MARSHALLESE MIGRATION: THE ROLE OF CLIMATE CHANGE AND ECOSYSTEM SERVICES

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CASE STUDY REPORT

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THE MARSHALL ISLANDS CLIMATE AND MIGRATION PROJECT (MICMP)

ENVIRONMENTAL LAW PROGRAM
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Pacific RISA
a NOAA RISA team

PACIFIC ISLANDS
Climate Adaptation Science Center

MICS
Marshall Islands Conservation Society
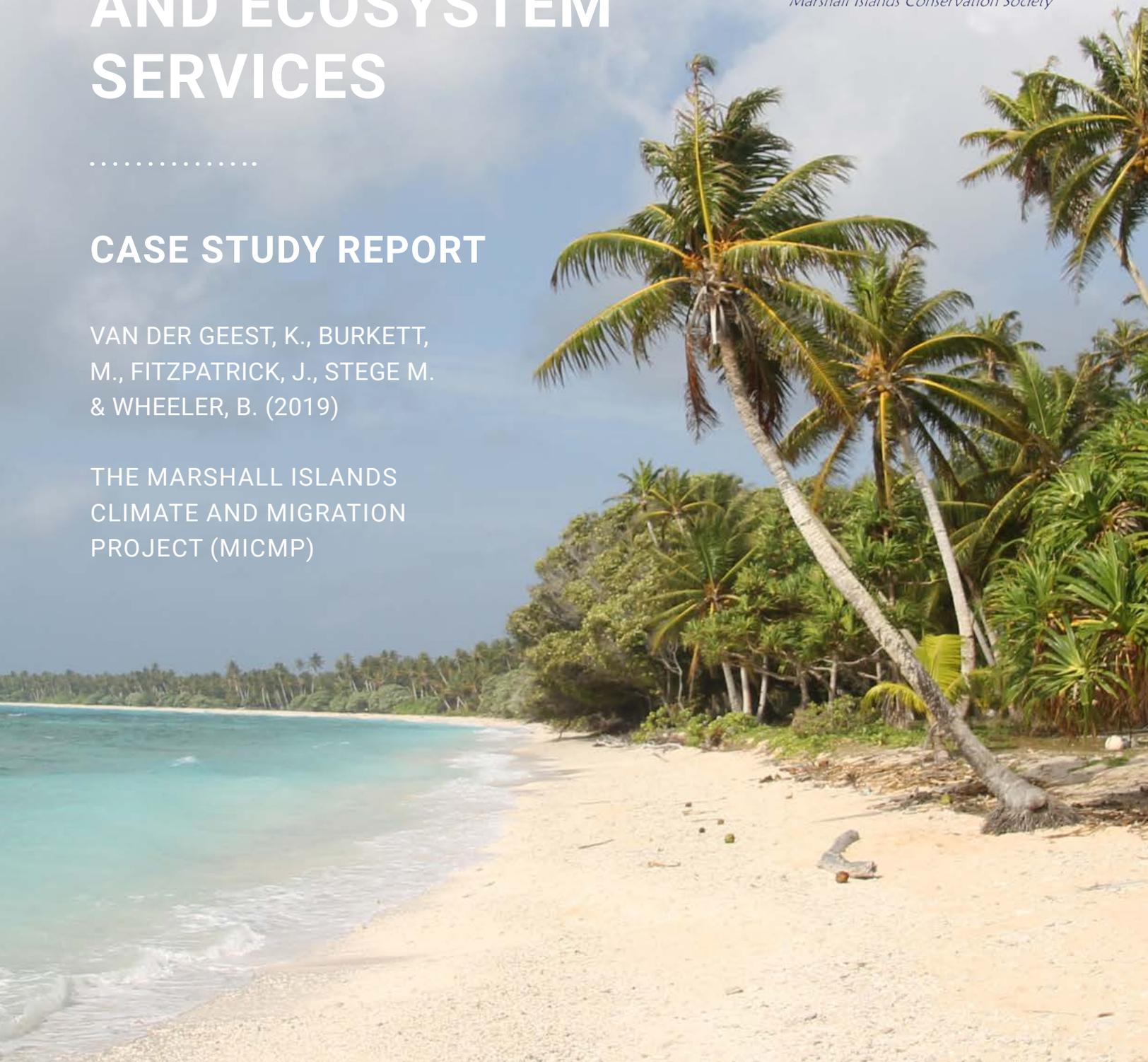
TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PICTURES

LIST OF TEXT BOXES

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Source: Kees van der Geest

Marshallese migration: The role of climate change and ecosystem services

Summary for Policymakers

The Marshall Islands Climate and Migration Project (MICMP)

Introduction: Climate change and migration

As one of the lowest-lying island nation-states in the world, the Republic of the Marshall Islands (RMI) is acutely vulnerable to heat stress, drought, storms, sea-level rise, and the associated impacts on freshwater supplies and habitable land. The RMI's chain of 29 coral atolls—70 square miles of land spread across 750,000 square miles of ocean—stand at six feet above sea level at their highest and are at risk of relatively near-term uninhabitability.

The RMI's long and unique history of migration and displacement are entwined with this environmental position. Oceanic voyaging, U.S. nuclear testing–induced relocation, and the recent dramatic emigration to the U.S., enabled by the Compact of Free Association (COFA), have created a distinctive context for research questions around contemporary climate-induced migration.

Central to the conceptual framework behind this study is the prevailing notion that people do not migrate because of climate change as such, but because of the way in which the changing climate affects their livelihoods, food security, and well-being. The impacts of climate change are often mediated through environmental impacts on ecosystems and the services they provide, and act in concert with socioeconomic factors to drive human mobility (Thomas 2014) or affect decision-making around migration.

| Climate change + extreme weather | ▶ | Impact on ecosystem services | ▶ | Impact on people and livelihoods | ▶ | Migrant decison | ▶ | Impacts of migration |
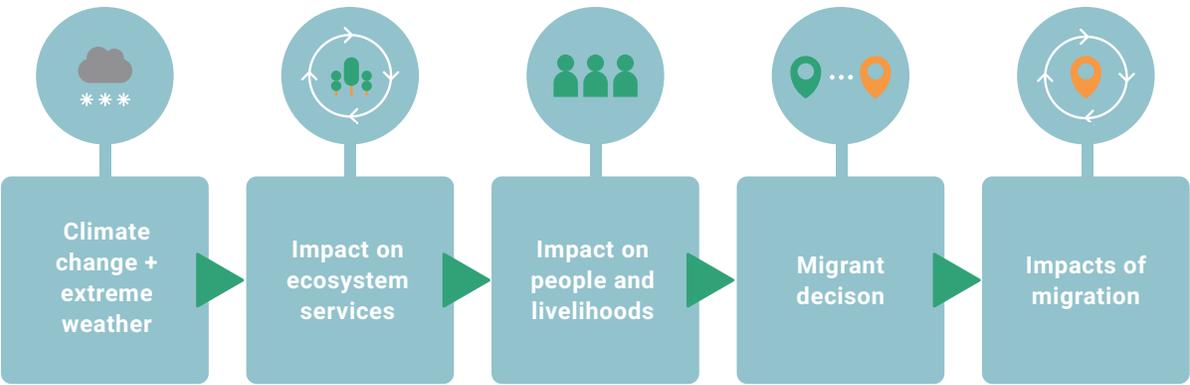
This study aims to clarify the extent to which Marshallese people are already migrating because of climate change, and the role affected ecosystem services play in their migration decisions. The research also aims to better understand the effects of this migration on migrants themselves, among communities in the RMI (in the capital of Majuro, and on Mejit and Maleolap), and in destination states (Hawai'i, Oregon, and Washington). Finally, the research provides an analysis of shared views found within Marshallese perceptions on these subjects, which allows for a more fulsome assessment of the current state of well-being for Marshallese migrants, contributes to a more informed discussion regarding whether migration is a successful adaptation strategy, and provides context for assessing which legal, economic, and social services the Marshallese may need and desire in coming years.

The Marshall Islands Climate and Migration Project (MICMP) asked three primary research questions:

1. *To what extent are climate-related stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands and from the Marshall Islands to the U.S.?*
2. *What are the impacts of migration on migrants themselves and their home communities?*
3. *Which shared views on climate change, environment, migration, and future habitability exist within the study population?*

This Summary for Policymakers begins by *Contextualizing migration in the Marshall Islands*, offering a brief demographic and environmental overview of the RMI. In *Research methods*, we review participant and site selection, supplementary and primary research methods (the household survey and Q-methodology), and methodological limitations. In *Research findings*, we present our key results, organized by the primary research questions, synthesizing *Migration drivers*, *Migration impacts*, and *Shared and differing perceptions*. In *Looking forward: concluding remarks*, we discuss the implications of our findings and future research directions.

Source: Kees van der Geest

Contextualizing migration in the Marshall Islands: Demographic and environmental overview
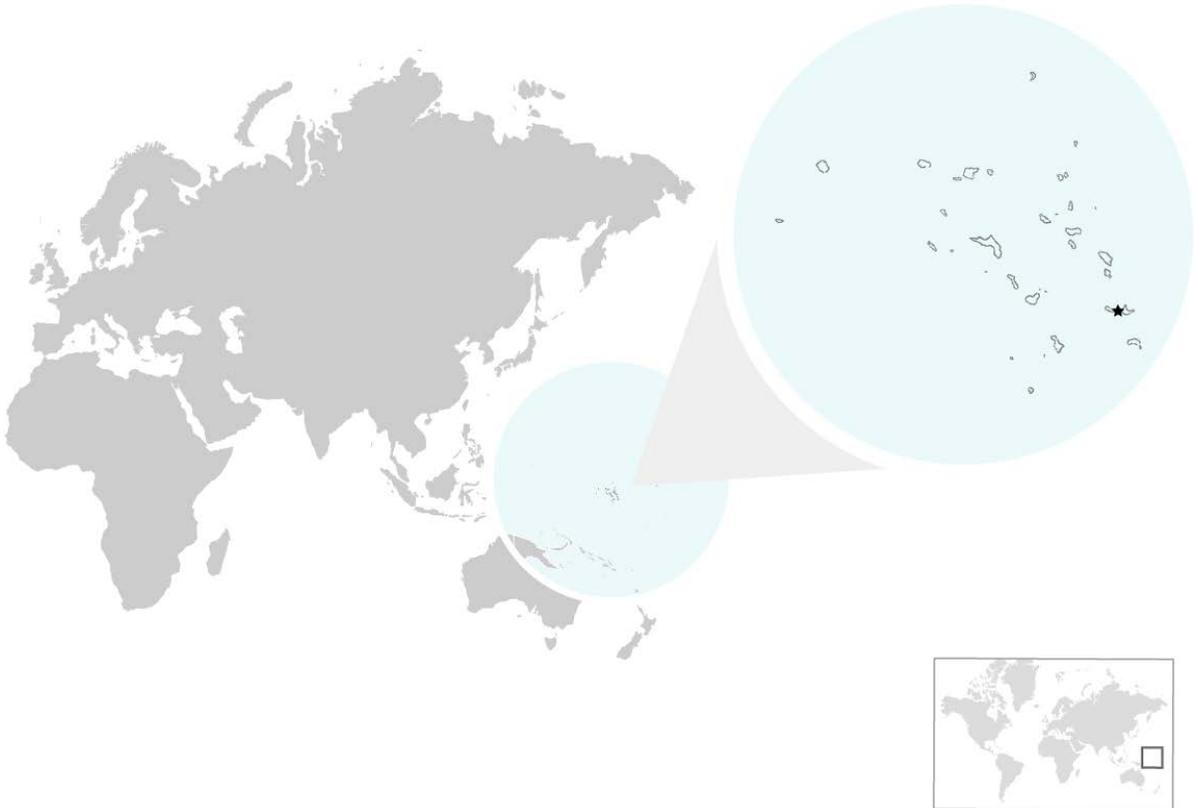
Source: Michael Christopher Brown, Magnum Photos, MSNBC, "Hell and High Water". Graphic by Melissa Paige Taylor.

The current estimated population of the RMI is 53,167 (United Nations Population Division, 2018). More than half the population of the Marshall Islands currently lives on Majuro[1] —a marked departure from half a century ago, when slightly less than a quarter did.[2] The 2011 RMI census shows that population growth slowed to an annual rate of 0.4 percent in the 1999–2011 intercensal period, and the outer islands' populations, apart from three, have all decreased since 1999. The increasing dominance of urban centers within the RMI is important as both an indicator of internal migration and a primary place of departure, including to the United States (U.S.). The number of Marshallese currently residing in the U.S. is roughly 30,000, and has risen rapidly over the

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1   The 2011 Population Census counted 27,797 people on Majuro out of a total of 53,158 for the entire nation (source: http://www.statoids.com/ymh.html).

2   The 1958 Population Census counted 3,415 people on Majuro out of a total of 14,163 for the entire nation (source: http://www.statoids.com/ymh.html).

past two decades. Overall, the population has increased four-fold between 2000 and 2010, and has sustained continued growth in the 2010s.

There is scientific consensus that global air and water temperatures will increase, sea levels will rise due to thermal expansion and glacier melting, oceans will absorb more carbon dioxide causing acidification (IPCC AR5, 2014), and extreme weather events are expected to become more intense (IPCC, 2012).

Climate change also has the potential to reduce the level of ecosystem services by causing environmental degradation, especially in atoll environments (Staudinger et al., 2012; Stege, 2018). Persistent climatic shocks and El Niño events are already affecting livelihoods in the RMI. Rising sea levels mean that the RMI's coastal areas are increasingly vulnerable to flooding, wave inundation, erosion from storms, shifts in precipitation and resulting drought, surface temperature increases, hurricanes, and tsunamis, as well as the associated impacts on freshwater supply and habitable land (Keener at al., 2012; Marra et al., 2017). Going forward, the Marshall Islands will see increased temperatures, increased heat stress days, and decreased annual rainfall.

Research methods

The Marshall Islands Climate and Migration Project used mixed social science methods to conduct six weeks of fieldwork in the Marshall Islands, and four weeks in Hawai'i, Oregon, and Washington states.

Participant and site selection

In the RMI, we surveyed 199 households across Majuro (99), Maloelap Atoll (50), and Mejit Island (50). The distribution of these households is representative of the total population of the RMI (roughly half live on urban Majuro, and half on the outer islands). Almost half the respondents on Majuro and Mejit were born on other islands, and Majuro is both a source of international migration and a destination for internal migration. Ecologically, the two outer islands represent an atoll (Maloelap) and a raised coral island (Mejit), of which there are 29 and 5, respectively, throughout the RMI. These sites were also selected for ease of transport (to and from Mejit and Maloelap) and because they were the sites of work already underway with the Marshall Islands Conservation Society (MICS), which offered in situ data on ecosystem services.

In the destination states, 79 households—located on Oahu (70%) and the Big Island (30%) in Hawai'i, and Oregon (92%) and Washington (8%) in the Pacific Northwest—were selected as primary destination states in need of further study. Most respondents were born in the Marshall Islands (100 percent in Hawai'i and 87 percent in the Pacific Northwest), and of those born in the RMI, 70 percent originated from Majuro or Ebeye. In the Pacific Northwest, most respondents lived in Salem, Oregon, and in Hawai'i, most resided in Honolulu, O'ahu. These states were chosen for their high concentration of diaspora groups, support from community-based organizations and NGOs able to facilitate introductions and translation, and linkages to the Marshallese Consulate. We used snowball sampling to select additional research participants.

Source: Kees van der Geest

Primary research methods

The MICMP used two primary research methods—a household survey and 40-question Q-methodology—both of which were undertaken with the same research populations in the RMI and the U.S. The methodology built on and expanded the methods used in the Pacific Climate Change and Migration project (Oakes et al., 2017).

The household questionnaire generated quantitative and qualitative information by gathering socio-demographic data, the risk-proneness of respondents' houses (recorded with GPS), the impacts of environmental stressors, trends in ecosystem services, respondents' migration histories and future migration intentions, and perceptions on policy interventions.

To gain a deeper understanding of respondents' attitudes and perceptions around climate change, ecosystem services, and migration drivers and outcomes, the research teams in the RMI and the U.S. also conducted a Q-study. Researchers use this method to investigate opinions or "shared views" on a particular theme by analyzing how participants rank a set of statements from "strongly agree" to "strongly disagree" about that theme (Oakes et al., 2017; Danielson, 2009). In Q-methodology, the data is analyzed quantitatively—with Principal Component Analysis—but the interpretation is largely qualitative. This methodology enabled the distinction of several groups of shared views within the survey population, beyond individual perceptions.

Source: Kees van der Geest
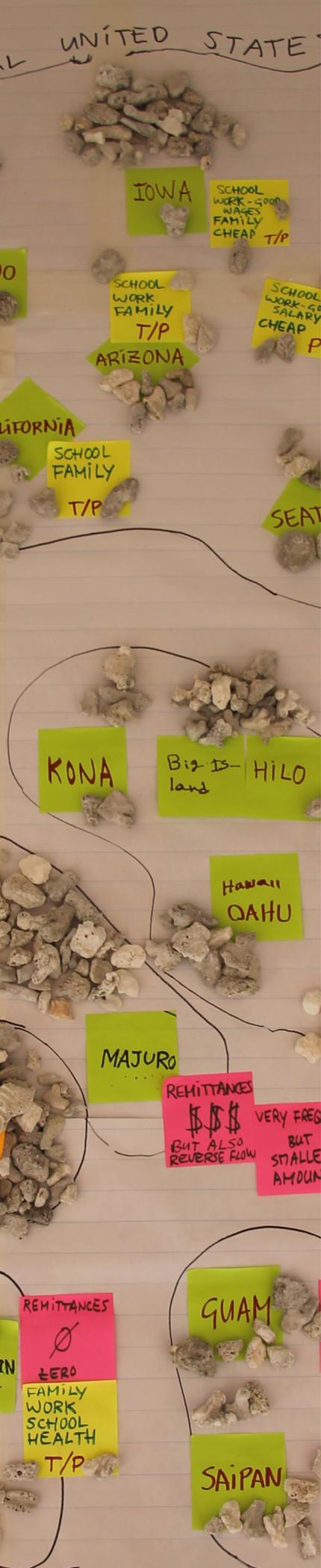
Supplementary and participatory methods

These methods were supplemented by a desk study, undertaken to better understand the impacts of climate change on ecosystems and to further contextualize the respondents' perceptions and experiences with the changing climate. In the RMI, geospatial information was collected to assess correlations between environmental stressors and migration decision-making of participant households.

In the RMI, we undertook participatory research (transect walks, contextual change listings, fuzzy cognitive mapping, and mobility mapping) with the aim of gathering qualitative and visual data to complement the household survey. The written Marshallese language was utilized, and research enumerators from the island were trained to conduct interviews and surveys.

Methodological limitations

A limitation of this research is that the research team could only survey three study sites in the RMI, while the country consists of 29 coral atolls and five raised coral islands. The study makes no claim about the relevance of these findings to all islands of the RMI. It is possible that sea-level rise, coastal inundation, drought, and freshwater scarcity are more severe in other parts of the RMI. In addition, the legacy of nuclear testing—and related compensation—may affect other islands and their population's migration decisions.

Research findings

Below, we present our key results, organized by the primary research questions, synthesizing migration drivers, migration impacts, and shared and differing perceptions.

Migration drivers

To what extent are climate-related stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands and from the Marshall Islands to the U.S.?

This study sought to provide a more complete picture of environmental and other drivers of migration by triangulating the findings from the household survey, focus group discussions, Q-methodology, and a spatial analysis of flood-extent and migration rates. Key findings include:

17

- **_Primary drivers of migration in the RMI and the U.S.:_** Respondents in the RMI and the U.S. primarily cite education, health care, work, and family connections as motivators of migration. However, the picture is more complex than this.

- **_A divergence in environmental migration rationales between the RMI and the U.S.:_** This study shows a divergence in findings regarding the rationales for migration between participants in the RMI and those in the United States. Many more respondents in the U.S., and particularly in Hawaiʻi, cite environmental problems in the RMI as the drivers for moving than those presently living in the RMI.

- **_Climate impact and ecosystem services variables in the RMI:_** Although the most pressing problems identified by those living in the RMI were a lack of job opportunities, respondents also ranked drought (2nd), lack of fresh water (3rd), and sea-level rise (4th) as serious concerns when problem ranking statements. In addition, half of the respondents in the RMI perceived a general negative trend in ecosystem services (the provision of local food and access to freshwater, fuelwood, and safety). The relationship between migration and ecosystem services shows several significant relationships, particularly between migration intentions and perceived trends in the ecosystem services of food provision, fuelwood provision, and protection against storms and floods. Household members of respondents who perceive that these ecosystem services are deteriorating are more likely to intend to migrate in the next 10 years. The survey also finds positive correlations between household-level impacts of heat waves, storm surges, and migration propensities, which is an indication that migration propensities tend to be higher in climate-stressed households.

- **_Climate impact and ecosystem services variables in destination states:_** Almost all respondents in the U.S. (95%) perceived that king tides have drastically increased in recent years, followed by large percentages of concern around drought and heat waves. Survey respondents identified sea-level rise as the most threatening factor facing their previous residences in the RMI, followed by ocean pollution. However, the study finds no statistically significant relationship between sea-level rise and the decision to migrate to Hawaiʻi or the Pacific Northwest. Sea-level rise is also more often mentioned as a factor that works against future return to the RMI. There is a positive correlation between the lack of access to drinkable water/freshwater sources as a threat to the interviewees' previous living situations in the Marshalls and respondents' reluctance to return to the RMI.

- **_"Non-environmental" migration rationales in the RMI:_** In the RMI, respondents identified job opportunities as their greatest concern, though migration for seeking better education and health care is also common. The primary reason that migration for work occurs (to both the U.S. and within the RMI) is the limited opportunities for generating income on the outer islands, which participants noted is because of stagnant (government) wages despite an increase in prices, delayed payment of goods sold and delivered (e.g., copra), not enough diversity in livelihoods and income sources, and a deterioration of the island's

productivity. The primary reason behind the decision to migrate for education or health care is the low level of these services on the island. Finally, family networks enable migration, as 40 percent of respondents noted that this was a factor in their migration decisions.

- **_"Non-environmental" migration rationales in destination states:_** Respondents selected education (80%), health care (72.5%), economic opportunities (70%), and familial networks (70%) as the most prominent drivers of recent migration. In the U.S., respondents also noted the inadequacy of the health and education systems and the stagnation of the economy in the RMI as significant reasons for recent migration. Respondents taking the household survey expressed concern about the inadequate response of the Marshallese government in mitigating against the loss of ecosystem services, the lack of extension of services beyond those that serve an emergency function, and the resulting reliance upon external aid. Among Marshallese interviewees, 55 percent of those based in Hawaiʻi stated that their rationale for selecting the state above others was its proximity to the RMI, its more closely aligned culture, and its strategic positioning as a departure point to travel to the continental U.S. Respondents in Hawaiʻi (82.5%) cited familial networks and the support system provided by extended family throughout their established diaspora networks as important to their rationale for migration.

- **_Spatial analysis of the relationship between environmental stressors and migration:_** In overlaying past flood extents (2014, 2015) and the migration data from the household survey, the study found no statistically significant difference in migration rates of households within and outside areas that had recently been flooded. This was the case when considering both the percentage of current migrant relatives in their household (in the U.S. or elsewhere) and the percentage of those that intended to migrate (to the U.S. or elsewhere).

Migration impacts

What are the impacts of migration on migrants themselves and their home communities?

This section summarizes the research findings on migration impacts, both from the perspective of migrants in the U.S. and from the perspective of the home community. The findings are based on the household survey and the Q-methodology. Key findings include:

- **_Overall findings from the RMI:_** Respondents were on average more positive (39.2%) than negative (20.1%) about the impacts of migration upon the economic situation and well-being of their households. The other respondents (40.7%) were neutral about the impacts of migration. Overall, evaluations were more positive on Mejit and Majuro than on Maloelap, and the impacts of the respondents' own previous migrations were assessed more positively than those currently undertaken by their siblings and children.

- ***Positive impacts perceived in the RMI:*** Respondents primarily noted the following positive impacts of migration: improved education, finding employment, receiving better health care, gaining life experience, connecting to relatives (which also eases migration), and reducing pressure on resources, such as foodstuffs and living space.

- ***Negative impacts perceived in the RMI:*** Respondents most frequently mentioned the following negative impacts of migration: it affected the lack of care for children and the elderly, contributed to "brain drain," had adverse effects on development, resulted in homesickness, being separated from loved ones, and undesirable experiences in migrant destination areas (unemployment, alcoholism, lack of mobility), and had damaging effects on social cohesion and the Marshallese culture and language.

- ***Overall findings from the U.S. fieldwork:*** Questionnaire respondents in the U.S. were, on average, also more positive than negative about the impacts of migration on the economic situation and well-being of their households. Among interviewees in the Pacific Northwest, 53.9 percent recorded an improvement in their economic situation, while 77.5 percent in Hawai'i did so. Furthermore, roughly half of respondents in each of the destination states felt that migration had "quite a positive" influence on the economic situation and well-being of family members in the RMI. Interviewees in the U.S. stated that there are available job opportunities for the Marshallese in Hawai'i and the Pacific Northwest.

- ***Remittances:*** In Hawai'i, 70 percent of respondents reported sending remittances home, and 85 percent did so from the Pacific Northwest. In the RMI, roughly a third of respondents (32.4%) had received remittances in the past 12 months.

- ***Perception of improved health care in Hawai'i:*** Respondents living in Hawai'i ranked their health care as highly improved over their previous residences within the RMI. Respondents reported a 64 percent increase in the perception of the quality of health care.

- ***Perceived negative effects of migration:*** According to survey respondents in the U.S., migration comes with significant non-economic losses, such as weakened conservation of language and cultural ties.

Photo source: Kees van der Geest

Shared and differing perceptions

Which shared views on climate change, environment, migration, and future habitability exist within the study population?

This study used Q-methodology to identify shared views within respondent groups in the **RMI**, **Hawai'i**, and the **Pacific Northwest.**

In the RMI, the Q-methodology identified three groups that shared similar views:

1. **Migration critics (43.6%):** Respondents in this group are satisfied with the quality of life, development, governance, and security in the RMI. They are clear about not wanting to move, and are very critical about the impacts of migration, both in the RMI and for migrants themselves. Although they are happy with life as it is now, they do worry about the future of their islands.

2. **Adaptation optimists (25.5%):** This group is more critical about the quality of life in the RMI, and especially the lack of employment. However, they are quite optimistic about the future of their islands. "God will take care of us" was one of the statements they most agreed with, and they also put more trust in the international community. They do not perceive the problems and risks that the other groups do, and answered more optimistically about future habitability, climate risk preparedness, and the level of adaptive capacity. They do not oppose migration and think it can be part of the solution, but they are critical about the impact of migration on Marshallese culture.

3. **Island pessimists (14.9%)[3]:** Respondents in this group are clearly dissatisfied with life in the RMI, and have a strong desire to move to a different place, preferably the U.S. Members of this group are very critical about changes in the quality of life, governance, development, and livelihood security in the RMI, and they question the future habitability of their islands. They see migration to the U.S. as the best or the only option, and are very positive about the impacts of migration, emphasizing its benefits and downplaying adverse effects.

The Q-analysis in the RMI shows that there are quite distinct views on migration and future habitability within the population of the Marshall Islands. This is important for policy-makers as people in these groups may respond differently to migration and climate change adaptation policy.

In Hawai'i, the Q-methodology identified two groups that shared similar views:

1. **Habitability pessimists (45.0%):** These respondents have had their livelihoods affected by climate-related stressors, have experienced discrimination, possess a fatalistic perspective on future island habitability, note the Marshallese government's lack of a resilience strategy, have a neutral position on employability in Hawai'i, and have often come to Hawai'i to seek health care.

2. **Migration optimists (37.5%):** Respondents in this group view migration as a successful adaptation strategy, and they try to integrate in the U.S. while also valuing preservation of Marshallese culture. They perceive that they have improved livelihoods in Hawai'i and place less importance on climate issues than the group of "habitability pessimists."

In the Pacific Northwest, the Q-methodology identified three groups that shared similar views:

1. **Health care migrants (30.8%):** These respondents are characterized by migrating to seek health care, employment, and training; having had their livelihoods and food security affected by a changing climate; and placing weight on the importance of remittances rather than government's support.

2. **Climate-concerned migrants (25.6%):** These respondents are characterized by seeing climate as a future driver of migration, believing that climate change is worsening extant environmental issues caused by nuclear testing, and having experienced discrimination in the continental U.S.

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3   The percentages do not add up to 100 percent because some respondents did not fit in any of the shared views.

3. **Community supporters (28.2%):** TThese respondents can be characterized by their migrating for employment and health care, feeling threatened by environmental changes in their past residences, and having strong cultural ties with Marshallese culture.

