

# **Highlighting Women's Voices in a Climate Change and Livelihood Narrative: A Case Study in a Rural Fiji Community**

*By*

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## **Abstract**

Climate change has wide implications for human health and affects social and environmental determinants of health (for example, shelter, drinking water, food security). The Republic of Fiji, a developing island nation in the South Pacific, is particularly burdened by climate change. This is due to sea-level rise, increasing temperatures, and an increase of extreme climate events compounded by livelihood strategies that rely on healthy ecosystems. Population groups such as women, residents in rural areas, and disadvantaged communities are disproportionately affected by health impacts linked to climate change. Small-scale, community-centered studies are needed to understand local perspectives and livelihood systems to facilitate equitable and culturally appropriate adaptation measures. This study promotes the voices of women in Yalobi Village, a rural Fiji community, by explaining their livelihood strategies, the way their health is impacted by climate change, and their adaptive capacity. Using a mixed methods approach, this study involved a quantitative survey (n=48) and qualitative interviews (n=10). Study participants exhibited a reliance on their natural environment demonstrated by their dependence on surrounding ecosystems for food, income generation, medicine, and cultural obligations. Their greatest concerns are the impacts of climate change on food security, income generation, water access, and culture. The primary climate change threats of concern are sea-level rise, stronger tropical cyclones and changing weather patterns. Traditional gender roles and responsibilities prompted differing impacts for women and men in Yalobi Village. Community-based study methods should be applied to climate change adaptation planning to ensure local voices are heard and efforts are community-led.

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## **Glossary**

### Abbreviations

CBA- community-based adaptation

GDP- gross domestic product

NCDs- non-communicable diseases

PACAF- Pacific Adaptive Capacity Analysis Framework

SIDS- Small Island Developing States

USD- United States dollar

WASH- water, sanitation, and hygiene, a category of initiatives working to improve access to clean water and sanitation

### Fijian Language Translations

Cassava- A starchy root crop commonly consumed in Fiji (also known as the yuca plant)

iTaukei- indigenous Fiji citizens

Talanoa- a form of storytelling which builds relationships and trust

Turaga ni Koro- elected male leader in an *iTaukei* village

Vanua- a concept which translates to land, home, and a sense of place

Voivoi- a plant used for weaving traditional handicrafts (also known as the pandanus plant)

Yaqona- the root of the kava plant, which is used for traditional Fiji ceremonies

## **I. Introduction**

Globally, climate change is an increasing concern that impacts both community livelihood strategies and health and human lives in a multitude of ways. Morbidity and mortality linked to climate change range from the direct impacts of extreme weather events to slower and more insidious changes leading to food insecurity, and to indirect adverse mental health implications (World Health Organization, 2019). Negative health outcomes linked to the climate crisis disproportionately affect vulnerable populations, amplifying and perpetuating existing health disparities and social inequities (Paavola, 2017; Terry, 2009; Thomas et al., 2019; Schnitter et al., 2019). Literature suggests that contextual factors such as social, economic and political structures often make women vulnerable yet these phenomena are not well studied in Pacific nations (Akinsemolu & Olukoya, 2020). To adequately examine vulnerability to climate change threats, contextual components, livelihood strategies, and area-specific challenges must be understood.

Small Island Developing States (SIDS) are particularly vulnerable to the impacts of climate change (UNDP, 2017). This vulnerability is due to livelihood strategies which rely on healthy ecosystems as well as specific sustainability challenges that arise from being small, geographically isolated nations (Kelman, 2010). Yet, differing political, cultural, and economic contexts and varying levels of extreme weather exposure across nations and within regions, requires that climate change adaptation plans be context and geographically specific.

The Republic of Fiji, a SIDS located in the Southwest Pacific Ocean, is particularly burdened by the climate crisis. Specifically, climate modeling predicts stronger tropical cyclones due to climate change (Walsh et al., 2016). Global sea levels rise approximately 3 mm annually and are projected to reach a yearly increase of 10 mm by 2100 (Nerem & Fasullo, 2018). Sea-level rise has caused several Fiji villages to relocate and placed many more at risk of future relocation. Ambient temperatures are increasing in the region and a drying trend has been observed since the 1950s (McGee et al., 2019). Higher temperatures and a drier environment are expected to impact access to clean

water, agricultural practices, and food security. Among Pacific Island countries the trauma caused by extreme weather events and climate variability, including heat-related illnesses and issues of food and water security, has been identified as the top health priority linked to climate change (McIver et al., 2016).

Small-scale studies and informed interventions are vital when investigating community level impacts caused by natural hazards and the ability to autonomously cope (Korovulavula et al., 2019; Meheux et al., 2007; Nolet, 2016; Nunn & Kumar, 2019). Studies should work in partnership with community members to identify local challenges, assets, and perspectives, especially for the purpose of sustaining adaptive strategies (McNamara et al., 2020). Thus, our study focuses on women in rural Fiji to understand community-level and livelihood impacts of climate change. It uses surveys and semi-structured interviews to amplify the voices of these women and lay the groundwork for localized, community-led climate change adaptation planning, which is considered to be an essential step towards future livelihood sustainability in the Pacific Island region (McNamara et al., 2020).

## **II. Background**

### **Small Island Developing States (SIDS)**

Historically, SIDS have faced numerous environmental and social variability challenges; as a result, they have developed resilience to environmental shocks. SIDS peoples tend to have a strong dependence on their surrounding environment, exhibit strong ties to land-based and ocean-based resources (Kelman, 2010), have a rich cultural heritage and demonstrate strong kinship ties (Hernandez et al., 2018; Nalau et al., 2018; Nunn & Kumar, 2018). Some studies focus on SIDS as a unit, painting an image of continuity and calling for a uniform approach within the context of climate adaptation. Yet, SIDS located in the Pacific, Atlantic, and Indian Ocean regions have unique political, cultural and economic contexts (Petzold & Magnan, 2019). Further, different regions experience diverse levels of exposure to changing weather patterns and extreme weather events.



