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External vulnerability, local resilience, and urban-rural heterogeneity in the Marshall Islands

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Abstract

Popular media often positions the Marshall Islands as especially vulnerable to environmental shocks and shifts. This framing overlooks sources of vulnerability, local resilience, and within country differences. To better understand relationships between social, economic, and cultural shifts and vulnerability and resilience in the Marshall Islands, this study draws on interviews with internal migrants and members of government and civil society to investigate perceptions of vulnerability and resilience in outer islands and Majuro. Findings reveal sharp perceived differences. Participants largely tied vulnerability on outer islands to increasingly variable environmental conditions affecting natural resource-dependent livelihoods and vulnerability on Majuro to the cash economy. In both urban core and rural outer islands, participants linked vulnerability to interdependencies far beyond the Marshall Islands. By evaluating historical and external influences and spatial heterogeneity, this study supports a nuanced understanding of vulnerability and resilience within archipelagic countries critical to policy development.

Keywords

Vulnerability; Resilience; Climate change; Marshall Islands; Pacific Islands

1. Introduction

International news headlines about the Marshall Islands (RMI) focus on anticipated catastrophic impacts from climate change (Francis, 2021). However, a reductionist emphasis on climate change impacts and, particularly, effects of sea-level rise, depoliticizes challenges faced in island communities, such as accessing resources and services, overlooks other pressing environmental and development issues and root causes, and disempowers local

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Author statement

The author confirms sole responsibility for study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Ethics approval

This study received ethics approval from the University of Wisconsin – Madison IRB: ID# 2018-1414.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

responses to social and environmental changes (van der Ploeg et al., 2020). The trope of climate change victimhood—of countries far from global economic centers contributing far less to global emissions yet facing the greatest risks from climate change—paints a picture of inherent vulnerability in “small island developing states” (SIDS) tied to insufficient development requiring further western intervention (Chan, 2018). Related modernity narratives that associate distance and difference with living in highly vulnerable states-of-nature unable to cope with shocks similarly approach local practices as inefficient and promote market-oriented shifts that undermine risk responses (Gaillard, 2007; Sassen, 2014; Skillington, 2017; VanWey et al., 2005; West, 2016). However, as Epeli Hau’Ofa crucially emphasized, perceptions that Pacific Islands are too small, poorly resourced, and isolated to thrive without foreign aid mischaracterize vulnerability and overlook prosperous, resilient, and deeply interconnected precolonial histories, as well as destructive and disempowering colonial legacies (Hau’Ofa, 1995).

Vulnerability, which can be defined as factors that make a population less able to respond, cope, and recover from environmental shocks or shifts (Cutter and Finch, 2008), is not natural to islands despite island stereotypes that hold vulnerability as a defining characteristic (environmental determinism) (Kelman, 2020; Moore, 2010). Rather, vulnerability is influenced by how colonialism and capitalism fashion space through dispossession and removal, environmental contamination and destruction, and disempowerment and neglect (Gaillard, 2007; Reenberg et al., 2008; Maldonado et al., 2014). Islands and other places geographically isolated from global economic centers are embedded in forces and institutions far beyond their political borders (Lazrus, 2012), with these extrinsic factors having vulnerability-producing intrinsic effects, for example reducing natural resource availability (Mercer et al., 2010). Thus, geographic isolation from economic centers may associate with severe climate change impacts, vulnerability, and barriers to adaptation (Patel and Moore, 2017; Sassen, 2016). On islands, environmental impacts on livelihoods may be particularly severe, transportation costly and infrequent, and goods and services limited or inaccessible (Kelman, 2007, 2020; Kim and Bui, 2019; Shultz et al., 2016).

To evaluate relationships between colonial legacies, global integration, and economic, social, and cultural shifts and vulnerability and resilience in the RMI, this study uses in-depth interviews with internal migrants and members of government and civil society to investigate perceived drivers of vulnerability on the main island of Majuro and outer islands. I also consider resilience, since traditional practices, communal values, and social ties may buffer vulnerability. In evaluating sources of vulnerabilities, I examine how colonial and global economic and political systems drive vulnerability through system exposure and abandonment, including new climate change-related exposures and international disinterest and disinvestment (Gilmore, 2007, 2008; Mitchell-Eaton, 2021; Smith, 2006). RMI leaders have corroborated such a vulnerability-producing dual process of exposure and abandonment, perceiving global origins of local vulnerabilities via environmental, economic, and cultural shifts and limited foreign investment (Bordner et al., 2020; Kabua, 2020; Rudiak-Gould, 2013).

The RMI is a country in the Pacific made up of 24 inhabited low-lying islands and atolls (Pacific Community and the Marshall Islands Economic Policy, Planning, and Statistics Office, 2023). The islands have a long history of adaptation, resilience, and interconnectedness (Teaiwa, 2018). From as early as 1526, the islands were colonized by Spain, Germany, Japan, and the United States, and, from 1946 to 1958, the US conducted 67 nuclear tests on the islands (Rudiak-Gould, 2013). Several years after independence in 1979, the RMI entered into an agreement with the US—the Compact of Free Association—that permits Marshallese to live and work visa-free in the US, provides financial support to the RMI, and permits the US exclusive use of RMI territory (University of Hawai'i at Manoa Library, 2023). The RMI population is 42,418, with 32,945 living on the urban Majuro and Kwajalein atolls (Pacific Community and the Marshall Islands Economic Policy, Planning, and Statistics Office, 2023). Urbanization is increasing. In 2021, 78% of the population lived on these urban atolls compared to 74% in 2011 and 65% in 1999 (Pacific Community and the Marshall Islands Economic Policy, Planning, and Statistics Office, 2012; 2023). On urban atolls, population density is high, at 6175 and 1546 persons per square mile on Majuro and Kwajalein atolls respectively, compared to 605 persons per square mile in the country at-large (Pacific Community and the Marshall Islands Economic Policy, Planning, and Statistics Office, 2023).

In investigating sources of vulnerability and resilience, I build on a decades-long cross-disciplinary turn in vulnerability research towards social factors and root causes (Wisner et al., 2003). Ethnographic scholarship has led this turn, positioning the circumstances surrounding natural disasters, from cause to recovery, as a social calculus (Bonilla and LeBrón, 2019; Smith, 2006). In this constructivist perspective—and in contrast to realist perspectives that approach risk as resulting directly from hazards—climate change is one of many drivers of risk, including non-climate environmental shocks and social inequalities and discrimination (McCubbin et al., 2015; Tierney, 2014). Despite growing attention to social, economic, historical, and political factors and their differential influences on vulnerability (Roland et al., 2023; Thomas et al., 2019), limited empirical research focuses on upstream drivers or variation in drivers' impacts. A review of anthropological research in island communities identified sources of vulnerability and barriers to adaptation as crucial questions for further research (Lazrus, 2012). This study contributes to this call and to the growing number of case studies that examine resilience in island settings, weigh historical contexts and global position, and challenge assumptions of island vulnerability (Ooi et al., 2023). Scrutinizing root causes may support more nuanced approaches to climate change adaptation in the Pacific beyond development-based perspectives that stress economic fragility to justify standard development practices (e.g., microeconomic reforms, structural adjustments) (Barnett and Waters, 2016).

This study also contributes to calls to investigate within country heterogeneity in archipelagic countries, particularly differences between rural, outlying islands (“peripheral”) and urban, central islands (“core”) (Nunn and Kumar, 2018; Petzold et al., 2023). Most research in SIDS has focused on core areas (Duvat et al., 2017; Klöck and Nunn, 2019; Nunn et al., 2014), and recent research has called for scrutiny of differences in vulnerability, resilience, and adaptation capacities and responses between and within islands, including environmental, economic, demographic, and cultural contexts that shape vulnerability and

resilience (Fernandes and Pinho, 2017; Nunn and Kumar, 2018). Peripherality influences vulnerabilities related to resource and service distribution as power and resources typically concentrate in cores (McNamara and Clissold, 2019), and more difficult accessibility in archipelagic settings compared to continental countries may amplify core-periphery dissimilarities (Nunn, 2009). By investigating perceived differences in vulnerability and resilience between outer islands and Majuro and global processes' varying influences in these contexts, this study stresses the diversity of experiences within archipelagic countries and contributes to numerous calls for contextual scrutiny within SIDS (Klöck and Nunn, 2019; Malatesta and Di Friedberg, 2017).

2. Literature review

2.1. Exposure

Environmental, economic, social, and cultural shifts related to colonialism, development, and globalization can undermine resilience and create new vulnerabilities in Pacific Island countries (Campbell, 2009). During colonialism, phosphate mining (Teaiwa, 2014a, 2015) and guano harvesting (Cushman, 2013) involved intensive resource extraction and abandonment once resources were either completely removed or no longer valued in the global economy. In the RMI, the US' nuclear tests transformed landscapes and populations for generations and reshaped social, cultural, political, economic, and environmental contexts (Mitchell-Eaton, 2021). Polychlorinated biphenyl contamination from the US military base in Kwajalein has threatened residents of nearby Ebeye for decades (Marcoux, 2022). Across the Pacific, globalization weakens traditional knowledge, and local adaptive capacities developed in response to changes in local social-ecological systems may struggle to adjust to changes originating in global political, economic, and environmental systems (Klöck and Nunn, 2019; Lauer et al., 2013). Considering Pacific Islands' limited influence over political and economic decisions driving exposures, island populations may be unable to block external influences or reduce effects (Fernandes and Pinho, 2017).

Cultural shifts reshape support systems across the Pacific, replacing traditional kinship networks that historically were protective of environmental shocks and creating new power structures, inequalities, and social pressures (Campbell, 2015). For example, new church-centered networks require religious engagement, which frequently includes large financial obligations (Kuruppu, 2009; Small, 2011). Increased reliance on remittances may increase work pressures and financial strains on migrants and limit resource access to families with migrant relatives (Dun et al., 2022; Small, 2011). In the RMI, 11% of households nationally reported receiving remittances in the last year (Pacific Community and the Marshall Islands Economic Policy, Planning, and Statistics Office, 2023). New hierarchies around money may also threaten the traditional social system around chiefs in the RMI. Historically, community members gave traditional leaders subsistence foods as tribute for disaster relief (Carucci, 1997). Transformed social relationships may reshape roles in ways that exacerbate vulnerability.