The Q-analyses in the destination states show that there are quite distinct views on migration drivers and impacts, integration in U.S. society, future habitability of the RMI, and the preservation of Marshallese language and culture. This is important for policy-makers as people in these groups may respond differently to policy— for instance, in the areas of integration, social welfare, education, and health.

Source: Kees van der Geest

Looking forward: concluding remarks

Decision-makers at local and state levels in both the RMI and the U.S. require better information on the factors contributing to current migration in order to anticipate possible future impacts of the changing climate on human migration, and to act appropriately in regard to policy and service provision. The findings in this report provide a mixed-methods, multi-site analysis of the ways in which migration impacts livelihoods and well-being in the places in which migrants arrive and settle, as well as the rationales informing migration that has already occurred and is yet to come.

Respondents in the RMI perceive that the main drivers of migration in and from the RMI are related to education, health care, work, and family networks. Very few respondents in the RMI cite climate impacts or environmental change as drivers of migration. This was the case for past migrations (of the respondents), current migrations (of siblings and children), and future migrations (of household members). In the U.S., a higher proportion of respondents stated that environmental problems and sea-level rise had influenced their decision to migrate to the U.S.

Triangulating these findings with other research tools and analyses revealed a more complex picture, including indications that households that had experienced more climate-related stresses and that perceived more negative trends in ecosystem services had higher migration propensities. The evidence found in the study sites is not conclusive. Moreover, it is important to distinguish between migration today and population movements a few decades from now. While climate hazards currently still play a modest role in driving migration, it is almost certain that climate change will have substantial impacts on mobility patterns in the next decades.

An important limitation of this research is that the research team could only survey three study sites, while the RMI consists of 29 coral atolls and five raised coral islands. Therefore, the findings may not be representative for the entire RMI. There may be parts of the RMI—particularly the northernmost islands—that are harder hit by drought and heat waves, and there may be lower-lying atolls that are more at risk of inundation. During a workshop on Majuro, in which the researchers presented results to Marshallese policy-makers and community representatives, participants emphasized that this research should be considered a baseline for future research, and that similar studies need to be conducted every five to ten years and covering more islands.

The next stage of the Marshall Islands Climate and Migration Project (MICMP) leverages the legal research being done within the Pacific Research and Integrated Science Association (Pacific RISA) program to support the critical quantitative and qualitative social science research on which optimal policy framework analysis relies.

Source: Kees van der Geest

Source: Kees van der Geest

Marshallese migration: The role of climate change and ecosystem services

Case Study Report

The Marshall Islands Climate and Migration Project (MICMP)

1. Introduction: Climate change and migration

Almost three decades ago, in 1990, the Intergovernmental Panel on Climate Change (IPCC) warned that "the gravest effects of climate change may be those on human migration as millions are displaced by shoreline erosion, coastal flooding and severe drought" (IPCC, 1990: 20). As one of the lowest-lying island nation-states in the world, the Republic of the Marshall Islands (RMI) is at the frontline of climate change, and its inhabitants are at risk of displacement due to climate change impacts (Constable, 2017). The country is acutely vulnerable to sea-level rise, flooding, and the associated intrusion of saltwater into crucial freshwater supplies. Persistent drought is further affecting agricultural production and access to drinking water, and heat stress is increasingly common. Many Marshallese communities are already experiencing these changes that affect the habitability of their islands.

Within the Marshall Islands there are substantial migration flows between islands, particularly from outer islands to the capital, Majuro. In addition, many are migrating to other countries, particularly the United States. The number of Marshallese residing in the U.S. rose rapidly, from 6,650 in the year 2000 to 22,434 in 2010.[2] It is estimated that currently 30,000 Marshallese live in the U.S.[3] To compare, the total population residing in the Republic of the Marshall Islands was 53,518 at the time of the last population census in 2011.[4]

While existing research shows that climate change is already affecting the Marshall Islands (Marra et al., 2017), and population censuses show that there are significant migration flows, it is not clear to what extent Marshallese people are already migrating because of climate change and its impact on ecosystem services and livelihoods. In other words, it is not clear to what extent Marshallese migrants can be considered environmental migrants or climate-induced migrants (see text box). In addition, if climate change is a cause of migration, we do not know whether the decision to migrate is a successful adaptation strategy or not.

Text box 1: Who is an "environmental migrant"? The IOM definition

"Environmental migrants are persons or groups of persons who, for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their territory or abroad." (Ionesco and Chazalnoël, 2015: 115). Following this definition, one would talk of climate-induced migrants in cases where environmental drivers of migration are related to climate change."

2   The source for the total Marshallese population in the U.S. in 2000 is U.S. Census Bureau (2001: 9). The document, called "The Native Hawaiian and Other Pacific Islander Population: 2000" is available online: https://www.census.gov/prod/2001pubs/c2kbr01-14.pdf. The source for the total Marshallese population in the U.S. in 2010 is the 2010 Census Summary File 2, Profile of General Population and Housing Characteristics: 2010. The data is available online: https://factfinder.census.gov/faces/nav/jsf/pages/guided_search.xhtml.

3   See Chapter 2 for the data and calculations underlying this estimate.

4   All population figures in this paragraph refer to "Marshallese population alone or in any combination."

The factors triggering human migration are complex and often intertwined, making it difficult to pinpoint and address specific causes (Foresight, 2011). For example, changes in ecosystems due to climate change can cause health problems or food insecurity, but these may have greater consequences in communities with political, social, or economic tension.

A recent review of the academic literature on migration and environmental change revealed four key findings. First, due to climate change, it is expected that the impact of environmental change on migration will be stronger in the future than it is today. Second, most environmentally-induced migration will be within state borders and over relatively short distances, rather than international. Notable exceptions are border areas and small states, particularly small island developing states. Third, migration is often seen as a failure to adapt to environmental changes, but more and more studies emphasize that migration can also be part of successful household strategies to diversify livelihoods and reduce risk. A last finding from the literature review is that climate change will not only force millions of people to migrate, but will also trap millions of people in vulnerable environments, unable to leave because they lack the means to migrate (Milan, 2016).

Decision-makers at local and state levels in both the RMI and the U.S. need better information to understand the factors contributing to current migration, as well as to anticipate possible future impacts of climate on human migration. For those who design policy related to immigrant access to services, a better understanding of how migration impacts livelihoods and well-being in the places in which migrants arrive and settle is also beneficial. Although this research does not provide solutions for either managing environmental degradation or migration challenges, it does examine the extent to which researchers can identify the relationship between patterns of human migration and climatic changes and shocks.

The RMI is in a unique relationship with the United States, owing to the Compact of Free Association (COFA), which allows for visa-free Marshallese migration to the U.S. and access to formal employment, education, and medical treatment. In a broader perspective, oceanic voyaging, U.S. nuclear-induced relocation, and recent increased emigration enabled by COFA have created a distinctive context for research questions around contemporary climate-induced migration within and from the Marshall Islands. It is hoped that the research undertaken here will uniquely contribute to understanding how climate variability and change influence human mobility in the RMI specifically and, perhaps, in the Freely Associated States generally.

a. Conceptual framework

Figure 1 shows the conceptual framework this research has developed and utilized to understand the relationship between the changing climate and migration within and from the RMI ("the climate-migration impact chain"). Central to the conceptual framework is the prevailing notion that people do not migrate because of climate change as such, but because of the way climate change affects their livelihoods, food security, and well-being. The framework further acknowledges that impacts of climate change on people are often caused by climate impacts on ecosystem services (Black et al., 2011; Zommers et al., 2016; van der Geest et al., 2019), which are the benefits that people obtain from ecosystems (MEA, 2005).

Figure 1: The climate-migration impact chain (conceptual framework)

From left to right, the conceptual framework moves from the natural environment to human behavior. The relevant content of each box in the framework varies by location. For example, in the first box (climate change and extreme weather), specific climate factors can be sea-level rise, floods, drought, storms, and glacier retreat. In landlocked countries or regions, sea-level rise would not be an issue, but drought could be, as well as impacts such as extreme heat. Similarly, in low-lying atoll nations, glacier retreat will not be a threat, but consequent sea-level rise will be. Between each set of adjacent boxes, there are relationships that this research investigates. For example, it looks at how drought (box 1) affects water provision (ecosystem service, box 2), and how this affects people's livelihoods and well-being on the islands (box 3). In the case of adverse effects, the next question would be whether drought and its effect on water provision and livelihood influence people's migration decisions.

b. Research questions

This research project studies the multi-causal nature of Marshallese migration, as well as its effects on migrants and communities in source and destination areas. It has a special focus on how climate change affects ecosystem services, livelihoods, and well-being, and how they together influence migration decisions. There are three central research questions:

1. *To what extent are climate-related stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands and from the Marshall Islands to the U.S.?*
2. *What are the impacts of migration on migrants themselves and their home communities?*
3. *Which shared views on climate change, environment, migration, and future habitability exist within the study population?*

2. Context: Marshall Islands

a. Geography

The Republic of the Marshall Islands (RMI) is a nation of widely dispersed, low-lying coral atolls and islands, with approximately 70 square miles of land area scattered across 750,000 square miles of ocean (Bureau of East Asian and Pacific Affairs, 2015). The Marshall Islands consist of 29 coral atolls and five separate islands. The atolls are divided in two groups, namely the Ralik Chain in the west and the Ratak Chain in the east. Average elevation for the RMI is approximately two meters above mean sea level (Owen et al., 2016).

Figure 2: Location of the Republic of the Marshall Islands
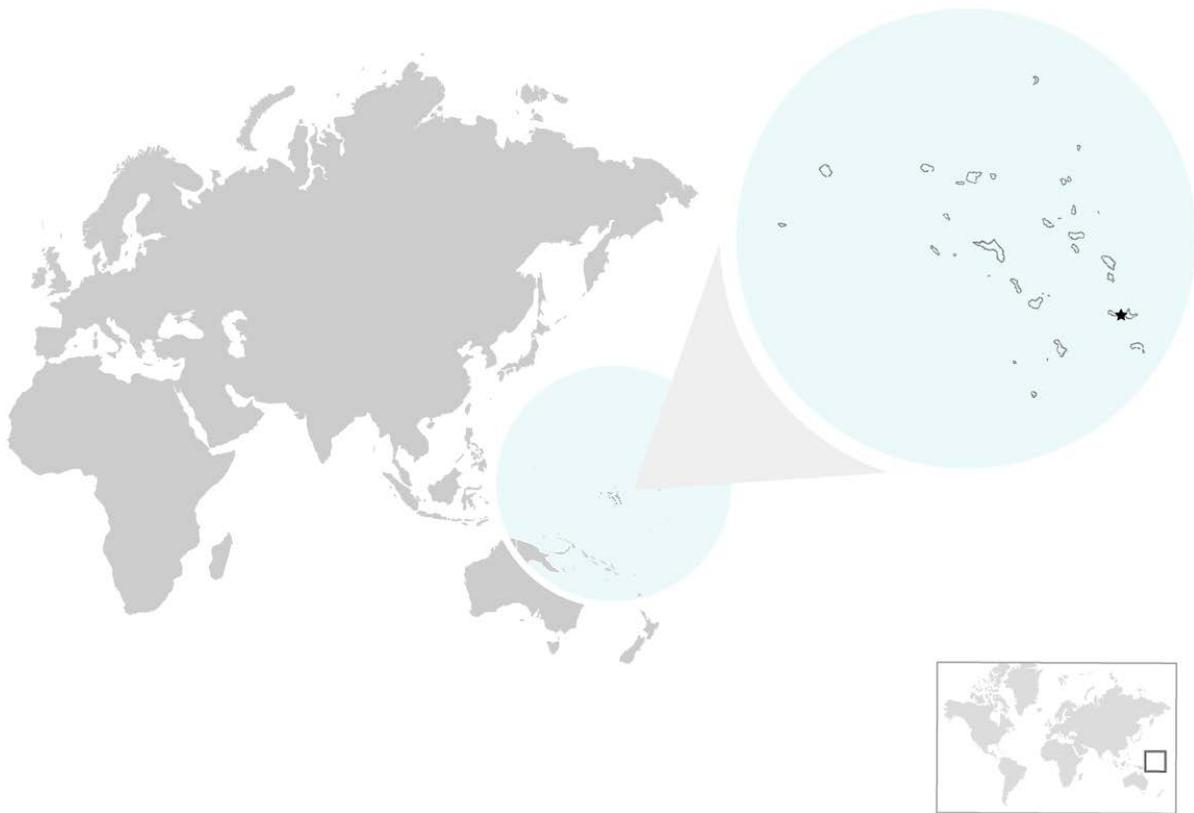
Source: Michael Christopher Brown, Magnum Photos, MSNBC, "Hell and High Water"

The Marshall Islands has a tropical climate with relatively constant temperatures around 27 degree Celsius. The average annual rainfall in the Marshall Islands follows a north-south gradient of precipitation driven by the Intertropical Convergence Zone (ITCZ), with interannual variation in total rainfall amounts mainly due to El Niño Southern Oscillation (ENSO). La Niña years bring wetter conditions and El Niño years bring warmer and drier conditions (Marra et al., 2017). On average, the most northerly atolls, which are furthest from the ITCZ, receive less than 50 inches per year and the most southerly atolls, nearest to the ITCZ, receive more than 100 inches per year. Weather data for Majuro, a southerly atoll, indicate a decreasing trend in average annual rainfall.

Marshallese traditional ecological knowledge identifies the drier windy season, known locally as Añoneañ, as lasting from December to April, and the wetter, less windy season, or Añondak, from May to November.

Livelihoods in the Marshall Islands vary greatly between the two urban atolls (Majuro and Kwajalein) and the "outer islands." Copra production, fishing, pensions, government salaries, and remittances from migrant relatives are the major sources of cash income on outer islands. Much of the local economy is not cash-based, however, but consists of subsistence activities. People buy imported rice as a staple food and consume locally available vegetables, fruits, and protein sources (mainly fish). On Majuro and Kwajalein, the economy is more diversified and urban, with less agriculture and more trade and services.

Many households in the Marshall Islands, and especially in the outer islands, identify "copra making" as their primary source of income. Other important crops include breadfruit, taro, pandanus, lime, bananas, papaya, pumpkin, and arrowroot. In some parts of the Marshall Islands, the soil is rich enough to support diverse and lush vegetation. These areas are often sites of expansive underground water reservoirs capable of sustaining good yields of tree crops, even over longer periods of drought. In other places, tree crops—particularly breadfruit trees—have had poor yields and yellowing leaves due to both drought and seawater overwash in recent years (MICS, 2017). Many pandanus varieties are largely salt-tolerant and continue to be important sources of nutrition throughout the Marshall Islands. On Majuro, the pandanus juice extracts are also produced into a rich energy drink. Parts of the pandanus tree are used as raw material for the handicraft sector, providing important economic value as well.

b. Climate change and disasters

At a global level, there is scientific consensus that global air and water temperatures will increase. Sea levels will rise due to thermal expansion and glacier melt. Oceans will absorb more carbon dioxide, causing acidification (IPCC, 2014). Extreme weather events such as storms, droughts, and excessive rainfall are expected to become more intense (IPCC, 2012).

Persistent climatic shocks and El Niño-aggravated climate change impacts severely affect the low-lying island nation-state of the Marshall Islands. Rising sea levels mean the RMI's coastal areas are increasingly vulnerable to flooding, wave inundation, and erosion from storms. Furthermore, the RMI is experiencing shifts in precipitation and resulting drought, surface temperature increases, hurricanes, and tsunamis, as well as associated impacts on freshwater supply and habitable land (Keener et al., 2012; Marra et al., 2017).

This section synthesizes key findings about observed as well as projected changes of climate from various assessments of climate change and its impacts in the RMI. The data come from the only two meteorological stations in the RMI, located in Majuro and Kwajalein.

Text box 2: Observed changes in climate

- The RMI experienced a 128% increase in the number of heat stress days between 1982 and 2016. The number of days with accumulated heat stress increased from 11 per year in the first decade of this period (1982–91) to 25 days in the last decade (2007–16) (Marra et al., 2017: 65).
- The meteorological stations of Majuro and Kwajalein registered a strong decreasing trend in annual rainfall since 1953 and 1950, respectively. El Niño years, such as 1983, 1998, and 2016, are particularly dry (PCCSP, 2011: 4; Marra et al., 2017: 23).
- Sea-level rise in the RMI amounted to 7 mm per year on average since 1993, which was more than double that of global average sea-level rise (2.8–3.6 mm per year) since 1993 (PCCSP, 2011; Keener et al., 2012).
- Data from the Kwajalein tide gauge show that high-water events are increasing. In the 1960s, such events occurred less than once a year, on average. By contrast, in the last decade, starting in 2005, such high-water events occurred 22 times a year, on average (Marra et al., 2017: 45).

i. Observed changes in climate

Although most storm systems pass over the RMI before increasing in intensity sufficient enough to pose a significant threat, during El Niño years, tropical storms have shown a propensity to form over Marshall Islands waters due to the warm water pool migrating into the area, coupled with the monsoon surging overhead (Spennemann and Marschner, 1994). For instance, in 1991, which was an El Niño year, Tropical Storm Zelda destroyed 60 percent of the houses on Ebeye, leaving 6,000 people homeless (UNDRO, 1991). On other islands of the RMI, saltwater intrusion contaminated food and freshwater supplies, destroyed 95 percent of the crops, and damaged coral reefs (UNDRO, 1991).

In 1918, a severe storm hit Majuro, drowning approximately 200 people, which was nearly one-fifth of the island's population (Hess et al., 2015: 11). A decade earlier, in 1905, another severe storm hit the Marshall Islands (Hess et al., 2015). These storms coincided with El Niño ocean conditions[5]. Based on historical descriptions of the 1918 storm, Spennemann (2004) concludes that its path bore resemblance to January 1979 Typhoon Alice that passed over Marshall Islands waters and prompted U.S. federal disaster relief assistance for atolls.

Coastal flooding poses a severe threat to ecosystems and livelihoods in the RMI due to the intrusion of saltwater, affecting agriculture and drinking water. Even small increases in the magnitude of sea levels have resulted in "dramatic increases in the frequency of minor flooding in the Marshall Islands" (Marra et al., 2017:

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5   International Research Institute of Climate and Society (2014). Available at: http://iridl.ldeo.columbia.edu/.

45). There is growing recognition that the frequency of such coastal flooding events will increase dramatically with rising sea levels (Marra et al., 2017). The severest floods in recent decades resulted from extratropical storms born at higher latitudes and whose waves traveled long distances, wreaking havoc elsewhere, such as in the Marshall Islands. Major flooding events occurred in 1979, 2008, and 2014. In 1979, the water crossed the land at several locations, covering it with sediment, destroying 300 houses, and damaging many more. Property damage was estimated at USD20 million (Hess et al., 2015). In 2014, a combination of high tides and high waves swept across portions of Majuro. The flood damaged 110 homes and displaced 940 people, who had to seek refuge in shelters and churches (Hess et al., 2015; Marra et al., 2017).

King tides are predictable and therefore easier to protect against, but if combined with other events, such as a tsunami or a tropical storm, the impacts can be extreme. Also, it is expected that because of sea-level rise, king tides will more frequently cause inundation and affect freshwater supplies. To protect against floods, government authorities and families in Majuro have built and reinforced seawalls and natural earthen berms along the most vulnerable shorelines, which are frequently flooded during king tide events.

ii. Projected changes in climate

Besides observed, historical changes in climatic patterns, future climate prediction is improving. In a joint publication[6], the Marshall Islands National Weather Service Office and the Australian Bureau of Meteorology identified the following trends in future climate for the Marshall Islands:

- Temperatures will continue to increase and more hot days will occur.
- Rainfall is expected to increase over the 21st century, with more frequent extreme rainfall events.
- Typhoons will become less frequent and less intense.
- Sea-level rise will continue. Importantly, the major threat of sea-level rise will not come from average conditions, but from the worsening impacts of storms and floods.
- Under all scenarios, it is expected that sea water around the Marshall Islands will become more acidic, affecting the health of coral reefs and fishermen's livelihoods.

c. Ecosystem services

The conceptual framework for this research highlights the importance of ecosystem services in mediating impacts of climate-related stressors on people. This section discusses how climate change affects ecosystems and habitability in the Marshall Islands. The concept of ecosystem services is a useful way to analyze, communicate, and quantify the value of the environment to human life and well-being (de Groot et al., 2002). The Millennium Ecosystem Assessment defines ecosystem services as the benefits that people obtain from ecosystems (MEA, 2005). Similarly, Adger et al. (2018) see ecosystems as "the benefits to society from nature." The Millennium Ecosystem Assessment distinguishes four types of ecosystem services:

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6   Pacific Climate Change Science Program, 2011.

- Provisioning services (food, water, fuel, and wood or fiber)
- Regulating services (climate, flood and disease regulation, and water purification)
- Supporting services (soil formation, nutrient cycling, and primary production)
- Cultural services (educational, recreational, aesthetic, and spiritual).

Table 1 shows the ecosystem services for low-lying coral island environments such as the Marshall Islands (adapted from Dykstra & Brander, 2018).

Table 1: Ecosystem services on coral islands

Ecosystem	Category	Services
Forest & agroforest	Provisioning	Food, soil, raw materials, medicinal resources
	Regulating	Local climate, carbon sequestration, soil erosion and soil fertility, pollination, coastal protection, water regulation
	Supporting	Genetic diversity, habitat for species
	Cultural	Spiritual, education, recreation
Intertidal zone	Provisioning	Food, raw materials
	Regulating	Soil erosion, wave break and buffer, water regulation
	Supporting	Genetic diversity, habitat for species
Lagoon	Provisioning	Food, raw materials
	Regulating	Coastal protection, water regulation
	Supporting	Genetic diversity, habitat for species
	Cultural	Spiritual, education, recreation
Coral reef	Provisioning	Food, raw materials
	Regulating	Carbon sequestration, coastal protection, water regulation
	Supporting	Genetic diversity, habitat for species
	Cultural	Spiritual, education, recreation
Open ocean	Provisioning	Food
	Regulating	Carbon sequestration
	Supporting	Genetic diversity, habitat for species, carbon sequestration
	Cultural	Spiritual, education, recreation
Freshwater pond & lens	Provisioning	Freshwater
	Supporting	Genetic diversity, habitat for species
	Cultural	Spiritual, education, recreation

When ecosystems are intact, complex, and have a high diversity of species, service delivery tends to be higher (Díaz et al., 2006). Climate change has the potential to reduce the level of ecosystem services by causing environmental degradation, especially in atoll environments (Staudinger et al., 2012; Stege, 2018). With respect

to human mobility, climatic changes often act in concert with socioeconomic factors to influence migration patterns (Thomas, 2014). In the case of the Marshall Islands, this was first evident around 3,000–2,000 BP, when long-distance Marshallese mobility was ushered in by sea level fall as the world's oceans receded to present levels (Woodroffe and Webster, 2014; Weisler, Yamano, and Hua, 2012; Dickenson, 2003). Those early Marshallese settlers had a proactive understanding of atoll ecosystem services, as they altered the natural environment and vegetation, especially to support expanding human settlement of these atolls (Weisler, 1999; Weisler, 2001). This close coupling of human industriousness and the environment remains very much evident today, especially in terms of ecosystem services that provide food, safety, water, and fuelwood.

In opposite but possibly greater measure, future climatic changes are predicted to degrade the integrity of atoll ecosystem goods and services. In a recent hydrodynamic study of two islands in Kwajalein Atoll, Storlazzi et al. (2018) identify tipping points for human habitability of atolls under different greenhouse gas (GHG)–emission scenarios. They conclude that "most atolls will be uninhabitable by the mid-21st century because of sea-level rise exacerbating wave-driven flooding" and affecting potable groundwater and other ecosystem services. This point is reached in the 2040s under the RCP8.5 scenario (increasing GHG emissions in the 21st century) and in the 2060s under the RCP4.5 scenario (emissions peak in 2040). As detailed in chapter 5 of this report, while Marshallese people are highly concerned about impacts of sea-level rise on their islands and atolls, these impacts have yet to become severe. Rather, droughts and associated forest fires have been the primary stressors to impact ecosystems and habitability across the island nation.

These stressors have been shown to occur in climatic cycles linked to El Niño Southern Oscillation (NOAA, 2015). Sometimes they occur more frequently, however, as was the case with back-to-back droughts in 2013 and 2016, which negatively affected the production of coconuts and breadfruit due to prolonged water deficits. As a result, the quality of copra meat declined and the yield of breadfruit trees was reduced by about half (Republic of the Marshall Islands, 2017; MICS, 2017).

Both slow-onset and rapid-onset hazards may play an even greater role in degrading ecosystem services if they emerge in communities characterized by poverty, economic dependency, and increasing population density (Woodward et al., 1998). Moreover, these climate shocks can also lead to distressing psychological effects, especially as the rate of sea-level rise under even moderate GHG–emission scenarios are alarming. At present, however, ecosystem services continue to sustain a resident population of Marshallese, and even the smallest islands have ecosystem service values that support trade (e.g., copra), food production, and other value to human life and well-being.

d. Population trends

At the time of the 2011 population census, the Republic of the Marshall Islands (RMI) had a population of 53,158 (2011 census).[7] In addition, an estimated 30,000 Marshallese are estimated to live in the United States (see Text box 3), particularly in Hawai'i and Arkansas. In 2011, more than half (52.3%) the population of the RMI resided on the capital island of Majuro.[8] By contrast, at the time of the first population census in 1958, less than a quarter of the population (24.1%) resided in the capital of Majuro.[9]

Text box 3: Estimating the current Marshallese population in the U.S.

For the 2010–2015 period, the U.S. Census Bureau estimated a 22.8% increase in Marshallese population residing in Hawai'i, Arkansas, Washington state, California, Oklahoma, Oregon, Arizona, and Utah. At the time of the 2010 U.S. Population Census, these eight states hosted 85.4% of the Marshallese population in the U.S. If the remaining states, which at the time of the 2010 census together hosted 14.6% of the Marshallese population, had similar growth figures, the total Marshallese population residing in the U.S. in 2015 would be more than 27,500. (U.S. Census Bureau, 2011–2015 American Community Survey 5-Year Estimates). If the Marshallese population in the U.S. has continued to grow at a similar rate, the figure stands at more than 30,000 in 2018.

Like Majuro, the other urban island of Ebeye in Kwajalein Atoll experienced strong population growth in the past 50 to 60 years. Figure 3 shows how the population on Majuro and Kwajalein increased more than eight-fold, while the total population of all other atolls and islands in the RMI together hardly grew at all. Several islands and atolls—Ailuk, Ebon, Likiep, Namorik, Rongelap, and Ujelang—experienced population declines between 1958 and 2011. The large difference in population growth rates is primarily due to internal migration from outer islands to the urban islands of Majuro and Kwajalein. Figure 4 shows that this internal migration pattern was particularly dominant in the 1950s, 1960s, and 1970s. Reduced growth rates for Majuro and Kwajalein in the last two intercensal periods can be attributed primarily to increased out-migration to the United States. It is difficult to estimate the exact number of Marshallese who have migrated to the U.S., but the overall trend is clear: a more than three-fold increase between 2000 and 2010, with sustained growth in the 2010s. The large number of abandoned houses in the RMI (1.369 out of 9,214 according to the 2011 census), particularly on the rural outer islands, is a testament to these migration trends.

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7   The RMI 2011 Census of Population and Housing Summary and Highlights Only. The report is available online: https://www.doi.gov/sites/doi.gov/files/migrated/oia/reports/upload/RMI-2011-Census-Summary-Report-on-Population-and-Housing.pdf.

8   The 2011 census counted 27,797 people on Majuro out of a total of 53,158 for the entire nation (source: http://www.statoids.com/ymh.html).

9   The 1958 census counted 3,415 people on Majuro out of a total of 14,163 for the entire nation (source: http://www.statoids.com/ymh.html).

Figure 3: Population growth in urban and outer islands of the RMI (1958–2011)
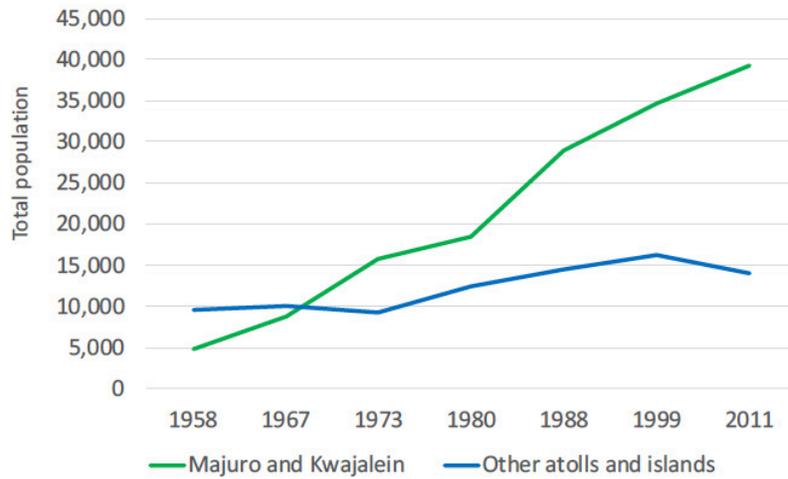
Data source: www.statoids.com/ymh.html. Graph by the authors.