Consequently, relevant literature calls for small scale studies to be conducted in partnership with community members to better understand localized climate change impacts (Korovulavula et al., 2019; McNamara et al., 2020; Meheux et al., 2007; Nunn & Kumar, 2019).

### **The Republic of Fiji**

The Republic of Fiji comprises approximately 330 islands, one third of which are inhabited (Figure 1). This island nation is home to approximately 883,000 citizens, most of whom reside on Fiji's two main islands: Vanua Levu and Viti Levu (Government of the Republic of Fiji, 2012; IndexMundi, 2019). The country's GDP per capita stands at \$5,860 USD, which denotes Fiji as a middle-income country. According to the Human Development Index, Fiji ranks 96 out of 185 countries (World Bank Group, 2019).

Climate change threats in Fiji have implications for health and wellbeing. Specifically, increasing ambient temperatures, periods of drying, and more intense tropical cyclones will affect water access, agricultural practices, and food security. The direct and indirect health implications caused by climate change will likely be exacerbated by Fiji's geography and health infrastructure. Given its archipelagic character, access to medical services and resources poses a unique challenge. As such, natural disaster response must extend across hard-to-reach, peripheral locations, and identifying and reaching individuals in need, across numerous islands, creates a challenge for responders. Tropical Cyclone Winston struck Fiji in 2016, following which approximately 26,125 individuals on more than 15 islands lacked access to water, sanitation, and hygiene (WASH) supplies, including access to safe drinking water (UNICEF, 2016).

In Fiji, non-communicable diseases (NCDs) are responsible for 80% of avoidable deaths, creating a burden on infrastructure and resources (Ministry of Health & Medical Services, 2020). Climate change hazards (tropical cyclones, droughts, floods) affect the prevalence of NCDs through compromised food security and increased reliance on high caloric foods (McIver et al., 2016). Findings by Medina Hidalgo et al. (2020) support these observations.

## **Island Survival**

In Fiji, individuals hold a number of strong ties to their natural surroundings.

Communities tend to rely heavily on land-based and ocean-based resources for their livelihoods (Mangubhai et al., 2017; Pearson et al., 2019). Income generation for rural Fiji villages depends on farming, fishing, and traditional artisanal activities and requires a reliable supply of natural resources within healthy ecosystems (Mangubhai et al., 2017). Thus, Fiji citizens feel obligated to conserve natural surroundings to support their livelihoods and ensure food security (Walshe et al., 2018).

Extreme weather events have detrimental implications for livelihood strategies. Thomas et al. (2018) investigated the social and economic impacts of Tropical Cyclone Winston (2016) and found that post-cyclone, fewer crabs were collected and a higher percentage of the crabs caught were sold (rather than being consumed) as a means of income generation. This demonstrates how climate change impacts livelihood strategies, especially in peripheral communities who rely on robust ecosystems.

Natural resources have deep cultural and traditional importance and many local customs depend on a healthy environment. For example, kava root (*yaqona* in Fijian) is important within cultural traditions to show respect for the land and local leaders and is essential for funerals, weddings, and birthdays. Further, local agriculture produces the raw materials for garments and woven mats commonly used in traditional ceremonies (Pearson et al., 2019; UNDP, 2017). Communities frequently express anxiety on behalf of future generations, with regard to the changing climate and anticipated impacts on culture and traditional knowledge (du Bray et al., 2019).

Natural resources also serve as physical capital or basic infrastructure for building, transportation, and tools. For instance, mangroves are crucial components for the production of essential items such as canoes and bridges (Pearson et al., 2019). Further, coconut trees play an important role in physical capital. Every aspect of the coconut tree holds value in Fijian culture; the fruit is eaten, the husks become fire starters (kindling), the shells are used for bowls in traditional kava ceremonies, the leaves are woven into

fans and baskets, and the oil is used for skincare and coating traditional garments. Thus, when ecosystems are threatened by climate change, physical capital will be compromised.

Studies have examined the relocation of Fiji villages due to climate change threats and found that a spiritual connection to place and local resources is vitally important for villagers (Piggott-McKellar, McNamara, Nunn, Sekinini, 2019). Understanding this connection to place is crucial when responses to climate change, including relocation, are planned (McMichael & Katonivualiku, 2020; Neef et al., 2018). The Fijian language also demonstrates this connection. Specifically, the word *vanua* encompasses the interconnectedness of location, spirituality, and identity. In many circumstances, this sense of place is as important as securing a livelihood (Campbell, 2010). For example, village leaders were hesitant to relocate despite local environmental challenges, due to their ties to ancestral land (Neef et al., 2018). Beyond this spiritual connection, there are economic and ownership bonds with land. The Native Lands Act gives indigenous Fijians of *iTaukei* descent birth rights to land; thus, it is passed down from generation to generation and remains in family units forever (Laws of Fiji, 1978). This connection to the land will impact many possible solutions to climate change threats.

### **Community-Based Adaptation**

Vulnerable SIDS communities need to adapt their livelihood strategies to address the threats posed by climate change (Nunn & Kumar, 2018). SIDS peoples must be central to the development of strategies to adapt current ways of life and ensure that such plans are effective and culturally accepted. Pacific communities have a long history of applying accumulated traditional knowledge for adaptation (Korovulavula et al., 2019; Lane & McNaught, 2009). Yet the voices of SIDS peoples are rarely acknowledged in adaptation strategies, despite their accumulated indigenous knowledge (Granderson, 2017; Kelman, 2010). Therefore, it is vital to include local perspectives and community voices in adaptation planning efforts.