Social and environmental shifts related to external exposures have uneven effects on vulnerability and resilience in Pacific countries' cores and peripheries (Nunn and Kumar, 2018). For example, while shifts to a cash economy that tie food access to cash work

drive food and water insecurity across archipelagos (Lazrus, 2012; McCubbin et al., 2015; Morrissey, 2013), shifts may be especially perilous in rural islands dependent on a single economic source and with few food alternatives and limited access to adaptation-supporting infrastructure and goods (Bach, 2017; Kirsch, 2020; Thomas et al., 2019; Watson et al., 2016). Across the Pacific, cash work on outer islands often revolves around copra production, introduced and promoted by foreign traders and missionaries from the mid-1800s (Lepowsky, 1991). This monoculture cash cropping for export replaced diversified and resilient subsistence food systems and undermined traditional adaptive practices of food preservation and storage (Campbell, 2015; Lauer et al., 2013; Nunn and Kumar, 2018). Copra production also reduced local autonomy, reshaped landscapes and customs, and created new hierarchies around cash livelihoods (Chambers and Chambers, 2000; Lepowsky, 1991; Rollason, 2014; Rudiak-Gould, 2013). Related erasure of traditional environmental knowledge has weakened self-sufficiency and resilience (Janif et al., 2016). Environmental shifts in the Pacific associated with global climate change and overfishing are also particularly harmful to outer island subsistence livelihoods (Barnett, 2020; Nunn, 2013; Sumaila et al., 2016). In the RMI, less abundant sea life, declining rainfall, increasing erosion, and higher heat extremes especially threaten outer island food security (Rudiak-Gould, 2013).

Social and economic shifts related to economic development and globalization pressures drive cultural shifts, but particularly on urban islands where these exposures are greatest (Chambers and Chambers, 2000; Fernandes and Pinho, 2017; Rudiak-Gould, 2013). Many of these shifts have health implications. For example, Majuro residents attribute new obesity and diabetes epidemics to lifestyle and cultural changes that accompanied colonialism (Blankenship et al., 2020; Dye et al., 2018; Helble and Francisco, 2017; Passmore and Smith, 2019). Reduced reliance on subsistence activities has increased the importance of alcohol consumption to male identity, particularly in urban Majuro and Ebeye, with consumption modeled after western behaviors (Carucci, 1987). Increased urban migration, overcrowding, and poverty have contributed to high tuberculosis incidence and mortality, and climate change impacts may exacerbate these direct risk factors (McIver et al., 2015; Yamada et al., 2016). In matrilineal RMI, economic shifts have also transformed gender relations in ways that exacerbate vulnerability, altering women's position in the household and affecting women's economic security and physical wellbeing (Carucci, 1987; Lipset, 2011). Emphasizing the new importance of money in family dynamics and vulnerability, an RMI government study on family health and safety found that over a quarter of women (27%) reported that their partner either took money they had earned or refused to give them money for family needs (Jansen and Abraham, 2014). This study further found that, across the country, 21% of ever-partnered women had experienced sexual violence, 48% physical violence, and 80% controlling behavior and that women on urban Majuro were most likely to report violence (Jansen and Abraham, 2014).

2.2. Abandonment

Validated by rhetoric around sea-level rise and mass out-migration, international support for large-scale climate change adaptation projects in the Pacific is extremely limited despite roles in resource extraction and destruction and global climate change (Barnett,

2017; Bordner et al., 2020; Mitchell-Eaton, 2021). When aid is available, receipt often requires meeting administrative requisites burdensome to Pacific Island governments and implementing set strategies that contribute to dependence rather than autonomy (Betzold, 2015; Murray and Overton, 2011; van der Ploeg et al., 2020; Yarina and Takemoto, 2017).

In the RMI, nuclear testing and the abandonment that followed drastically transformed atolls and their residents. The US exposed residents to nuclear fallout, unsafe levels of radiation, and excess cancers, forcibly relocated residents to uninhabitable islands, and created conditions of economic dependency (Marcoux, 2022). Like abandonment in other contexts (Gilmore, 2008; Pulido, 2016), the US has approached the nuclear legacy as a Marshallese problem, ignoring ongoing risks and embodied legacies. For example, the US has constructed its own legal frameworks to avoid accountability, disregarded increasing risks of leakage from the Runit Dome, which houses 3.1 million cubic feet of radioactive material, and, until December 2020, denied Marshallese in the US access to Medicaid while benefitting from Marshallese labor through the Compact of Free Association (Bahng, 2020; Marcoux, 2022; Mitchell-Eaton, 2021).

Abandonment may be particularly severe in more remote communities and outer islands. Compared to urban cores, archipelagic countries' peripheral islands are not often national priorities for climate change adaptation or development and have less access to economic and technical resources, including essential facilities, goods, and services (Duvat et al., 2017; Malatesta and Di Friedberg, 2017; McNamara and Clissold, 2019; Nunn et al., 2014). More difficult provision of services and resources on outer islands and high out-migration exacerbate this policy neglect (Fernandes and Pinho, 2017). The success of community-based adaptation in rural atolls depends on continuous financial and technical support (Jarillo and Barnett, 2021), yet abandonment may require peripheral communities to pursue adaptation and development planning on their own (Janif et al., 2016).

2.3. Resilience

Indigenous and island populations have long histories of adapting to environmental shocks and shifts (Fitzhugh, 2012; Gaillard, 2007; Reenberg et al., 2008; Maldonado et al., 2014; Simpson, 2017; Steiner, 2015; Teaiwa, 2018). Sustainable livelihoods, strong traditions and identities, close social networks, and traditional systems of exchange have enabled island communities to thrive (Hovgaard, 2002; Kelman, 2007), and Indigenous language and culture may support adaptation and community health (Hilgendorf et al., 2019; Johnson et al., 2015). Island communities may thus be particularly self-reliant and resilient. For example, following a 1907 storm surge in the low-lying Ta atoll in Micronesia that killed hundreds immediately and in a subsequent famine, residents began to rebuild and remained until they were forcibly relocated by German colonizers for their labor (Oleson, 2007). Indigenous knowledge was also credited with reducing loss of life following a 1999 tsunami in an outer island community in Vanuatu (Walshe and Nunn, 2012).

Economic and social ties within and between islands and the sharing of cultural knowledge and resources have long been a form of disaster insurance in the Pacific (Campbell, 2015; Hau'Ofa, 1995; Teaiwa, 2014b). In the Caroline Islands, in what is today the Federated States of Micronesia, exchange and disaster-related assistance occurred primarily

within kinship groups living on different islands, but when shocks affected whole islands, neighboring islands' entire populations sent aid (Alkire, 1965). In the RMI, as throughout the Pacific, conviviality is intertwined with subsistence lifestyles, with the sharing of food and resources a social requirement that levels access across residents (Berman, 2020; Chambers and Chambers, 2000; Pollock, 1992; Rudiak--Gould, 2013). However, during and since colonialism, local systems of support and traditions of giving have been lost or degraded, replaced by imported foods and emergency aid that reduce local adaptive capacities and create dependency (Campbell, 2015; Lauer et al., 2013; Weir et al., 2017).

Economic, social, and cultural changes that result from shifts such as transitions from subsistence to cash work are differently influential in urban and peripheral island communities and have differential effects on resource sharing traditions in these communities (Du Toit and Neves, 2009; Rudiak-Gould, 2013). Support networks and traditional knowledge have been most affected in urban and peri-urban island communities where cultural changes have been most pronounced (Petzold and Magnan, 2019; Weir et al., 2017). However, in peripheral islands, the persistent strength of close social ties and traditional knowledge may create opportunities for localized and culturally grounded adaptation strategies, which have proven more effective than predetermined, imported solutions (Nunn and Kumar, 2018).

3. Methods

I conducted this research over two three-month trips to Majuro in January to March and September to November 2019, with assistance from two organizations, the Marshall Islands Conservation Society (MICS) and the RMI office of the International Organization for Migration (IOM). Both organizations had recently led or supported research related to this study. Staff from these organizations, as well as from the RMI Office of the Chief Secretary, assisted in developing research questions, identifying appropriate methods, and reviewing protocols. This community consultation and direction ensured that research aligned with local research needs (O'Fallon et al., 2003).

The focus of research activities was 28 in-depth interviews with adult migrants from outer islands living on Majuro. This study's guiding themes included perceived sources of vulnerability and resilience on outer islands and Majuro. Questions asked about participants' livelihoods, support systems, housing situations, perceived community strengths, and perceived challenges related to work, health, the environment, and daily life on outer islands and Majuro. A separate group of questions asked about migration drivers and experiences (Roland, 2023). Interviews lasted approximately one hour. Participants were sampled from a 2018 IOM internal migrant household survey conducted as part of a World Bank funded project on community-based disaster risk reduction. The survey aimed to offer a demographic overview of internal migrants and investigate migration push and pull factors. Survey participants (n = 508, of 1215 contacted) were recruited in-person in conjunction with a tuberculosis screening program across Majuro from July to September 2018. Interviews were intended to contextualize survey results, which was a need highlighted in the survey report (International Organization for Migration, 2018). Interview participants were recruited from survey respondents who indicated that they had moved from an outer

island, would be willing to be recontacted, and gave either an email or phone number for recontacting (n = 220, 82 men and 138 women). From this list, potential participants were grouped by island of origin and recruited at random from these groups to ensure a mix of migration origins in the sample. Participants varied widely by age (age 19 – 70), gender (6 men, 22 women), occupation, socioeconomic status, place of residence in Majuro, migration origin (participants had moved from ten of the more populated outer islands, including Maloelap: 5, Namu: 2, Ailinglaplap: 5, Ebon: 3, Aur: 2, Wotje: 2, nuclear-affected Rongelap: 1, Likiep: 2, Mili: 1, Jaluit: 3, and multiple islands: 2), and time of migration (arriving in Majuro between 1.5 and 41 years prior). Participants were mostly women as 63% of survey respondents were women. Participant variation was important to compare cases of vulnerability. When quoting, I note age range (young ages, 18–35; middle-ages, 36–55; older ages, 56 and older), gender, and origin island, determined by where participants had spent the most time before moving to Majuro.