Figure 4: Annual, intercensal population growth rate (1958–2011)
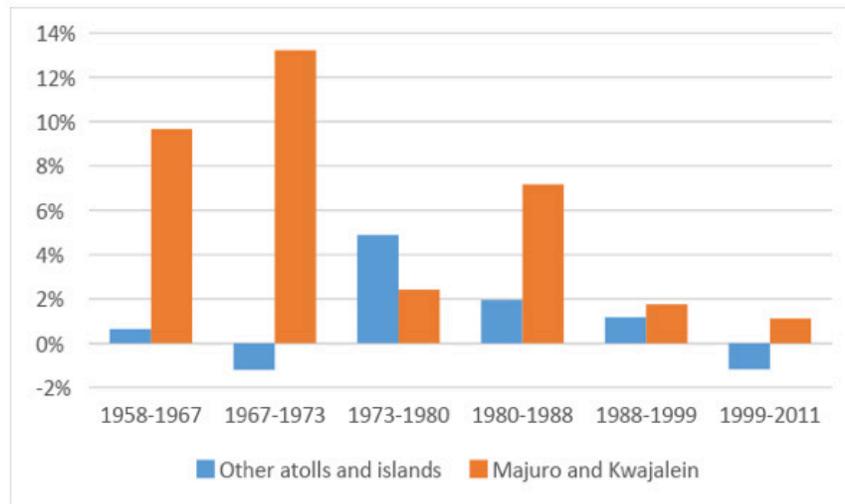
The 2018 estimate of the population residing in the RMI is 53,167 (United Nations Population Division, 2018), indicating almost zero population growth in the past seven years, or since the 2011 census. It is reasonable to assume that this population stagnation in the Marshall Islands is primarily due to out-migration to the U.S., where the number of Marshallese residents has increased. Theoretically, the population stagnation could also result from a strong increase in mortality or a strong decrease in fertility, but that is not the case in the Marshall Islands.[10]

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10   The RMI 2011 Census of Population and Housing Summary and Highlights Only (2012). Available at: https://www.doi.gov/sites/doi.gov/files/migrated/oia/reports/upload/RMI-2011-Census-Summary-Report-on-Population-and-Housing.pdf.

Hawaiʻi, Arkansas, and the state of Washington are the most popular destinations for Marshallese out-migration (see Figure 5). Besides the fieldwork in the RMI, the Marshall Islands Climate and Migration Project also involved fieldwork in Hawaiʻi and in the Pacific Northwest (Oregon and Washington).

Figure 5: Destination states of Marshallese migrants in the U.S.

Source: The 2010 Census Summary File 2, Profile of General Population and Housing Characteristics: 2010. Map by the authors.
Note: This map is for illustration purposes only. The boundaries and names shown and the designations
used on this map do not imply official endorsement or acceptance by IOM.

e. Migration and the Compact of Free Association (COFA)

The Republic of the Marshall Islands (RMI) has a unique history of immigration and displacement. Oceanic voyaging, relocation induced by U.S. nuclear weapons testing, and recent increased out-migration enabled by the Compact of Free Association (COFA) have created a distinctive context for our research questions around contemporary climate-induced migration.

In the 1940s and 1950s, when the U.S. government used coral atolls as nuclear testing grounds, the Marshallese experienced environmental dispossession. With a nuclear impact equivalent to 7,200 Hiroshima bombs, the "near-irreversible environmental contamination" resulting from the series of tests led to the loss of livelihoods and "indefinite displacement." [11] In the early 1980s, the U.S. government made compensation payments to residents and descendants for the damages and displacements that the nuclear tests caused. Entering into force in 1986, the COFA agreement granted the United States exclusive military rights over two million square miles of ocean. In exchange, the RMI received financial aid and their citizens were permitted to

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11   The Guardian (2014), "Bikini Atoll nuclear test: 60 years later and islands still unlivable." Available at: https://www.theguardian.com/world/2014/mar/02/bikini-atoll-nuclear-test-60-years.

work in the United States without a visa. The RMI gained independence in 1986, following COFA's entry into force in 1985. The 1986 commencement of COFA established free and open access for the Marshallese to the U.S. (and its territories such as Guam), constituting what some consider "the defining moment" in the history of Marshallese emigration. Migration to the U.S. increased rapidly after the establishment of COFA, reaching a peak of more than 2,000 net migrants per year in the early 2000s (Graham, 2008). In 2003, the U.S. and the RMI re-negotiated an Amended Compact, which stipulated that although the RMI is a sovereign nation, the U.S. has full authority and responsibility for "security and defense" of the Marshall Islands.[12]

Marshall Islanders' status as legal residents of the U.S. under COFA means they can migrate between the two nations without obtaining a visa and still be allowed to participate in formal employment and education. Additionally, Marshall Islanders residing in Hawaiʻi and the continental U.S. are required to pay local, state, and federal taxes, which contribute to social service programs such as SNAP (food stamps), Medicaid, the Children's Health Insurance Program, and federally subsidized education loans.[13] However, when the 1996 federal Welfare Reform Act passed, Congress excluded COFA migrants from having access to these welfare programs, including the federal health care system Medicaid. Since then, Marshallese are only eligible for health care benefits from a limited number of states that provide such programs. Hawaiʻi is one such state, which since 2010 has offered a restrictive form of health care to COFA migrants known as Basic Health Hawaiʻi, a program with less coverage than the standard state-funded Med-Quest available to all other Hawaiʻi residents (Shek and Yamada, 2011).

3. Site selection and methods

To answer the three central questions of this research project (see Chapter 1), the research team conducted fieldwork in the Marshall Islands, Hawaiʻi, Oregon, and Washington state, using innovative social science methods to assess local perceptions of climate change, ecosystem services, habitability, and migration. Fieldwork in the RMI took place in March and April 2017, totaling six weeks. The team spent almost four weeks on Majuro and 16 days on two outer islands, Mejit and Maloelap. Fieldwork in the U.S. took place in two periods of three to four weeks, in the summer (Hawaiʻi) and autumn (Pacific Northwest) of 2017. This chapter discusses the different research methods and tools that were used in this study and sheds light on the site-selection process and sampling methods.

The fieldwork team in the RMI consisted of one post-doctoral researcher at the University of Hawaiʻi at Mānoa; one environmental law fellow at the University of Hawaiʻi who works with the Marshall Islands Conservation Society (Mark Stege); a translator; and a team of five enumerators from the RMI, most of whom were recent graduates of the College of the Marshall Islands. The fieldwork team in the U.S. consisted of a social science researcher, an intern, and a translator.

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12   Bureau of East Asian and Pacific Affairs, Fact Sheet (2015), available at http://www.state.gov/r/pa/ei/bgn/26551.htm

13   Al Jazeera English, "Micronesians in Hawaiʻi Face Uncertain Future." Accessed June 17, 2019 at https://www.aljazeera.com/humanrights/2013/10/micronesians-hawaii-face-uncertain-future-201310191535637288.html.

Picture 1: Training of enumerators

Source: Kees van der Geest

The team conducted mixed-method research, with quantitative and qualitative analyses of what has motivated migration from the outer islands of the RMI to Majuro, the main population center, and from the RMI to the state of Hawai'i and the continental U.S. In line with the research questions, the study addressed two themes that required different research approaches:

1. Impacts of climate change on ecosystems and society: For this theme, the study relied on published literature from the natural sciences, respondents' perceptions and experiences with climate change impacts, and their assessments of trends in ecosystem services.
2. Migration decisions and impacts of migration: For this theme, the study relied almost entirely on insights and findings from the primary data gathered during fieldwork in the RMI.

a. Site selection

In the Marshall Islands, the team surveyed a total of 199 households in three study sites: Majuro (99 households), Maloelap Atoll (50 households), and Mejit Island (50 households). The locations of these islands is shown in Figure 6. People from these locations migrate internally and internationally. It is important to note that Majuro is both a source area for international migrants and a destination for internal migrants from outer islands.

Figure 6: Map of the Marshall Islands indicating the study sites
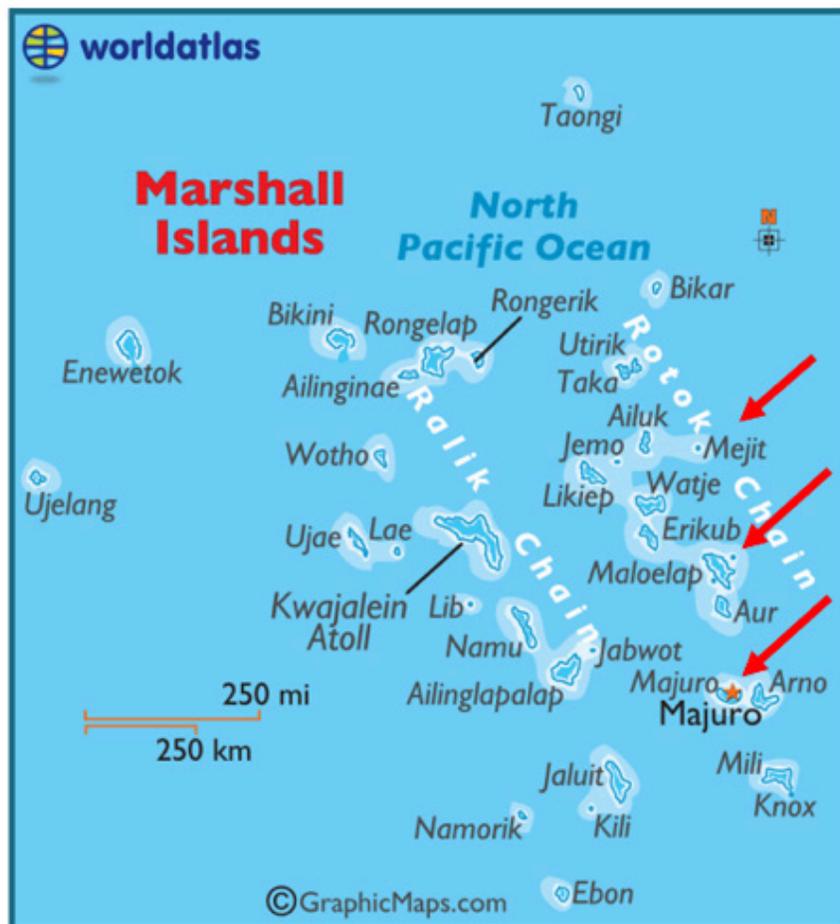
Source: Worldatlas.

Due to time and budget constraints and limited transport to outer islands, we could only cover three study sites. The distribution of surveyed households between the capital and outer islands is representative of the total population of the RMI (half on Majuro, half on the remaining islands). Due to the varying ecological and social conditions on the many outer islands of the RMI, however, findings from the current study are not necessarily representative of all islands. Thus, this study makes no claim about the validity of the findings for all islands of the RMI. One finding, for example, is that respondents in the RMI hardly cite climate-related

problems as drivers of migration. It is possible that sea-level rise, coastal inundation, drought, and freshwater scarcity are more severe in other parts of the RMI.

The two outer islands (Maloelap and Mejit) were selected based on several criteria. First, they represent an important difference between an atoll (Maloelap) and a raised coral island (Mejit), of which there are 29 and 5 in the RMI, respectively. This distinction was deemed important for understanding potential variability of climate impacts between two geologically different island formations. Second, the Reimaanlok process currently underway in these sites by our local partner, the Marshall Islands Conservation Society (MICS), offered in situ data on ecosystem services that otherwise would have been unavailable given the limited project budget.

Another selection criterion was the availability of weekly flights to and from the two selected islands, which made it more feasible to survey them within a six-week time frame. Finally, the research team had good contacts within the communities of Mejit and Maloelap, which was an important condition for conducting research on the sensitive topic of climate-induced migration.

Picture 2: Aerial view of Rita, on Majuro

Source: Rita Reimaanlok Climate Action Group.

Nuclear testing, radiation, and compensation payments have significantly influenced the migration patterns of some of the outer islands in the northwest of the RMI, around Bikini Atoll and Enewetak Atoll. Therefore, the research team deemed them less suitable for studying the impacts of climate change on human mobility.

In the U.S., the team surveyed a total of 79 households. The study sites investigated in the U.S. were Hawai'i (July–August 2017), and Oregon and Washington (October–November 2017). Hawai'i, Arkansas, and the Pacific Northwest are the most popular destinations for Marshallese migrants. The Marshallese community in Springdale, Arkansas—most of whom work in poultry factories—has been a topic of several studies and media coverage. To avoid duplication and problems with research fatigue, the team decided not to include Arkansas in the site selection. The study sites in Hawai'i, Oregon, and Washington were selected due to the concentration of diaspora groups, support from community-based organizations able to facilitate introductions to the communities, and the availability of interpretation and translation services.

Picture 3: Community meeting on Mejit, in the context of the Reimaanlok process

As part of the Reimaanlok process in Mejit, the Marshall Islands Conservation Society has facilitated a series of participatory exercises, as shown here, that use local knowledge and experience combined with science to improve community understanding of climate change and begin early stages of adaptation planning.

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b. Desk study

Desk study involves collation, review, and analysis of information that is already available about a topic or place. Information sources included published scientific literature, grey literature, available GIS layers and analysis, online databases, population censuses, and popular press articles. The team used these data for two reasons: (i) to understand the context in which Marshallese people make their migration decisions, and (ii) to create maps showing spatial distributions of key variables in this research and linkages between them. Data from the 2010 U.S. Census[14] was used, for example, to prepare a map showing the principal destination states of Marshallese migrants (See Chapter 2).

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14   Source: 2010 Census Summary File 2, "Profile of General Population and Housing Characteristics: 2010." Available at: https://factfinder.census.gov/faces/nav/jsf/pages/guided_search.xhtml.

Several sources of spatial data were assessed for inclusion in the project's geospatial analysis of environmental change and population dynamics. Examples of such databases were the Normalized Difference Vegetation Index (NDVI) and global precipitation data of the International Research Institute for Climate and Society (IRI). However, these data were not of high enough resolution to depict the nuances of biophysical vulnerability within atoll environments and to explore variations in island exposure to sea-level rise and inundation (Owen et al., 2016). To resolve the nuances and achieve localization, our project partnered with the Marshall Islands Conservation Society to access local-scale biophysical spatial data layers for our study sites. Specifically, the local-scale spatial data used included the location and extent of areas that were flooded in 2014 and 2015.

c. Participatory research approaches (PRA)

Participatory research approaches (PRA) are a family of research tools that help researchers understand how local people evaluate the challenges and issues they face in their local setting. PRA tools can also help develop solutions or actions to respond to local challenges, thus informing local people in their decision-making. Finally, PRA methods generate qualitative data that can help answer research questions (Chambers, 2008). The fieldwork team in the RMI conducted four types of PRA sessions, with the aim of gathering qualitative and visual data to complement the other research tools.

Transect walk: During this exercise, the researchers made two hour-long walks with villagers on the islands, inquiring about what they saw (see Picture 4). This exercise helped to enhance researchers' understanding of the spatial dimensions of people's realities and local perceptions of resources. The route for the walk was discussed beforehand with local resource people to make sure that there was sufficient variety in terms of the natural and socioeconomic environment.

Picture 4: Group picture during transect walk

Source: Kees van der Geest

Contextual change: During this exercise, participants produced a detailed list of perceived positive and negative changes in the study sites. The assessed changes were organized according to six "domains": the natural environment, the physical or built environment, human capital, the economy, social and political organization, and culture. For each item on the list (e.g., groundwater, soil fertility, tree cover, fish stocks, quality of education, transport facilities, income, crime, governance, etc.) the group decided whether the change in each domain had been (very) positive or (very) negative and explained why. This exercise served to place the specific topic of this research—migration and climate change—in a broader context of development and change (see Dietz et al., 2013; Pouw et al., 2017).

Fuzzy cognitive mapping: During this exercise, participants and researchers discussed the reasons and underlying causes of migration. In addition, they considered obstacles and enablers of migration. The exercise utilized a flipchart, with a circle in the middle, showing the word "migration." The group then identified different reasons why people move to other places, such as Majuro, Hawai'i, and the continental U.S. For each reason, the facilitators asked about underlying causes (see Picture 5). This PRA exercise served to enhance the researchers' understanding of people's views on how different factors influence migration and to understand the possible linkages between these factors. Participants explained, for example, that drought and increasing salinity affect agricultural production. Because of this, some inhabitants want to migrate to places with better economic opportunities.

Picture 5: Example of a "fuzzy cognitive map" of migration (left)
Picture 6: Example of a mobility map (right)

Source: Kees van der Geest

Mobility mapping: This exercise explored the prevalent mobility patterns on the islands, with a focus on where people move and for what reason. Picture 6 shows the mobility map for Mejit Island. During the session, participants first identified all the places where people from the island have migrated, and wrote the names of these places on post-it notes. Then they organized the destinations in geographic clusters (e.g., Hilo, Maui, Kona, and O'ahu as one cluster: Hawai'i) and according to distances from the home island. After that, they used pebbles to indicate the (relative) number of people from the islands who moved to each of the destinations. Lastly, they identified the main pull factors for each destination (e.g., good wages, nice weather, or family ties). The mobility mapping exercise helped the researchers understand people's observations and perceptions of mobility patterns in their community.

d. Questionnaire

The principal research instrument for the RMI fieldwork was the household questionnaire. We conducted 199 questionnaire interviews. Five enumerators were trained to conduct the interviews. The questionnaire had 13 pages and the interviews took approximately one hour each. The questionnaire comprised mainly closed-ended questions generating quantitative information, but also a few open-ended questions that generated qualitative information. An example of a closed-ended question is: "Compared to other houses in the village, is the location of your house relatively risky or safe in case of natural disasters, such as floods and storms? 1=Riskier| 2=Average | 3=Safer." The follow-up question is open-ended: "If 1 or 3: Please explain what makes it riskier or safer."

The questionnaire had the following sections:

- Interview information: Date of the interview, name of the interviewer, GPS location of the household, etc.
- Basic socio-demographic data: Household composition, gender, age, education level, marital status, occupation, land ownership, income, etc.
- Housing: Quality and risk-proneness of respondents' homes and access to amenities such as drinking water, latrines, and electricity
- Impacts of environmental stressors: Type of environmental stressors that affect households in the study sites, trends therein, and how these stressors affect households
- Ecosystem services: Perceptions of importance of ecosystem services, the current state of these services, and trends over the past 10 years
- Respondents' own migration history: Timing, duration, destination, and motivation of previous migrations; reasons for non-migration; and perception of how migration has changed respondents' lives
  Migration of relatives, including remittances: Whereabouts of respondents' siblings and children, use of remittances, and perceptions of impacts of relatives' migration

- Migration intentions: Whether or not respondents and their households planned to migrate in the next 10 years
- Policy interventions: Perceptions of what the government and NGOs have done to protect people against impacts of climate change, and what respondents think they should do

The fieldwork team in the RMI recorded GPS locations of respondent households (see Figure 7), classifying them according to their proximity to ocean, lagoon, or interior locations in an island topography. This enabled the researchers to link information from the household questionnaire to geospatial data, such as flood extent. Combining household data (e.g., on migration propensities) with geospatial data depicting climate change impacts and ecosystem services is a relatively new method for studying migration-environment linkages (Eklund et al., 2016). In a review of methods for studying environmental migration, Piguet (2010) calls this method "multi-level analysis" as it combines area-level data (e.g., from remote sensing) with individual data (e.g., from household surveys). While "considered an ideal approach" (Gemenne, 2018: 122), few studies so far have applied this method to study environmentally induced migration because it is time-consuming and requires multidisciplinary research skills (Gemenne, 2018; Van der Land et al., 2018).

In Hawai'i and the Pacific Northwest, the research team used a questionnaire to interview 79 Marshallese respondents across diaspora communities. The questionnaire covered similar topics as the one used in the RMI, but with more emphasis on the impacts of migration, and less detailed questions about impacts of climatic stressors and trends in ecosystem services. The destination areas questionnaire had the following sections:

- Interview information
- Respondent information
- Rationale for migration
- Migration process and community integration
- Overall well-being indicators
- Current living conditions: housing and living standard
- Current living conditions: livelihoods
- Remittances
- Government support
- Future migration intentions

Figure 7: The study sites, showing GPS locations of surveyed households
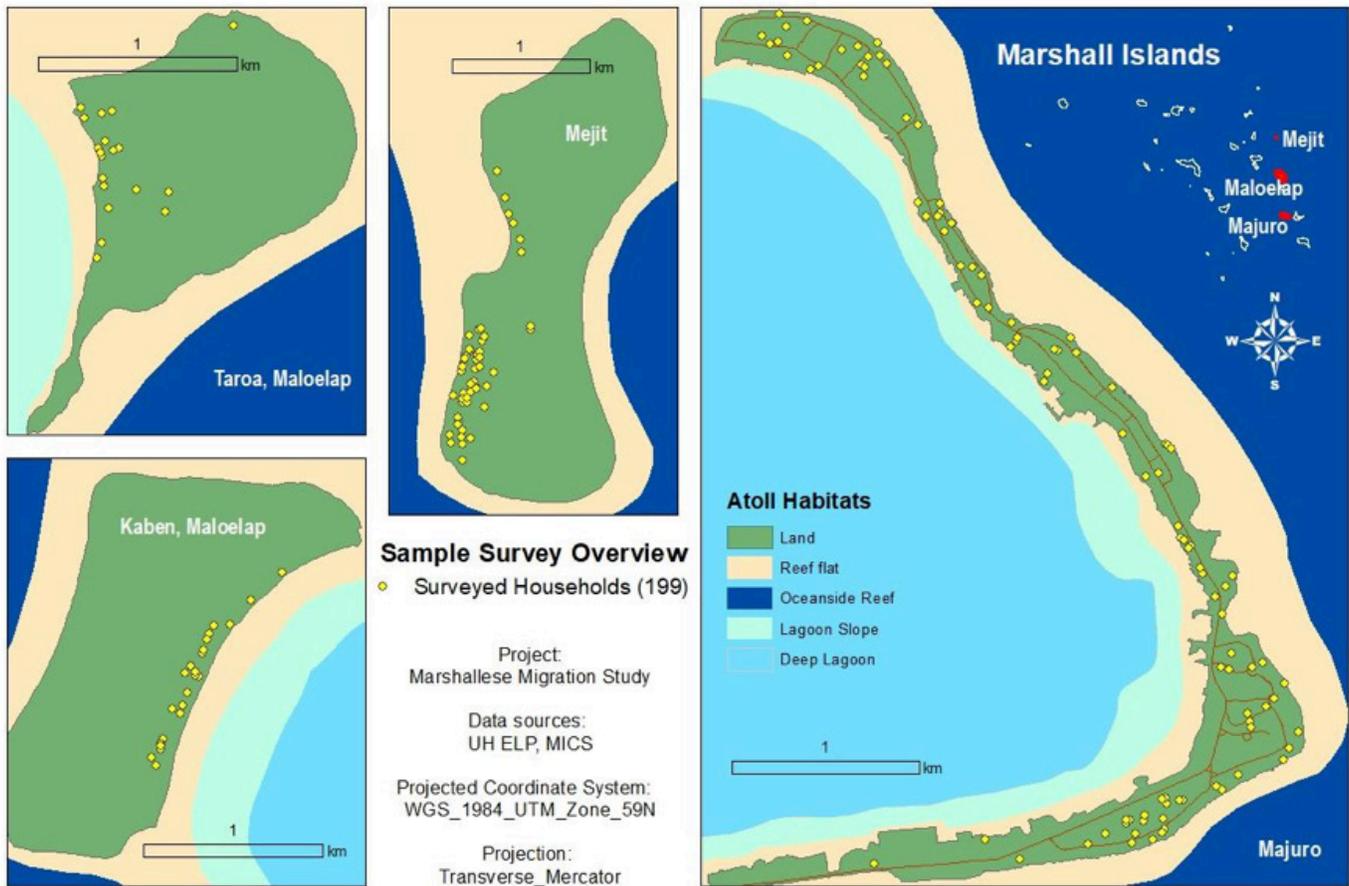
e. Q-study

To gain a deeper understanding of respondents' attitudes and perceptions around climate change, ecosystem services, and migration drivers and outcomes, the research teams in the RMI and the U.S. also conducted a Q-study. Researchers use this method to investigate opinions or "shared views" on a particular theme by analyzing how participants rank a set of statements about that theme (Oakes et al., 2017; Danielson, 2009). Picture 7 shows how a respondent in the RMI sorts the statements from "disagree most" to "agree most" on a grid. The Q-study interviews took approximately 30 minutes each.

Q-analysis is partly qualitative and partly quantitative (Eden et al., 2005). Data is analyzed using data-reduction methods to discern the shared views, perspectives, and discourses of distinct groups within a population (Zografos, 2007). The data is analyzed quantitatively—with Principal Component Analysis[15]—but the interpretation is largely qualitative.

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15   Principal Component Analysis (PCA) is a statistical technique that can be used to reduce a large set of variables to a small set that still contains most of the information in the large set. In the current study, the large set of variables consists of respondents' sorting of 40 statements on a 11-point scale from "strongly agree" to "strongly disagree." The small set in this study consists of the "shared views" that the analysis revealed.

Picture 7: Respondent sorting Q-study statements
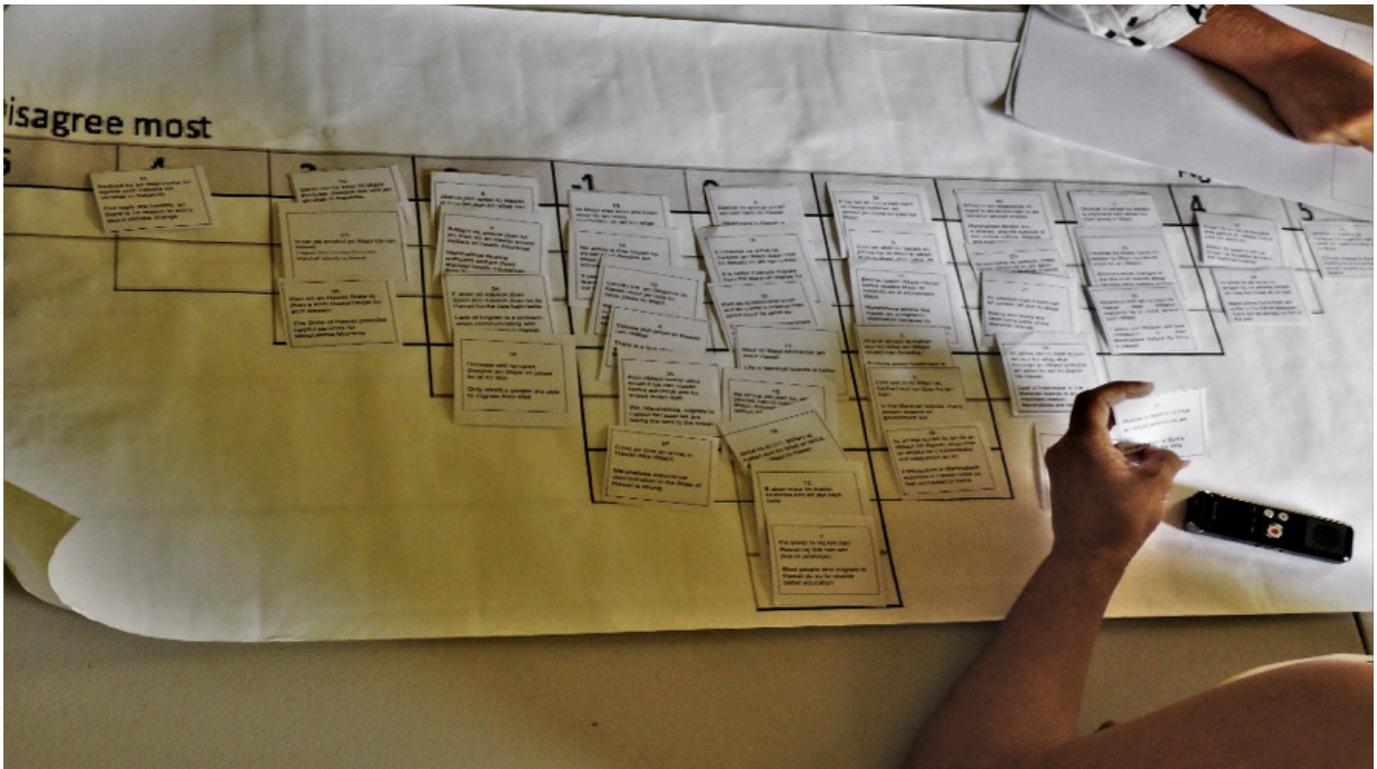
Source: Kees van der Geest

The research team conducted the Q-study interviews with the same respondents who completed the questionnaire survey. This enabled an analysis of attitudes and perceptions among different categories of the survey population (e.g., men and women, migrants and non-migrants, poorer and richer households).
The sets of statements that the research teams used in the RMI fieldwork and the U.S. fieldwork had overlap, but were not the same. The statements in the destination areas in the U.S. focused more on the situation of migrants in the U.S., and how migration influenced well-being. In the RMI, more emphasis was on environmental change, habitability, and future migration intentions. The results of the Q-study are presented in Chapter 7. That chapter also provides a more detailed description of the different steps in a Q-study interview.

f. Sampling

At the onset of the RMI fieldwork, the objective was to survey 200 households and have equal representation for respondents on Majuro and the outer islands. Hence, we aimed to interview 100 households in Majuro and 100 households on Mejit and Maloelap together. Census data from Mejit revealed that there were 54 households on the island. In Maloelap Atoll, there were 140 households spread out over five inhabited islands. The team decided to interview all households on Mejit and select two islands of Maloelap Atoll (Taroa and Kaven) whose population was slightly more than 50 households cumulatively. This way, as in the case of Mejit, the team could take a 100 percent sample of the households on Taroa and Kaven.

