owned and managed, together with the solar power supply for the bore and pump. Based on extraction of groundwater that has been tested as of high quality, this water supply system provides the community with relative water security in the face of hydro-meteorological hazards such as drought and flood. Communal strategies are evident in agricultural practices (such as guarding high-value crops close to harvest to avoid poaching – e.g. watermelon), removal of invasive grasses using heavy machinery, and transport of heavy crops back to the settlement with a tractor. These practices may provide a basis for communal pooling strategies more closely linked with climate change adaptation as the new community matures.

4.5. Market exchange

Market exchange can act as a mechanism of adaptation by reducing the risk that disaster poses to livelihoods and financial security. This includes improved access to markets, access to insurance and the sale of new products (Agrawal & Perrin, 2008).

4.5.1. Votua

The occurrence of exchange-based adaptive strategies in Votua was rather limited. Five households referred to exchange as a mechanism of short-term adaptation involving the sale of small crabs that became available as flood waters receded. Mapping session discussions also highlighted that when income was lost in agriculture it could be made up for by fishing and vice versa. Despite the gross decline in the capacity for market exchange in the post-flood context, those households that shifted temporarily to collecting and selling alternative produce were able to achieve a more immediate self-sufficiency. The exchange of *kuka* (small crabs) acted as a short-term coping mechanism, for households whose livelihoods from fishing had been affected by flooding, rather than as a long-term adaptive strategy. Despite some association between diversification practices and the capacity for exchange, this relationship is not strong. Twelve out of 28 surveyed households referred to agricultural diversification in the post-flood period, while only five referred to market exchange as a form of adaptation. This indicates that crop diversification is used fundamentally for subsistence purposes rather than income security.

4.5.2. Nawaqarua

Post-flood market exchange practices in Nawaqarua were also limited, with only one household referring to the sale of small crabs as a post-flood coping strategy. Despite this, households in Nawaqarua placed greater emphasis on financial savings as a form of disaster insurance. Six out of 16 households talked about saving as a way of managing the risk of flooding and of avoiding reliance on outside assistance. These households described how they save, so in times of need they have enough money to buy food. Other respondents also mentioned the need to create more community awareness around the importance of saving money for disaster times. Alongside savings these same households talked about the potential of investing in canteens as a form of food and income security in case of post-flood shortages.

This demonstrates how savings can become a more long-term insurance strategy for dealing with recurrent disasters compared to the short-term exchange of goods as a means of coping. Savings help to mitigate the risk to food and income security by giving people a platform from which to re-establish their livelihoods. This strategy also has the capacity to increase people’s ability to make choices around agricultural and housing diversification, mobility and storage.

⁵ Lack of awareness and education of climate change among key decision makers has been identified by Nunn et al. (2014) as one of three principal barriers to effective environmental decision-making in rural Fiji.

4.5.3. *Etatoko*

Etatoko has minimal capacity for market exchange as a means of climate change adaptation, due to their small physical resource base, limited access to boats as a means of accessing riverine or marine resources, and the fact that many crops are grown for home consumption. Some high-value crops, such as watermelon and pumpkin, are sold at market, whereas the majority of freshwater resources (mussels) are for home consumption. Following the 2012 floods, the community was reliant on rations supplied by external agencies. However, the community's focus on self-sufficiency in the face of challenging conditions was evident in the fact that post-flood rations (each intended to last for one week) were typically portioned out to last 10 days just in case the next ration delivery was delayed.

5. Discussion: adaptation strategies in a context of limited choice

Our study examined how three indigenous Fijian communities have adapted to a series of climate-related disaster impacts. We found that their adaptation strategies were embedded in a complex set of social norms and cultural values that may act as both enabling and constraining factors, contingent upon the specific local context.

By regarding post-disaster adaptive actions as both reactive and preventative, this study attempted to be inclusive of the diverse ways in which people make decisions about which long-term changes are acceptable, necessary and desired—recognizing that in many cases short-term coping strategies may be more appropriate than more permanent attempts at adaptation. While securing sufficient nutrition, shelter and access to economic markets in an increasingly risky environment was of a high priority for all households and communities, our findings do not suggest that ensuring the material basis of people's lives necessarily justifies the fundamental loss of place, tradition and livelihood that would result from government-planned relocation. As the case of the resettled community *Etatoko* has demonstrated, such sense of loss can even occur when people move within their own *Vanua*, which is generally deemed the least disruptive type of relocation (cf. Campbell, 2010). At the same time, we do not argue for the preservation of static 'tradition', recognizing instead how "what is deemed to have intrinsic social value also changes over time" (Adger et al., 2009: 339) and that "any outcome of climate change adaptation that is considered acceptable today may be evaluated differently in the future" (O'Brien, 2009: 165). By considering culture, identity and place as key aspects of a secure livelihood we are able to understand how these factors influence choices around adaptation, and how adaptation can in turn re-shape social and cultural norms. The point at which adaptation becomes maladaptive or undesirable is determined not by the loss of 'culture' or 'tradition' in any generalized sense, but rather by the collective perception of what socio-cultural changes can be justified in order to adapt to a changing climate.