As an examination of internal migrant perceptions of current vulnerability and resilience on Majuro and past experiences on outer islands, the study involves generalizability limitations. Internal migrant perceptions likely differ from the perceptions of individuals remaining on outer islands. For example, challenges on outer islands influenced some participants' migration decisions. Other participants may hold nostalgic and overly positive views of life on outer islands (Connell, 2016). Migrant perceptions likely also differ from perceptions of life-long Majuro residents. Life-long residents may have stronger social networks and support systems and be better adjusted to Majuro's cash economy and western cultural influences. Including these perspectives in future study might offer valuable comparative insight and a fuller picture of vulnerability and resilience on island cores and peripheries and across population characteristics.

Five interpreters supported participant recruitment and interview conduct. Four of the interpreters worked with MICS or IOM, which meant that they were familiar with and interested in the subject matter. This large number of interpreters was necessary for interview scheduling but also increased the number of key informants informing the research process and allowed for interpreter-participant matching by gender when schedules allowed (Edwards, 1998). Interpreters were trained together to promote consistency and encouraged to identify and ask follow-up questions to minimize translation-related disruptions (Adamson and Donovan, 2002; Williamson et al., 2011). Post-interview, interpreters translated and transcribed recordings.

Data collection also included 12 key informant interviews with elected officials, government staff, and members of civil society. Participants included mayors, senators, and presidents and leaders of aid organizations and government departments. These interviews focused on policy implications, strategies, and barriers and larger contexts of environment and development-related changes affecting vulnerability, resilience, and adaptation. Elected officials also described island-specific challenges and projects. These interviews were conducted in English without interpreters present and lasted approximately one hour. Perceptions of elected officials, government staff, and members of civil society are presented separately, following internal migrants' perspectives on vulnerability and resilience on outer islands and Majuro.

Transcripts of both sets of interviews were cleaned and imported to NVivo for coding and analysis by major themes from the protocol and using grounded theory to identify novel perspectives on origins and drivers of vulnerability. Grounded theory approaches participants as creators of meaning and prioritizes participants' ideas and framings, rather than externally developed concepts, in analysis and interpretation (Morse and Field, 1995; Strauss and Corbin, 1994). In line with this methodological orientation, results include the frequent use of quotations to emphasize participants' narratives.

Understanding that the most widely accepted versions of reality are created by those with privilege to reinforce positions of privilege, I was mindful of how my identity and assumptions shaped the research processes (Mao et al., 2016; Mertens, 2017). My outsider position and visible identities determined who I was able to engage with, what participants chose to share, and how I interpreted data (Berger, 2015; Mertens, 2017). These factors likely had a restricting effect in interviews with internal migrants. However, my position also opened doors. My social interactions helped form connections and establish trust with elected officials, government staff, and members of civil society. To address my positionality methodologically, I debriefed and reviewed themes with interpreters following interviews and at the end of data collection.

4. Results

4.1. Internal migrants' perceptions of vulnerability and resilience on outer islands

On largely environment-dependent outer islands, internal migrants perceived vulnerability as closely linked to environmental shocks and shifts. Participants shared how global interdependencies shape exposures to environmental risks, largely through climate change impacts but also through globalization and resource extraction. Low availability of goods, together with high costs and few cash-earning opportunities, remove adaptation options that might offset increasing risks associated with subsistence livelihoods. Limited international interest and investment in in-place adaptation projects may reflect abandonment. Nevertheless, participants reported strong networks within and between islands that support resilience.

4.1.1. Environmental risks—Internal migrants stressed environmental risks from droughts and storms on outer islands and linked increasing severity and frequency to climate change. Droughts closed schools, storms limited imports and triggered diarrhea and flu outbreaks, and both droughts and storms decreased copra production and natural food and water supplies. Increasing climate change impacts require adaptation, but participants stressed that many adaptation strategies require large cash investments and that the primary source of cash incomes on outer islands, copra, yields only modest returns and depends on environmental conditions. Environmental shocks like heavy rainfall ruin crops, and shipping delays decrease copra weight and value since copra dries in storage. Storms and public health emergencies like dengue or COVID that reduce or halt shipping also remove this cash source. The low value of copra relative to imports diminishes purchasing power and increases resource exploitation. As one participant described the situation:

Regarding financial conditions, things are really getting worse. Because they (outer island residents) are making their living from copra and copra production is dependent on environmental conditions that are worsening, people are less able to buy food and other supplies they need. The drought is really affecting our copra areas, and this then affects our financial situation and our living conditions.

(Older woman from Namu)

While the RMI government subsidizes copra production so that residents can compete with producers in countries with lower shipping expenses and costs of living, participants noted the large production quantities still needed to afford basic goods and services.

4.1.2. Infrastructure investments—Adaptation has proven successful but is severely constrained by insufficient investment. While noting that weak infrastructure and limited services contribute to vulnerability, participants stressed that government and non-governmental organizations' investments had facilitated in-place adaptation and reduced out-migration pressures. Two participants noted brackish, contaminated, and unusable well water during droughts; others described water infrastructure improvements that had prevented water shortages during droughts:

We had reverse osmosis units from IOM that helped us with the drought... conditions have gone back to normal, especially now that we have better services provided like the reverse osmosis units.

(Young man from Wotje)

During the drought an organization (IOM and the National Disaster Management Office) came to give out aid in response to the drought. This was very helpful for them (outer island residents), the aid, and prevented people from leaving.

(Older woman from Namu)

Infrastructure projects and aid are complemented by communal adaptation strategies: "They (the government) have recently installed water systems...When they say on the radio that there is going to be something like this (a drought), the men prepare big water catchments and then we live off of that." (Young man from Likiep). However, despite the demonstrated benefits of local adaptation initiatives, participants reported that funding to support projects was limited.

4.1.3. Imported goods—Imported goods provide alternatives to subsistence livelihoods and can diversify associated risks, but limited availability and purchasing power on outer islands constrain access. Participants stressed the importance of imported foods after storms: "The government came and brought us food, and I was so grateful to the government at the time because had they not come, we wouldn't have had food. All the plants were destroyed." (Middle-aged woman from Ebon). Outside of disaster response, however, participants observed that access to imported goods depends on infrequent and unpredictable shipping, with populations on some islands regularly waiting 3–4 months between shipments.² Participants noted that prices are high, increasing, and often prohibitively expensive. Populations farther from Majuro also receive fewer goods as items are offloaded at earlier stops and pay more for goods due to higher transportation costs and profit-taking across

long supply chains. Participants observed that prices peak during environmental shocks and accompanying shortages, which further shrinks abilities to offset subsistence-related risks.

Despite providing disaster insurance, imports of highly processed foods radically alter self-sufficient subsistence lifestyles. One participant described a shift in her parents' dietary habits: "My dad would call and be like, "we don't have any food here," and I'm like, "what do you mean you don't have any food." And he'll be like, "there's no rice, there's no meat." And I'm like, "come on, go fish dad." (Middle-aged woman from Likiep). Cultural shifts that accompany changing routines lead to a loss of traditional skills and knowledge. As one participant described her son who grew up in Majuro: "He wouldn't know how to live and do their everyday routine, like make copra and collect the coconuts. He wouldn't be able to climb the coconut trees or husk the coconuts." (Older woman from Maloelap). Participants recognized an inevitability to shifting ways of life but lamented changes and their seeming permanence, reflecting that without the experience of "living off of the land," their children would find it difficult to participate in subsistence lifestyles and feel less comfortable on outer islands.

4.1.4. Cultures of giving—Traditions of giving and close support networks within and between outer islands support resilience in outer island communities. Several participants noted that, on outer islands, assistance from neighbors is expected, with residents relying on neighbors for help and regularly sharing fishing catches and food. One participant described the sense of community: "Everyone knows each other and works to take care of each other. There is a lot of camaraderie there (on Ebon), and everyone is very welcoming." (Middle-aged woman from Ebon). This support system is also strong between islands. Another participant recounted inter-island support following a storm: "All of the breadfruit and pandanus and bananas fell so food ran out eventually. So people from other islands had to bring us food and water." (Older woman from Ailinglupalap). To increase access to goods on outer islands and diversify subsistence livelihood risks, residents may move to Majuro to send goods to family remaining on outer islands: "One of the reasons we come out here, go to school and go to work, is to get the stuff they (outer island residents) need." (Young man from Likiep). In addition to sending goods, migrants also send remittances, although the direction of exchange is not unidirectional and several participants described receiving traditional foods from relatives on outer islands. However, remittances may tie resource access on outer islands to vulnerability in migration destinations, as participants noted that sending money to relatives was not always easy given their own economic precarity.

4.2. Internal migrants' perceptions of vulnerability and resilience on Majuro

Unlike vulnerability on outer islands that internal migrants described as largely stemming from climate change impacts increasingly impeding environment-dependent livelihoods, internal migrants reported that vulnerability on Majuro more often relates to the cash economy and associated social and cultural shifts. On Majuro, cash earning opportunities are few, yet cash is required to access basic goods and services, and, consequently, many

²During my second trip, a dengue outbreak on Majuro suspended inter-island travel and further limited access to goods as shipments became even more infrequent and supplies had to be offloaded a mile offshore. Government officials described accompanying supply shortages on outer islands.

participants described struggling to afford expensive imported foods. Like perceived low investment on outer islands, participants commented on limited large-scale adaptation and infrastructure projects on Majuro and few employment opportunities. According to participants, cultural changes related to the cash economy also create social isolation and weaken traditional cultures of giving that historically supported resilience.