This approach (a 100 percent sample) was not possible in Majuro as there were far too many households. We selected the most populated east side of the atoll, for which in situ GIS (geographic information system) flood data was available, and used a random spatial sampling technique to select a quota of 100 households. As a sample framework, the team used a GIS data layer of all households on Majuro. Figure 8 shows an excerpt of the sample framework. The random sample of households (the houses shown in black in Figure 8) was complemented by another randomly selected reserve list of households (the white houses with thick black borders in Figure 8), which would be interviewed if a selected house had been abandoned.

Figure 8: Excerpt of the spatial sample framework applied on Majuro

Note: The black houses are randomly selected households; white houses with a black border are the reserve list of households, included in the sample when a selected house was not available (e.g., in the case of abandonment).

In destination states, the study used "snowball sampling" to identify participants. Snowball sampling is a process in which participants use their own community connections to suggest other participants who may be interested in assisting with the study. In Hawai'i and the Pacific Northwest, the study aimed its outreach to NGOs, the Marshallese Consulate, and known community leaders, with the goal of building relationships and exchanging information with the community so as to minimize research fatigue and increase willingness to participate. Among the numerous NGOs were the Compact of Free Association–Community Advocacy Network (COFA-CAN), the Asian Pacific American Network of Oregon (APANO), We Are Oceania (WAO), and the Kalihi-Palama Health Center. The research team took the diversity of respondents into account during the referral sampling process. The aim was to find a broad demographic spread of individuals with differing insights into how ecological stressors associated with climatic change may have led to the decision to migrate to Hawai'i and the Pacific Northwest.

4. Study population: Demographics, livelihood, and income

Chapters 4 to 7 present the results of the empirical research conducted in the Republic of the Marshall Islands and the United States. The main data source for the first three results chapters is the household questionnaire. The current chapter describes the study population. Chapter 5 looks at patterns and drivers of migration, and tries to answer the first research question.[16] Chapter 6 analyzes impacts of migration and addresses the second research question.[17] Chapter 7 presents the results of the Q-study, which is used to answer the third research question.[18] Insights from the PRA methods are occasionally used to supplement findings from the main data sources.

In the results chapters, findings are presented separately for the fieldwork in the RMI and the U.S. The concluding chapter provides a synthesis of the findings from the different study sites.

a. The RMI

This section looks at basic socio-demographic characteristics, such as age, gender, education level, marital status, economic activities, and income levels of the respondents we interviewed in the three study sites in the RMI. It demonstrates similarities as well as differences between the study sites.
On Majuro, respondents were a bit younger on average, more often women, and more often unmarried (see Table 2). Respondents on Majuro also had higher levels of formal education than on the two outer islands. Household sizes on Majuro were also higher, which is probably due to young relatives from outer islands

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16 Research question 1: To what extent are climatic-related stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands and from the Marshall Islands to the U.S.?

17 Research question 2: What are the impacts of migration on migrants themselves and their home communities?

18 Research question 3: Which shared views on climate change, environment, migration, and future habitability exist within the study population?

coming to study on the main island. An important difference between Mejit and the other two study sites is the high dependency ratio (the number of people younger than 18 and those older than 65, per adult aged 19−64). High dependency ratios are typical for places with high out-migration rates because migration propensities are higher among adults than among children and the elderly (Connell, 2005). Education levels were lowest on Mejit. In Maloelap Atoll, the dependency ratio was substantially lower than in the other two sites. This is an indication (confirmed below) that migration propensities are lower in Maloelap.

In all three study sites, more men than women were respondents of the household questionnaire. The team of enumerators attempted to include more women among the respondents, but when male household members were present, they usually insisted on being the respondents.

Table 2: Socio-demographic profile of the three study sites in the RMI

	Mejit	Maloelap	Majuro	Total
Households interviewed	50	50	99	199
Female respondents	32%	26%	35%	32%
Respondent is head of household	64%	54%	47%	55%
Mean age of respondent	42	40	38	40
Household size	5.9	6.1	7.2	6.6
Dependency ratio	1.38	1.05	1.19	1.20
Elderly dependency	0.15	0.07	0.10	0.10
Child dependency	1.24	0.99	1.09	1.10
Education level of respondent				
Primary school or less	18%	16%	11%	14%
High school	74%	60%	53%	60%
College or university	8%	24%	37%	26%
Marital status of respondent				
Married	84%	84%	74%	79%
Other	16%	16%	26%	21%

The survey found large differences in the sources of income between Majuro and the two outer islands (See Table 3). Agriculture, fishing, and copra production are the main sources of income on Mejit and Maloelap. By contrast, on Majuro private sector employment and government salaries are the most common income sources. Overall, 44 percent of the households we interviewed in the three study sites received government salaries.

Table 3: Income sources in the three study sites in the RMI (% of respondent households)

Income source	Mejit	Maloelap	Majuro	Total
Agriculture	98%	94%	2%	49%
Fishing	82%	78%	20%	51%
Government salary	40%	34%	52%	44%
Private sector salary	2%	0%	66%	33%
Own business	10%	14%	11%	12%
Remittances from migrants	20%	24%	12%	17%
Income from properties (rent)	0%	0%	5%	3%
Income from savings and investments	2%	0%	7%	4%
Other (mostly copra making)	62%	40%	11%	31%

When asked about income sources, about one in six respondents (17%) reported that they received remittances from migrant relatives. In reality, however, remittances were an income source for more respondents. In another part of the questionnaire, we asked about remittances more explicitly and in more detail, and the answers to these questions revealed that about a third (32.3%) had received remittances in the past 12 months. The average amount they received in the 12 months prior to the interview was USD832.

Estimated household incomes were significantly higher on Majuro than on the outer islands (see Table 4). On Mejit, none of the surveyed households had an annual income of more than USD5000, and on Maloelap only 8 percent did. By contrast, 72 percent of respondents on Majuro had an annual income of more than USD5000. The outer island economies are much less centered on cash income and more on subsistence. A large proportion of the food that people on Mejit and Maloelap consume is gathered or produced locally (see Table 5).

Table 4: Estimated household income in the three study sites in the RMI (% of respondent households)

Annual household income	Mejit	Maloelap	Majuro	Total
Less than $1,000	38%	38%	11%	26%
$1,000–$2,000	48%	19%	10%	23%
$2,000–$5,000	14%	35%	8%	17%
$5,000–$10,000	0%	2%	23%	11%
$10,000–$20,000	0%	6%	33%	17%
More than $20,000	0%	0%	16%	7%
Total	100%	100%	100%	100%

Table 5: Dependence on local food in the three study sites (% of respondent households)

Locally produced or gathered food	Mejit	Maloelap	Majuro	Total
(Almost) Nothing	2%	8%	39%	21%
Less than half	33%	33%	44%	38%
Approximately half	46%	35%	13%	27%
More than half	8%	20%	3%	9%
(Almost) Everything	10%	4%	1%	4%
Total	100%	100%	100%	100%

Not only did respondents on Majuro have much higher incomes presently, they also reported much more positive trends in their income over the past 10 years. By contrast, on the two outer islands, few respondents thought that their income had increased in the last decade (see Table 6).

Table 6: Perceived income trend over the last ten years (% of respondent households)

Income trend	Mejit	Maloelap	Majuro	Total
Increased	14%	12%	43%	28%
Stayed more or less the same	59%	55%	43%	50%
Decreased	27%	33%	14%	22%
Total	100%	100%	100%	100%

b. Destination states

This section provides a demographic overview of the Marshallese migrants interviewed on O'ahu and the Big Island (Hawai'i) in July and August of 2017, as well as those interviewed in Oregon and Washington in October and November of 2017. Table 7 presents a summary of their birthplaces, diaspora locations, entry years/average years living in respective states, gender, current livelihoods, average educational level, language skills, marital status, and religion.

Among other characteristics, most respondents were born in the Marshall Islands (100 percent in Hawai'i and 87 percent in the Pacific Northwest), and of those born in the RMI, 70 percent primarily originated from Majuro or Ebeye. A majority speak English (75 percent in Hawai'i and 62 percent in the Pacific Northwest), and the most common current domiciles were Salem, Oregon (25 respondents) and Honolulu, O'ahu (16 respondents).

Table 7: Socio-demographic characteristics of respondents in the U.S.

	Hawai'i	Pacific Northwest
Respondents interviewed	40	39
Birthplace	100% of cohort were born in the Marshall Islands	87% of cohort were born in the Marshall Islands. 13% were born in the mainland U.S.
Location of diaspora destination sites	30% (12) of the sample group live on the Big Island; 70% (28) of the sample group live on O'ahu. 21% of the sample group are based in urban Honolulu	92% (36) of the sample group live in Oregon and 8% (3) live in Washington. 64% (25) of the sample group is based in Salem, Oregon
Entry years	1986–2017	1985–2017
Average number of years in destination state	15 years	12 years
Gender	42.5% (17) men 57.5% (23) women	53.85% (21) men 46.15% (18) women
Livelihoods	Legal aids, cleaners, airport staff, supermarket cashiers	Translators, community advocates, direct care providers, cannery factories, supermarket cashiers
Average education level	"Some college"	"High school diploma"
Language	75% of the sample group speak English	62% of the sample group speak English
Marital status	60% married	46% married
Religion	47.5% Protestant	43.5% Protestant

The sample group in Hawai'i are defined by spending their youth in transition between the RMI, Hawai'i, the mainland U.S., Saipan, Japan, and the Federated States of Micronesia. Of those interviewed, 37.5 percent spent their youth in Majuro. Other atolls of previous residence include: Ebeye, Ebon, Kwajalein, Mili, Ailinglaplap, Jaluit, and Rongrong. Similarly, interviewees in the Pacific Northwest traveled extensively as children between family groups based on Ujelang, Jaluit, Enewetak, Arno, Ebeye, Majuro, the continental U.S., Palau, and Guam.

Source: Kees van der Geest

Figure 9 shows the arrival years of respondents. For the two groups of respondents, located in Hawai'i and the Pacific Northwest, migration from the Marshall Islands started around the time of the COFA agreement in 1986. Those interviewed in Oregon and Washington had a higher rate of more recent migrants, predominantly elderly family members moving to receive health care under the Oregon Health Plan.

Figure 9: Respondents' years of arrival in the U.S.
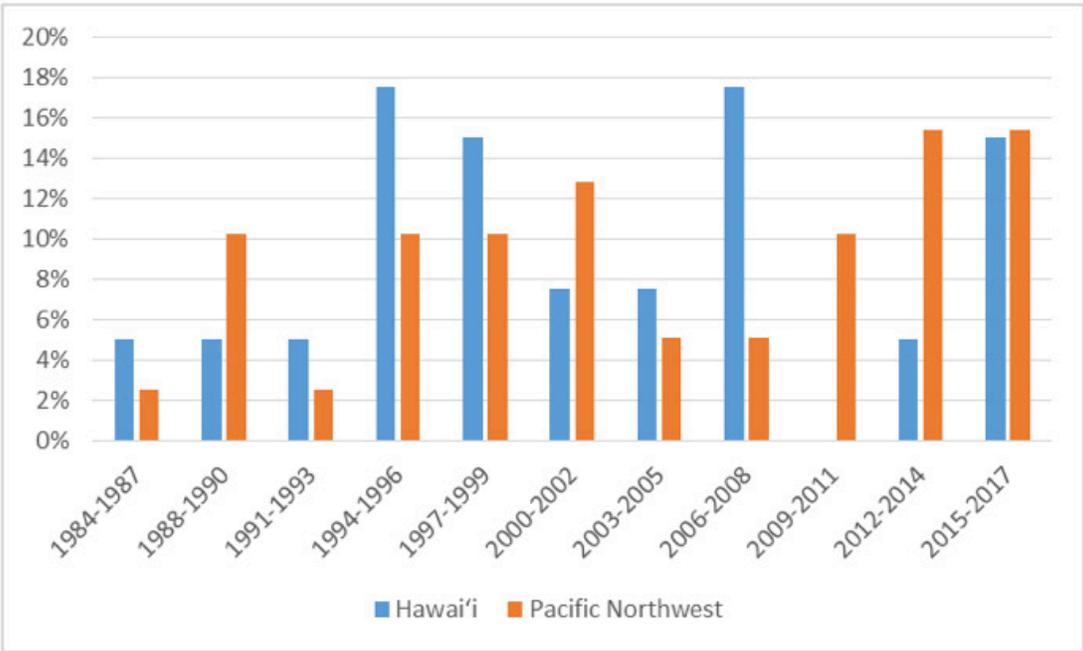
Figure 10 depicts respondents' birthplaces and current residences. It shows that most respondents in the U.S. come from urban islands in the RMI (Majuro and Ebeye), and that they moved to places with a pre-existing population of Marshallese diaspora groups, namely Honolulu and Salem. It is important to note that the figure only shows respondents' birthplaces and current residences. It does not reveal the complexities of people's migration trajectories. Marshallese migrants frequently change their location depending upon economic opportunity, life cycle, and familial networks in processes of step and circular migration.

Figure 10: Sankey diagram of destinations of respondents' siblings and children
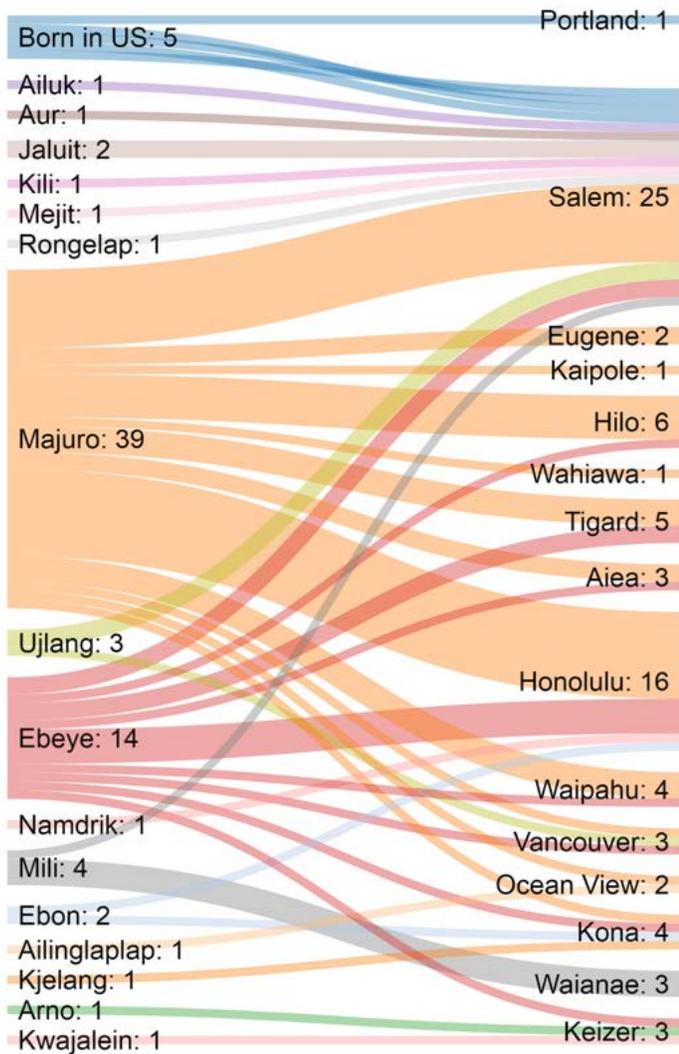
Source: Household survey. Diagram by the authors, using sankeymatic.com software.

Source: Kees van der Geest

5. Patterns and drivers of migration, with a focus on climate impacts and ecosystem services

This chapter tries to answer the first research question of this project: To what extent are climate-related stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands and from the Marshall Islands to the U.S.?

It first looks at whether respondents perceive climate-related stressors as a problem and how their households have been affected by such stressors already. It then discusses respondents' views on the importance, current state, and trends of four ecosystem services (provision of food, water, fuelwood, and protection against floods and storms). Subsequently, the chapter looks at migration patterns and drivers, and finally, it explores the link between climate impacts, ecosystem services, and human mobility.

Findings from the RMI fieldwork are presented first, followed by findings from Hawai'i and the Pacific Northwest.

a. Findings from the RMI

i. Problem ranking

The questionnaire included a problem-ranking exercise to assess what kind of problems people in the Marshall Islands grapple with most. To inform research question 1, the researchers were particularly interested in the relative importance respondents placed on environmental and climate-related stresses and hazards. Respondents were shown a list of 12 problems and were asked to select and rank the five problems that were most important to them and their households. The most pressing problem overall was lack of job opportunities (see Figure 11). The list of 12 problems included three climate-related stressors (red bars in Figure 11), which respondents ranked second (drought), third (not enough freshwater), and fourth (sea-level rise). This is an indication that respondents are concerned about impacts of climate change on their islands. Two additional environmental problems (littering and not enough fish) clearly ranked lower in terms of concern.

Source: Kees van der Geest

Figure 11: Problem ranking (% ranked in top-5)
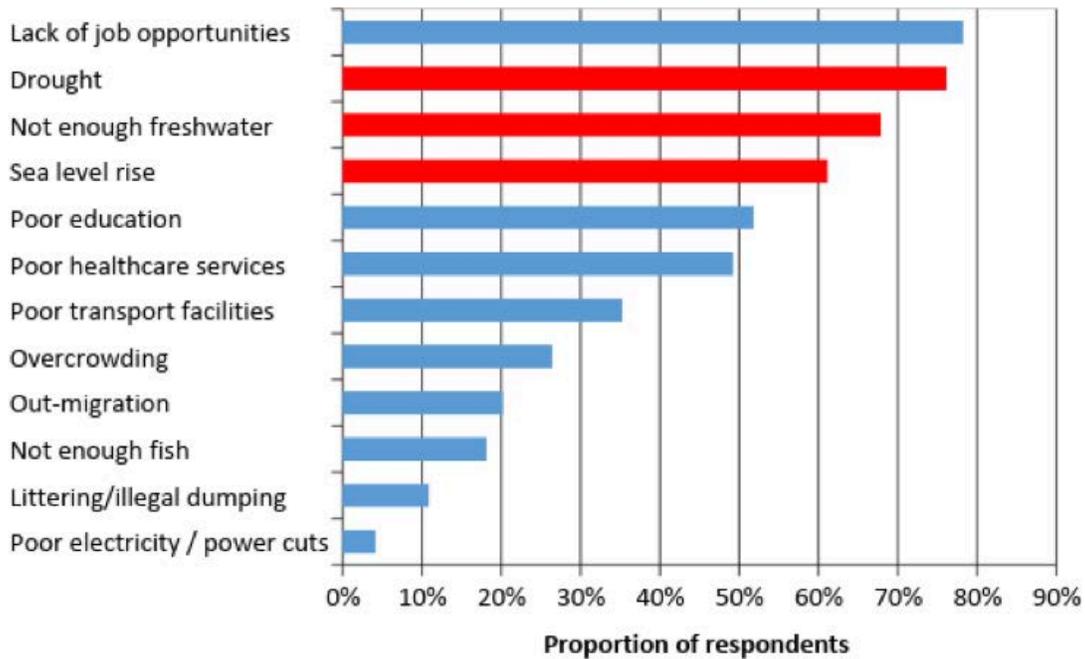
The analysis of the problem ranking by island (Figure 12) reveals a few important differences between islands. Drought and lack of freshwater were considered the highest and second-highest ranking problems on the two outer islands (Mejit and Maloelap), while they ranked slightly lower on Majuro. This evidences recent exposure to prolonged droughts at all sites in 2013 and 2016, yet a relatively greater vulnerability to drought on the outer islands. This finding also reflects the north-south gradient in annual rainfall amounts, with northern islands of the RMI receiving less rainfall on average (Marra et al., 2017). For respondents on the two outer islands, "lack of fish" was also more often a problem than for respondents on Majuro. Sea-level rise was considered a problem by a smaller proportion of respondents on Mejit than on Majuro and Maloelap. This is in line with the team's expectations for Mejit, as raised coral islands tend to be more elevated than coral atolls, and thus slightly less exposed to threats from sea-level rise. Overcrowding and littering were perceived to be problems, particularly on Majuro.

Figure 12: Problem ranking by island (% ranked in top-5)
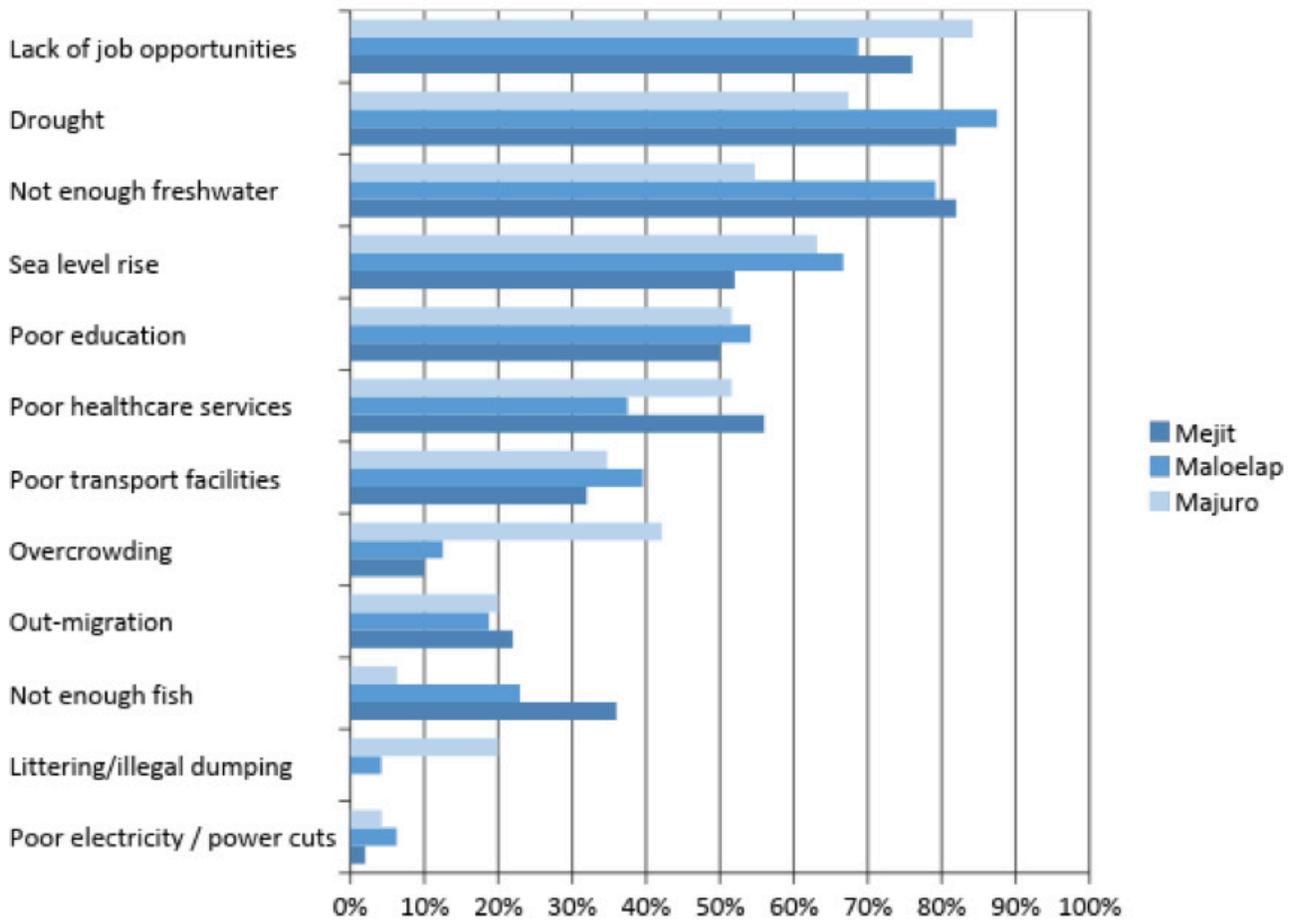
Source: Kees van der Geest

ii. Impact of and responses to climate-related stressors

In addition to problem ranking, which looked at the perceived severity of stressors, the questionnaire also asked respondents whether their households had actually been affected by any climate-related stressors in the past five years. A clear finding, shown in Table 8, was that many more households indicated that they had been affected by drought (92%) and heatwaves (47%) than by king tides (37%), storm surges (14%), and typhoons (5%). This is consistent with two major droughts occurring across the Marshall Islands in 2013 and 2016. Typhoons are not common in this part of the Pacific, and the last time one hit the Marshall Islands was Typhoon Zelda in 1991 (UNDRO, 1991). Flooding of houses due to storm surges and king tides have also been rare in the past five years, except in the lower-elevated and less-populated northern half of Mejit Island, where flooding occurred in 2015 (MICS, 2017), as well as parts of Majuro that were affected in 2014.

Table 8: Proportion of population affected by climate-related stressors in the past five years

Climate-related stressor	Mejit	Maloelap	Majuro	Total
Drought	96%	94%	88%	92%
Heat wave	82%	40%	33%	47%
King tide	36%	44%	35%	37%
Storm surge	22%	8%	13%	14%
Typhoon	6%	8%	3%	5%

The questionnaire also inquired about changes in the severity of these stressors over the past 10 to 20 years. Across the three study sites, a vast majority perceived that the severity of drought had increased, and that the severity of typhoons and storm surges had remained the same. A bit more than half the respondents (55.1%) thought that the severity of king tides had increased. Almost half the respondents (48.9%) perceived that heat waves had increased, but the percentage was much higher on Mejit (83.3%).

When asked how these natural hazards affected households, the most common impacts respondents mentioned were—in decreasing order—adverse effects on drinking water, trees, land, crops, livestock, health, properties, houses, and fish (see Figure 13). On Mejit, respondents reported the highest number of impacts (5.18 on average), followed by Maloelap (4.60) and Majuro (3.54).[19]

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19   The differences were significant at 0.01 level, measured with Anova.