Facilitation of initiatives for sustainable and culturally appropriate climate change adaptation requires inclusion of community members in the planning and implementation process. Community-based adaptation (CBA) is “a community-led process, based on communities’ priorities, needs, knowledge and capacities, which should empower people to plan for and cope with the impacts of climate change” (Reid et al., 2009, p. 13). When using a CBA approach, the diversity of individuals within a community should be recognized to avoid perpetuating existing disparities (Buggy & McNamara, 2016).

Further, CBA initiatives must extend beyond implementing strategies at the community level. Frequently, initiatives and evaluation metrics are created according to western values, rather than beliefs that are specific to the people the initiatives serve (Warrick et al., 2017). Within the South Pacific, it is vital to incorporate key aspects of a society-kinship bonds and reciprocity within local communities- across communities and across national borders (Yila et al., 2014). Further, livelihood systems within a subsistence context should be incorporated when designing initiatives (Mercer et al., 2007; Piggott-McKellar et al., 2020; Piggott-McKellar, McNamara, Nunn, Sekinini, 2019).

Recognizing this imperative, the Pacific Adaptive Capacity Analysis Framework (PACAF), a theoretical framework for analyzing adaptive capacity within Pacific Island communities, was developed (Warrick et al., 2017). The PACAF examines the following seven factors to determine localized strategies for increasing adaptive capacity: 1) human capital, 2) social capital, 3) belief systems, worldviews, and values, 4) resources and their distribution, 5) options for adaptation, livelihood and food supply, 6) information and awareness, and 7) history of dealing with climate stress. These categories were created based on global literature that discussed adaptive capacity and modified to reflect the Pacific Island community context. Warrick et al. (2017) apply the PACAF to a community in the Solomon Islands and emphasize that, for Pacific communities, function-based aspects (which dictate resource access) and cognitive factors (values and beliefs) are particularly relevant.

Adapting local livelihoods must be approached as a process incorporating the past, present, and future histories and experiences of Pacific peoples (Nunn & Campbell, 2020). This planning process should take account of cultural and political factors and not focus on a single event. Adaptive planning must acknowledge the everyday experiences of Fijian villagers regarding environmental changes, their histories, and their sense of place (McMichael & Katonivualiku, 2020). While local stories and perspectives should guide strategies to ensure cultural relevance throughout adaptation planning and implementation processes, it is vital to recognize differences within a community which contribute to its ability to adapt as a unit.

### **Gendered Vulnerability**

Literature shows that, globally, women are more vulnerable to climate change impacts. Table 1 below lists women’s vulnerabilities and provides a summary of relevant literature to confirm these findings.

**Table 1.** Women’s global vulnerability within climate change adaptation planning

<b>Climate change vulnerability</b>	<b>Reference</b>
Social, economic and political structures	Akinsemolu & Olukoya, 2020; Djoudi et al., 2016; Jerneck, 2018
Limited decision-making and information	Piggott-McKellar, McNamara, Nunn, Watson, 2019
Women’s domestic roles and household chores	Chandra & Gaganis, 2016
Traditional economic, fishing and agricultural roles	UN Women, 2019
Reliance on resources facing environmental degradation	Pearson et al., 2019

Climate change literature in Fiji does not focus explicitly on gendered vulnerabilities, and yet they should be considered, given the local social, economic, and political structures. Specifically, a disproportionately greater number of men hold national and local leadership roles. Women comprise 19.61% of Fiji’s Parliament and hold 23.08% of Fiji’s Ministerial portfolios (Parliament of the Republic of Fiji, 2019). Within indigenous Fiji communities, *iTaukei* villages, the majority of leaders are men. In only a few regions, women serve as the village chief, a position of leadership passed down through

bloodlines. The locally elected village leader is called the “*turaga ni koro*,” which directly translates to “man of the village.” As implied, this local leader, who serves as a liaison between an *iTaukei* village and the regional government, is almost always a man.

In Fiji, traditional gender roles and responsibilities are rooted in cultural and social structures. The social and economic status of Fiji women often limits their livelihood options (UN Women, 2019). After marrying, women generally relocate to different villages or islands to join their husband’s family, which affects social capital and decision-making capacity within the in-law’s family. Further, 64% of women in Fiji have experienced physical abuse and/or sexual intimate partner violence, which is more than twice the global average (UN Women, 2019). However, despite high rates of gender-based violence, women rarely leave their husbands due to economic dependence, cultural norms, and social stigma (United Nations Population Fund, 2009). In light of these power dynamics and traditional roles, it is vital to focus on empowering women by increasing their decision-making capacity and involvement in adaptation planning to promote sustainable livelihood strategies and health. Narratives from and the perspectives of Fiji women will guide strategies and ensure cultural relevance and the involvement of women leaders in community-based adaptation processes.

### **Study Site**

To highlight the experiences of women residing in a rural community, this study collected data in Yalobi Village on Waya Levu Island (Figure 1). Waya Levu is a comparatively remote (outer) island in the Yasawa Group of islands and is home to approximately 750 people living in four villages. Waya Levu does not have roads, electricity or running water on tap. Yalobi Village is the island hub with approximately 175 residents, the island’s primary (boarding) school, and a regional nursing station. Yalobi Village is about 25 miles from Fiji’s largest and most developed island, Viti Levu. Transport from Yalobi Village to Viti Levu must be chartered: a privately-owned fishing boat will take approximately 2-3 hours (depending on weather, boat engine capacity, and cargo). The access point in Viti Levu is the fishing wharf in the city of Lautoka, Fiji’s second largest city.