4.2.1. A cash economy—On Majuro, internal migrants reported that participating in the cash economy is necessary to live and that the precarious nature of this participation is a leading driver of vulnerability. Participants observed effects of urbanization and forced relocations from US nuclear testing on high population density and constraints to subsistence capacities, even in less dense areas:

There's not enough space to make gardens. Even though I live in Laura (less dense area) where there's more plants with food, we still need to buy things. Living in Laura and living in Uliga (more dense area) is not very different. Either way, we don't have as much food from the land (compared to outer islands).

(Middle-aged woman from Ebon)

High costs of local foods further limit accessibility and encourage their commodification. As one participant recounted: "We have some coconuts and bananas where I live in Uliga but not enough. The boys from the neighborhood will take them and sell them before we can use them." (Older woman from Ailinglapalap). Many participants thus contrasted cash-related food insecurities on Majuro with outer island subsistence lifestyles and food accessibility. Despite increasing risks from climate change, subsistence lifestyles find new connotations of resilience when juxtaposed with having to "work to live" in a cash economy:

Here, everything relies on money. We can't do anything and can't get any food if we don't have money. But back home, even though I don't have money sometimes, I still get to eat something.

(Older woman from Aur)

It's pretty hard (in Majuro) because you have to buy all the time. But over there (on outer islands) you don't buy. You just go out, get it, cook it, eat it. Over here, if you don't have money, you don't get the things you want. That's one of the big differences over here. Here you need to have cash at all times.

(Young man from Likiep)

Given the inaccessibility of subsistence livelihoods, participants observed that participation in the cash economy was required.

Most internal migrants interviewed shared financial challenges, including those in households with multiple family members working well-paid, stable jobs. Participants described life on Majuro as "hard," "difficult," and "pretty tough," and many stressed links between money and food:

In Majuro, when we eat we need, you know, green like green paper. When we drink, green paper again.

(Young woman from Ailinglapalap).

When I first moved out here, we couldn't get the things we need because we didn't have enough money. And things have gotten worse since I've been here. Compared to Maloelap, it's harder to get food out here. When we don't have money, we just starve.

(Middle-aged woman from Maloelap)

Financial challenges also reduce access to local foods. Participants noted that fishing is difficult for residents without a boat and thus less available to cash-poor residents. For participants able to purchase local foods, doing so is frustrating: "I don't like it (having to buy local foods in Majuro). I come from places where it's free and came here only to pay for it." (Young man from Ebon). Given the inaccessibility of local foods, most participants relied on cheaper and more readily available heavily processed imported foods, although several described this diet as unhealthy and were unhappy with these foods. Participants also reported prohibitively high costs of water, transportation, healthcare, and school supplies:

Supplies are expensive, and everything we do takes money. Taxis, school supplies, food. There is so much to pay for.

(Young woman from Ebon)

I want to be able to provide for my own children, their wants and their needs. I want to give them healthy food and be able to take them to the doctors so that they can be healthy, but what I have is not enough to do that.

(Middle-aged woman from Wotje)

To manage hardships, participants discussed regular borrowing and loans against social security payments and future paychecks.

Most participants struggled to find enough work to afford necessary goods, and, for these residents, the cash economy creates new, deeply social vulnerabilities. Low wages and the low price of locally produced goods relative to imports create intense work pressures. Participants observed that costs were rising, and several felt that high costs made life increasingly difficult: "I think the reason why it gets very hard is because the wages are small, and it does not cover the needs of this family." (Young woman from Ailinglaplap). Work pressures and few employment alternatives enable poor conditions, such as one woman working 24-hour shifts at a convenience store and another working exceptionally long hours making handicrafts. Work pressures change how residents spend their time and create new stress: "Life on Majuro is different now. We don't go out and do things as much because we're always working, always busy...I think about this all the time, that I need to find more ways to find money." (Middle-aged woman from Ebon). Women reported bearing an oversized share of work burdens within the household, often serving as primary breadwinner in large households while also doing all the domestic work.

Despite needing to work to afford food and other essentials, participants reported that employment opportunities are severely limited and depend on social networks and education. Internal migrants tend to have weaker networks on Majuro and less education, so finding work is particularly difficult and takes time. Many participants recounted these employment barriers:

We faced many challenges with job hunting because we did not complete school. When we do get jobs, they are low wages.

(Middle-aged woman from Mili)

If you have relatives here that work in high branches of a company or government, then it's easy for you to get hired. But if you don't have any connections then you're going to need that educational background.

(Young man from Likiep)

Participants who reported not working and not seeking work described feeling unsuited to or unqualified for most of the jobs they saw.

Participants felt that reverential attitudes towards foreigners removed employment opportunities. One participant working as a teacher described associations between English fluency and perceived intelligence and self-worth: "If the students know how to speak English more, they feel like, oh we're better... And the ones who don't speak as well, they feel like they're not good enough... You go to the States, you come back, you can speak English so well, you are seen as very smart." (Middle-aged woman from Likiep). Participants reported a similar dynamic in the workplace. Noting the many non-Marshallese in management level positions, including in government, participants felt that deferential perceptions of foreigners blocked qualified Marshallese from these jobs.

4.2.2. Cultural shifts—Cultural shifts are dramatic on Majuro. Participants described how these shifts, often related to the cash economy, promote individualism, weaken communal values, and undermine community safety. Participants noted effects on conviviality and traditions of giving:

This concept (of money) has shattered our ways of life where now we have a saying, "it's each person for his own."

(Young man from Ebon)

In our Marshallese culture, we are about taking care of each other, we are about love, and I feel that these days it is less. Things have changed a lot. When our bank accounts are low, this makes a difference in how we act.

(Middle-aged woman from Ebon)

To emphasize how money has reshaped social dynamics and shrunk support systems on Majuro, participants drew frequent comparisons with outer islands, juxtaposing strong traditional cultures on outer islands, where residents look after each other, with new cultures on Majuro, where residents must first look after themselves:

The culture here (on Majuro) is pretty different from Maloelap in terms of how they help each other out. In Maloelap we usually helped out our neighbors because it's part of our culture. That was the culture of the whole RMI, but Majuro is now different. Here in Majuro now people just think about themselves. Life here is hard so people tend to look after themselves and not really think about others.

(Middle-aged woman from Maloelap)

Participants tied differences between Majuro and outer islands to greater financial stress but also to being less familiar with neighbors and less forthcoming about challenges: “The community here doesn’t help us with our needs like the community in Wotje...In Majuro, only a few people help out their neighbors unlike in Wotje where...people know each other personally so they help out one another.” (Young man from Wotje). Participants reported that, given less familiarity with neighbors on Majuro, help often must be requested, but that since asking for help is shameful, communal assistance on Majuro is less common and frequently limited to relatives.

Participants described how new cultures of money affect identity and wellbeing, including how people socialize and support one another. Participants reported new class strata discouraging interactions and mutual support across new divisions:

If I don’t have enough money, people won’t really want to know you, won’t come to you because they think, what are we going to go do with her, she doesn’t have money to go do things, we won’t eat with her because she doesn’t have money for food. But on the outer islands...it doesn’t matter how much money you have.

(Middle-aged woman from Ebon)

Say we were brothers, and we grew up together, and I have more money than you. Your family would then feel like they can’t ask for anything from me because of my status. Your children wouldn’t play with my children because of our status.

(Young man from Ebon)

Participants felt that these changes made Majuro less welcoming than outer islands, and several described the tradition of sharing meals as an example of financial pressures affecting traditional practices and community support:

Ebon was nice because you could go anywhere, to anyone’s home, and they’d offer you food. Here it’s not like that because things are so expensive and so they aren’t as willing to share, and so that part of our culture (the tradition of sharing meals) is beginning to fade. Even though giving is a big part of our culture, it’s not something that we do as much on Majuro.

(Middle-aged woman from Ebon)

For some participants, these social and cultural shifts associated with the cash economy made them “feel like a foreigner” on Majuro.

Urbanization may contribute to weaker social ties and support systems on Majuro. While internal migrants sometimes move to areas of Majuro with other migrants from their outer island, most participants described being less socially active than on outer islands and less familiar with their neighbors, particularly in Majuro’s denser communities. Consequently, many described social isolation, particularly older participants: “I don’t feel as comfortable as back home (on the outer island) where I knew everyone and felt I could go anywhere. Here I’m mostly in the house.” (Older woman from Jaluit). However, not all migrants felt isolated. Participants from Majuro’s more rural community, Laura, reported participating in community activities, and younger migrants and migrants with close family ties in Majuro felt more supported: “The other houses around here are my family. One of the houses is my

cousin. I'm happy about my community here because everyone is very close and is family.” (Middle-aged woman from Ailinglaplap). Several participants also described relying on nearby relatives for help, illustrating how strong family networks can offset Majuro's weaker communal networks.

Cultural shifts and less familiarity with neighbors contribute to participants feeling less safe, but perceptions of safety are acutely gendered. Only female participants reported not feeling safe, and most female participants expressed safety concerns. Common concerns and experiences included drunk behavior and fights, burglaries, and gender-based violence. One participant had been physically assaulted several times by a man in her community and another had witnessed men beating their wives. Several women described community ties and proximity to family tempering safety concerns. Comparisons to feelings of greater safety and comfort on outer islands and comments that linked violence against women to drunken behavior and western culture emphasize the perceived external origins of safety concerns.

Participants described how cultural changes that emphasize the importance of cash and weaken ties to land also reshape relations with traditional leadership in ways that exacerbate vulnerability. Traditional leaders have attempted to adapt to cultural changes by revising gift-giving practices. Participants reported that traditional leadership were previously given gifts from subsistence practices, with the understanding that residents might rely on leadership during times of need. However, gifts must now be purchased, which creates new cash pressures, and reciprocal aid is not certain. One participant from a cash-poor household discussed what her family was expected to give and the associated burden:

When it comes to traditional leadership, they take a lot from us because contributions to them are very frequent. It is very hard on us...It (the collection) is usually every quarter (four times a year), but when they have events like funerals and birthdays, it is more frequent. It is usually \$25, one case of quarter chicken legs 33lbs, one bag of rice, and one case of ramen. Sometimes it is \$50 plus the other items, but during their birthdays, 5 muumuus (dresses) are added to the other items.