Figure 13: Impacts of climate-related stressors in the past five years (% of households affected)
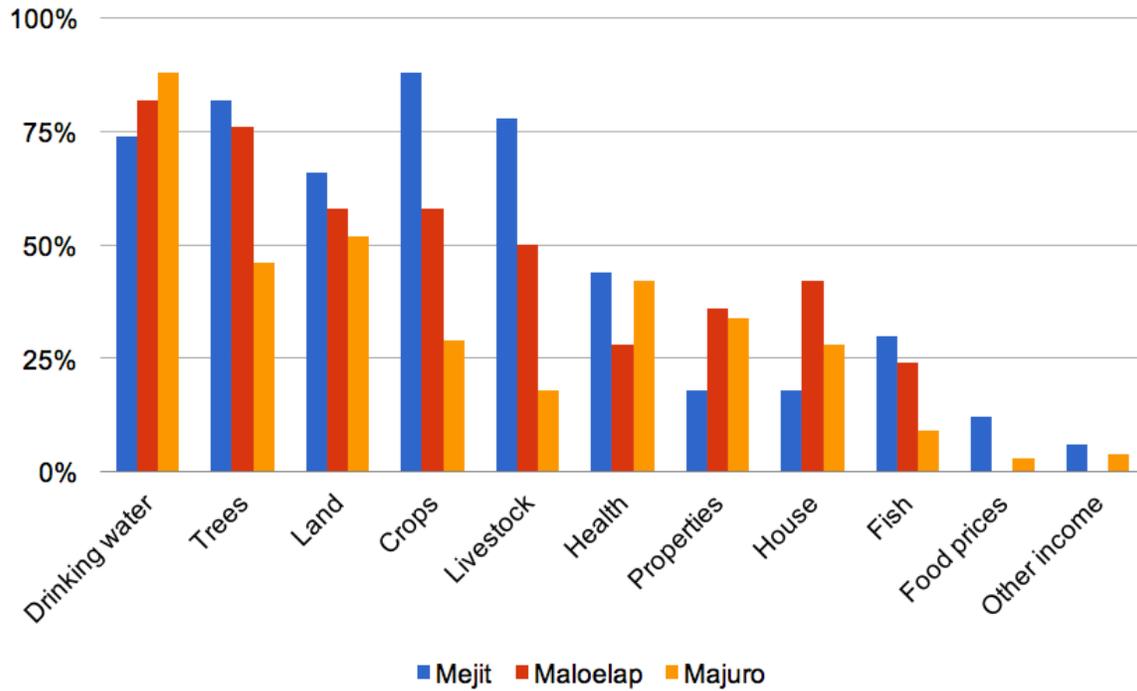
The questionnaire included an open-ended question about how respondents' households were affected by different climatic stressors. The information from this question gave more detail about stressor-specific impacts on people's lives and livelihoods. Key insights are listed below:

- During droughts, household members become dehydrated and sick because they do not drink enough or because they drink well water, which is too salty.
- In times of drought, respondents spend more money on buying drinking water.
- Some people have to beg for water when their reserves are down and if they lack money to buy water. One respondent said:

"We go to other [people's] houses during droughts and ask if they can give us water, which is a very shameful thing to do." (R-82, Majuro)

- During droughts, people need to walk far to find potable drinking water.
- Drought brings more dust, which affects human health, especially among children.
- During heat waves, animals die and fish move further away from the islands.
- Plants don't grow well and some die in times of drought and heat.
- Trees don't produce much fruit in dry times, and some die.
- King tides and storms cause damage to houses, properties, trees, crops, and seawalls.

Most households (70.4%) adopted measures to prevent or adapt to impacts of climate-related stressors (see Figure 14). Tree planting was by far the most common measure. The analysis by island shows a difference in measures between Majuro and the two outer islands. On Mejit and Maloelap, measures were more often ecosystem-based (planting trees and changing to more drought-resistant or salt-tolerant crops). On Majuro, by contrast, respondents invested more often in stronger building materials and building private seawalls. In the "other adaptation" category, several respondents mentioned the use of water tanks to deal with water scarcity in dry periods. Two adaptation measures involved human mobility: relocation and labor migration. In the case of relocation, a whole household moved from a more exposed place to a safer location on the island— for example, from the shoreline to the interior. In the case of labor migration, individual household members moved to other places temporarily to work, when regular income sources failed due to drought, for instance.

Figure 14: Adaptation measures adopted by respondents' households (%)
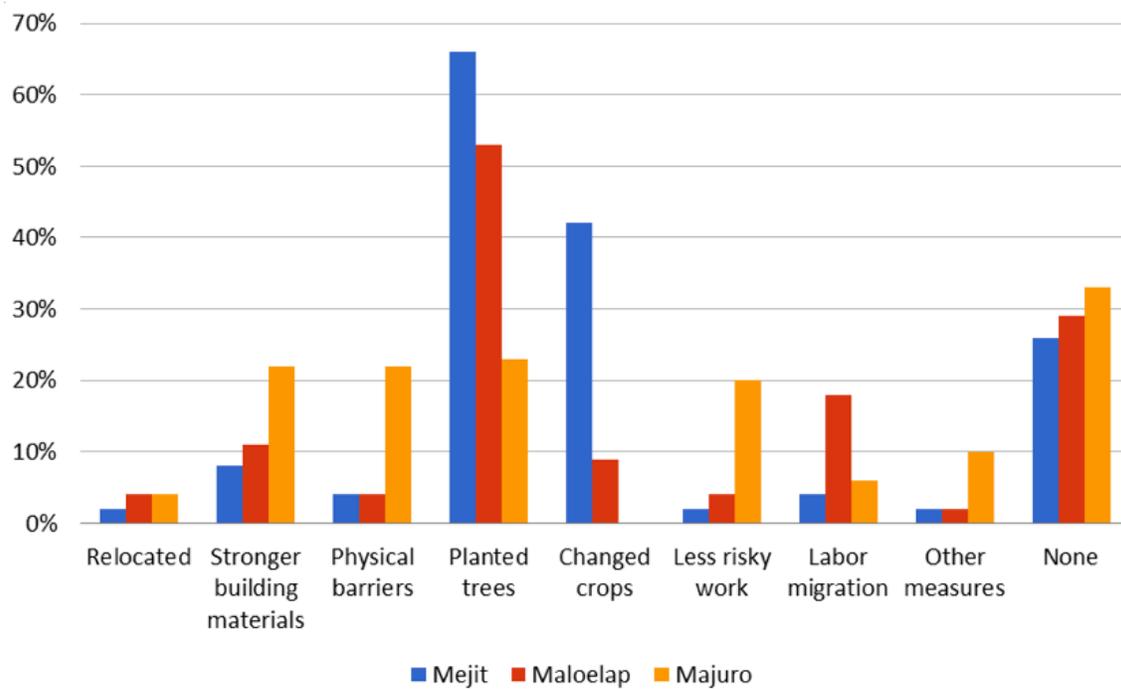
iii. Ecosystem services: Perceptions in the RMI

The questionnaire survey in the Marshall Islands assessed people's views on the importance, current state, and trends of four ecosystem services. The four broad categories that the Millennium Ecosystem Assessment distinguishes (provisioning, supporting, regulating, cultural) were too abstract to ask directly to respondents. Therefore, the questionnaire inquired about more tangible services that were relevant to people in the study sites: ecosystem provisioning of food, freshwater, fuelwood, and protection against storms and flooding. Table 9 summarizes the results.

Table 9: Ecosystem services: Importance, state, and trend

	Food	Fuelwood	Water	Protection	Average
Importance					
Very important	69.5%	58.4%	88.0%	69.6%	71.4%
A bit important	21.3%	18.3%	10.9%	26.8%	19.3%
Not very important	9.1%	23.4%	1.0%	3.6%	9.3%
Current state					
Providing enough	6.6%	39.8%	14.3%	11.9%	18.1%
Providing but not enough	76.1%	33.7%	63.0%	76.3%	62.2%
Hardly providing	17.3%	26.5%	22.8%	11.9%	19.7%
Trend					
Improved	4.7%	20.6%	10.2%	7.4%	10.7%
Stayed the same	52.6%	42.3%	42.2%	66.5%	50.9%
Deteriorated	42.6%	37.0%	47.6%	26.1%	38.3%

Overall, respondents attach great importance to ecosystem services for their lives and livelihoods, especially in the two outer-island sites. Most perceive that the ecosystem on their island is still able to provide food, water, fuelwood, and protection, but not enough. Further, more than a third of respondents perceived a negative trend in ecosystem services provision, particularly in the case of food and water provision.

When respondents indicated that ecosystem services had deteriorated, the questionnaire inquired—in an open-ended question—about their views on the causes of the changes. Below, the changes for each of the four ecosystem services are summarized.

> "The temperature of the heat wave is so high that it kills most of the local foods." (R-048, Mejit)

Food: Most respondents pinpointed drought, heat waves, salinity, changing seasons, and climate change as the main causes of reduced food provisioning by the local ecosystem. These factors affect the productivity of soil and trees. A few respondents mentioned other causes, particularly the lack of space for farms and trees due to urbanization. One respondent stated that certain plants that they used to have no longer exist on the island. A few also mentioned the reduced availability of fish, but gave no reasons for the decline.

> "The coconut trees and other trees which we used to rely on for firewood are now degraded or gone." (R-74, Majuro)

Fuelwood: Respondents mentioned two reasons for reduced availability of fuelwood. First, they noted that trees had died due to drought and salinity. Secondly, they pointed to population pressure, with too many depending on trees for fuelwood.

Water: In the respondents' view, it was quite clear that the deterioration of ecosystem provisioning of water was due to drought or lack of rainfall. Some added that there was not enough storage capacity (rainwater tanks), and a few mentioned increased soil salinity, which makes the water less suitable and less healthy for consumption.

> "The coral and reefs are so badly damaged that they are no longer effective natural barriers against the sea." (R-501, Majuro)

Protection against floods and storms: The loss of trees played a central role in people's views on the reduced ability of the ecosystem to protect them against storms and floods. They added that trees along the coast were affected by king tides, bigger waves, heat, storm surges, and saltwater intrusion. Other reasons mentioned for the reduction in protection against floods and storms were climate change, coastal erosion, sea-level rise, more frequent king tides, and the degradation of coral and the reef platform due to ocean heating and damage caused by people. One respondent further complained that a neighboring seawall, which extends too far into the water, causes harm to his yard and house.

Perceptions of ecosystem services: Differences between islands

Thus far, the analysis of ecosystem services has looked at all study sites in aggregate. However, as alluded to above, there are clear differences between the islands, particularly between Majuro and the two outer islands. Table 10 shows the different responses gathered in the three study sites about the importance of the four selected ecosystem services for people's lives and livelihoods. Map 15 to Map 18 show the differences between and within islands in terms of respondents' perceptions of the state of ecosystem services and the trends.

Source: Kees van der Geest

Table 10: Importance of four ecosystem services by island

Ecosystem service	Mejit	Maloelap	Majuro	Total
Food provision				
Very important	92.0%	98.0%	43.3%	69.5%
Somewhat important	8.0%	2.0%	38.1%	21.3%
Not very important	0.0%	0.0%	18.6%	9.1%
Fuelwood provision				
Very important	90.0%	100.0%	20.6%	58.4%
Somewhat important	10.0%	0.0%	32.0%	18.3%
Not very important	0.0%	0.0%	47.4%	23.4%
Water provision				
Very important	89.8%	100.0%	80.9%	88.0%
Somewhat important	10.2%	0.0%	17.0%	10.9%
Not very important	0.0%	0.0%	2.1%	1.0%
Protection				
Very important	79.6%	84.0%	57.3%	69.7%
Somewhat important	16.3%	16.0%	37.5%	26.7%
Not very important	4.1%	0.0%	5.2%	3.6%

Importance of ecosystem services: There is a clear difference in the importance of ecosystem provisioning of food, fuelwood, and protection between Majuro and the outer islands (see Table 10). On Majuro, people depend less on these services and have non-ecosystem-based alternatives (imported food available in shops, gas stoves, and seawalls or embankments). The difference is smaller for water provision. While Majuro has a government water supply system (tap water), only 30.9 percent of the respondents had access to it. The majority relies on rainfall (stored in tanks and bins) for their water provision.

State of ecosystem services: Respondents on Majuro were most negative and respondents on Maloelap were least negative about the state of their ecosystem in terms of its ability to provide food, fuelwood, and protection against storms and floods (see Map 15 to Map 18). Mejit took an intermediate position. The pattern was different for water provision. On Majuro, respondents were less negative about the ability of the ecosystem to provide enough water. This is probably because Majuro receives more rainfall than Maloelap and Mejit. Within Majuro, respondents in Rita (north) and Delap (south) were more positive about the state of ecosystem services than in Jenrok and Uliga (central). An explanation could be that the latter are most densely populated.

Trends in ecosystem services: On Maloelap and especially Mejit, negative perceptions of trends in food and water provisioning dominate (see Map 15 to Map 18). Respondents' views on changes in fuelwood and safety provision, however, are more balanced between positive and negative, and at times tend toward the positive (e.g., fuelwood on Maloelap). On Majuro, a negative perception of trends in fuelwood provision is discernible, while views on changes among the other three ecosystem services are more balanced.

Figure 15: Map of household views on the state and trend of food provision (ecosystem service)

Figure 16: Map of household views on the state and trend of water provision (ecosystem service)
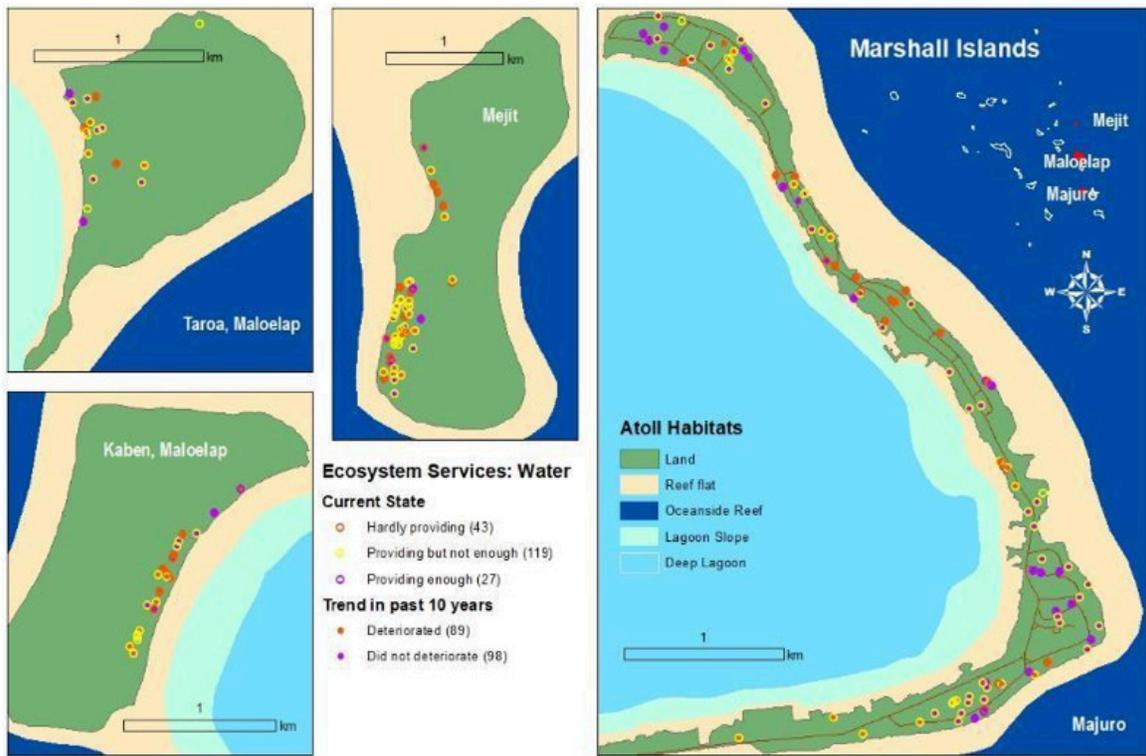
Figure 17: Map of household views on the state and trend of fuelwood provision (ecosystem service)

Figure 18: Map of household views on the state and trend of safety provision (ecosystem service)

iv. Migration patterns

Three sections of the questionnaire focused on migration. The first inquired about the respondents' own migration histories. The second looked at respondents' siblings and children who are currently residing elsewhere. The third section focused on the intentions of household members to migrate in the next 10 years. In each section, detailed migration data were gathered, such as destination, purpose, occupation, and year of departure.

The past: respondents' migration experience(s)
Internal migration within the RMI is common. Over 40 percent of the respondents were not born on their current island of residence (see Table 11). Almost half the respondents in Majuro and Mejit were born on other islands. The figure was much lower for Maloelap (22%).

Table 11: Birthplace by island (% of respondents)

Birthplace	Mejit	Maloelap	Majuro	Total
This island	54%	78%	51%	59%
Elsewhere in the RMI	46%	22%	45%	39%
U.S.	0%	0%	2%	1%
Abroad (not U.S.)	0%	0%	2%	1%
Total	100%	100%	100%	100%

Table 12 summarizes the migration experiences of respondents in the three study sites. It distinguishes between people who have never left their island, those who moved for periods of less than a year, and those that moved for periods of more than a year. Within the last group, the table distinguishes between those who moved within the RMI, and those who migrated internationally and then returned. Comparing Majuro with the two outer islands, the table shows that non-migration and international migration were most common among respondents in Majuro. In the two outer islands, there were more respondents who had moved within the borders of the RMI. Comparing Mejit and Maloelap, the propensity to migrate—including international migration—was higher among respondents on Mejit.

Table 12: Migration experience

Migration experience	Mejit	Maloelap	Majuro	Total
Never left the atoll/island	8%	18%	23%	18%
Only short migration (<1 year)	38%	31%	28%	31%
Long-term, but only within the RMI	42%	49%	31%	38%
Long-term, including abroad	12%	2%	19%	13%
Total	100%	100%	100%	100%

The present: migrant relatives

The survey findings on migrant relatives confirm the high migration propensities of the Marshallese. Almost all respondents (91.5%) had at least one brother, sister, son, or daughter who had migrated, and approximately seven out of ten (68.7%) had siblings or children who lived abroad, mostly in the U.S. The average number of migrant siblings and children per respondent was 3.1. Of these migrant relatives, about half (49.4%) lived elsewhere in the RMI and the rest had migrated internationally. A gender breakdown of migrant relatives shows that 55.8% were men and 44.2% were women. Among those who moved to the U.S., the figures were similar: 57.4% were men and 42.5% were women. Arkansas, Hawai'i, and the state of Washington were the most frequent international destinations for the siblings and children of survey respondents.

Table 13: Destination states of migrant relatives in the U.S.

State	Migrant relatives	State	Migrant relatives	State	Migrant relatives
Arkansas	58	Oregon	10	Idaho	1
Hawaiʻi	51	Nevada	8	Indiana	1
Washington	32	Utah	8	Louisiana	1
Oklahoma	26	Iowa	7	Minnesota	1
California	21	Guam	3	New York	1
Florida	18	North Carolina	3	Ohio	1
Texas	17	Saipan	3	Total	286
Arizona	14	Denver	1		

The survey results on migrant relatives revealed significant differences between the three study sites. The outer island of Mejit has the highest out-migration rate. More than half the siblings and children of questionnaire respondents (54.4%) had moved, while in the other two study sites about a third had migrated. Another significant difference between study sites is that less than 40 percent of the migrant relatives of respondents on Mejit and Maloelap migrated internationally, while most migration from Majuro (65.7%) was international.

Table 14: Proportion of domestic and international migrants among siblings and children

	Mejit	Maloelap	Majuro	Total
Migrant siblings and children (% of all living siblings + children)	54.4%	33.6%	33.8%	39.4%
Siblings and children who migrated internationally (mainly U.S.)	21.6%	11.6%	22.2%	19.0%
Proportion of migrants moving internationally	39.7%	34.6%	65.7%	48.3%

The future: migration intentions

In the questionnaire, we asked respondents whether they thought that they or any of their household members would migrate within the RMI or abroad in the next 10 years. About half (53.3%) replied "yes" or "maybe."[20] Within this group, about a third (35.2%) thought they would move within the RMI, mostly to Majuro. The rest almost exclusively intended to move to the U.S., with Arkansas, Hawaiʻi, and Washington being the most popular destinations. Together, Majuro and the U.S. cover two-thirds of all intended migrations. In the next section ("drivers of migration"), we look at the purpose of these intended migrations.

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20   Approximately one out of three respondents (34.2%) thought that a household member would migrate in the next 10 years. Approximately one out of five (19.1%) answered that "maybe" a household member would migrate.

Table 15: Key characteristics of respondents in relation to household migration intentions

	No intention to migrate	Intention to migrate within the RMI	Intention to migrate to U.S.
Island**			
Mejit	48.8%	32.6%	18.6%
Maloelap	58.0%	30.0%	12.0%
Majuro	48.9%	2.3%	48.9%
Sex*			
Male	53.2%	19.8%	27.0%
Female	47.3%	10.9%	41.8%
Age			
Average	38.6	41.2	40.3
Median	36	39	38
Education			
None or primary	69.2%	7.7%	23.1%
Secondary	46.2%	22.1%	31.7%
Tertiary	51.1%	12.8%	36.2%
Annual household income**			
Less than $1,000	52.6%	31.6%	15.8%
$1,000–$5,000	55.1%	21.7%	23.2%
More than $5,000	54.4%	3.5%	42.1%

Note: ** = significant at p=0.01 level; * = only significant for migration to U.S. at p=0.05 level

Table 15 looks at key characteristics of three types of respondent households: those who do not intend to migrate; those who intend to migrate within the RMI; and those who intend to migrate to the U.S. The intention to migrate to the U.S. within the next 10 years was highest on Majuro. Here, almost half the respondents thought that at least one household member would migrate to the U.S. On Mejit and Maloelap, international migration intentions were significantly lower. The table further shows that women and households with higher annual incomes were significantly more likely to expect household members to move to the U.S. in the next 10 years. For education level, small differences were found (the higher the education level, the higher the migration intentions), but the differences were not statistically significant. There was also no statistically significant relation between age of the respondent and migration intentions.

Trapped populations?

In global policy dialogues about migration and displacement due to climate change, an important category of people are trapped populations (Ayeb-Karlsson et al., 2018). A landmark publication about this phenomenon was the Foresight Report on Migration and Global Environmental Change (Foresight, 2011), which defined trapped populations as people who are unable to move away from locations in which they are extremely vulnerable to environmental change. Due to the fact that Marshallese citizens do not need a visa to enter the U.S. and work there, they are arguably more able to move abroad than people in other climate hotspots. However, people may be trapped in risk-prone environments not just because of visa requirements, but also

for other reasons, such as a lack of financial resources to migrate. To test whether our respondents in the Marshall Islands could be considered trapped populations, we included questions in the survey about their experiences with the inability to migrate.

Exactly one-third of the respondents indicated that at some point in time, a member of their household (including themselves) had had the desire or need to migrate but could not. The remaining two-thirds had never experienced this. Inability to migrate was most common in Maloelap (42%), followed by Majuro (33%) and Mejit (26%). The rationales that respondents mentioned most frequently to explain their inability to migrate were lack of money (45), poor health (17), responsibilities at home (12), lack of transportation (3), and lack of contacts, such as family and friends, in the destination area (3).

The Q-methodology (presented in Chapter 7) included two statements related to the topic of trapped populations. The first one said, "Only rich people can migrate to other countries." About half the respondents (49%) disagreed with this statement, while 32 percent agreed and 19 percent were neutral. The second statement was, "If I had enough money I would move abroad." This statement had a very similar score: 52 percent disagreed, 26 percent agreed, and 22 percent were neutral.

v. Drivers of migration

The three sections in the questionnaire that focused on migration each inquired about the reasons for migration. One section focused on the respondent's own migration history; the second on siblings and children who are currently residing elsewhere; and the third on the intentions of current household members to migrate in the next 10 years. In each section, we used the same categories of migration drivers: work, education, health care, visiting relatives, environmental drivers, and other. Figure 19 shows how frequently different reasons were offered for each migration type.

Figure 19: Marshallese migration drivers in the past, present, and future
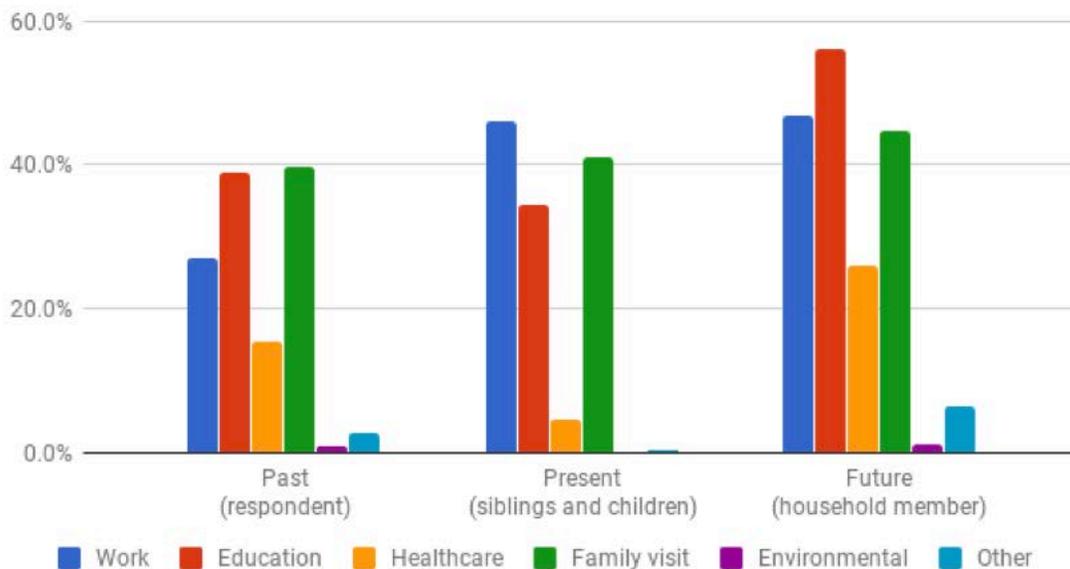
The graph shows that work, education, and family visits are the most common reasons for migration, each being a factor in approximately 40 percent of the moves. Migration to seek health care is also common but tends to be of shorter duration, which explains the lower number of current migrants who moved for medical reasons.

Of particular relevance for the first research question is the very low number of respondents who mentioned environmental reasons for migration. While respondents expressed concern about the future impacts of climate change on their islands, the survey findings show that they do not yet identify these impacts as important drivers of migration.

The insights from the PRA sessions (particularly the fuzzy cognitive mapping of migration exercise) are largely in line with these findings. According to the participants in Mejit, for example, the reasons people migrate include poor education, poor health care, limited income-generation opportunities, and adventure seeking. In addition, participants mentioned the threat of climate change and sea-level rise. After probing, however, they said that climate change is not yet causing people to migrate; rather, it is something that might spur migration in the future.

For each migration driver, the facilitators asked about underlying causes.

Poor education and health care: The main reason behind people's decision to migrate for education or health care is the low level of education and health care on the island. Underlying the poor education and health care are the logistical difficulties of infrequent inter-island transportation, which makes it harder to provide sufficient resources for a good education, such as materials and qualified teachers. More generally, the weak economy of the RMI reinforces the scarcity of capital (human and financial).

Work: The main reason why people migrate for work is that there are limited opportunities for generating income. This is particularly the case on the outer islands, but also applies to Majuro. Participants identified four underlying reasons: stagnant (government) wages despite an increase in prices, delayed payment of goods sold and delivered (e.g., copra), and not enough diversity in livelihoods and income sources. A fourth underlying reason for limited income-generating opportunities is what the participants called a deterioration of the island's productivity. The reasons behind the decline in island productivity, they indicated, are both natural and human. They include increasing soil salinity, more frequent droughts and heat waves, invasive species or pests, and controlled fires (to clear unwanted organic material and other waste) that turn into forest fires. Lastly, they mentioned that out-migration contributes to a decreasing availability of labor to cultivate the land, which reduces island productivity.

Seeking adventure: The last reason for migration that participants mentioned was "seeking adventure" and a desire to see and experience the world beyond one's island. An underlying cause of this desire is the curiosity that is fed by increased access and exposure to U.S. popular culture through TV and the internet.
Besides migration drivers, the group also identified enablers or facilitators of migration. These are things that make it easier to migrate from their island. As an example, participants mentioned the tax refund in the U.S.

that makes it possible for migrants to buy tickets for their relatives at home. Another enabler is that no visa is needed for entry and work in the U.S. Lastly, they mentioned the fact that almost all islanders have relatives and friends in the U.S. with whom they can stay.

vi. Linking climate change, ecosystem services, and migration

This section reviews the evidence concerning possible linkages between the set of variables related to climate impacts and ecosystem services and those related to migration. Based mostly on the questionnaire survey, the present chapter thus far has presented descriptive statistics of people's perceptions and experiences with climate impacts and ecosystem services, and their migration behavior in the past, present, and future. The current section moves from descriptive statistics to a more analytical and inferential approach, exploring how climate impacts, ecosystem services, and migration are related. The aim of doing this is to answer the first research question: To what extent are climatic stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands?

The analysis relates a range of climate impact and ecosystem services variables to four migration variables. The four migration variables have two dimensions: time and space. The time dimension distinguishes current and future migration. In the spatial dimension, a distinction is made between all migration and international migration only. The four resulting migration variables are:

1. The percentage of all living siblings and children of the respondent who were residing elsewhere (not on the island of enumeration) at the time of the questionnaire interview;
2. The percentage of all living siblings and children of the respondent who were residing abroad (mostly in the U.S.) at the time of the questionnaire interview;
3. Household members' intention to migrate in the next 10 years;
4. Household members' intention to migrate abroad (mostly to the U.S.) in the next 10 years.

We relate the migration variables to climate impact and ecosystem services variables. The climate impact variables are:

- Whether respondents included drought, sea-level rise, or lack of freshwater in their top-5 of 12 most pressing problems;
- Whether the respondent's household has been affected by droughts, heat waves, typhoons, king tides, and storm surges in the past 5 years;
- Whether any of these stressors affected particular assets or activities (e.g., crops, fishing, properties);
- Perceived trends in climate-related stressors over the past 10–20 years: drought, heat wave, typhoon, king tide, and storm surge.