**Figure 1.** Right: The Republic of Fiji, located in the Southwest Pacific Ocean  
 Left: Waya Levu Island, the study geographical location

### **III. Methodology**

#### **Study Design**

The combination of quantitative and qualitative data enabled a deeper understanding of local climate change concerns, the impacts of these climate change threats, and unique livelihood strategies. A convenience sampling frame was used for study participation. Eligibility criteria included being 18 years or older in age, self-identifying as a woman, and living in Yalobi Village for at least 12 months. Upon completion of a quantitative survey, respondents could choose to participate in a semi-structured interview, or not. The first author lived in Yalobi Village for over two years prior to this research, but study data were collected by a local research assistant, between April and August 2020 owing to travel restrictions during the COVID-19 global pandemic.

Within the Fijian language, the word *talanoa* represents a concept of storytelling which builds trust, understanding, and respect. *Talanoa* is important within relationships and for sharing rich historical and local knowledge (Farrelly & Nabobo-Baba, 2014). Thus, our study used surveys to gather quantitative data and recruit participants for interviews, a second data gathering method, to capture stories from women in Yalobi Village in a culturally appropriate manner. In other words, the study used methods that opened up opportunities for *talanoa*.

## **Data Collection**

### *Quantitative survey*

The quantitative survey used the online Qualtrics platform. It was self-administered and taken on the research assistants' mobile phone. The survey was translated into the *Wayan* dialect of the Fijian language with the support of the research assistant and programmed into the Qualtrics software. The survey was taken in either English or the *Wayan* dialect of the Fijian language depending on the participant's preference. The survey tool first screened for study inclusion criteria, and then asked 42 questions about demographics, climate change concerns (impacts and perceptions), health, and daily life in the village. At the end of the survey, participants, who were interested in sharing their stories and experiences in a *talanoa* session, provided their contact information for the phone interview.

### *Talanoa (qualitative interviews)*

Among those who opted in for a phone interview, a convenience sampling method was used to select participants and continued until data saturation was reached. The first author conducted all interviews. After verbal consent was granted, 30-minute semi-structured interviews were audio-recorded and conducted in either the *Wayan* dialect of the Fijian language or in English depending on the participant's preference. The interviews involved discussion around: climate change impacts and consequences, food and water security, income generation, cyclone preparedness, and gender roles and decision making.

## **Data Analysis**

Descriptive statistics from the quantitative survey data were analyzed in Excel. The interviews were translated into English while being transcribed. These transcripts were coded using a focused coding approach in Dedoose qualitative data management software, and a codebook was created based on quantitative survey results. Survey responses informed codebook development in order to understand the implications and the extent of each participant's climate change concerns. The following categories were



included in the codebook (Table 2): climate change concern, implications of climate change concern, and extent of impact.

**Table 2.** Focused coding framework for the qualitative analysis

<b>Coding Category</b>	<b>Sub-codes for Analysis</b>
Climate change concern	<i>Sea-level rise; Tropical cyclones; Temperature; Rainfall patterns; Other</i>
Implications for climate change concern	<i>Food security; Income generation; Water access; Culture</i>
Extent of impact	<i>Gender; Household; Village</i>

#### **IV. Results**

##### **Participant Demographic Data**

A total of 48 women participated in this study. All participants completed the Qualtrics quantitative survey and a subset (n=10) took part in a (qualitative) interview. A detailed display of participant demographic information is shown in the Appendix (Table A1 and A2). Quantitative survey respondents ranged from 18 to over 65 years in age. Most survey respondents were married (70.83%; n=34) and had one or more children (79.17%; n=38). Over half the survey participants had attended some of, or completed, their secondary school education, and almost all participants had resided in Yalobi Village for four years or more.

In Yalobi Village, 91.67% (n=44) of the households surveyed owned a farm or plantation. The results indicate households get most of their food from the farm or the sea. The primary source of income for households in Yalobi Village is selling fish or food from their farm.

##### **Climate Change Concerns**

Study findings show a widespread belief among women in Yalobi Village that climate change poses a threat to livelihood and health. All survey respondents (n=48) were familiar with the term ‘climate change’ and 66.67% (n=32) of the participants thought

about climate change every day. Nearly all of the survey respondents (97.92%; n=47) either ‘Strongly Agree’ (45.83%; n=22) or ‘Agree’ (52.08%; n=25) with the following statement: *I am concerned about climate change*. The vast majority of survey respondents (91.67%; n=44) either ‘Strongly Agree’ (20.83%; n=10) or ‘Agree’ (70.83%; n=34) with the following statement: *Climate change affects my health*. Further, all participants either ‘Strongly Agree’ (25.00%; n=12) or ‘Agree’ (75.00%; n=36) that in recent years, climate change effects have been more noticeable in the village.