(Young woman from Ailinglaplap)

Another participant questioned whether these adjusted practices were faithful representations of traditional culture:

They (traditional leaders) are supposed to take care of their people, not take from their people. It used to be so different because people had resources, like breadfruit, and they'd bring that, but now it's not like that. They have to buy things to give to the chiefs. Where are they going to get that money?

(Middle-aged woman from Likiep)

Attempts by traditional leadership to limit perceived negative influences of westernization through social policies like curfews, drinking bans, and rules on women's dress also provoke backlash. While some participants appreciated the structure and strictness, others criticized what they perceived as restrictions on freedoms and hypocritical behavior when traditional

leadership broke their own rules. Women were especially critical of restrictions that placed rules on women's dress and behavior but not men's.

4.2.3. Natural and built environments and public health—Climate change affects vulnerability on Majuro, but, unlike on outer islands where impacts affect whole island populations and risks stem more from physical vulnerabilities (e.g., effects on subsistence livelihoods), participants described environmental risks on Majuro as stemming more from social vulnerabilities tied to economic, social, and cultural changes. For example, risks of inundation, the most common environmental concern on Majuro, reflect economic inequalities, as household and community abilities to invest in coastal defenses determine risk. Participants described inundations in and around homes lasting for days and occurring with increasing frequency but noted less flooding following the construction of seawalls. However, seawalls exacerbate flooding in other areas, increasing risks for unprotected neighbors: “We live on the eastern side of the community, and when there is high tide, the area easily floods...My house is built on the edge of the seawall, so the surf hits it and seawater comes over the house.” (Middle-aged woman from Mili).

Storm impacts and water shortages on Majuro also reflect social inequality. Participants observed that limited resources prevented storm repairs: “Our house really needs repair, and it's bad when strong winds come, but we can't do much to fix it because we don't have much.” (Middle-aged woman from Maloelap). Non-landowning participants also stressed that not owning the land limited abilities to conduct repairs. Comments about drought and water shortages similarly reflect social inequality, as well as the effects of scarcity on feelings towards communal support: “A lot of the people in the neighborhood will come and use our water, and we can't tell them not to and so often there isn't enough drinking water.” (Middle-aged woman from Jaluit).

Participants described how overcrowding also drives new vulnerabilities on Majuro. Overcrowding stems from internal migration, urbanization, and nuclear testing-related displacement and reflects low foreign interest in development-related projects like housing. Overcrowding is particularly common for internal migrants. Of those interviewed, most lived with multiple nuclear families and 10 or more people. Participants reported overcrowding contributing to unhealthy and unsafe conditions, such as sleeping outside: “When we first arrived, my brother and sister-in-law were still here. It was a packed house. We were sleeping outside. When it rained, it rained on us. We lived that way until they moved out and we came inside.” (Young woman from Ailinglaplap). Participants also commented on how overcrowding contributes to financial stress, particularly for women, who face exceptionally high demands in overcrowded households:

We live with a family that's big (about 15 people live in the household). Having one person who works and the majority who don't makes it so that the financial situation is not sufficient. There are a lot of things that we can't afford. My husband has brothers and sisters who we live with, and they don't work. I'm the only full-time worker. My husband works part time. Sometimes he'll drive a taxi. And this is one of the challenges of living in a full house. My husband's siblings have children and grand-children and are often in need, so I provide for them. It's tough.

(Middle-aged woman from Wotje)

For some female participants, these demands increase desires to gain more independence and live with just their nuclear families. Stress from crowded housing was less common among male participants and in households with many breadwinners. For example, one male participant living in a large household with several cash-workers described the situation as cost-saving and supportive.

Transportation-related dangers and inaccessibility are another source of vulnerability in Majuro related to the built environment and largely stem from overcrowding, a new car-centric transportation culture, and limited investments in pedestrian infrastructure and transportation services. 12 out of the 28 participants discussed dangers for pedestrians, particularly children:

Out here you don't walk around, you might get run over.

(Young man from Likiep)

The road is right here, and I feel that for my kids that can be very dangerous.

(Middle-aged woman from Namu)

Like many vulnerabilities on Majuro, transportation dangers and access are tied to economic inequality. Most residents do not have a car and taxis are too expensive for many (\$1–2 USD depending on distance travelled). Participants noted that high transportation costs required them to walk long distances to work or school despite the dangers of walking and described other cost-related transportation inaccessibility: “Sometimes I find it hard to get places in Majuro because I don't have the money. Sometimes I still find it hard to get to the hospital, even though I now live in Majuro.” (Middle-aged woman from Namu).

Economic inequality may also affect health, blocking prevention and treatment by limiting access to care. While Majuro has more extensive healthcare services than outer islands, cash-poor participants described how basic care could be less accessible on Majuro:

Many times we have been sick, but if we do not have money we cannot go see the doctor...In Woja and Ailinglaplap, you just pay 25 cents to see the doctor, and sometimes you don't (pay). If there is no money, you don't pay. But in Majuro, you have to pay \$5. And if you do not have \$5, you won't see the doctor...Even though we were very sick, we stayed home... there have been many times we couldn't see the doctor.

(Young woman from Ailinglaplap)

Access to healthcare is particularly crucial on Majuro. Compared to outer islands, participants perceived greater health risks, including higher risks of diabetes, hypertension, asthma, and dengue fever, as well as more frequent and severe cases of flu and diarrhea, particularly following storms and inundations:

I fear getting sick more here. I feel like there is more sickness here. For example, the dengue fever. People are stuck here because of that sickness, but it's not in the outer islands.

(Older woman from Ailinglaplap)

I think health in the outer islands is better...I often see fevers, people with stomach aches and diarrhea here.

(Middle-aged woman from Jaluit)

Participants tied higher rates of infectious disease to climate change, overcrowding, pollution, and poor sanitation and higher rates of diabetes to western cultures of food and work. Participants also linked physical and mental health to the cash economy, tying exhaustion and poor mental health to new work pressures: “Here you’re more tired. There are days that I have to get up and start working but I haven’t had enough sleep.” (Older woman from Ailinglaplap).

4.3. Perspectives of elected officials, government staff, and members of civil society

Interviews with elected officials, government staff, and members of civil society focused on broader contexts of vulnerability and resilience, adaptation and development strategies, and barriers to accessing these strategies. These interviews raised similar challenges as interviews with internal migrants but more explicitly critiqued structural factors underpinning vulnerabilities. Echoing a framework of exposure and abandonment, government officials emphasized vulnerabilities’ external origins, often tying increasing climate change risks to global economic growth. Stressing immediate needs for large, cross-sectoral projects, government representatives observed that limited international investment undermined adaptation capacities and called for greater compensation for climate change-related exposures. Several elected officials also commented on disparities between densely populated Ebeye and the neighboring US military base on Kwajalein, where many Ebeye residents work. Describing disparities in water access, for example, one official expressed a sense of injustice and betrayal at the base’s rejection of requests to share large water reserves during a water shortage on Ebeye.

Government officials and members of civil society expressed a cynical view of international development activities. Many officials noted a preoccupation with publicity campaigns and seminars, the prioritization of topics important to international institutions, and the widespread use of western framings. I made similar observations. Most seminars are conducted in lecture format by non-Marshallese presenters flown in from the US or Europe, and presentations often take an institutional, western perspective that overlooks local contexts and knowledge. For example, a seminar on water and gender asked how gender in the RMI fit within western constructs. As participants from both sets of interviews observed, the Marshallese who contribute to policy discussions are typically US educated and well off as others have been made to believe that their perspectives have less merit.

Similar to internal migrants, elected officials, government staff, and members of civil society perceived differential vulnerabilities between Majuro and outer islands but focused on human implications and disparities in investments. For example, in observing that traditions of “living off the land” were highly vulnerable to climate change, government representatives from drought-susceptible northern atolls warned that environmental changes that further limited agricultural and fishing capacities would immediately and substantially

impact vulnerability and outmigration. Most representatives from outer islands also commented on unequal resource distribution between Majuro and outer islands, including resources for education and social services. For example, one representative described a senior housing program being cut on all islands except Majuro and another noted that students in outer island schools were several grade levels behind students in Majuro. Outer island representatives shared concerns that outmigration might continue to reduce investments in outer islands since government funds are allocated by population size.

Representatives favored in-place adaptation strategies but recognized residents' varying desires and supported both in-place adaptation and adaptation via internal or international migration. However, representatives stressed overlap in these strategies, as well as between often siloed climate change adaptation and economic development. For example, representatives observed that recent investments in power, transportation, communication, sewage, and agriculture infrastructure on outer islands had enhanced both in-place adaptation and internal migration capacities. Power infrastructure enabled residents to store medicines and fishing catches rather than fish daily, disaster warning systems and shelters prevented immediate loss of life, and new docks and paved runways increased access to supplies and facilitated travel. Government officials also highlighted boat purchases aimed at increasing transportation and shipping frequency to and from outer islands, caps on the price of rice that limited inflation on outer islands, and copra subsidies that several officials claimed had enabled families to stay on outer islands and return to abandoned villages. Representatives observed that investments in education such as vocational and maritime schooling in Majuro might promote a more autonomous local economy and facilitate in-place adaptation. However, like internal migrants, government officials expressed concern over perceived widespread practices of hiring foreign workers and weak enforcement of policies requiring foreign workers to train Marshallese replacements. Throughout discussing adaptation strategies, representatives stressed that funding constraints severely limited government abilities.

5. Discussion

5.1. External drivers of vulnerability

This study evaluates perceived sources of vulnerability and resilience in the RMI to better understand underlying issues behind diverse vulnerabilities in archipelagic countries. While perceived vulnerabilities differ between outer islands and Majuro, across the RMI, internal migrants stressed external drivers and protective effects of traditional lifestyles and culture. Despite rhetoric around sea-level rise that stresses physical risk, vulnerability in the RMI, as elsewhere, is deeply social (van der Ploeg et al., 2020). In weighing the influence of human systems, this study contributes to growing research that evaluates sources of vulnerability and resilience in different contexts (Lazrus, 2012; Ooi et al., 2023) and approaches environmental risks not as crises of nature but as crises of society (Patel and Moore, 2017). A systems-centric understanding of vulnerability's origins emphasizes industrial over-production and consumption and impacts of colonial legacies and global integration (Beck, 1999) and counters narratives that infer inherent vulnerability to island nations (Lipset, 2011; McKittrick, 2013).