By understanding adaptation as influenced by the diverse values, perceptions, processes and power structures within society, we recognize that the limitations of adaptation are shaped by context (Adger et al., 2009). What is considered 'successful adaptation' will thus constantly shift to accommodate change in social values. Consequently, standardized approaches to adaptation planning are not likely to transfer smoothly between different geographic and cultural landscapes. Our findings have shown that adaptation strategies in the Fijian context are not only determined or constrained by environmental factors and available technological and human resources, but need to be negotiated within a complex system of social norms, power relations and cultural values. This

supports the argument made by Adger et al. (2009: 338) that "values held by the actors involved in decision-making around adaptation can act as limits if these values are not deliberated."

Traditional leadership has been regarded by some authors as a major asset for fostering climate adaptation in the South Pacific (e.g. Fletcher et al., 2013). While our findings confirm that strong village leadership can play an important role in developing communal adaptation strategies and in linking the community with external actors, its emphasis on seniority and hierarchical decision-making can also constrain households' own adaptive capacity, e.g. when a family or individual would like to move permanently to another location that is deemed safer. This is particularly disadvantageous for the majority of women who have limited control over land and resources and play a lesser role in both formal and informal decision-making processes at the community level when compared to their male counterparts within the patriarchal system of rural *i-Taukei* communities (e.g. Charan, Kaur, & Singh, 2016).

The ability to be mobile generally refers to geographical or physical mobility across spaces. Yet, Cattan (2008: 86) suggests that "being mobile [is] not just about geographical space, but also, and probably above all, about social space". This includes the ability to deal with change through social and existential relationships. Existential mobility, as Kronlid (2014: 57) describes it, refers to "immaterial features of mobility which transcend its physical features" including the spiritual and cultural aspects of mobility. This refers to the way in which adaptation causes changes within cultural, spiritual and social structures, as well as how those changes can themselves become tools for coping or adapting to the impacts of climate change. This suggests that the ability to reconstruct identity and create new meaning is itself a form of adaptation that can be used to adjust to a changing environment.

Making sense of the meaning people give to disaster events can help draw attention to how existential mobility might function as a way of coping with change. In all three communities, flooding was understood to be caused by physical erosion of the river bank, a shallow river bed and deforestation as well as being seen as an act of God. The ability to reconcile the physical and existential causes of disaster events can help people to accept or deal with the change these events inflict. While people recognize a need to prepare for floods and other hazards, they also understand these events as something largely beyond their own control. This indicates the presence of an 'existential mobility' in which people are able to accept changes to their social and ecological landscape by understanding disasters as externally driven events. Existential mobility is often accompanied by physical mobility, especially in situations where people must construct new identities and relationships in new landscapes, as in the case of the resettled community of *Etatoko*. This indicates a need to better understand how people find internal ways of dealing with external change and how their capacity to cope and adapt is likely to be shaped by their belief systems and ideas of how change is produced. This is an area where further research is required.

6. Conclusion

Our analysis of highly situated climate adaptation strategies suggests that institutional attempts to link adaptation to disaster risk reduction must recognize how adaptation occurs relative to place. This calls for strategic approaches to adaptive planning that acknowledge diverse subjectivities, complex ideas of acceptable risk, and nuanced approaches to change. The attempt to integrate highly complex adaptation strategies into standardized disaster risk reduction frameworks requires a consideration of "who is driving the frameworks" (Nalau et al., 2016: 9) and to what extent

these frameworks can accommodate diverse values, traditions and social structures.

While climate change adaptation may lead to positive overall change for some, such as improved housing and community infrastructures, the disaster itself and the processes which produce it should never be legitimized by the ability of people to ‘successfully adapt’ (de Shalit, 2011). To do so would be to treat an adaptive preference—actions undertaken in the context of limited choice—as a fully autonomous decision. While we recognize the autonomy involved in adaptive decisions, we should also bear in mind the way in which these decisions are shaped by limitations on the choices available.