The ecosystem services variables are:

- Perceived state of ecosystem services (food, fuelwood, water, protection);
- Perceived trends in ecosystem services (food, fuelwood, water, protection).

First, we analyze the links between the migration variables and whether or not respondents ranked three climate-related stressors (drought, sea-level rise, and lack of freshwater) in their top-5 of 12 problems facing their island (See Table 16). In all tables in this chapter, cells are shaded green when the statistical relationship between two variables confirms the hypothesis that climate impacts and environmental problems drive migration within or from the RMI. By contrast, grey-shaded cells show statistically significant relations between a migration and a climate impact or environmental variable that oppose this hypothesis. When cells are white-shaded and contain an "X" symbol, it means that there is no statistically significant correlation (p>0.05) between the two variables.

Table 16: Relation between migration variables and environmental problem ranking

Problem ranking (0=not ranked in top-5; 1=ranked in top-5)	% migrant relatives	% migrant relatives in the U.S.	Intention to migrate (0=no; 1=maybe; 2=yes)	Intention to migrate to the U.S. (0=no; 1=maybe; 2=yes)
Drought	X	X	X	Negative (*)
Sea-level rise	X	X	Negative (*)	Negative (*)
Not enough freshwater	Positive (*)	X	X	X

Note: "X" means there is no significant difference; * means significant at p<0.05 level; ** means significant at p<0.01 level.

Table 16 shows that respondents who ranked drought or sea-level rise among their top-5 of 12 problems were less likely to have household members who intended to migrate to the U.S. in the next 10 years. Respondents who ranked lack of freshwater as a top-5 problem had significantly more migrant relatives. The findings from the problem ranking do not support the hypothesis that climate impacts and environmental problems drive migration within or from the RMI.

The statistical relations examined in Table 17 are in stronger support of the hypothesis. The green cells in the table indicate positive correlations between climate impacts and migration. In the case of heat wave impacts, for example, respondents whose households have been affected by heat waves (such as health impacts or agricultural losses) had significantly more siblings and children who had moved away from the island. The same applies to storm surge impacts (such as salinity intrusion and damage to properties). Heat wave and storm surge trends also correlate positively with the proportion of migrant relatives. Respondents who perceive that the frequency and severity of heat waves have increased tend to have a higher proportion of siblings and children who have left the island. It is important to note that positive correlations do not provide evidence for causality. What Table 17 shows is that in about a quarter of the statistical relations examined, there is a positive correlation between the climate impact variables and the migration variables, which is an indication

that migration propensities tend to be higher in climate-stressed households. The table also shows that the number of positive correlations between climate impact variables is similar for general migration variables as for international migration variables.

Table 17: Relation between migration variables and climate impacts

Affected in past 5 years (0 =no; 1=yes)	% migrant relatives	% migrant relatives in the U.S.	Intention to migrate (0=no; 1=maybe; 2=yes)	Intention to migrate to the U.S. (0=no; 1=maybe; 2=yes)
Drought	X	X	X	X
Heat wave	Positive (**)	Positive (**)	X	X
Typhoon	X	X	X	X
King tide	X	X	X	X
Storm surge	Positive (*)	Positive (*)	X	X
Impact type (0 =no; 1=yes)				
Crops	Positive (**)	X	X	X
Livestock	Positive (**)	X	Positive (*)	X
Fish	X	X	X	X
Trees	Positive (**)	X	X	Negative (**)
Land	Positive (*)	Positive (*)	X	X
Other income	X	Positive (*)	X	X
Food prices	X	Positive (**)	X	X
Housing	X	X	Positive (*)	X
Properties	X	X	Positive (**)	Positive (**)
Drinking water	X	X	X	X
Health	X	X	Positive (**)	Positive (**)
Trend in past 10–20 years (0=did not increase; 1=increased)				
Drought	X	X	X	X
Heat wave	Positive (**)	Positive (*)	X	X
Typhoon	X	X	X	X
King tide	Negative (*)	X	X	X
Storm surge	Positive (**)	Positive (**)	X	X

*Note: "X" means there is no significant difference; * means significant at p<0.05 level; ** means significant at p<0.01 level.*

It is important to recall from the section on migration patterns that respondents on the island of Mejit had the highest percentage of migrant relatives. Mejit has a slightly higher elevation than the other two study sites, and the expectation was that sea-level rise was less pressing there. However, Mejit is also the northernmost of the three study sites, where drought and heat waves have been more severe (see Marra et al., 2017). This may explain some of the correlations we are seeing in Table 17.

The relationship between migration and ecosystem services is examined in Table 18. The table shows several significant relations, particularly between migration intentions and perceived trends in the ecosystem services of food provision, fuelwood provision, and protection against storms and floods. Household members of respondents who perceive that these ecosystem services are deteriorating are more likely to intend to migrate in the next 10 years. However, in most cells in the table, no significant relation is found, and in two cases the relation is negative. Previous analysis in this chapter showed that the ecosystem in the three study sites was under pressure, and in many cases not providing enough services to the islanders, or as much as it once did. Here, there is some indication that people who perceive negative trends in ecosystem services are more likely to migrate in the future.

Table 18: Relation between migration variables and perceptions of ecosystem services

State of ESS 1=providing enough; 2=providing but not enough; 3=hardly providing	% migrant relatives	% migrant relatives in the U.S.	Intention to migrate (0=no; 1=maybe; 2=yes)	Intention to migrate to the U.S. (0=no; 1=maybe; 2=yes)
Food	X	X	X	X
Fuelwood	Negative (*)	X	X	Positive (**)
Water	X	X	X	X
Protection	X	X	X	X
Trend in ESS 1=improved; 2=stayed the same; 3=deteriorated				
Food	X	X	Positive (*)	X
Fuelwood	X	X	X	Positive (**)
Water	Positive (*)	X	X	Negative (**)
Protection	X	X	Positive (*)	X

Spatial analysis

The analysis linking climate impacts, ecosystem system services, and migration in this report has thus far relied on perception data and the self-reporting of respondents. To triangulate the results, geospatial flood-extent data are now used to explore whether households in recently flooded areas are more inclined to migrate. Figure 20 shows, in blue lines, the areas in our study sites that have been inundated in the past years,

specifically March 2014 in Majuro and January 2015 in Mejit. The flood-extent data was based on participatory mapping that leveraged photographic documentation and experiential knowledge by flood-extent witnesses (Stege 2018). In total, 34 households (21 on Majuro and 13 on Mejit) within our survey sample were flooded or within a 30-meter distance of observed flood areas. On the map, these households are represented with a red dot. The other households have yellow dots.

Figure 20: Flood extent on Majuro (2014) and Mejit (2015)
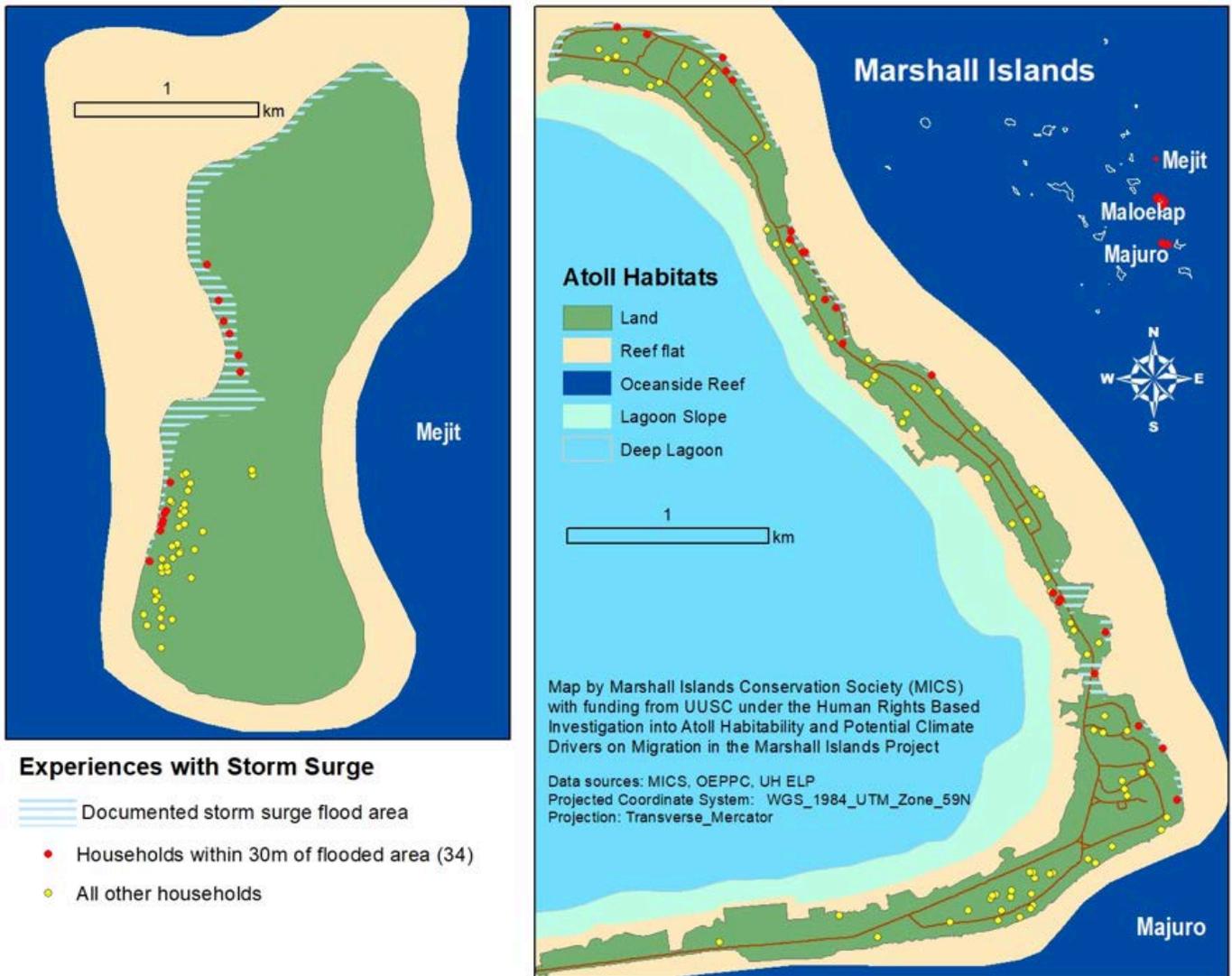
To check the quality of the flood-extent data, we compare respondents' perceptions of the riskiness of their house locations for the two groups: households inside and outside the flooded zones. Table 19 shows that households that are in or very near the flooded areas indeed perceive their homes' locations as riskier than households outside the flooded areas.

Table 19: Respondents' perception of how risky the location of their house is

	Riskier	Average	Safer	Total
In flooded area	70.6%	29.4%	0%	100%
Not in flood area	29.5%	57.1%	13.4%	100%
Total	39.0%	50.7%	10.3%	100%

Note: The difference between households within and outside the flood zones is significant at p<0.001 level.

Table 20 compares current and future migration propensities between households inside and outside the flood zones. "Current migration" is expressed as the percentage of siblings and children who are currently internal or international migrants. "Future migration" is expressed as the percentage of households with at least one member who intends to migrate in the next 10 years.

Table 20: Migration propensities of households in flooded and non-flooded areas

	In flood area	Not in flood area	Total
% migrant relatives	44.4%	40.2%	41.2%
% migrant relatives in the U.S.	24.7%	23.5%	23.8%
Household member intends to migrate within 10 years (%)	55.9%	57.4%	57.0%
Household member intends to migrate to the U.S. within 10 years (%)	33.3%	40.6%	38.9%

Note: None of the differences between households within and outside the flood zones are significant at p<0.05 level.

The differences in migration propensities between households within and outside the flooded areas on Majuro and Mejit are small and not statistically significant. This is the case for current and future migration, and for internal and international migration. The findings from this spatial analysis do not support the hypothesis that climate impacts and environmental problems drive migration within or from the Marshall Islands. However, this particular spatial analysis only looked at coastal flooding. Future research efforts should include spatial analyses of the relation between other climate change impacts and migration behavior to get a more complete picture of the link between climate and migration in the RMI.

b. Findings from the destination states

This section presents the results of the fieldwork in the U.S. It first looks at the challenges associated with various climate risks and environmental threats that Marshallese migrants in the U.S. faced prior to leaving the RMI. Subsequently, rationales for migration are discussed, and lastly the link between migration and environmental factors is explored in more depth.

i. Perception of climate change and extreme events in the RMI

Table 21 lists seven different environmental problems, and shows to what extent respondents in Hawai'i and the Pacific Northwest perceived these as threats to their living situations when they still lived in the RMI. Respondents were asked to rate the threat level from 1 (low threat) to 5 (severe threat), and the scores in Table 21 are the averages. Respondents in both Hawai'i and the Pacific Northwest perceived sea-level rise as the most threatening environmental factor, and ocean pollution was the second-most threatening environmental condition. Respondents in the Pacific Northwest perceived environmental factors to be less of a threat than respondents in Hawai'i. The contrast in response could be due to the cohort in the Pacific Northwest returning to the Marshall Islands less frequently than their Hawai'i counterparts due to financial limitations such as airfare costs and geographical distance.

Table 21: Perceptions of environmental factors as a threat to the living situations in the RMI

	Hawai'i	Pacific Northwest
Rising sea level	4.9	4.5
Ocean pollution	4.8	4.4
Saltwater intrusion	4.7	4.3
Lack of drinkable water	4.6	4.2
Destruction of homes caused by environmental factors	4.5	4.1
Decrease in fish populations	4.5	4.0
Air pollution	4.2	3.62

Note: The scores are calculated as the average rating between 1 (low threat) and 5 (severe threat).

Table 22 shows the proportion of respondents who perceive an increase in the severity of different environmental stressors in the last 5–10 years. Across the study sites, a large majority of respondents noted that king tides, droughts, and heat waves have increased in severity. On average, king tides are perceived as having increased most dramatically, as noted by approximately 95 percent of the 79 people interviewed. A much smaller percentage of respondents thought that storm surges and typhoons had increased in the RMI.

Table 22: Perceptions of increasing severity of environmental stressors in the last 5–10 years

	Hawai'i	Pacific Northwest
King tides	95.0%	94.9%
Drought	85.0%	74.4%
Heat waves	87.5%	69.2%
Storm surges	52.5%	30.8%
Typhoon	20.0%	18.0%

"We have land to cultivate. We have our indigenous plants. But due to climate change, these are not feasible anymore—you cannot cultivate it. And if you did, if you brought in artificial soil that you bought from the stores and use that to replace the poor soil of the natural land, even though you put that [in] and then you grow a plant, still it's not going to grow because of drought, the invasive species due to the changes in weather, and salt intrusion. So it's really hard to provide for your family due to the environmental changes." (R-114, O'ahu)

ii. Drivers of migration

As part of the questionnaire, respondents in Hawai'i and the Pacific Northwest were asked why they decided to come to the U.S. They were able to select multiple migration rationales. On average, education (80%), health care (72.5%), economic opportunities (70%), and familial networks (70%) were the most frequently selected (see Table 23). Participants in Hawai'i more commonly selected several migration rationales than their counterparts in the Pacific Northwest. In both sites, environmental factors were mentioned less frequently as migration rationales. Comparing the two destination areas, respondents in Hawai'i had a higher rate of selection of "poor environmental conditions in the RMI," "environmental disasters in the RMI," and the "threat of sea-level rise" as migration drivers than respondents in the Pacific Northwest. Compared to respondents in the RMI (see analysis in the first part of this chapter), those in Hawai'i cite an environmental issue much more often as one of the reasons for migration. An explanation could be that Marshallese people in the U.S. are more exposed to media speaking of climate change impacts in the Marshall Islands. By contrast, people residing in the Marshall Islands may not be sufficiently aware of the climate risks their islands face.

Table 23: Migration rationales mentioned by respondents in the U.S.

	Hawai'i (N=40)	Pacific Northwest (N=39)
Better education and schools than the RMI	32	25
Spouse and familial network	28	22
Better health care than in the RMI	29	17
Better economic opportunity and living conditions	28	13
Poor environmental conditions in the RMI	13	1
Threat of sea-level rise	12	1
Environmental disasters in the RMI	10	1
Development displacement (due to military or industrial investment project)	8	1

The survey also included a question about why respondents had moved to a particular state and not to other states. Of Marshallese interviewees based in Hawai'i, 55 percent stated that their rationale for selecting the state was its proximity to the RMI, that it was more closely aligned culturally to the RMI, and that it held a strategic position as a departure point for travel to the continental U.S. In the Pacific Northwest, 82.5 percent cited familial networks and the support provided by extended family and diaspora networks as important to their rationale for choosing the Pacific Northwest as their migration destination. Networks connected new arrivals to housing, job opportunities, and sharing "risks" across households.

Besides the rationales for their migration decisions, respondents were also asked about facilitators and barriers[21] to migration (see Table 24). They noted, for instance, that the ability to migrate, while enabled by the Compact of Free Association, is constrained by the cost of relocation, including airfare.

Table 24: Facilitators and barriers of migration to the United States

Facilitators	Barriers
Migrant networks (family)	Financial barriers: cost of migration
Remittances	Lack of "official" documented presence in the U.S
Compact of Free Association	Language & cultural barriers to integration

Respondents noted that while climate factors had not played the deciding role in their migration decisions, they were contributing factors that perpetuated the existing push to migrate in order to access health, education, and employment services and opportunities.

In the following paragraphs, we look in some more detail at the underlying causes of migration, based on literature review, expert interviews, and qualitative information from the questionnaire interviews.

Economy

Respondents interviewed note that the economy in the RMI is "stagnant." The RMI's economy following the Amended Compact in 2003 experienced a sustained pattern of growth, though interviewees stated that economic growth was due to significant increases in grant assistance from the United States and the Republic of China. Moreover, interviewees across the research sites commented on the steady increase in the cost of living, high unemployment, and the deterioration of wages. One respondent commented:

"We are in a state of emergency. The government relies on Japan, U.S., Australia, and Taiwan for infrastructure support. In this way, other countries are spoon-feeding the RMI as opposed to maintaining resources and sustainable development." (R-134, Big Island)

21   The distinction between migration rationales and barriers and facilitators of migration is shown in the Foresight Report on Migration and Global Environmental Change (Foresight, 2011: 12).

And one key informant said:

"Expansionary fiscal policy has been the main driving force behind economic growth. Employment in the public sector has expanded by 700 jobs, or 48 percent, since fiscal year 1999. However, the rate of increase is not sustainable, and failure to control public service employment has resulted in a stressed fiscal position, with the government suffering a tight cash flow."
(Ben Graham[22])

In 1986, Pastor Franz Hezel of the Micronesian Seminar wrote that "unless the island nations of Micronesia are somehow able to turn around their economies and create hundreds of new jobs without the assistance of higher levels of U.S. aid, there is a good chance that more young people will elect to leave home and pursue jobs, wherever they are to be found."[23] Indeed, almost 30 years on, Hezel notes that there needs to be a renewed focus on infrastructure growth that offers viable alternative livelihoods for the RMI citizens at home, with residents "getting money commensurate with what people anticipate is a good income."[24]

Education

Interviewees indicate that the "relative absence of educational opportunities in the RMI" is a driving force of migration. There are inequities in school enrollment across the wealth spectrum in the RMI, with only roughly 40 percent of RMI adults finishing high school or beyond (Hezel, 2002; Graham, 2008). Educator Natalie Nimmer, who has worked extensively in the Marshalls Islands, stated that although access to high school, community college, and a branch of the University of the South Pacific in Majuro is driving internal migration, households view education in the United States as a motivation for relocating outside of the RMI. Growing numbers of RMI households are reported to have moved to Pittsburg, Kansas, and Enid, Oklahoma, in addition to Hawai'i and the Pacific Northwest, in order to enable youth to attend the local community colleges in these areas.[25]

Health

The context for health and health care in the RMI includes a consideration of a range of ecological, economic, and social factors. Throughout much of the Marshall Islands, the burden of health issues is substantial. The World Health Organization's global rankings on the overall performance of health systems placed the RMI at 141 out of a total of 191 countries in the year 2000, and the Pacific Island News Association (PINA) has

22 Interview with Ben Graham, July 14, 2016.

23 Franz Hezel, (2016) "Emigration: The Brain Drain in Palau, Marshalls, and the Federated States." In Graham (2008): 24.

24 Pastor Franz Hezel, June 22, 2016: 6.

25 Interview with Natalie Nimmer, June 23, 2016.

illustrated the absence of staff and medical supply shortages in Majuro. As one interviewee commented, "People are very sick back home—we need hospitals, doctors, and medications. The majority of people are ill because of bombings, our water, the heat, and the fact we have no healthy fruits or vegetables."

The socioeconomic determinants of health in the RMI include poverty, overcrowding, and poor sanitary conditions in the country's urban centers, as well as the loss of traditional forms of subsistence (Duke, 2014). The latter is reflected in the contamination of land and soil due to nuclear radiation, which led to the loss of the traditional diet of fresh fish, breadfruit, coconut, and pandanus in favor of white rice and highly processed packaged foods. Respondents also commented that the legacy of nuclear testing by the United States in the 1940s and 1950s continues to contribute to ecological, genetic, psychosocial, and environmental health problems.

Interviewees noted that the Marshallese are affected by tuberculosis, diabetes, hypertension, thyroid tumors, alcoholism, depression, Hansen's disease, leprosy, and mental health problems. Michael Duke of the Migration Policy Institute notes that life expectancy in the RMI is 60 years compared with 79 years in the United States, and that access to health care is a contributing factor to out-migration. The news site Civil Beat has written about why residents are relocating to Hawai'i and Arkansas as a "matter of survival," and noted that with deficient medical treatment, "it's no surprise that many Micronesians capitalize on the 'free association' element of the COFA agreement and migrate in droves to Hawai'i, Guam and cities on the U.S. mainland."[26]

iii. Return and onward migration

Results from qualitative interviews identify trends in Marshallese diaspora groups that intend to migrate back to the Marshall Islands. Approximately one out of every four respondents based in the Pacific Northwest (25.6%) would transition to another host state, in comparison to 42.5% of the cohort based in Hawai'i (see Table 25). The Hawaiian Islands are arguably used as a departure point for further travel within the continental U.S. Survey respondents note that they would return to the Marshall Islands in order to maintain cultural ties, organize burial arrangements, and fulfill the desire to be buried in their homeland. In addition, respondents desire to improve the adaptive capacity of their home communities in response to climate change and natural disasters. Developing and maintaining links with the population living overseas would enable local governments, businesses, and institutions to draw on the expertise of the diaspora.

Table 25: Migration intentions

	Hawai'i	Pacific Northwest
% plan on migrating to another U.S. state in the future	42.5	25.6
% plan to return to the Marshall Islands in the future	62.5	38.5

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26   Civil Beat, "Health Care: Migration Is Often a Matter of Survival," 2015, at: https://www.civilbeat.org/2015/10/health-care-migration-is-often-a-matter-of-survival/.

iv. Linking climate change, ecosystem services, and migration

The questionnaire in the destination areas asked in a direct manner whether environmental problems in the RMI, such as the ones discussed earlier in this chapter (e.g., drought, heat waves, sea-level rise, and storms) had influenced the respondents' decision to move to the U.S. Similarly, respondents were asked whether environmental factors currently play a role in their decision whether or not to return to the RMI. The results are shown in Table 26.

Table 26: The role of environmental factors in respondents' migration and return decisions

	Hawaiʻi	Pacific Northwest
Did environmental factors play a role in your decision to migrate to the U.S.?	42.5%	43.6%
Will environmental factors play a role your decision to migrate back to the Marshall Islands?	65.0%	59.0%

Across both U.S. study sites, the cohort is split between those who attributed their migration to environmental factors and those who did not, though both cohorts view rising sea levels as a high threat to their previous occupancy of their home atolls. In Hawaiʻi, 42.5 percent of respondents stated that environmental factors played a role in influencing their decision to migrate to the state. Similarly, 43.5 percent of respondents in the Pacific Northwest stated that environmental factors played a role in influencing their decision to migrate to Oregon and Washington.

When questioned as to the perception of climate change and extreme events in the RMI affecting their future return from Hawaiʻi, 65 percent of respondents stated that environmental factors play a role in their future decision to permanently return (see Table 26). The aforementioned 65 percent of the sample group named rising sea levels as a threat to their previous living situations in the Marshall Islands. In line with our emerging understanding, qualitative data indicates that sea-level rise is more often mentioned as a factor working against future return and less as a factor of past movements. In the Pacific Northwest, approximately 59 percent of respondents stated that environmental factors played a role in the decision whether or not to migrate back to the Marshall Islands.

In order to understand the relationship between respondents' identification of environmental factors and migration from the RMI, several logistic regressions were performed to determine whether and where there is a linear relationship.

Counter to popular Pacific Islands climate variability, analysis of the household questionnaire data revealed no statistically significant correlation between perceiving sea-level rise as a threat to the interviewees' previous living situations in the Marshall Islands and their decisions to migrate to Hawaiʻi or the Pacific Northwest. Among respondents in Hawaiʻi, however, there was a positive correlation between the lack of accessible drinking water/freshwater sources in the RMI and whether climate affected the respondents' decisions to migrate from the Marshall Islands. Respondents in Hawaiʻi who perceived lack of freshwater as a threat in the RMI were also significantly more reluctant to return to the RMI than respondents who did not perceive lack of freshwater as a problem. No such significance was deduced for respondents in the Pacific Northwest.

6. Impacts of migration

This chapter tries to answer the second research question of this project: What are the impacts of migration on migrants themselves and their home communities? In the first part, the focus is on impacts of migration on the home community in the RMI. The second part looks at the impact of migration on migrants themselves in the destination states.

a. Impacts of migration in the RMI

Each section in the questionnaire that inquired about migration included questions about how migration influenced the economic status and well-being of the household. Respondents were first asked to indicate whether the impact was "very positive," "positive," "neutral," "negative," or "very negative." After that, they were asked to explain why in an open-ended question. This was done for respondents' own migration in the past (Figure 21) and for that of migrant relatives in the present (Figure 22). Respondents tended to be slightly more positive than negative about the consequences of their own migration (in the past) on the economic status and well-being of their household, especially on Mejit and Majuro.

Figure 21: Perceived impact of respondents' own migration
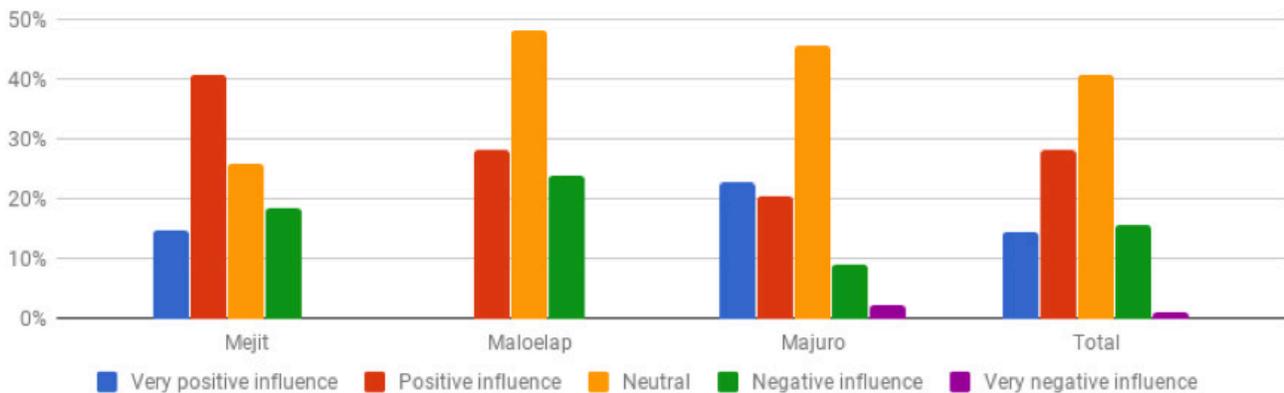
The typical reasons respondents provided for positive evaluations of their own migration were: 1) the ability to improve their level of education; 2) finding better employment and salaries; 3) the ability to support their family at home with money, food, and consumer goods; 4) receiving adequate health care; and 5) the chance to spend time with relatives they had not seen for a long time. A few respondents also mentioned learning new skills, gaining experience, and the fact that they did not have to worry about food and clean drinking water in their destination areas.

Those who perceived the impact of their own migration negatively typically did so for four reasons: 1) due to their migration there was no one at home to care for the household and support elderly parents or young children; 2) they were homesick and missed their family and loved ones; 3) they did not like the lifestyle (lack of exercise, lack of mobility, alcoholism) in their destination areas; and 4) their migration did not work out because they were not able to find a job or further their education.