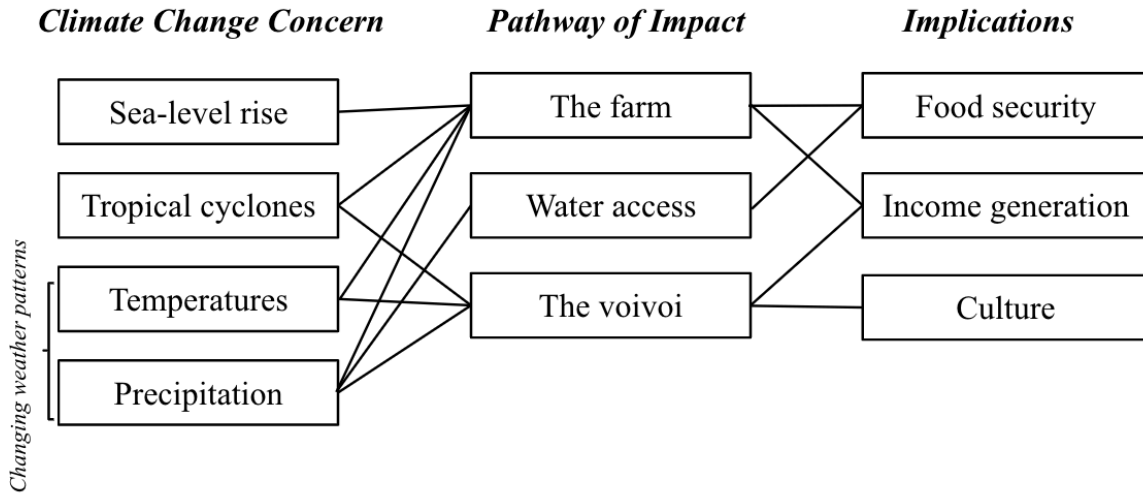
The open-ended question, *What is the biggest climate change problem in your village?* elicited responses indicating that rising sea level was the leading concern followed by intensifying (tropical) cyclones and changing weather patterns (Table 3). In the quantitative survey, the majority of participants expressed concern for the ways (tropical) cyclones, floods, lack of rain, rising sea levels, and extreme heat were impacting life in the village (Table A3 in the Appendix).

**Table 3.** The principal climate change concerns

<b>Largest Concern</b>	<b>Quantitative Results (n=48)</b>
Rising sea level	(54.17%; n=26)
(Tropical) Cyclones	(33.33%; n=16)
Changing weather patterns	(8.33%; n=4)
Other	(4.17%; n=2)

The qualitative interviews provided more cultural context for these concerns. Analysis of the qualitative results revealed two primary weather-related concerns: rising temperatures and changing rainfall patterns. Specifically, over half of the participants (60.00%; n=6) stated that changing rainfall patterns were an issue in the village, while 80.00% (n=8) considered increasing temperatures to be problematic. However, in interview conversations, sea-level rise was not mentioned as a primary concern, which differs from the quantitative survey results.

Interview narratives and quantitative survey findings illustrate how the climate change threats in Table 3 are experienced. Figure 2 illustrates the pathway of impact for these concerns, together with their implications on: *food security, income generation and culture.*



**Figure 2.** The pathway of impact for local climate change concerns

### Food Security

In the quantitative survey, livelihood is defined as a way of securing food or money. Nearly all survey respondents (97.97%; n=47) indicated that most of their household’s food comes from the farm or the sea. The vast majority of survey respondents (95.83%; n=46) either ‘Strongly Agree’ (35.42%; n=17) or ‘Agree’ (60.42%; n=29) with the following statement: *Climate change is affecting my farm.* The qualitative data confirmed this finding. Ninety percent (n=9) of the interviewees mentioned food security concerns linked to climate change hazards, and said their farms were threatened by lack of rain, higher temperatures and stronger (tropical) cyclones (Table 4). Sea-level rise was not mentioned as a concern for food security. The primary concern for respondents whose main livelihood relied on farm or sea yields, was a lack of rain and higher temperatures, both of which create difficulties for the planting process.

**Table 4.** Climate change threats to food security

		Qualitative Results	
Climate Threat	Quantitative Results (n=47*)	Illustrative Quotes	Implication(s) of Climate Change Threat
Lack of rain	(87.23%; n=41)	<p>“There is not always enough water for the sweet potatoes...” <i>Interviewee 108</i></p> <p>“There is not enough rain so some of the food is no good. Some of the fruit is ruined and the cassava... it is too hard.” <i>Interviewee 106</i></p> <p>“Like in the olden days, when I was in school, the crops were easier to grow. But like recently [due to lack of rain], last year and this year, the crops are really small.” <i>Interviewee 102</i></p>	Crops die, unhealthy crops
Heat	(78.72%; n=37)	<p>“... The plants are dying... The cassava is affected too... the sweet potato plants are dying. It is because [of] the sun. It is too hot.” <i>Interviewee 106</i></p> <p>“Climate change has really changed our farm. The sun is too hot. The farm is not healthy.” <i>Interviewee 109</i></p> <p>“When it is really hot out we are too tired to work in the plantation.” <i>Interviewee 107</i></p>	Crops die, hot working conditions
Tropical cyclones	(72.34%; n=34)	<p>“... Everything. The <i>voivoi</i>, the breadfruit, the plantains... Everything was flattened to the ground. Even the papaya. It was all damaged because of the cyclone.” <i>Interviewee 108</i></p> <p>“... In the plantation, like our food... Our cassava gets hard from the cyclone.” <i>Interviewee 100</i></p>	Crop destruction, unhealthy crops

*\*In the quantitative surveys, this question about farming was asked only of women who indicated that most of their household income came from selling fish or food, or that most of their household food came from the farm or the sea (n=47).*

### *Water Access*

Neither water access nor lack of rain were mentioned as a primary climate change concern in the quantitative survey. This was contradicted in the qualitative interviews. Interviewees discussed rainfall patterns and water shortages at length, expressing concern about access to both potable and non-potable water. The majority of interviewees (70.00%; n=7) mentioned that water shortages were common in the village and on the school compound, adjacent to the village.