Through a focus on specific adaptive strategies undertaken in three communities within the same district of Fiji, this study has attempted to understand adaptation within a highly localized cultural context and to examine how these adaptive practices have contributed to the building of long-term community risk reduction. This has demonstrated the likely challenges of rolling out adaptation programs across diverse contexts and hence the need for external actors to recognize the diversity of adaptation strategies used by local actors. Expanding the breadth of what counts as an adaptive strategy can help policy makers to recognize the importance of engaging with diverse local practices rather than attempting to shape practice according to a standardized metric of disaster risk reduction and adaptation. This is particularly important in Fiji’s current policy discourse around relocating hundreds of communities from ‘at-risk’ locations to ‘safer’ spaces.

In attempting to arrive at a “more holistic vision of adaptation in the context of climate related threats to rural livelihoods” (Agrawal & Perrin, 2008: 13), we must become aware of our own role in the construction of what counts as ‘climate adaptation’, recognizing how we have selected particular categories of adaptation and how these may be resisted in certain contexts. This involves acknowledging how what is deemed a ‘successful adaptive strategy’ by policy-makers may be understood by others as simply a necessary way of coping in situations of limited choice. Finally, as our study has shown, classifying climate adaptation strategies *per se* as ‘appropriate’, ‘successful’ or ‘maladaptive’ can be highly problematic due to the complexity of multi-risk environments and diverse and value-based assessments of ‘risk’.

Conflict of interest

None.