While respondents were slightly more positive than negative about their own migration, they felt less positive about the impact of their siblings' and children's migrations on their household. Positive and negative perceptions were more or less in balance in all study sites, but were slightly more positive on Majuro (See Figure 22).

Figure 22: Perceived impact of the migration of respondents' relatives
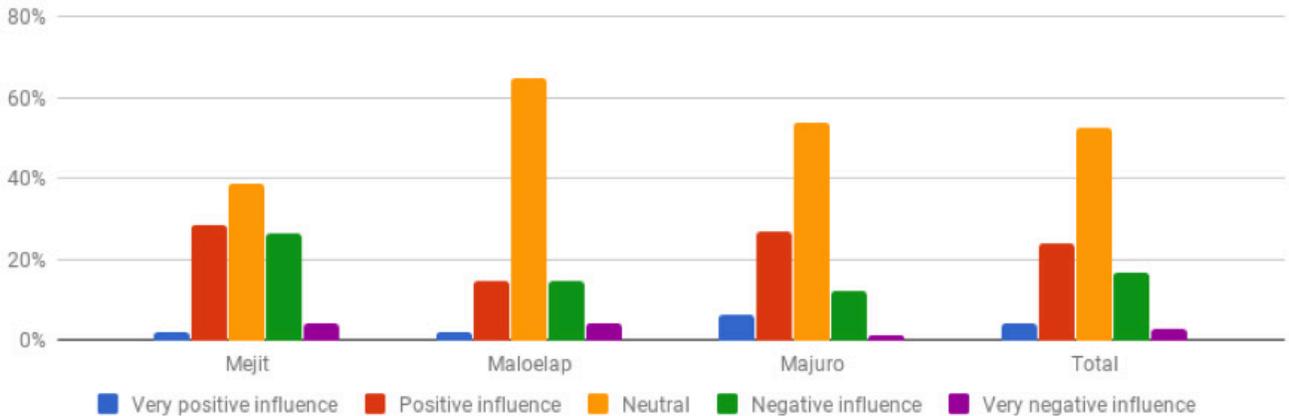
The typical reasons respondents provided for positive evaluations of their relatives' migration were:

1. The support they received from these migrants, particularly money (remittances), clothes, and consumer goods that they would not be able to buy with their own income, such as mobile phones. Many respondents relied on remittances for basic needs. One respondent said:

> "Without the support of my son and daughters I would be dead."
> (R-644, Majuro)

2. Satisfaction with the knowledge that their relatives are better-off where they are now in terms of employment, income, and education. A typical quote among respondents was:

> "I don't have to worry about their future." (R-642, Majuro)

3. Reduced pressure on household foodstuffs, living space, and natural resources. One respondent noted:

> "There are less people in the house so it is easier to provide food for them." (R-115, Maloelap)

4. Having an entry point in the migrants' destination areas. One respondent explained:

> "My sister's home in New York City is a hub for my family to expand our opportunities." (R-55, Majuro)

On the negative side, by far the most common explanation was that respondents missed their migrant siblings and children, and that they sometimes felt lonely without them. Typical quotes were:

> "My son is far away from me and I miss him." (R-627, Majuro)
>
> "I haven't seen my daughter for nine years!" (R-127, Majuro)
>
> "I miss them and feel I am not really part of their life anymore." (R-104, Maloelap)

People felt particularly bad and worried when they had no recent information about the whereabouts and well-being of their close relatives. Many respondents further lamented that they could no longer do some of the things that they typically did with their relatives, such as making handicrafts, copra production, fishing, and playing cards. Another negative social effect of migration that several respondents mentioned was that migrants cannot attend the family gatherings that are so important in Marshallese culture. One respondent mentioned that when migrants die abroad, they are usually not buried at home, which he clearly evaluated negatively.

Besides the social and cultural effects, respondents also mentioned two more practical and economic negative effects. They complained that there was a lack of "hands" for all the tasks in and around the house. Second, several complained that they received no support (remittances) from their migrant relatives.

Insights from the problem-ranking exercise

The problem-ranking exercise, discussed in a previous section, also revealed information about migration impacts. The exercise included a follow-up question for respondents who ranked out-migration in their top-5 of problems affecting their island. While the effects discussed in this section pertain largely to the household/personal level, the information from the problem-ranking module focuses more on the island or national level, providing us with information on a different scale.

A first observation from the problem-ranking exercise is that only a minority (20%) included out-migration in the top-5 of 12 problems facing their islands. Many of those who did rank out-migration in the top-5 of problems simply felt that it is not good for a country or island if the population is reduced. Some lamented specifically that migration propensities are higher among people with a college education, whose skills and knowledge are needed for development. Others highlighted the fact that many houses are abandoned and land is not cared for, which gives their island a deserted look and feel. Another reason for ranking migration in the top-5

of problems was that respondents feared that it would cause a loss of customs and threaten the Marshallese language. Lastly, one person mentioned that migration is increasingly causing land disputes, when people make claims on lands whose former tenants have migrated.

b. Impacts of migration in destination states

This section tries to answer the part of the second research question ("What are the impacts of migration on migrants themselves and their home communities?") that focuses on the migrants themselves. It evaluates the comparative states of well-being in the RMI and in destination states, as reported by Marshallese respondents. The findings draw from a set of questions in the survey asking respondents to compare their current state of well-being in terms of employment, education, health care, housing, and other factors with the situation back home in the RMI, before they migrated. Participants were asked to score each of the indicators of well-being from 1 (low level of well-being) to 5 (high level of well-being). The results are shown in Table 27 (for Hawai'i) and Table 28 (for the Pacific Northwest). Both tables are sorted from the most positive change to the most negative change (see last column). The results are similar for both study sites: Marshallese migrants report the most positive changes in well-being in the areas of employment, health care, welfare, and education. This mirrors the primary drivers for migration (see Chapter 5). Respondents in both destination areas also report substantial improvements in food security compared to their situations at home, before migrating to the U.S. Respondents were more ambivalent or negative about changes in safety, housing, and purchasing power.

Table 27: Changes in well-being scores: Before and after migration to Hawai'i

	Well-being score in RMI (home)	Well-being score in Hawai'i (destination area)	Change
Health care	1.9	4.1	+2.2
Social services	1.8	3.7	+1.9
Employment	2.3	3.9	+1.6
Education	3.1	4.4	+1.4
Food security	3.2	4.2	+1.0
Safety	4.0	4.1	+0.1
Purchasing power	3.3	3.2	-0.2
Housing	4.3	3.4	-1.0

Table 28 : Changes in well-being scores: Before and after migration to the Pacific Northwest

	Well-being score in the RMI (home)	Well-being score in the Pacific Northwest (destination area)	Change
Employment	2.1	4.3	+2.2
Health care	2.2	4.1	+2.0
Social services	1.9	3.6	+1.7
Education	3.1	4.6	+1.5
Food security	2.8	4.2	+1.3
Purchasing power	3.0	3.6	+0.6
Housing	3.8	3.7	-0.2
Safety	4.4	3.8	-0.6

In the sub-sections below, some more detail is provided about the current living conditions and performance of Marshallese migrants. There are sub-sections about employment and income, remittances, health care, education, food security, housing and homelessness, and access to social services.

i. Employment and income

Generally, respondents noted an improvement in their employment and income after migrating to the U.S. When comparing the RMI to destination states, 53.85 percent of interviewees in the Pacific Northwest rated an improvement in their economic situation, in comparison to 77.5 percent in Hawaiʻi. In Hawaiʻi, 12.5 percent of the sample group is unemployed. Only 2.56 percent of the cohort in Oregon and Washington self-identified as unemployed. However, roughly a third of participants in the Pacific Northwest faced barriers in finding employment—including language barriers, issues writing a resume, non-applicable work experience, lack of a commercial driving license, and lack of U.S. citizenship. An Oregon-based interviewee commented:

> "We are employed in canneries and food-packing industries. We move for better jobs and better pay." (R-233, Oregon)

Types of employment were predominantly low-salary private employment in providing care for the disabled and the elderly, work in canning factories, and as supermarket cashiers. In comparison, respondents on the Big Island and Oʻahu were more likely to engage in seasonal farm employment and serve at fast-food restaurants. In the Pacific Northwest, 64 percent of those interviewed faced challenges at work, including language barriers, low pay, disrespect or discrimination, toxic exposure, or long hours.

Self-reported annual household incomes were slightly higher in Hawaiʻi than in the Pacific Northwest. For both areas, the median income was in the $25,000–$35,000 bracket, but the distribution was less equal in Hawaiʻi, where more than a third of the respondents earned more than $50,000, while 22.5 percent earned less than $15,000. By contrast, in the Pacific Northwest, a majority of households were in the middle-income brackets, between $15,000 and $35,000 (see Table 29).

Table 29: Estimated annual average income in the two destination areas

	Hawaiʻi	Pacific Northwest
1=Less than $5,000	2.5%	2.8%
2=$5,000–$15,000	20.0%	8.3%
3=$15,000–$25,000	15.0%	27.8%
4=$25,000–$35,000	12.5%	30.6%
5=$35,000–$50,000	15.0%	11.1%
6=More than $50,000	35.0%	19.4%

ii. Remittances

A majority of respondents in the U.S. were able to send remittances to their relatives in the RMI. In Hawaiʻi, 70.0 percent sent remittances, and 84.6 percent in the Pacific Northwest did so. Remittances are used primarily for food, daily needs, and, in the case of Hawaiʻi, to purchase passports or plane tickets (see Table 30). Remittances tend to increase after annual tax refunds are received in the U.S. This plays an important role in the economy of the RMI and the funding of future migration from the RMI. Several respondents noted that they send additional remittances after economic and environmental shocks. Remittance-receiving households in the Marshall Islands would arguably have stronger cash reserves in order to cope with times of uncertainty, such as more stable housing structures and access to mobile phones. Remittances can thus play a role in building resilience against a stagnant economy and climate shocks.

Table 30: Use of remittances by relatives in the RMI

	Hawaiʻi	Pacific Northwest
To buy food	65.0%	59.0%
To pay for other daily needs	40.0%	38.5%
To pay for passport or plane tickets	37.5%	7.7%
To pay school fees	30.0%	12.8%
To buy clothes and other goods	22.5%	17.9%
To invest in housing	10.0%	17.9%
To pay hospital bills	15.0%	10.3%
To stockpile items in view of prolonged period of drought or food insecurity	10.0%	0.0%
To invest in economic activities	7.5%	0.0%

Most respondents in each of the two destination areas perceived that their migration had a positive or very positive influence on the economic situation and well-being of family members in the RMI. The perceptions of migrants about the impact of their migration on the family at home is substantially more positive than the perception of respondents in the RMI, as reported in the first part of this chapter.

Table 31: Perceived influence on economic situation and well-being of family back home

	Hawaiʻi	Pacific Northwest
1=Very positive influence	22.5%	17.9%
2=Positive influence	50.0%	48.7%
3=Neutral	15.0%	25.6%
4=Negative influence	10.0%	5.1%
5=Very negative influence	0.0%	0.0%

iii. Access to health care

Respondents in Hawaiʻi and the Pacific Northwest perceived a substantial improvement in access to quality health care after migrating to the U.S. Survey results indicate that a primary driver of Marshallese migration is access to health care. The 1986 Compact of Free Association (COFA) enabled most RMI citizens to access the same health benefits as U.S. citizens. However, in 1996, the national Personal Responsibility and Work Opportunity Reconciliation Act removed COFA immigrants' eligibility for federal benefits, including Medicaid, despite being subject to state, federal, and local taxes.[27] In 2015 in Oregon, a state-sponsored health bill established funding for an office within the Oregon Health Authority to promote equitable access to health care for Pacific Islanders legally residing in the United States under COFA.[28] The result was the COFA Oregon Health Plan, which is not a Medicaid program, but a Medicaid-equivalent program.

> "We have extreme health issues. I think this is because of the Bravo shot, the nuclear testing, and radiation. Our hospitals are overpopulated, we have low numbers of staff, and no equipment. The care is very poor." (R-149, Hawaiʻi)

Lack of English proficiency and prominent cultural differences in communication style may impact the ability of Marshallese migrants to navigate a complex health care system. For instance, Pobutsky et al. (2005: 59) have noted that with "differing expectations [held] by providers and patients, serious compliance issues arise such that health care providers almost uniformly regard Micronesians as 'difficult' patients." Despite these perceived difficulties, most survey respondents noted a substantial improvement in terms of access to health care, compared to the situation in the RMI.

iv. Education and English proficiency

Respondents in Hawaiʻi and the Pacific Northwest perceive substantial improvements in education. On average, respondents in Hawaiʻi attain a higher level of education than their counterparts in the Pacific Northwest, perhaps due in part to educational scholarships offered for relocation to Hawaiʻi. In Hawaiʻi and the Pacific Northwest, the majority of interviewees self-identified as English speakers. Even with English proficiency, however, Marshallese migrants may experience barriers to educational integration, to the health care they seek, and to more general cultural assimilation.

Among interviewees, 75 percent and 62 percent self-identified as English speakers in Hawaiʻi and Oregon, respectively. In Hawaiʻi, 65 percent of the group who are able to speak English continue to experience barriers and challenges, suggesting that language is not the only limiting factor. Interviewees from the education

27   http://salemweeklynews.com/2015/02/pacific-islanders-seek-health-justice/

28   https://olis.leg.state.or.us/liz/2015R1/Measures/Overview/HB2522

sector in Hawai'i commented upon challenges in assimilation and cultural discrimination. The Marshallese have "highly distinctive cultural values and social organization [that] can leave the Marshallese vulnerable to misunderstandings"[29] with the host country.

In Washington, the Spokane Public School systems report[30] that Marshall Islanders are one of the fastest-growing ethnic groups in Spokane County, with a reported 370 Marshallese speakers in their school system as of 2006. In Washington, Spokane refugee assistance agencies estimate that the local population of Marshallese is the third largest, below Russians-Ukrainians and Latinos. Organizations affiliated with the Marshallese community state that barriers to integration include language and the test-driven, time-bound nature of the American school system.

v. Food security

Respondents living in Hawai'i and the Pacific Northwest also perceive improvements in food security compared with their previous residence in the RMI. Respondents highlight a triad of issues that contribute to food insecurity in the RMI: a weakening of agricultural practices, a reliance on food imports, and a resultant increase in the prevalence of obesity and diabetes among islanders. These tenets are framed by environmental changes, including those that issue from the nuclear legacy, which contribute to the alteration of traditional farming practices and continued environmental degradation from pollutants leaked from the army base at Kwajalein Atoll. As one O'ahu participant stated:

> "We cannot grow food like our ancestors. Our soil is salty. Some cannot afford food from the store. The food in the store is mainly rice and tinned foods.
> (R-239, Oregon)

The reduced availability of traditional food sources and subsistence fisheries makes it increasingly difficult for the Marshallese to sustain their connection to their environment and "their unique set of customs, beliefs, and languages."[31] The consumption of non-contaminated, "safe" U.S imports of canned and processed foods lessens the dependency on smallholder subsistence farming and impacts the health of consumers.[32] One respondent stated:

29   Duke, 2014. "Marshall Islanders: Migration Patterns and Health-Care Challenges." Available at https://www.migrationpolicy.org/article/marshall-islanders-migration-patterns-and-health-care-challenges.

30   http://www.spokesman.com/stories/2012/mar/04/marshallese-making-a-new-life-in-spokane/#/0

31   Keener et al., 2012.

32   Interview with Chad Blair, Monday, June 20, 2016.

> "We depend on imported food. This affects our health and we migrate to U.S. for health services." (R-122, Hawai'i)

vi. Housing and homelessness

In the Pacific Northwest, 33 percent of respondents reported an improvement in their housing situation compared to when they lived in the RMI, while 26 percent stated that their housing situation was worse. The rest (41%) perceived no major changes in the quality of their housing. In Hawai'i, the improvement statistic is somewhat stronger, with 47.5 percent of respondents noting an improvement (see Table 32). A majority of Marshallese migrants rent their accommodation. In both destination areas, on average, households comprised of roughly six to seven people. Household sizes of Marshallese migrants are increasing in size in Hawai'i according to census data, and are the largest average households in Hawai'i according to a recent demographic report.[33] Further, access to housing is a persistent problem for Marshallese migrants in Hawai'i. This is due to high rent prices (Hawai'i), which have fueled homelessness. In the Pacific Northwest, the problem is the high cost of heating bills.

Table 32: Housing characteristics of Marshallese migrants

	Hawai'i	Pacific Northwest
% who perceived an "improved" housing situation compared to when they lived in the RMI	47.5%	33.3%
% currently "live in rented property"	72.5%	84.62%
Average years at current residence	7.77	3.4
Average persons per household	6.68	6.41
Average number of rooms occupied	3.44	2.83

National media has primarily covered the issue of homeless among Marshallese populations in Hawai'i.[34] Department of Human Services Deputy Director Pankaj Bhanot states that 1,150 COFA migrants are homeless in the state of Hawai'i, with 933 on O'ahu, specifically the area of Kaka'ako.[35] As of 2015, the Department of Health workers have been mapping the growth of tent encampments in the area. Housing services in O'ahu and

33 Demographic, social, economic, and housing characteristics of 14 groups in the state of Hawai'i categorized as "race alone and in combination with one or more other races," using data collected by the U.S. Census Bureau. Statistics in this report are based on the selected population data from the American Community Survey for data collected between 2011 and 2015, page 39.

34 *The Washington Times*, accessed April 21, 2017, at http://www.washingtontimes.com/news/2015/may/13/homeless-migrants-from-former-nuclear-test-sites-c/.

35 Mileka Lincoln, "State Officials: Majority of Kaka'ako Homeless Are COFA Migrants," accessed April 21, 2017, at http://www.hawaiinewsnow.com/story/29049224/state-officials-majority-of-kakaako-homeless-are-cofa-migrants.

Next Step Shelter[36] officials say they are "nearly always at capacity, with 30 percent of their clients being COFA migrants." The Hawai'i Appleseed Center for Law and Economic Justice reports that in a 2011 study, COFA citizens were exposed to "both blatant and subtle housing discrimination" with regard to housing allocation.[37]

vii. Access to social services

Respondents in the two destination areas note substantial improvements in access to social services when they move to the U.S. In Hawai'i, 42.5 percent of respondents report that they received government welfare, and in the Pacific Northwest, 52.5 percent received support (see Table 33). Food stamps, child benefits, and low-income housing initiatives are key support systems for lower-income households with young families. Furthermore, one out of every five respondents in Hawai'i had received an education scholarship.

Table 33: Social and financial support

	Hawai'i	Pacific Northwest
% received support from government	42.5	52.5
% received education scholarship	20.0	7.7

Interviewees voiced a lack of preparedness to come to the U.S., and significant language barriers when relocating. A respondent expressed the difficulty this way:

"There's no services that prepares us to come into Hawai'i, like how to fill out important forms in order to get a job, filling out social security forms, forms to enroll to health care[...]. We don't have services that gets Marshallese migrants ready in order to move here." (R-114, O'ahu)

Source: Kees van der Geest

36   Next Step Shelter website, accessed April 22, 2017 at http://waikikihc.org/locations/nextstep/.

37   Hawai'i Appleseed Center for Law and Economic Justice Policy Brief, Systemic Barriers to Self-Achievement and Economic Security for Compact of Free Association Migrants in Hawai'i, accessed April 22, 2017 at http://www.hicore.org/media/assets/COFA_Report.pdf.

7. Identifying shared views on climate change, ecosystem services, habitability, and migration

This chapter contributes to answering the project's third research question: Which shared views on climate change, environment, migration, and future habitability can be distinguished within the study population?

a. Q-analysis: The RMI

In order to gain a deeper understanding of the range of attitudes and perceptions on migration and the impacts of climate change on island ecosystems, livelihoods, and future habitability, the research included a Q-study. Q is a method for investigating opinions and shared views on a particular issue by statistically analyzing participants' ranking of statements about the topic (Oakes, 2019). We conducted the Q-study with the same respondents who completed the household survey. This enables an analysis of attitudes and perceptions among different categories of the survey population (e.g., men and women, young and old, migrants and non-migrants, poorer and richer households, and inhabitants of the main island and outer islands).

The purpose of Q-methodology is to identify a certain number (typically 3, 4, or 5) of shared views on a topic within a target population. This is important for policy-makers, as people's perceptions of societal problems, environmental risk, and other issues influence how they respond to legislation and incentives (Eden et al., 2005; Oakes, 2019). Q-analysis uses Principal Component Analysis to find correlations between respondents in terms of how they rank-order a set of statements—from "strongly disagree" (-5) to "strongly agree" (+5)—and through this process the groups are identified. The Q-study for the Marshall Islands Climate and Migration Project is comprised of a total of 40 statements, addressing the following topics:

- Migration drivers
- Impacts of migration
- Migration intentions
- Climate indicators/trends
- Impacts of climate change
- State of ecosystem services
- Expectations of future habitability
- Development and well-being
- Marshallese culture and social cohesion

The Q-study interviews involve three steps, which are explained in more detail in Text Box 4:

- Step 1: The respondent divides the set of 40 statement cards into three piles: (i) agree, (ii) don't agree, or (iii) neutral;
- Step 2: He or she sorts the cards in the Q-method pyramid, placing one card in each cell (see figure);
- Step 3: The interviewer asks questions about the extremes (-5, -4, +4, +5) in the final sorting.

Text Box 4 is an excerpt of the household questionnaire, with instructions to the interviewer and respondents about how to conduct the Q-sorting.

Text box 4: Instructions about how to conduct a Q-interview (excerpt from the questionnaire)

1) Start by explaining to the informant what we are going to do, and read out a few of the numbered statement cards so that the informant has an idea about what kind of statements there are.

2) Ask the respondent to place the cards on 3 piles: agree, disagree, and neutral. Before starting with the actual statements, practice a bit with fictional statements (e.g., 1+1=3; "my shirt is green"). The "neutral" pile can mean things like "I don't know," "I don't care," or "I agree only partially."

3) When all statements have been assessed, indicate in the table below which numbers went in the three piles. Cross-check once to be sure the numbers are entered correctly.

Agree																			
Neutral																			
Disagree																			

4) In the next step, all 40 cards are placed on the grid (see below) that you have drawn on a flipchart. Start by placing the cards in the "agree" pile onto the grid, one card per cell. The stronger the feeling about the statement (very much agree), the more the card should go to the extreme right. After that, do the same with the "disagree" cards and then the statements that respondents felt "neutral" about. The respondent can shift cards in the process.

5) If there is a large difference between the number of "agree" and "disagree" cards, then the respondent will have to shift the cards accordingly (so, an "agree" card could end up in the "neutral" part of the grid).

6) When the respondent has finished placing all cards on the grid, the numbers should be copied to the grid in this questionnaire form. Cross-check once to be sure numbers are entered correctly.

Disagree most					Neutral				Agree most	
-5	-4	-3	-2	-1	0	1	2	3	4	5

7) Lastly, ask the respondent some follow-up questions, focusing on the extremes (agree most and disagree most).

  a. Why do you "agree most" (+5) with the statement on card .... [fill in card number]? Why do you feel so strongly about it?

  b. Why do you "disagree most" (-5) with the statement on card .... [fill in card number]? Why do you feel so strongly about it?

  c. Why do you agree strongly (+4) with the statement on card .... [fill in card number]? Why do you feel so strongly about it?

  d. Etc.

The Q-findings presented have three parts. The first part is a descriptive analysis that considers the Q-sorts of all respondents together. It shows their level of agreement and disagreement with the 40 statements. In the second part, a statistical procedure (Principal Component Analysis) is used to divide the sample into separate groups who share common views on the key themes of this research. The section describes the groups' views and studies the key differences between the groups. In the third and final step of the analysis, a connection is made between the Q-study results and key variables from the questionnaire survey. This shows us which respondents (young, old, men, women, higher or lower educated, Majuro or outer island inhabitants, etc.) have different kinds of views on climate change impacts, ecosystem services, future habitability, and migration. This section also includes a spatial analysis of the Q-groupings with GPS locations of the households. The aim of that analysis is to explore whether there are geographic patterns in respondents' views. Examples of such patterns could be spatial clusters of respondents with similar views, or differences between ocean-side and lagoon-side atoll dwellers.

Picture 8: Close-up of Q-grid
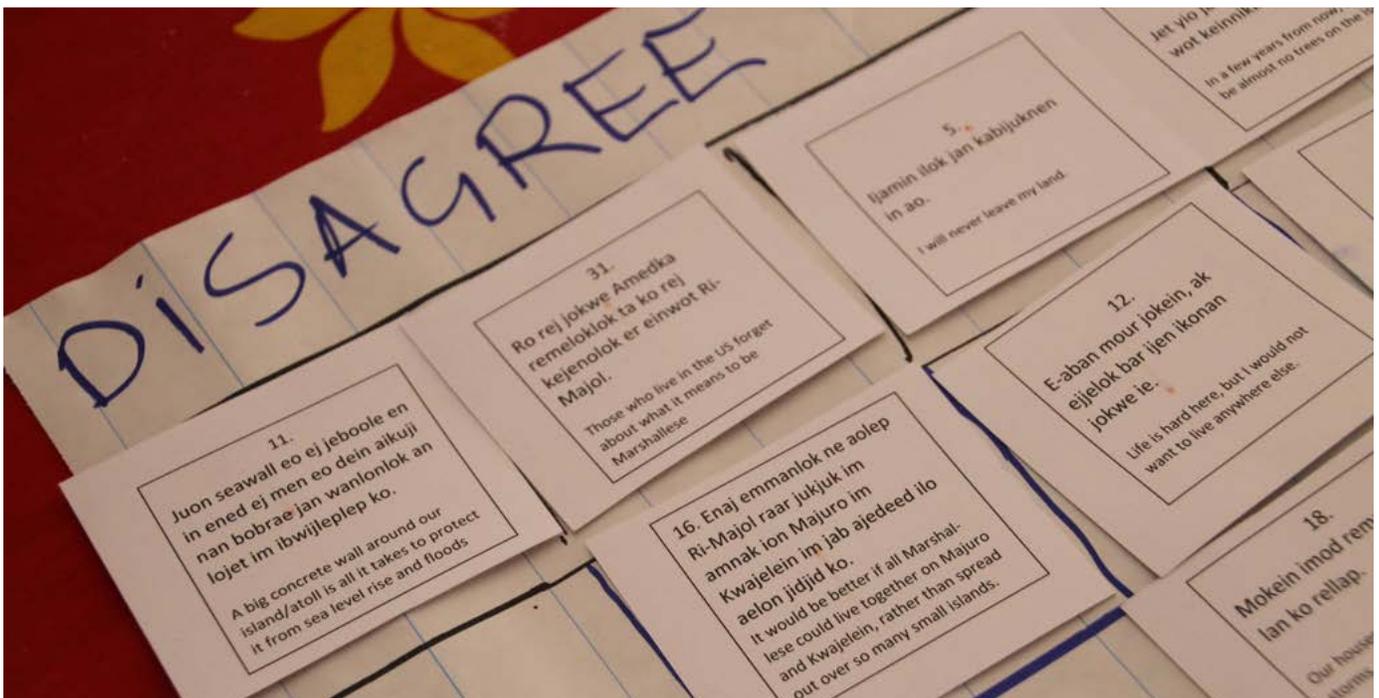
Source: Kees van der Geest

i. Descriptive analysis of the whole sample in the RMI

We first analyze how the sample of almost 200 respondents in the RMI ranked the 40 statements. We look at averages and distribution to discern the statements that elicited most and least agreement. The distribution analysis gives us information about the level of consensus on the statements. Clearly, the set of 40 statements included some that were more polemical than others. Reporting on Q-analysis often omits this step of presenting results for the overall sample, but these data contain valuable insights about how most people think about the key themes of this research.

Figure 23: Q-sort grid with the average responses for the whole sample

Strongly disagree			Disagree		Neutral	Agree		Strongly agree		
-5	-4	-3	-2	-1	0	1	2	3	4	5
Our houses can withstand heavy storms.	There is enough work on the island.	Reefs are healthy; no need to worry about climate change.	In 50 years, this island will be uninhabitable.	Without money from migrants, life would be hard here.	I am afraid to leave the island.	I don't want to live anywhere else.	The problem is lack of schools, clinics, infrastructure.	Lack of fresh water is the main problem.	Most migrate for better education.	People migrate to the United States for health care.
	Salinity is no problem; water and crops are okay.	Better if all Marshallese lived on Majuro and Kwajalein.	Quality of life has improved.	Storms and floods are of all times; not climate change.	US migrants loose Marshallese identity.	Migration of the educated undermines development.	With support, there are solutions to all challenges.	No worry about future; God takes care of us.	High tides and storms more frequent.	
		Good if people migrate; reduces population pressure.	If I had enough money, I would move abroad.	Only rich people can migrate abroad.	Climate change is God's punishment for our sins.	Big wall around the island enough to protect against sea-level rise.	I will never leave my land.	We have to stay together as a community.		
			No solution to sea-level rise; all have to leave.	I want to move to a place with better opportunities.	In the world, nobody cares about the future of the Marshall Islands.	Majuro and Kwajalein are overcrowded; can't fit more people.	Life in the Marshall Islands is better than in the United States.			
				Marshallese in the United States have pleasant lives.	Migration threatens our unique culture and lifestyle.	Short-term migration better than permanent migration.				
				In few years, there will be no trees on the island.	Good if youth leave so they send money to family.	Government does all it can do to improve the Marshall Islands.				
					Never heard of Marshallese migrating due to climate change.					
					Fishermen will suffer; no fish in the sea.					