5.2. Vulnerability and resilience on outer islands

Understanding that local social, economic, cultural, political, and environmental contexts interact with external processes to set conditions of vulnerability and resilience (Farbotko and Lazrus, 2012; West, 2005), this study investigates variation in perceived sources of vulnerability within the RMI. Previous research on the RMI's outer islands and in neighboring Tuvalu and Kiribati has identified environmental changes as a leading driver of vulnerability on outer islands (Milan et al., 2016; Oakes et al., 2016; Rudiak-Gould, 2013). In this study, participants similarly linked vulnerabilities on outer islands to natural resource-dependent livelihoods and an environment increasingly affected by global climate change. Participants also emphasized few cash-earning opportunities on outer islands and imported goods' limited accessibility and varying impacts. For example, while participants stressed imported foods' effects on diets, health, traditional practices and knowledge, and self-sufficiency, like traditional practices of storing primary local foods breadfruit and pandanus (Pollock, 1992), imported foods may also support risk diversification (Lazrus, 2012; McCubbin et al., 2015). Participants further described successful but extremely limited adaptation and infrastructure projects and protective effects of traditional adaptation and resource sharing practices, which research across the Pacific has stressed as historically supportive (Berman, 2020; Chambers and Chambers, 2000; Du Toit and Neves, 2009; Fitzhugh, 2012; Kelman, 2007; Ooi et al., 2023; Pollock, 1992; Reenberg et al., 2008).

While outer island vulnerabilities can be partially attributed to policy neglect, stronger traditional networks of support and cultural practices compared to Majuro may offer opportunities for context-appropriate adaption. Research has observed the prioritization of urban atolls in Pacific countries' adaptation planning as well as challenges in identifying and implementing appropriate strategies on outer islands (Nunn, 2013; Nunn et al., 2014). Internal migrants in this sample perceived effective, if severely limited, government projects on outer islands, and interviews with elected officials, government staff, and members of civil society discussed wide-ranging, atoll-specific adaptation and development strategies, although many projects were qualified as proposals pending financial support. Research in other archipelagic countries' outer island communities has identified effective adaptation strategies, including tailoring projects to environmental and social contexts, incorporating Indigenous knowledge and practices, promoting self-sufficiency, and reducing rather than creating community stress (Magnan and Duvat, 2020; Malatesta and Di Friedberg, 2017; McNamara et al., 2020; Sovacool, 2012). The community-engaged nature of some of the activities discussed by internal migrants and the perceived success of many governmental and non-governmental adaptation projects is promising for in-place adaptation efforts, if sufficiently funded, locally driven and supported, and designed with local strengths in mind.

5.3. Vulnerability and resilience on Majuro

Participants frequently tied vulnerability on Majuro to the cash economy and related social and cultural shifts. Other research in archipelagic countries has similarly linked new food and water insecurities to economic changes (Lazrus, 2012; McCubbin et al., 2015), connected disparities in adaptation capacities to income disparities (Sovacool, 2012), and stressed vulnerability-producing effects of social, economic, and cultural shifts on urban atolls especially (Chambers and Chambers, 2000; Fernandes and Pinho, 2017; Rudiak-

Gould, 2013). Internal migrants in this study emphasized the wide-ranging implications of new economic challenges and disparities on Majuro. Participants observed that needing cash to travel around Majuro, visit the doctor, and buy food, water, and other essentials could make goods and services less accessible for cash-poor residents than on outer islands. Participants described shifts in cultures of giving and communal support, increased social isolation, and new work cultures and stress. Participants further commented that while adaptation investments such as seawalls and water catchments reduced risks, expensive costs tied hazard exposure to new economic inequalities. Similar to ethnographic scholarship in the RMI (Carucci, 1987), participants stressed effects of shifts on gender relations and attributed new vulnerabilities for women to economic insecurity, western culture, and weaker traditional culture and social ties.

Government officials emphasized that policy to address economic inequalities is severely constrained by limited resources. Pacific governments are more likely to invest limited funds in infrastructure projects that support the economy rather than non-revenue generating activities such as poverty reduction (Nunn, 2009). The RMI's copra subsidy is a government program intended to alleviate poverty, but the program also supports export revenue generation. Internal migrants rarely mentioned social programs such as social security or government support with food or housing. Rather, internal migrants reported this assistance from familial networks. Research in the Pacific has emphasized that donor interest in rapid results leads to short-term strategies that discourage long term planning and policies that may not have easily observable or quantifiable results (Lata and Nunn, 2012; Nunn, 2013). This study finds perceived economic vulnerabilities and disparities in Majuro that suggest an urgent need for sustained interest and investment in basic needs.

5.4. Barriers to adaptation

In highlighting broader contexts of vulnerability and resilience and barriers to implementing adaptation strategies, interviews with elected officials, government staff, and members of civil society critiqued common aid practices and perceived low levels of international support. These critiques are not new, but government officials felt that they had not been addressed. Research has widely critiqued "capacity-building," the veneration of foreign knowledge, and the use of development funds on expensive travel and conferences (Kelman et al., 2012; Kirsch, 2020; Klepp and Fünfgeld, 2021; West, 2016). Representatives' frustration with externally developed strategies echo frustration with externally imposed constructs and climate change discourses in other archipelagic countries (Fulu, 2007; Malatesta and Di Friedberg, 2017). Calls for locally driven strategies reflect similar calls for context-appropriate adaptation in island nations (Grydehøj and Kelman, 2017; McNamara, 2013; Nunn, 2009) and community-based adaptation in the RMI (Barnett, 2022; Campbell and Bedford, 2022; Jarillo and Barnett, 2021). Funding demands have been reported in other research also interviewing RMI government officials (Bordner et al., 2020). While appeals for more funding may seem counterintuitive given the cash economy's role in driving vulnerability, investments may mitigate negative effects of economic and environmental changes, assisting adjustments to a cash economy and supporting the continuation of resource-dependent livelihoods where possible.

6. Conclusion

Vulnerability and resilience vary by how local conditions interact with external processes and cannot be homogenized across or within island nations (Fernandes and Pinho, 2017; Nunn and Kumar, 2018). By evaluating spatial heterogeneity and how global exposures and abandonment shape vulnerability and resilience differently on outer islands and Majuro, this study contributes to a nuanced understanding of vulnerability and resilience in the RMI that may support calls for context-specific, locally driven solutions. Future research might examine specific cases of external exposures and abandonment to trace and quantify impacts, including intergenerational effects, and identify remedial strategies. Future research might also investigate spatial variation in vulnerability and resilience in other settings to reveal differences associated with local social, economic, cultural, and environmental conditions, particularly core-periphery/ urban-rural heterogeneity in archipelagic countries. Finally, future research might further assess variation by population characteristics. For example, this study identified gender and age differences in vulnerability associated with economic, social, and cultural shifts, where women described greater economic burdens and safety concerns and older participants were more likely to report social isolation. Closer scrutiny of the experiences of these populations and others may support the development of targeted interventions.

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The data that has been used is confidential.

References

- Adamson J, Donovan JL, 2002. Research in black and white. *Qual. Health Res* 12 (6), 816–825. [PubMed: 12109726]
- Alkire WH 1965. Lamotrek Atoll and inter-island socioeconomic ties. University of Illinois at Urbana-Champaign.
- Bach JL 2017. Perceptions of Environmental Change: Nikutoru, Tabiteuea Maiaki, Kiribati. Graduate Student Theses, Dissertations, & Professional Papers. University of Montana.
- Bahng A, 2020. The Pacific proving grounds and the proliferation of settler environmentalism. *J. Transnatl. Am. Stud* 11 (2).

- Barnett J, 2017. The dilemmas of normalising losses from climate change: towards hope for Pacific atoll countries. *Asia Pac. Viewp* 58 (1), 3–13.
- Barnett J, 2020. Climate change and food security in the Pacific Islands. *Food Secur. Small Isl. State* 25–38.
- Barnett J, 2022. Global environmental change III: political economies of adaptation to climate change. *Prog. Hum. Geogr* 46 (4), 1106–1116.
- Barnett J, Waters E, 2016. Rethinking the vulnerability of small island states: climate change and development in the Pacific Islands. *Palgrave Handb. Int. Dev* 731–748.
- Beck U, 1999. *World Risk Society*. Polity Press.
- Berger R, 2015. Now I see it, now I don't: researcher's position and reflexivity in qualitative research. *Qual. Res* 15 (2), 219–234.
- Berman E, 2020. Avoiding sharing: how people help each other get out of giving. *Curr. Anthropol* 61 (2), 219–239.
- Betzold C, 2015. Adapting to climate change in small island developing states. *Clim. Change* 133 (3), 481–489.
- Blankenship JL, Gwavuya S, Palaniappan U, Alfred J, deBrum F, Erasmus W, 2020. High double burden of child stunting and maternal overweight in the Republic of the Marshall Islands. *Matern. Child Nutr* 16, e12832. [PubMed: 32835441]
- Bonilla Y, LeBrón M, 2019. *Aftershocks of disaster: Puerto Rico before and after the storm*. Haymarket Books.
- Bordner AS, Ferguson CE, Ortolano L, 2020. Colonial dynamics limit climate adaptation in Oceania: perspectives from the Marshall Islands. *Glob. Environ. Change* 61, 102054.
- Campbell J, 2009. Islandness: vulnerability and resilience in Oceania. *The International Journal of Research into Island Cultures* 3 (1).
- Campbell JR, 2015. Development, global change and traditional food security in Pacific Island countries. *Reg. Environ. Change* 15, 1313–1324.
- Campbell JR, Bedford RD 2022. Climate change and migration: Lessons from Oceania. In *Routledge Handbook of Immigration and Refugee Studies* (pp. 379–387). Routledge.
- Carucci LM, 1987. Jekero: symbolizing the transition to manhood in the Marshall Islands. *Micronesica* 20 (12), 1.
- Carucci LM, 1997. Irooj ro ad: measures of chiefly ideology and practice in the Marshall Islands. *Chiefs Today: Traditional Pacific Leadership and the Postcolonial State* 197–210.
- Chambers K, Chambers A, 2000. *Unity of Heart: Culture and Change in a Polynesian Atoll Society*. Waveland Press.
- Chan N, 2018. Large ocean states: sovereignty, small islands, and marine protected areas in global oceans governance. *Glob. Gov. A Rev. Multilater. Int. Organ* 24 (4), 537–555.
- Connell J, 2016. Population resettlement in the Pacific: lessons from a hazardous history. *Migration, Land and Livelihoods*. Routledge, pp. 13–28.
- Cushman GT, 2013. *Guano and the opening of the Pacific world: a global ecological history*. Cambridge University Press.
- Cutter SL, Finch C, 2008. Temporal and spatial changes in social vulnerability to natural hazards. *Proc. Natl. Acad. Sci* 105 (7), 2301–2306. [PubMed: 18268336]
- Du Toit A, Neves D 2009. Informal social protection in post-apartheid migrant networks: Vulnerability, social networks and reciprocal exchange in the Eastern and Western Cape, South Africa.
- Dun O, McMichael C, McNamara K, Farbotko C, 2022. Investing in home: development outcomes and climate change adaptation for seasonal workers living between Solomon Islands and Australia. *Migr. Dev* 11 (3), 852–875.
- Duvat VKE, Magnan AK, Wise RM, Hay JE, Fazey I, Hinkel J, Stojanovic T, Yamano H, Ballu V, 2017. Trajectories of exposure and vulnerability of small islands to climate change. *Wiley Interdiscip. Rev. Clim. Change*, e478.
- Dye TDV, Sy A, Albert P, Cash H, Hadley J, Tomeing T, Muir E, Robles B, McIntosh S, Ikerdeu E, 2018. Critical medical ecological perspectives on diabetes in the Pacific Islands: colonialism, power, and balance in human-environment interaction over time. *Lancet Glob. Health* 6, S36.