*“Right now, it [the water] is open for a few days, then it is closed again. When this happens, we don’t have enough water.” Interviewee 104*

*“... After two days or three days, then we can open up the water again.” Interviewee 109*

Water availability is inconsistent and the village will often endure days without tap water. Water is fed from an elevated reservoir (spring-fed and rain-filled) located on the mountain slopes above Yalobi Village, to communal taps in the village. Village leaders monitor reservoir levels and control the flow to the taps. Households fill storage containers with water when access is allowed, and ration water use when access is denied. Thus, interviewees emphasized concern around access to drinking water, water for washing clothes and dishes, water for cooking, and water for crops, which impacts food security, sanitation, and hygiene.

### **Income Generation**

Quantitative findings show the primary source of household income is selling fish or food from the farm (80.85%; n=38) followed by weaving mats and fans (handicrafts) and making brooms (46.81%; n=22). Interview participants were much more likely to discuss handicrafts as a source of income generation, than selling food or fish. Specifically, 70.00% (n=7) of the women interviewed made money by weaving and selling traditional mats, and 20.00% (n=2) made money by selling fish or crops from their farm.

Study results show that climate change poses a threat to the *voivoi* (pandanus) plant, which is used by village women to make woven items. The quantitative survey reveals that the women who rely on weaving and making brooms as a primary source of income generation, said the difficulty with growing *voivoi* was due to higher temperatures and a lack of rain. Yet, in the qualitative interviews, cyclone destruction was the primary concern regarding cultivation of *voivoi* (Table 5).

**Table 5.** Climate change threats to the *voivoi* plant

		Qualitative Results
Climate Threat	Quantitative Results (n= 25*)	Illustrative Quotes
Higher temperatures	(88.00%; n=22)	*not discussed by interviewees
Lack of rain	(76.00%; n=19)	“When we have enough rain... only then, it [the <i>voivoi</i> ] is healthy” <i>Interviewee 102</i>  “... it [lack of rain] is a problem for the <i>voivoi</i> ...” <i>Interviewee 104</i>
Tropical cyclones	(52.00%; n=13)	“... the <i>voivoi</i> plant, yes. We use that a lot but right now they aren’t doing well, so we have to wait a long time. It is because of the cyclone last year. So we have to leave the <i>voivoi</i> to grow back again. It will take some time. Only one cyclone has come and it affects everything.” <i>Interviewee 100</i>  “... We just have to wait until the cyclone is over and then have to look to see if the winds ruined it [ <i>voivoi</i> ].” <i>Interviewee 109</i>

*\*In the quantitative surveys, this question about voivoi was only asked of women who said they were making handicrafts or selling goods to tourists as one of their top two sources of household income generation (n=25).*

## Culture

Weaving of traditional mats with *voivoi* is a key source of income for the village (see **Income Generation** above). It is also a group social activity for women.

*“The women are able to get together to do the weaving... and the talking. Lots of gossiping!” Interviewee 108*

During the interviews, 80.00% of the interviewees (n=8) discussed using herbal medicine. Of these respondents, all but one mentioned a reliance on herbal medicine remedies prior to visiting the village nurse. Participants only mentioned visiting the village nurse or the hospital in Lautoka with a larger medical issue.

*“When people are feeling sick, we boil the water and use the leaves of the cassava for tea. We can use this as our medicine instead of going to the nurse.” Interviewee 102*

*“The leaves from many of the plants are helpful. If they don’t work, or there is a bigger*

*problem, we go right to the hospital...” Interviewee 106*

These important aspects of Fiji culture, weaving and herbal medicine, rely on the natural environment and require a robust ecosystem.

### **Extent of Impact**

In the quantitative survey, study participants indicated that their village and households were impacted by climate change (Table 6). Yet, within the qualitative interviews, the way climate change hazards impacted households versus the village, could not be separated. Given the closeness of ‘household’ and ‘village’ within this community, the threats of climate change are felt by all residents at both the household and village levels.

Within Yalobi Village, women are responsible for the cooking and laundry, household and otherwise, so challenges related to cooking and washing impact women disproportionately. Specifically, in the quantitative survey, 95.83% (n=46) of the women were responsible for cooking and 89.58% (n=43) did the laundry.

Interview conversations support these findings and reveal that other roles- weaving (70.00%; n=7) and gathering seafood during low tides (40.00%; n=4)- are also the responsibility of women. Survey participants were not primarily responsible for farming activities or for decision making, beyond the bounds of food preparation, weaving, and domestic household duties (Table 7).

**Table 6.** Extent of impact

<b>Quantitative Results (n= 48)</b>			
<b>Statement</b>	<b>‘Strongly agree’ or ‘Agree’</b>	<b>‘Neither agree nor disagree’</b>	<b>‘Strongly disagree’ or ‘Disagree’</b>
<i>My village is being impacted by climate change.</i>	(95.83%; n=46)	(0.00%; n=0)	(2.08%; n=1)
<i>My household is being impacted by climate change.</i>	(81.25%; n=39)	(10.42%; n=5)	(4.17%; n=2)