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References

- Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., ... Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climate Change*, 93, 335–354.
- Agrawal, A., & Perrin, N. (2008). Climate adaptation, local institutions, and rural livelihoods (Working Paper No. W081-6). Retrieved from: <http://www.umich.edu/~ifri/Publications/W0816%20Arun%20Agrawal%20and%20Nicolas%20Perrin.pdf>.
- Barnett, J., & Campbell, J. (2010). *Climate change and small island states: Power, knowledge and the South Pacific*. London, UK: Earthscan.
- Biggs, E. M., Bruce, E., Boruff, B., Duncan, J. M. A., Duce, S., Haworth, B. J., ... Imanari, Y. (2015). Sustainable development and the water-energy-food nexus: A perspective on livelihoods. *Environmental Science & Policy*, 54, 389–397.
- Campbell, J. R. (2010). Climate-induced community relocation in the Pacific: The meaning and importance of land. In J. McAdam (Ed.), *Climate change and displacement: Multidisciplinary perspectives* (pp. 57–80). Oxford, UK: Hart.
- Cattan, N. (2008). Gendering mobility: Insights into the construction of spatial concepts. In T. Cresswell & T. P. Uteng (Eds.), *Gendered mobilities* (pp. 83–99). Aldershot: Ashgate.
- Chand, S. S., Tory, K. J., Hua, Ye, & Walsh, K. J. E. (2017). Projected increase in El Niño-driven tropical cyclone frequency in the Pacific. *Nature Climate Change*, 7, 123–127.
- Chandra, A., & Gaganis, P. (2016). Deconstructing vulnerability and adaptation in a coastal river basin ecosystem: A participatory analysis of flood risk in Nadi, Fiji Islands. *Climate and Development*, 8(2), 256–269.
- Charan, D., Kaur, M., & Singh, P. (2016). Indigenous Fijian women’s role in disaster risk management and climate change adaptation. *Pacific Asia Inquiry*, 7(1), 106–122.
- Connell, J. (2012). Population resettlement in the Pacific: Lessons from a hazardous history? *Australian Geographer*, 43(2), 127–142.
- De Shalit, A. (2011). Climate change refugees, compensation and rectification. *The Monist*, 94(3), 310–328.
- Fernández-Giménez, M. E., Batkhisig, B., Batbuyan, B., & Ulambayar, T. (2015). Lessons from the Dzud: Community-based rangeland management increases the adaptive capacity of Mongolian herders to winter disasters. *World Development*, 68, 48–65.
- Fletcher, S., Thiessen, J., Gero, A., Rumsey, M., Kuruppu, N., & Willetts, J. (2013). Traditional coping strategies and disaster response: Examples from the South Pacific region. *Journal of Environmental and Public Health*, 2013, 1–9.
- IFAD (2009). *Good practices in participatory mapping: A review prepared for the international fund for agricultural development*. Rome, Italy: IFAD.
- Janif, S. Z., Nunn, P. D., Geraghty, P., Aalbersberg, W., Thomas, F. R., & Camailakeba, M. (2016). Value of traditional oral narratives in building climate-change resilience: Insights from rural communities in Fiji. *Ecology and Society*, 21(2), 7.
- Kronlid, D. O. (2014). *Climate change adaptation and human capabilities*. New York, USA: Palgrave Macmillan.
- Leckie, S. (2016). Using human rights to resolve the climate replacement problem: The promise of the Peninsula principles. In S. Leckie & C. Huggins (Eds.), *Repairing domestic climate displacement: The Peninsula principles*. New York, USA: Routledge.
- Lough, J., Gupta, A. S., Power, S. B., Grose, M. R., & McGree, S. (2015). Observed and projected changes in surface climate of tropical Pacific Islands. In M. Taylor, A. McGregor, & B. Dawson (Eds.), *Vulnerability of pacific agriculture and forestry to climate change*. Noumea, New Caledonia: Secretariat of the Pacific Community.
- Magan, A. K., Schipper, E. L. F., Burkett, M., Bharwani, S., Burton, I., Eriksen, S., ... Ziervogel, G. (2016). Addressing the risk of maladaptation to climate change. *WIREs Climate Change*, 2016. <https://doi.org/10.1002/wcc.409>.
- McGregor, A. M., Tora, L. D., & Lebot, V. (2016). Planting breadfruit orchards as climate change adaptation strategy for the Pacific Islands. *Acta Horticulturae* 1128: XXIX International Horticultural Congress on Horticulture: Sustaining Lives, Livelihoods and Landscapes (IHC2014): International Symposium on Horticulture in Developing Countries and World Food Production. doi: 10.17660/ActaHortic.2016.1128.8.
- Nalau, J., Handmer, J., Dalesa, M., Foster, H., Edwards, J., Kauhiona, H., ... Welegtabit, S. (2016). The practice of integrating adaptation and disaster risk reduction in the southwest Pacific. *Climate and Development*, 14(1), 365–375.
- NOAA (2009). *Stakeholder engagement strategies for participatory mapping*. Office for Coastal Management, Charleston, USA: National Oceanic and Atmospheric Administration (NOAA).
- Noble, I. R., Huq, S., Anokhin, Y. A., Carmin, J., Goudou, D., Lansigan, F. P., ... Villamizar, A. (2014). Adaptation needs and options. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, & L. L. White (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. contribution of working group ii to the fifth assessment report of the intergovernmental panel on climate change* (pp. 833–868). Cambridge, United Kingdom and New York, USA: Cambridge University Press.
- Nunn, P. D., Aalbersberg, W., Lata, S., & Gwilliam, M. (2014). Beyond the core: Community governance for climate change adaptation in peripheral parts of Pacific Island Countries. *Regional Environmental Change*, 14(1), 221–235.
- O’Brien, K. L. (2009). Do values subjectively define the limits to climate change adaptation? In N. W. Adger, I. Lorenzoni, & K. O’Brien (Eds.), *Adapting to climate change: Thresholds, values, governance* (pp. 164–180). Cambridge, United Kingdom: Cambridge University Press.

- O'Brien, K. L., & Wolf, J. (2010). A values-based approach to vulnerability and adaptation to climate change. *Wiley Interdisciplinary Reviews: Climate Change*, 1(2), 232–242.
- Pelling, M. (2011). *Adaptation to climate change*. New York, USA: Routledge.
- Pelling, M., O'Brien, K., & Matyas, D. (2015). Adaptation and transformation. *Climatic Change*, 133, 113–127.
- Pettenger, M. E. (2007). *The Social construction of climate change*. Aldershot, UK: Ashgate.
- Warrick, O., Aalbersberg, W., Dumaru, P., McNaught, R., & Teperman, K. (2017). The 'Pacific adaptive capacity analysis framework': Guiding the assessment of adaptive capacity in Pacific island communities. *Regional Environmental Change*, 17(4), 1039–1051.
- Wood, L., Boruff, B., & Smith, H. (2013). When disaster strikes... How communities cope and adapt: a social capital perspective. In C. D. Johnson (Ed.), *Social capital: Theory, measurement and outcomes* (pp. 143–169). New York, USA: Nova.
- Yila, O., Weber, E., & Neef, A. (2013). The role of social capital in post-flood response and recovery among downstream communities of the Ba River, Western Viti Levu, Fiji Islands. In A. Neef & R. Shaw (Eds.), *Risks and conflicts: Local responses to natural disasters* (pp. 79–107). Bingley, UK: Emerald Publishing Group.