- Edwards R, 1998. A critical examination of the use of interpreters in the qualitative research process. *J. Ethn. Migr. Stud* 24 (1), 197–208.
- Farbotko C, Lazrus H, 2012. The first climate refugees? Contesting global narratives of climate change in Tuvalu. *Glob. Environ. Change* 22 (2), 382–390.
- Fernandes R, Pinho P, 2017. The distinctive nature of spatial development on small islands. *Prog. Plan* 112, 1–18.
- Fitzhugh B, 2012. Hazards, impacts, and resilience among hunter-gatherers of the Kuril Islands. In: *Surviving Sudden Environmental Change: Answers from Archaeology*. pp. 19–42.
- Francis E 2021. Marshall Islands pleads with world leaders to stop the 60,000-person nation from drowning. *The Washington Post*.
- Fulu E, 2007. Gender, vulnerability, and the experts: responding to the Maldives tsunami. *Dev. Change* 38 (5), 843–864.
- Gaillard J, 2007. Resilience of traditional societies in facing natural hazards. *Disaster Prev. Manag. Int. J* 16 (4), 522–544.
- Gilmore RW, 2007. *Golden gulag: Prisons, surplus, crisis, and opposition in globalizing California*. Univ of California Press.
- Gilmore RW, 2008. *Forgotten Places and the Seeds of Grassroots Planning*. In: *Engaging contradictions: Theory, politics, and methods of activist scholarship*. University of California Press, pp. 31–61.
- Grydehøj A, Kelman I, 2017. The eco-island trap: climate change mitigation and conspicuous sustainability. *Area* 49 (1), 106–113.
- Hau'Ofa E, 1995. Our sea of islands. In: *Asia/Pacific As Space of Cultural Production*. Duke University Press, pp. 86–98.
- Helble M, Francisco K, 2017. *The imminent obesity crisis in Asia and the Pacific: first cost estimates*. Asian Development Bank.
- Hilgendorf A, Anahkwet Reiter G, Gauthier J, Krueger S, Beaumier K, Corn R Sr, Moore TR, Roland H, Wells A, Pollard E, 2019. Language, culture, and collectivism: uniting coalition partners and promoting holistic health in the Menominee Nation. *Health Educ. Behav* 46 (1_suppl), 81S–87S. [PubMed: 31549556]
- Hovgaard G 2002. *Coping Strategies and Regional Policies-Social Capital in the Nordic Peripheries: Country Report Faroe Islands*. Nordregio.
- International Organization for Migration, 2018. *Navigating Internal Migration: The case of the Republic of the Marshall Islands*.
- Janif SZ, Nunn PD, Geraghty P, Aalbersberg W, Thomas FR, Camailakeba M, 2016. Value of traditional oral narratives in building climate-change resilience: insights from rural communities in Fiji. *Ecol. Soc* 21, 2.
- Jansen H.A.F.M. (Henriette), Abraham BT 2014. *Republic of the Marshall Islands National Study on Family Health and Safety*. Ministry of Internal Affairs, Republic of the Marshall Islands.
- Jarillo S, Barnett J, 2021. Contingent communality and community-based adaptation to climate change: insights from a Pacific rural atoll. *J. Rural Stud* 87, 137–145.
- Johnson N, Alessa L, Behe C, Danielsen F, Gearheard S, Gofman-Wallingford V, Kliskey A, Krümmel E-M, Lynch A, Mustonen T, 2015. The contributions of community-based monitoring and traditional knowledge to Arctic observing networks: reflections on the state of the field. *Arctic* 28–40.
- Kabua D, 2020. The climate crisis will sweep away my country if the world doesn't keep its promises. *The Guardian*.
- Kelman I, 2007. The island advantage: Practices for prospering in isolation. *Id21 Insights* 70, 1–6.
- Kelman I, 2020. Islands of vulnerability and resilience: manufactured stereotypes. *Area* 52 (1), 6–13.
- Kelman I, Mercer J, Gaillard JC, 2012. Indigenous knowledge and disaster risk reduction. *Geography* 97 (1), 12–21.
- Kim K, Bui L, 2019. Learning from hurricane Maria: Island ports and supply chain resilience. *Int. J. Disaster Risk Reduct* 39, 101244.

- Kirsch S, 2020. Why Pacific Islanders stopped worrying about the apocalypse and started fighting climate change. *Am. Anthropol* 122 (4), 827–839.
- Klepp S, Fünfgeld H, 2021. Tackling knowledge and power: an environmental justice perspective on climate change adaptation in Kiribati. *Clim. Dev* 1–13.
- Klöck C, Nunn PD, 2019. Adaptation to climate change in small island developing states: a systematic literature review of academic research. *J. Environ. Dev* 28 (2), 196–218.
- Kuruppu N, 2009. Adapting water resources to climate change in Kiribati: the importance of cultural values and meanings. *Environ. Sci. Policy* 12 (7), 799–809.
- Lata S, Nunn P, 2012. Misperceptions of climate-change risk as barriers to climate-change adaptation: a case study from the Rewa Delta, Fiji. *Clim. Change* 110 (1–2), 169–186.
- Lauer M, Albert S, Aswani S, Halpern BS, Campanella L, La Rose D, 2013. Globalization, Pacific Islands, and the paradox of resilience. *Glob. Environ. Change* 23 (1), 40–50.
- Lazrus H, 2012. Sea change: Island communities and climate change. *Annu. Rev. Anthropol* 41 (1), 285–301.
- Lepowsky M, 1991. The way of the ancestors: custom, innovation, and resistance. *Ethnology* 30 (3), 217–235.
- Lipset D, 2011. The tides: masculinity and climate change in coastal Papua New Guinea. *J. R. Anthropol. Inst* 17 (1), 20–43.
- Magnan AK, Duvat VKE, 2020. Towards adaptation pathways for atoll islands. Insights from the Maldives. *Reg. Environ. Change* 20, 1–17.
- Malatesta S, Di Friedberg MS, 2017. Environmental policy and climate change vulnerability in the Maldives: from the ‘lexicon of risk’ to social response to change. *Isl. Stud. J* 12, 1.
- Maldonado JK, Shearer C, Bronen R, Peterson K, Lazrus H, 2014. The impact of climate change on tribal communities in the US: displacement, relocation, and human rights. *Climate change and indigenous peoples in the United States* 93–106.
- Mao L, Mian Akram A, Chovanec D, Underwood ML, 2016. Embracing the spiral: Researcher reflexivity in diverse critical methodologies. *International Journal of Qualitative Methods* 15 (1).
- Marcoux S, 2022. Contamination and a compact: remediless environmental harm in the Marshall Islands. *Environ. Claims J* 34 (2), 95–135.
- McCubbin S, Smit B, Pearce T, 2015. Where does climate fit? Vulnerability to climate change in the context of multiple stressors in Funafuti, Tuvalu. *Global Environmental Change* 30, 43–55.
- McIver L, Viney K, Harley D, Hanna L, Kienene T, 2015. Climate change, overcrowding and non-communicable diseases: the “triple whammy” of tuberculosis transmission risk in Pacific atoll countries. *Ann. ACTM* 16 (3), 57–61.
- McKittrick K, 2013. Plantation futures. *Small Axe: A Caribbean Journal of Criticism*, 17 (3(42)), 1–15.
- McNamara KE, 2013. Taking stock of community-based climate-change adaptation projects in the Pacific. *Asia Pac. Viewp* 54 (3), 398–405.
- McNamara KE, Clissold R, 2019. Vulnerable groups and preliminary insights into intersecting categories of identity in Laamu Atoll, Maldives. *Singap. J. Trop. Geogr* 40 (3), 410–428.
- McNamara KE, Clissold R, Westoby R, Piggott-McKellar AE, Kumar R, Clarke T, Namoumou F, Areki F, Joseph E, Warrick O, 2020. An assessment of community-based adaptation initiatives in the Pacific Islands. *Nat. Clim. Change* 10 (7), 628–639.
- Mercer J, Kelman I, Taranis L, Suchet-Pearson S, 2010. Framework for integrating indigenous and scientific knowledge for disaster risk reduction. *Disasters* 34 (1), 214–239. [PubMed: 19793324]
- Mertens DM, 2017. Transformative research: personal and societal. *Int. J. Transform. Res* 4 (1), 18–24.
- Milan A, Oakes R, Campbell J, 2016. Tuvalu: climate change and migration: relationships between household vulnerability, human mobility and climate change. United Nations University Institute for Environment and Human Security.
- Mitchell-Eaton E, 2021. No Island is an Island: COVID exposure, Marshall Islanders, and imperial productions of race and remoteness. *Soc. Space*
- Moore A, 2010. Climate changing small islands: considering social science and the production of island vulnerability and opportunity. *Environ. Soc* 1 (1), 116–131.