**Table 7.** Roles and responsibilities among women in the village

		Qualitative Results
Roles and Responsibilities	Quantitative Results (n=48)	Illustrative Quotes
Cooking	(95.83%; n=46)	<p><i>"I just stay in the house and do most of the cooking..." Interviewee 104</i></p> <p><i>"Me... I mostly do the cooking." Interviewee 108</i></p>
Washing or doing laundry	(89.58%; n=43)	<p><i>"... My daughter will go to school and I will work in the household. I do the laundry." Interviewee 100</i></p> <p><i>"... I did the clothes washing in the village well." Interviewee 102</i></p>
Providing food	(43.75%; n=21)	<p><i>"I look for the seashells and snails on the shore when the tide is low." Interviewee 102</i></p> <p><i>"... I go to the sea to do the fishing or looking for the seaweed, the octopus or the snails." Interviewee 109</i></p>
Earning money	(27.08%; n=13)	<p><i>"I make the mat. I also sell the snails and the hot peppers and the traditional Fijian bread [made from cassava] in the market in Lautoka." Interviewee 106</i></p> <p><i>"Us women, we can sell the mats in the market in Lautoka.. Or maybe we can sell them in the hotel. At times, those who are working in the hotels need to buy mats because they don't have time to make them." Interviewee 109</i></p>
Making decisions	(14.58%; n=14)	<p><i>"I just make the decisions about the cooking and weaving." Interviewee 104</i></p> <p><i>"The women have to make decisions around the house but the men are responsible for making decisions." Interviewee 108</i></p>
Maintaining the farm	(8.33%; n=4)	<p><i>"I also take care of my garden." Interviewee 104</i></p> <p><i>"I am watering my vegetable garden... All the time, I focus on my garden..." Interviewee 105</i></p>

## V. Discussion

In this small-scale, community-centered study, women’s voices reveal concerns about climate change. Study participants outlined the ways in which they believe climate change poses an active threat to their households and community. Respondents linked the implications of climate change threats (tropical cyclones and sea-level rise) and insidious fluctuations (changing weather patterns) to tangible impacts on food security, income generation, and traditional cultural practices. Based on these findings, their vulnerability to the health and livelihood impacts of climate change is clear. In addition, the results provide local context, which enhances the need for adaptive capacity.



### **Climate Change Vulnerability**

Climate change is a growing concern for women residing in Yalobi Village. Specifically, women are concerned about the rising sea level, stronger tropical cyclones, increasing temperatures, and changing rainfall patterns. These threats pose varying risks to livelihood strategies and daily life in the village. A salient primary concern in this coastal village, indicated by the quantitative survey, is sea-level rise. Yet, transcripts from qualitative interviews did not support this finding. The qualitative interviews discussed climate change impacts, including stronger tropical cyclones, increasing temperatures and changing rainfall patterns, which were considered a greater threat (than sea-level rise) to food security, income generation, and culture. The different results revealed by the quantitative and qualitative data justify the importance of a mixed-method approach to understand local climate change perceptions and concerns.

Study findings emphasize a reliance on the natural environment by women within Yalobi Village. This is consistent with the literature, which illustrates the importance of both land and ocean-based resources for island survival (Mangubhai et al., 2017; Pearson et al., 2019). A healthy natural environment is essential when livelihoods and survival depend on it. Participants indicated that their natural environment is under threat, and their declared heavy reliance on the ecosystem makes this community especially vulnerable.

Community vulnerability is amplified through interdependence of the themes highlighted during the qualitative interviews. These findings show that primary climate change concerns (tropical cyclones, rising sea level, and changing weather patterns) have several closely linked implications for life within Yalobi Village. Climate change threats impact farming, which affects food security, income generation streams, and health. A comparable study suggests that, rather than heavily depending on a small number of resources as a livelihood strategy, diversification is important (Remling & Veitayaki, 2016). For communities directly threatened by climate change, diversification of livelihood strategies and income-generating activities is imperative for climate resilience and adaptation.

Various studies show that social and environmental determinants of health are impacted by climate change. Medina Hidalgo et al. (2020) found that, when weather patterns impact farming and crop yield, individuals tend to consume more processed foods. Increased consumption of processed food is a concern in Fiji, where NCDs are responsible for the vast majority of avoidable deaths (Ministry of Health & Medical Services, 2020). Consequently, issues of food security have serious implications for the health of rural populations. When the social determinants of health are impacted, vulnerability to the health implications of climate change is the inevitable result.

Results from this study demonstrate distinct gender roles and responsibilities within the village, emphasizing the different ways in which men and women bear the burden of climate change. For women, this includes access to water: women are responsible for cooking and washing, but both these tasks rely on water; women are responsible for weaving, using the *voivoi* plant, but the *voivoi* plant is affected by tropical cyclones, increasing temperatures and a lack of rainfall, which jeopardizes income generation and culture. Although women in Yalobi Village are not primarily responsible for farming, this activity is critically necessary for food and income generation- but farming too is adversely affected by climate change.

Further, women discussed decision-making linked to their primary roles in the village: cooking, housekeeping, child-rearing and weaving. Women did not report decision-making capacity beyond these duties. Without decision-making capacity for issues related to adaptation planning and natural resource governance, women's unique vulnerabilities to climate change will continue (Piggott-McKellar, McNamara, Nunn, Watson, 2019).

### **Adaptive Capacity**

Climate change has made it increasingly important to understand resilience and community assets which promote adaptive capacity. As discussed, Fiji residents have generations of experience of dealing with environmental changes, and therefore, adaptation planning must be sensitive to histories, environmental changes, and a sense of

place (McMichael & Katonivualiku, 2020). The unique characteristics of an island community such as local knowledge, kinship ties, reliance on natural surroundings, and coping abilities should be highlighted in implementing strategies for a sustainable future (Korovulavula et al., 2019).

Utilization of traditional and modern skills is an important contributor to adaptive capacity within the Pacific Island context (Warrick et al., 2017). Within Yalobi Village, several traditional and modern skills were discussed during the interviews: the majority of women make traditional woven articles to generate household income; and herbal medicine was commonly used and served as a first line of defense against illnesses.

The community described organization and coordination within the village to prepare for tropical cyclones. Modern technologies (phones or radios), or traditional knowledge of natural cyclone warning signs, inform the community of an approaching tropical cyclone. The village is then able to prepare, secure their homes, and store food and water. Despite the innate vulnerability of the Pacific to natural shocks, men and women have used their traditional knowledge to adapt and mitigate disasters, for generations (Lane & McNaught, 2009). These skills represent important knowledge and abilities for future climate change adaptation.