- Morrissey JW, 2013. Understanding the relationship between environmental change and migration: the development of an effects framework based on the case of northern Ethiopia. *Glob. Environ. Change* 23 (6), 1501–1510.
- Morse JM, Field PA, 1995. *Nursing research: the application of qualitative approaches*. Nelson Thornes.
- Murray WE, Overton J, 2011. The inverse sovereignty effect: Aid, scale and neostructuralism in Oceania. *Asia Pac. Viewp* 52 (3), 272–284.
- Nunn P, Kumar R, 2018. Understanding climate-human interactions in Small Island Developing States (SIDS) implications for future livelihood sustainability. *Int. J. Clim. Change Strateg. Manag* 10 (2), 245–271.
- Nunn PD, 2009. Responding to the challenges of climate change in the Pacific Islands: management and technological imperatives. *Clim. Res* 40 (2–3), 211–231.
- Nunn PD, 2013. The end of the Pacific? Effects of sea level rise on Pacific Island livelihoods. *Singap. J. Trop. Geogr* 34 (2), 143–171.
- Nunn PD, Aalbersberg W, Lata S, Gwilliam M, 2014. Beyond the core: community governance for climate-change adaptation in peripheral parts of Pacific Island Countries. *Reg. Environ. Change* 14, 221–235.
- O’Fallon LR, Wolfle GM, Brown D, Deary A, Olden K, 2003. Strategies for setting a national research agenda that is responsive to community needs. *Environ. Health Perspect* 111 (16), 1855–1860. [PubMed: 14644657]
- Oakes R, Milan A, Campbell J 2016. Kiribati: Climate change and migration-Relationships between household vulnerability, human mobility and climate change.
- Oleson AA, 2007. *All People Want to Sing: Mortlockese Migrants Controlling Knowledge, Historical Disaster, and Protestant Identity on Pohnpei, FSM*. University of Wisconsin-Madison.
- Ooi C-S, de Waegh R, Trifan CA, Zhang Y 2023. *Islands and Resilience: Experiences from the Pandemic Era*. Springer Nature.
- Pacific Community and the Marshall Islands Economic Policy, Planning, and Statistics Office. 2012. *Republic of the Marshall Islands 2011 Census Report*.
- Pacific Community and the Marshall Islands Economic Policy, Planning, and Statistics Office. 2023. *Republic of the Marshall Islands 2021 Census Report, Volume 1: Basic Tables and Administrative Report*.
- Passmore E, Smith T, 2019. Dual burden of stunting and obesity among elementary school children on Majuro Republic of Marshall Islands. *Hawai’i J. Health Soc. Welf* 78 (8), 262. [PubMed: 31463476]
- Patel R, Moore JW, 2017. *A History of the World in Seven Cheap Things: A Guide to Capitalism, Nature, and the Future of the Planet*. University of California Press.
- Petzold J, Magnan AK, 2019. Climate change: thinking small islands beyond Small Island Developing States (SIDS). *Clim. Change* 152 (1), 145–165.
- Petzold J, Joe ET, Kelman I, Magnan AK, Mirbach C, Nagle Alverio G, Nunn PD, Ratter BMW, Team, G. A. M. I, 2023. *Between tinkering and transformation: a contemporary appraisal of climate change adaptation research on the world’s islands*. *Frontiers in Climate* 4.
- Pollock NJ 1992. *These roots remain. Food habits in islands of the central and eastern Pacific since western contact*.
- Pulido L, 2016. *Flint, environmental racism, and racial capitalism*. Taylor & Francis.
- Reenberg A, Birch-Thomsen T, Mertz O, Fog B, Christiansen S, 2008. Adaptation of human coping strategies in a small island society in the SW pacific—50 years of change in the coupled human–environment system on Bellona, Solomon Islands. *Hum. Ecol* 36 (6), 807–819.
- Roland HB, 2023. *Compelled and constrained migration: restrictions to migration agency in the Marshall Islands*. *Frontiers in Climate* 5, 1212780.
- Roland HB, Curtis KJ, Malecki KMC, Lee D, Bazo J, Block P, 2023. Geographic isolation and vulnerability across Peru’s ecological regions: the influence of regional contexts of extraction. *Annals of the American Association of Geographers* 113 (9), 2126–2148. [PubMed: 37982018]

- Rollason W 2014. Coconuts and the landscape of underdevelopment on Panapompom, Papua New Guinea. *Belonging in Oceania: Movement, Place-Making and Multiple Identifications*, 71–93.
- Rudiak-Gould P, 2013. *Climate Change and Tradition in a Small Island State*. Routledge.
- Sassen S, 2014. *Expulsions: Brutality and Complexity in the Global Economy*. Harvard University Press.
- Sassen S, 2016. A massive loss of habitat. *Sociol. Dev* 2 (2).
- Shultz JM, Cohen MA, Hermosilla S, Espinel Z, McLean A, 2016. Disaster risk reduction and sustainable development for small island developing states. *Disaster Health* 3 (1), 32–44. [PubMed: 28229013]
- Simpson LB 2017. *As we have always done: Indigenous freedom through radical resistance*. U of Minnesota Press.
- Skillington T, 2017. *Climate Justice and Human Rights*. Palgrave Macmillan US.
- Small CA 2011. *Voyages: from Tongan villages to American suburbs*. Cornell University Press.
- Smith N, 2006. *There's No Such Thing as a Natural Disaster*.
- Sovacool BK, 2012. Expert views of climate change adaptation in the Maldives. *Clim. Change* 114 (2), 295–300.
- Steiner CE, 2015. A sea of warriors: Performing an identity of resilience and empowerment in the face of climate change in the Pacific. *Contemp. Pac* 27 (1), 147–180.
- Strauss A, Corbin J 1994. *Grounded theory methodology: an overview*.
- Sumaila UR, Bellmann C, Tipping A, 2016. Fishing for the future: an overview of challenges and opportunities. *Mar. Policy* 69, 173–180.
- Teaiwa K, 2014a. *Consuming Ocean Island: stories of people and phosphate from Banaba*. Indiana University Press.
- Teaiwa K, 2014b. Postcolonial cultural identities in the Pacific. In *The Globalization of World Politics: Case Studies from Australia, New Zealand and the Asia Pacific*, third ed., Oxford University Press.
- Teaiwa K, 2015. Ruining Pacific islands: Australia's phosphate imperialism. *Aust. Hist. Stud* 46 (3), 374–391.
- Teaiwa K 2018. *Our rising sea of islands: Pan-Pacific regionalism in the age of climate change*.
- Thomas K, Hardy RD, Lazrus H, Mendez M, Orlove B, Rivera-Collazo I, Roberts JT, Rockman M, Warner BP, Winthrop R 2019. Explaining differential vulnerability to climate change: A social science review. *Wiley Interdisciplinary Reviews: Climate Change*, 10(2), e565. [PubMed: 31007726]
- Tierney K, 2014. *The social roots of risk: Producing disasters, promoting resilience*. Stanford University Press.
- University of Hawai'i at Manoa Library. 2023. *Micronesians in Hawai'i: Compacts of Free Association (COFA)*. Available at: <https://guides.library.manoa.hawaii.edu/c.php?g=105631&p=686651>.
- van der Ploeg J, Sukulu M, Govan H, Minter T, Eriksson H, 2020. Sinking islands, drowned logic; climate change and community-based adaptation discourses in Solomon Islands. *Sustainability* 12 (17), 7225.
- VanWey L, Ostrom E, Meretsky V, 2005. *Theories Underlying the Study of Human-Environment Interactions*. In: *Seeing the Forest and the Trees: Human-Environment Interactions in Forest Ecosystems*. MIT Press.
- Walshe RA, Nunn PD, 2012. Integration of indigenous knowledge and disaster risk reduction: a case study from Baie Martelli, Pentecost Island, Vanuatu. *Int. J. Disaster Risk Sci* 3, 185–194.
- Watson MS, Claar DC, Baum JK, 2016. Subsistence in isolation: fishing dependence and perceptions of change on Kiritimati, the world's largest atoll. *Ocean Coast. Manag* 123, 1–8.
- Weir T, Dovey L, Orcherton D, 2017. Social and cultural issues raised by climate change in Pacific Island countries: an overview. *Reg. Environ. Change* 17, 1017–1028.
- West P, 2005. Translation, Value, and Space: theorizing an ethnographic and engaged environmental anthropology. *Am. Anthropol* 107 (4), 632–642.
- West P, 2016. *Dispossession and the Environment*. Columbia University Press.

- Williamson DL, Choi J, Charchuk M, Rempel GR, Pitre N, Breitzkreuz R, Kushner KE, 2011. Interpreter-facilitated cross-language interviews: a research note. *Qual. Res* 11 (4), 381–394.
- Wisner B, Blaikie P, Cannon T, Davis I, 2003. *At Risk: Natural Hazards, People’s Vulnerability, and Disasters*, second ed.,. Routledge.
- Yamada S, Riklon S, Maskarinec GG, 2016. Ethical responsibility for the social production of tuberculosis. *J. Bioethical Inq* 13 (1), 57–64.
- Yarina E, Takemoto S, 2017. Interrupted atolls: riskscape and edge imaginaries in Tuvalu. *Plan J* 2, 461–495.