During interview conversations, the distinction between household and village was negligible in the context of climate change implications. This is primarily due to strong kinship ties between households. Literature that focuses on rural Fiji highlights kinship ties and social cohesion as a key aspect of the community (Nalau et al., 2018; Nunn & Kumar, 2018). Close-knit social networks are advantageous for recovery from natural hazards, and thus increase adaptive capacity (Yila et al., 2014). Further, when relocation of two Fiji communities was examined, social cohesion was found to play a positive role in their repositioning (Piggott-McKellar, McNamara, Nunn, Sekinini, 2019). Accordingly, the strong social ties within Yalobi Village should be viewed as an asset for adaptive capacity.

Cognitive factors such as belief systems and values are an important determinant of adaptive capacity within the Pacific Island context (Luetz & Nunn, 2020; Warrick et al., 2017). This study demonstrated a reliance on traditional belief structures. The majority of participants accessed herbal medicines first, prior to seeking medical care; and results show a reliance on natural surroundings and customary practice for livelihood sustainability. This relationship with nature goes beyond resource utilization and reliance and is expressed through a spiritual connection (Nunn & Kumar, 2018). The value and belief systems in such rural communities tend to be rooted in indigenous knowledge (Piggott-McKellar, McNamara, Nunn, Sekinini, 2019).

Looking ahead, adaptive strategies used by Fiji citizens should be supported and strengthened to meet the demands of increasing climate variability. The study results can inform such strategies to increase adaptive capacity by using locally developed frameworks. Adaptive capacity among the women in Yalobi Village should be enhanced and leveraged according to the PACAF to initiate CBA planning processes (Warrick et al., 2017).

## **VI. Conclusion**

This paper investigates the implications of climate change for women's livelihoods and wellbeing in a Fiji village. The approach and methods used can be applied in other rural Pacific communities to understand localized climate change threats and perceptions and ensure that all voices are included in adaptation planning. Climate change threats affect daily life in the Pacific Islands having implications for health and wellbeing. Thus, proactive planning is required to help safeguard vulnerable populations.

This study helps understand localized perspectives and livelihood systems to examine adaptive capacity. It highlights opportunities to increase adaptive capacity and mitigate livelihood implications. With a clear understanding of climate change threats, the reliance on natural surroundings for food security, income generation, and sustaining culture and identifying who is being impacted, community adaptation efforts can be initiated. Culturally appropriate and equitable adaptation measures can be designed and should

focus on areas that need strengthening. As highlighted above, strategies should be community focused and designed based on a locally developed framework such as the PACAF. These findings should be considered in adaptation planning to ensure these efforts are community-led.

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## Appendix A

**Table A1.** Participant demographics

Qualtrics Online Survey Participants (n=48)		
Characteristic	Category	(percent; n=x)
Age	18-24 years	(18.75%; n=9)
	25-34 years	(25.00%; n=12)
	35-44 years	(20.83%; n=10)
	45-54 years	(22.92%; n=11)
	55-64 years	(6.25%; n=3)
	65+ years	(6.25%; n=3)
Time residing in Yalobi Village	1-4 years	(4.17%; n=2)
	More than 4 years	(95.83%; n=46)
Marital status	Yes	(70.83%; n=34)
	No	(29.17%; n=14)
Number of children	None	(20.83%; n=10)
	1 or 2	(33.33%; n=16)
	3 or 4	(35.42%; n=17)
	5 or more	(10.42%; n=5)
Highest level of education	Primary school (some or completed)	(29.17%; n=14)
	Secondary school (some or completed)	(60.42%; n=29)
	University (some or completed)	(10.42%; n=5)

**Table A2. Interview participant demographics**

Interview Participants (n=10)		
Characteristic	Category	(percent; n=x)
Age	18-24 years	(10.00%; n=1)
	25-34 years	(40.00%; n=4)
	35-44 years	(10.00%; n=1)
	45-54 years	(20.00%; n=2)
	55-64 years	(10.00%; n=1)
	65+ years	(10.00%; n=1)
Time residing in Yalobi Village	1-4 years	(0.00%; n=0)
	More than 4 years	(100.00%; n=10)
Marital status	Yes	(70.00%; n=7)
	No	(30.00%; n=3)
Number of children	None	(10.00%; n=1)
	1 or 2	(40.00%; n=4)
	3 or 4	(40.00%; n=4)
	5 or more	(10.00%; n=1)
Highest level of education	Primary school (some or completed)	(30.00%; n=3)
	Secondary school (some or completed)	(60.00%; n=6)
	University (some or completed)	(10.00%; n=1)

**Table A3.** Implications of climate concerns for life in the village

Qualtrics Online Survey Participants (n=48)			
Statement	'Yes'	'No'	'I don't know'
I am concerned about the way (tropical) cyclones impact my life in the village.	(100%; n=48)	(0.00%; n=0)	(0.00%; n=0)
I am concerned about the way floods impact my life in the village.	(100%; n=48)	(0.00%; n=0)	(0.00%; n=0)
I am concerned about the way the lack of rain impacts my life in the village	(91.67%; n=44)	(6.25%; n=3)	(2.08%; n=1)
I am concerned about the way the rising seas levels impact my life in the village	(100%; n=48)	(0.00%; n=0)	(0.00%; n=0)
I am concerned about the way extreme heat impacts my life in the village	(91.67%; n=47)	(0.00%; n=0)	(2.08%; n=1)