The inverted pyramid (Figure 23) shows the average sort for the whole sample, and Figure 25 shows the distribution of responses in percentage quartiles for each of the 40 statements. Figure 25 groups the statements in thematic areas, and within each theme group the statements are ranked in order of agreement. Based on these two figures, we are able to describe the general patterns in the Q-study findings, with a focus on the key themes of the research project (environmental change, ecosystem services, future habitability, drivers of migration, impacts of migration). In the inverted pyramid, statements situated toward the extreme left and right are issues about which people had strong opinions. Toward the center are the statements that people are less outspoken or more uncertain about. The pyramid in Figure 23 reveals important insights into how respondents perceive the key themes of the research, as described below.

Climate change and ecosystem services: Respondents are concerned about impacts of climate change on their island ecosystems. They identify salinity and lack of freshwater as key problems, and are worried about the health of the coral reefs surrounding their islands.

Preparedness: Respondents do not think that they are well-prepared for climate change and extreme weather events right now. For instance, the statement with which people disagreed most strongly was, "Our houses can withstand heavy storms."

Future habitability: However, respondents also strongly resist the idea that they will be forced to leave their islands because of climate change in the future. They generally disagreed with the two statements about habitability, which stated that the islands will not be habitable in the future.[38] Most respondents are hopeful that between now and a future in which climate change poses an even bigger threat, there will be solutions. On average, respondents were mildly positive about the role that their government is playing.

Migration drivers: Respondents perceive seeking better education and health care to be key reasons to migrate. In addition, lack of employment is an important push factor. A majority of the respondents disagreed with the statement that the quality of life on their island had increased compared to when their parents were young. This does not necessarily mean that the quality of life has declined in reality (there are strong indications that, for example, the level of education, health care, and infrastructure is much better now than in the past), but dissatisfaction with the quality of life in the RMI may be an important factor in migration decisions.

Figure 24: Respondent views on Q-statements about climate migration in the RMI

"I never heard of Marshallese migrating due to climate change"
— Average distribution
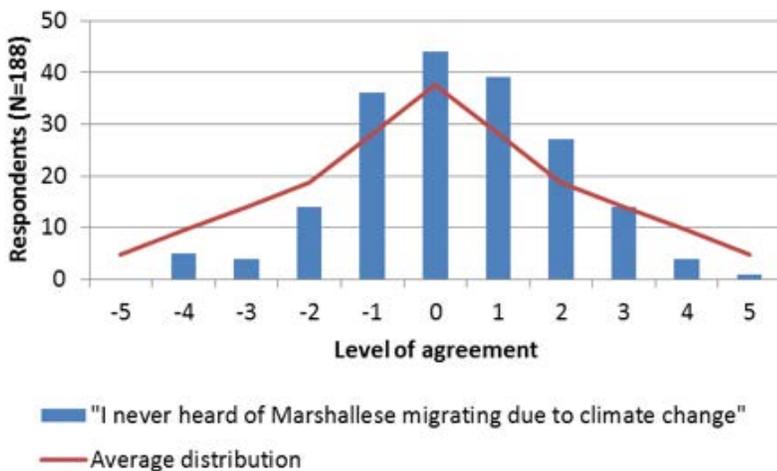
The set of Q-statements included one statement that directly addressed the question of whether people from the Marshall Islands have already migrated because of climate impacts. It was phrased as follows: "I have never heard of any Marshallese migrating because of climate change." Almost half the respondents (45%) agreed they had never heard of Marshallese migrating due to climate change. Respondents on Majuro agreed with the statements more often than respondents on Mejit and Maloelap. Almost a third

....

38 Both "future habitability" statements are in the -2 column of the inverted pyramid. The full statements are: "Within 50 years it will no longer be possible to live on this island" and "In the long term there is no solution to sea-level rise, and we'll all have to leave this island."

of the respondents (31%) disagreed with the statement, but most "disagree" sorts were under the -1 column, indicating only slight disagreement or even neutrality. Very few respondents (2.7%) disagreed strongly with this statement, and thus thought that climate-induced migration is already a reality for some in the Marshall Islands. Figure 24 compares respondents' sorts on this statement (blue bars) to the average distribution (red line). It shows that people tended to place the "climate migration" card more toward the center of the pyramid. This is an indication that while people are concerned about climate change, climate-induced migration is not yet something that they have strong opinions about. It could also mean that they are uncertain whether climate is a driver of migration.

Migration impacts: Respondents were quite divided, but slightly more negative than positive, about impacts of migration on migrants themselves, their relatives at home, and the Marshall Islands in general. They think that the migration of educated people undermines development in the RMI, and many question the potentially positive role migration plays in generating remittances. Also, many respondents viewed migration as a threat to Marshallese culture. They are more in favor of temporary migration than permanent migration—for example, in the pursuit of education, health care, and short-term employment. This generates benefits without the associated social and cultural costs.

Source: Kees van der Geest

Figure 25: Distribution of level of agreement on 40 Q-statements grouped by theme

For each statement, the figure shows the quartiles. The blue and green boxes are Q2 and Q3, the line inside the box is the median and the black lines depict Q1 and Q4.

Average level of agreement: from 'strongly disagree' (-5) 'to strongly agree' (+5)
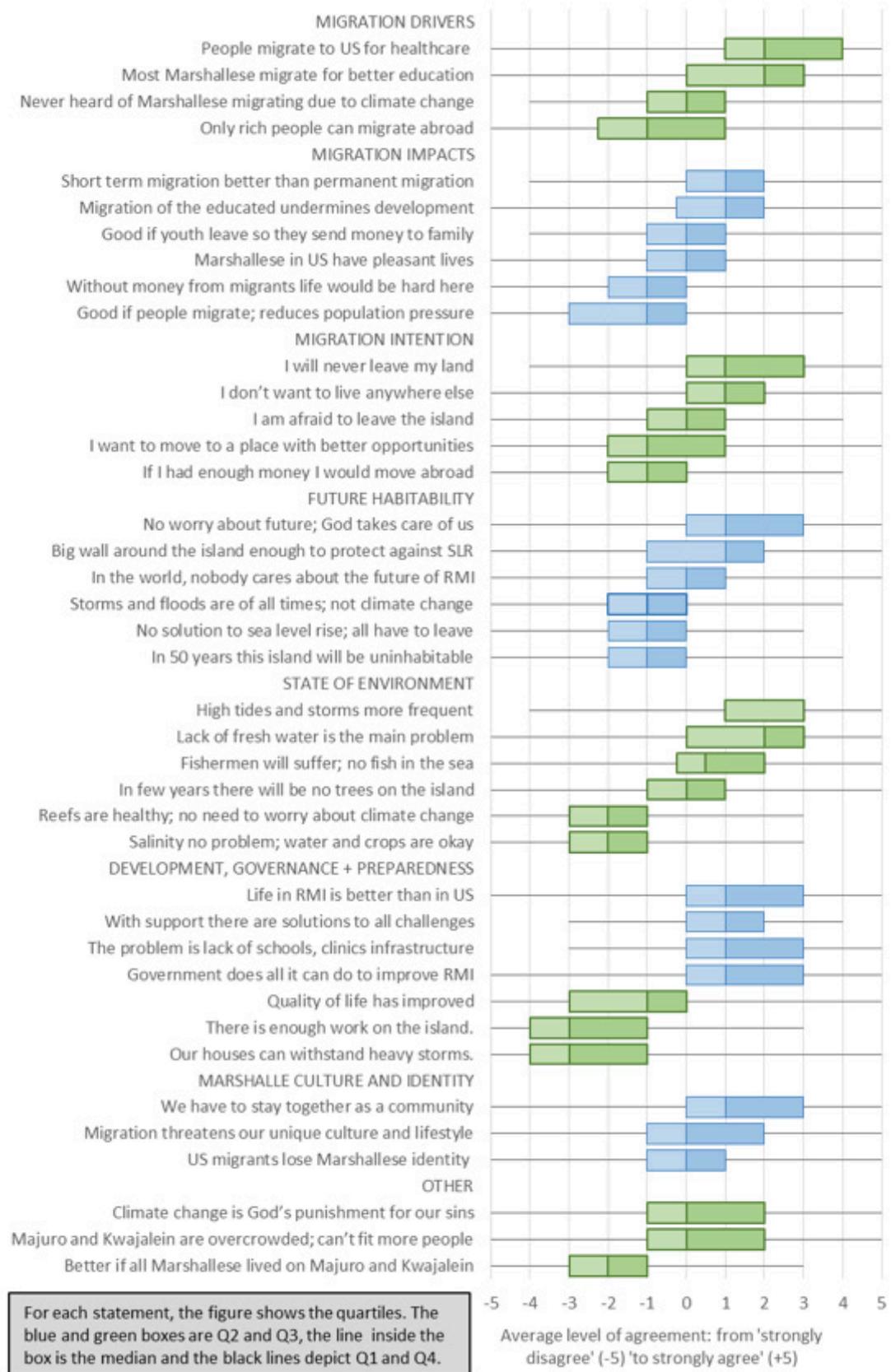
Several differences were discernible in the way respondents sorted the Q-statements in the three study sites. All differences between islands, highlighted in the list below, were significant at the p<0.05 level (tested with ANOVA). The statements upon which each point of differentiation below are based are mentioned in parentheses.

1. On Maloelap, respondents were less convinced that people migrate to the U.S. primarily for health care (S25) and education (S13). They were also more skeptical about the positive effects of migration through remittances (S10), and they were more inclined to think that migrants lose their Marshallese identity (S31).

2. On Majuro, people do not agree that only the rich can migrate (S15). On three different statements about migration intentions (S3, 19, 22), respondents from Majuro indicated they were more inclined to move to a different place than respondents on Mejit and Maloelap.

3. Most people were neutral about the statement "I never heard of Marshallese migrating due to climate change" (S33), but more people on Majuro agreed with this statement, which means that they are more skeptical about the existence of climate "refugees" or climate-displaced people in the RMI.

4. On Majuro, people are more critical of the government (S17), and they also do not trust that God will take care of them (S04), but they are less skeptical than people on Maloelap and especially Mejit about the role of the international community (S32).

5. On Maloelap, respondents were most convinced that "Life in the RMI is better than in the U.S." (S1), and they were the least concerned about lack of schools, clinics, and infrastructure (S38).

6. A last, somewhat surprising finding is that respondents on the island of Mejit agreed less with the statement "A big wall around the island is enough to protect against SLR (sea-level rise)" (S11) than people on the atolls of Majuro and Maloelap, where building such a wall would be more problematic due to much longer coastlines than on Mejit. A possible explanation is that people on Mejit generally have less confidence that "with the right support there are solutions to all challenges" (S23).

ii. Identifying shared views with PCA and Varimax rotation

In this section, we discuss the process of how the sample of respondents was divided in groups with similar views on the research topics, and the results of this process. While we interviewed a total of 199 respondents, and conducted the Q-sort exercise with all of them, the analysis included only 188 respondents. Eleven Q-sorts were dismissed because of inconsistencies. Data entry for the Q-sorts was first done in Microsoft Excel, and then exported to the software we used for identifying the groups, Ken-Q Analysis.

We used Principal Component Analysis and Varimax rotation to divide the sample of respondents into 2, 3, 4, 5, and 6 groups, each based on how they sorted the statements. For each division, we carefully compared the results in terms of how clearly the groups differed from each other, how well different views in the total sample

were represented, and how many respondents fit within one of the groups. The best results were obtained with three groups—158 out of the 188 respondents (84%) with valid Q-sorts fit within one of the three groups.

iii. Description of the three Q-factors and key differences between the groups

The three groups of respondents that shared similar views on the statements are as follows:

1. **Migration critics ("Happy where we are"):** Respondents in this group are satisfied with the quality of life, development, governance, and security in the RMI. They are clear about not wanting to move, and are very critical about the impacts of migration, both in the RMI and for migrants themselves. Although they are happy with life as it is now, they do worry about the future of their islands.

2. **Adaptation optimists ("In God and the world we trust"):** This group is more critical about the quality of life in the RMI, and especially the lack of employment. However, they are quite optimistic about the future of their islands. "God will take care of us" was one of the statements they most agreed with, and they also put more trust in the international community. They do not perceive the problems and risks that the other groups do, and answered more optimistically about future habitability, climate risk preparedness, and the level of adaptive capacity. They do not oppose migration, and think it can be part of the solution, but they are critical about the impact of migration on Marshallese culture.

3. **Island pessimists ("Emigration is the best option"):** Respondents in this group are clearly dissatisfied with life in the RMI, and have a strong desire to move to a different place, preferably the U.S. Members of this group are very critical about changes in the quality of life, governance, development, and livelihood security in the RMI, and they question the future habitability of their islands. They see migration to the U.S. as the best or the only option, and are very positive about the impacts of migration, emphasizing its benefits and downplaying adverse effects.

As is clear from the group descriptions, the views of the three groups diverged on important issues. This section describes the main differences between the groups, building on Table 34.

Differences between migration critics and island pessimists: The clearest inter-group difference is between migration critics (no. 1) and island pessimists (no. 3). The former are happy where they are and do not want to move anywhere else. The opposite is true for the latter, who are very negative about life in the RMI and for whom emigration is the best option. Migration critics are very negative about the impacts of migration, while island pessimists only see the benefits. Another difference is that migration critics refuse to believe that their islands will become uninhabitable and that they might have to leave some day. In the eyes of island pessimists, this is a more realistic scenario.

Table 34: Differences between Q-groups

Statements (in descending order of z-score variance)	Migration critics	Adaptation optimists	Island pessimists
I want to move to a place with better opportunities	-3	2	2
I will never leave my land	5	0	-1
People migrate to the U.S. for health care	1	5	5
Life in the RMI is better than in U.S.	3	1	-1
Migration of the educated undermines development	2	-2	2
Fishermen will suffer; no fish in the sea	1	-1	3
In the world, nobody cares about the future of the RMI	1	-2	1
Our houses can withstand heavy storms	-5	-1	-5
Good if people migrate; reduces population pressure	-3	-3	0
No worry about future; God takes care of us	2	4	0
I don't want to live anywhere else	1	0	-2
Majuro and Kwajalein are overcrowded; can't fit more people	2	-1	2
Government does all it can do to improve the RMI	3	0	-1
U.S. migrants lose Marshallese identity	0	2	-1
If I had enough money, I would move abroad	-3	0	0
Marshallese in U.S. have pleasant lives	-1	0	2
Only rich people can migrate abroad	-1	-4	-2
The problem is lack of schools, clinics, infrastructure	0	3	4
Lack of freshwater is the main problem	4	0	3
In 50 years this island will be uninhabitable	-2	-3	0
Good if youth leave so they send money to family	-1	1	3
No solution to sea-level rise; all have to leave	-1	-1	0
Most migrate for better education	1	3	4
High tides and storms more frequent	3	4	1
There is enough work on the island	-2	-5	-4
In a few years there will be no trees on the island	0	-2	1
We have to stay together as a community	4	3	1
Big wall around the island enough to protect against sea-level rise	0	2	1
I am afraid to leave the island	0	0	-2
Migration threatens our unique culture and lifestyle	0	1	-1
Climate change is God's punishment for our sins	0	1	0
With support, there are solutions to all challenges	2	2	1
Short-term migration better than permanent migration	1	1	0
Quality of life has improved	-1	-1	-4
Storms and floods are of all times; not climate change	-2	-1	-2
Without money from migrants, life would be hard here	-1	0	-1
Reefs are healthy; no need to worry about climate change	-2	-4	-3
Better if all Marshallese lived on Majuro and Kwajalein	-4	-2	-3
Salinity no problem; water and crops are okay	-4	-3	-3
Never heard of Marshallese migrating due to climate change	0	1	0

Differences between migration critics and adaptation optimists: While migration critics are clearly negative about migration, and island pessimists are clearly positive about migration, adaptation optimists see advantages as well as disadvantages, also with regard to the option of migrating themselves. Another difference between migration critics and adaptation optimists is that the former are more worried about the future and about environmental problems, such as lack of freshwater, salinity, and future fish stocks. The latter are more focused on current employment and development issues, and trust that there will be a solution for most future environmental problems.

Differences between adaptation optimists and island pessimists: The main difference between adaptation optimists and island pessimists is their divergent view on the problems the RMI faces and the ability to adapt. This involves future habitability of the islands, but also more current issues. Island pessimists mainly see problems, and they think that migrating to the U.S. is the only way to a better life. By contrast, adaptation optimists do not see some of the problems and tend to have a quite positive outlook.

iv. Characteristics of Q-group members

In this section, we take a closer look at the relationship between Q-group membership (whether a respondent is in the group of migration critics, adaptation optimists, or island pessimists) and key socioeconomic indicators, such as gender, age, education, religion, income, and migration history. We begin by looking at how Q-group membership differed between respondents from our three study sites: the capital Majuro, the outer island Mejit, and the outer atoll Maloelap.

Geography

Interesting and significant differences were found with regard to the relationship between Q-group membership and the island on which the respondents lived at the time of the interview. Particularly interesting is the case of Maloelap, where a relatively large number of people were part of the "migration critics" group who are satisfied with life in the RMI and critical of migration (Group 1: "migration critics"). On Majuro, relatively few respondents were in the group of migration critics, and many were among the "adaptation optimists." On Mejit, relatively few respondents were among the group of adaptation optimists.

Table 35: Proportion of Q-group membership by island

Island	Migration critics	%	Adaptation optimists	%	Island pessimists	%	Total	%
Mejit	21	61.8%	5	14.7%	8	23.5%	34	100%
Maloelap	32	74.4%	9	20.9%	2	4.7%	43	100%
Majuro	29	35.8%	34	42.0%	18	22.2%	81	100%
Total	82	51.9%	48	30.4%	28	17.7%	158	100%

Differences significant at 0.01 level (Chi-square).

Socio-demographic indicators

In this subsection, we look at key socio-demographic indicators, such as gender, age, education level, and religion.

Gender

Relatively more men are among migration critics, and relatively more women are adaptation optimists and island pessimists, but the differences are not significant (tested with Chi square). Gender does not influence factor loading.

Table 36: Q-group membership by gender

Gender	Migration critics	%	Adaptation optimists	%	Island pessimists	%	Total	%
Male	60	56	30	28	17	16	107	100
Female	22	44	18	35	11	22	51	100
Total	82	52	48	30	28	18	158	100

Differences significant at 0.01 level (Chi-square).

Age

The age composition of the three Q-groups shows that, on average, adaptation optimists are younger (36 years) than the other two groups, which had the same age on average (41). Only the age difference between "migration critics" and "adaptation optimists" is significant (at >0.05 level, tested with ANOVA).

- Migration critics: 41.1 (average)
- Adaptation optimists: 35.7 (average)
- Island pessimists: 40.8 (average)

Education

In the group of migration critics, a relatively large number have a low level of education. By contrast, almost no "adaptation optimists" have low levels of education. Respondents who have attended college or university are overrepresented in this group. The differences are significant (tested with Chi square), so we conclude that education level influences factor loading.

Table 37: Q-group membership by education level

Education	Migration critics	%	Adaptation optimists	%	Island pessimists	%	Total	%
Primary or less	20	83.3%	1	4.2%	3	12.5%	24	100%
Secondary	42	46.2%	29	31.9%	20	22.0%	91	100%
Tertiary	18	46.2%	16	41.0%	5	12.8%	39	100%
Total	80	51.9%	46	29.9%	28	18.2%	154	100%

Four missing values for education level. Differences significant at 0.01 level (Chi-square).

Other

We found no significant differences between Q-groups in terms of religion, marital status, and birthplace.

Income

In the household questionnaire, we asked respondents to estimate their annual household income, using income brackets (Table 38). Household incomes were significantly higher on Majuro than on the outer islands. On Mejit, none of the surveyed households had an annual income of more than $5,000, and on Maloelap only 8 percent had this level of income. By contrast, on Majuro 71 percent had an annual income of more than $5,000.

Table 38: Q-group membership by income bracket

Annual household income	Migration critics	%	Adaptation optimists	%	Island pessimists	%	Total	%
Less than $1,000	20	52.6%	11	28.9%	7	18.4%	38	100%
$1,000–$2,000	20	66.7%	6	20.0%	4	13.3%	30	100%
$2,000–$5,000	16	72.7%	4	18.2%	2	9.1%	22	100%
$5,000–$10,000	7	41.2%	6	35.3%	4	23.5%	17	100%
$10,000–$20,000	10	40.0%	7	28.0%	8	32.0%	25	100%
More than $20,000	6	50.0%	3	25.0%	3	25.0%	12	100%
Total	79	54.9%	37	25.7%	28	19.4%	144	100%

Differences not significant (tested with Chi square).

The big difference in income levels between Majuro and the two outer islands makes any relation between income and Q-grouping spurious. For example, respondents with high incomes (>$5,000) were less often found in the group of "migration critics," but this difference is entirely caused by the fact that respondents from Majuro are underrepresented in that group. We ran separate analyses for the relation between income level and Q-grouping on Majuro and for the outer islands. In none of these did the self-reported income bracket have a significant influence on factor loading.

Migration and Remittances

In the questionnaire, we inquired about respondents' migration history. We distinguished short migration (a month to a year) and longer migration (more than a year), and for each we asked about destinations. The information from these questions is summarized in the table, distinguishing people who have never migrated, those who have done so only on short trips (less than a year), internal migrants, and international migrants.

Table 39: Q-group membership by migration status

Status	Migration critics	%	Adaptation optimists	%	Island pessimists	%	Total	%
Never migrated	16	55.2%	8	27.6%	5	17.2%	29	100.0%
Only short trips	27	52.9%	14	27.5%	10	19.6%	51	100.0%
Only within the RMI	30	54.5%	18	32.7%	7	12.7%	55	100.0%
Abroad	8	40.0%	6	30.0%	6	30.0%	20	100.0%
Total	81	52.3%	46	29.7%	28	18.1%	155	100.0%

Differences between Q-groups not significant (tested with Chi square).

We found no significant differences between the migration histories of respondents and their Q-grouping. Non-migrants, short-term migrants, internal migrants, and people who had returned from international migration (mostly to U.S.) were represented in all three Q-groups in similar proportions. We also checked if parents' migration history influenced Q-factor loading, but found no significant differences.

In the questionnaire, we also asked respondents for the whereabouts of their children and siblings. The table below summarizes the average number and percentage of children and siblings who have migrated for each Q-group, and it also specifies how many currently reside abroad. Migration critics have the lowest average number of migrant relatives who have moved to the U.S., and they receive significantly fewer remittances, which may explain their critical opinion about the impacts of migration.

Table 40: Q-group membership by number of migrant relatives and remittances

	Migration critics	Adaptation optimists	Island pessimists	Total
Migrant siblings and children (average)	2.95	2.56	3.61	2.95
Migrant siblings and children (%)	39.4%	31.8%	46.9%	38.4%
Siblings and children in U.S./abroad (average)	1.26	1.77	1.75	1.50
Siblings and children in U.S./abroad (%)	19.2%	22.3%	24.4%	21.1%
Remittances in past 12 months ($)	88	462	338	244
Reverse remittances in past 12 months ($)	44	35	49	42

Differences for remittances significant at <0.01 level (tested with ANOVA).

A very strong correlation exists between Q groups and future migration intentions (whether the respondent expects that a household member will migrate in the next 10 years). In households of migration critics, the majority (71.4%) did not expect a household member to migrate in the next 10 years, as opposed to 48.8 percent in the case of adaptation optimists, and only 28 percent in the case of island pessimists. The figures for the intention to migrate to the U.S. specifically are 14.3 percent, 34.1 percent, and 56.0 percent, respectively.

Table 41: Q-group membership by migration intention

Status	Migration critics	%	Adaptation optimists	%	Island pessimists	%	Total	%
No intention to migrate	55	71.4%	20	48.8%	7	28.0%	82	57.3%
Within the RMI	11	14.3%	7	17.1%	4	16.0%	22	15.4%
To U.S.	11	14.3%	14	34.1%	14	56.0%	39	27.3%
Total	77	100.0%	41	100.0%	25	100.0%	143	100.0%

Differences significant at 0.001 level (tested with Chi square).

Spatial Analysis

As the questionnaire recorded GPS locations of all surveyed households, it is possible to map the spatial distribution of Q-groups in the three study sites (see Figure 26). This reveals an interesting pattern: respondents who belonged to the group of adaptation optimists (the purple dots in the map) were more likely to live in less-exposed places. On the island of Taroa in Maloelap Atoll, for example, adaptation optimists live further away from the coastline than the other households. That pattern is also visible on Mejit. On Majuro, adaptation optimists live more often on the lagoon side and in the southeast corner, which has not been affected by inundation for many years.

The map also shows that very few respondents in Maloelap were grouped among island pessimists (red dots). As seen in previous sections, people on this atoll tended to be quite satisfied with life in the RMI and were critical about migration.

Figure 26: Map showing distribution of Q-group membership
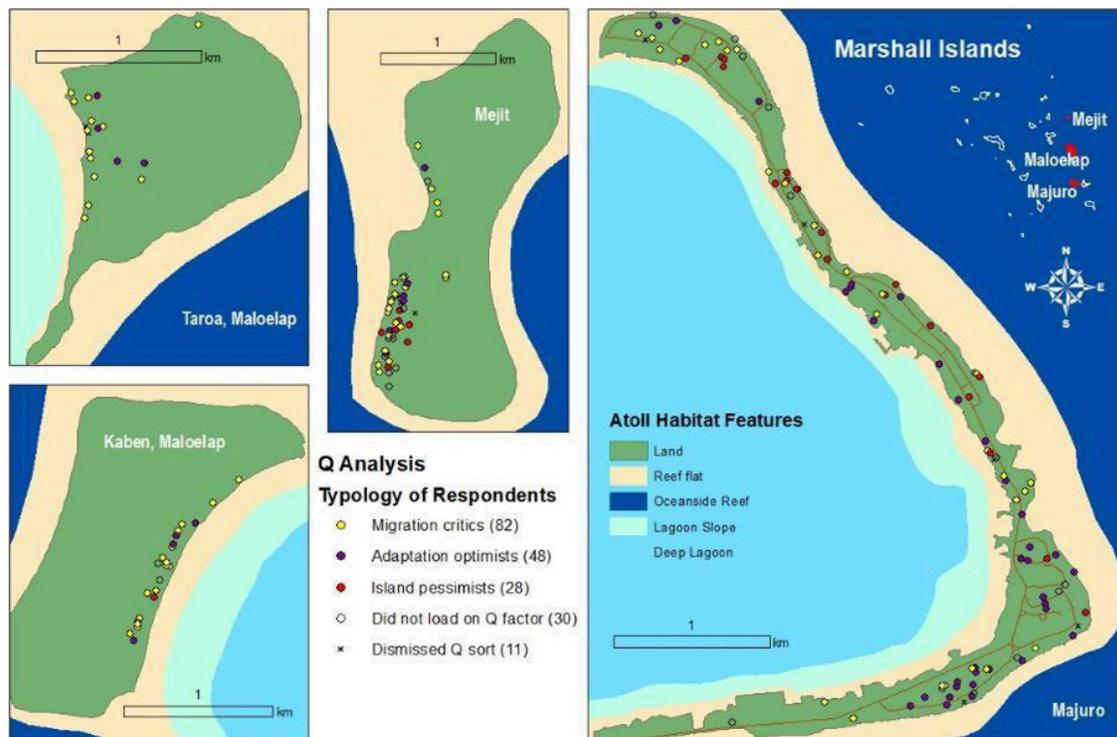
b. Q-analysis: Hawaiʻi

The Q-study undertaken in Hawaiʻi was comprised of 40 statements organized under the following seven thematic areas:

- Push and pull factors driving migration
- Effective migration strategy: development and well-being
- Migration behaviors: expectations of future habitability
- Government response
- Environmental change
- Non-economic loss and damage
- Marshallese culture and social cohesion

i. Descriptive analysis of the whole sample in Hawaiʻi

This section provides findings from the Q-method analysis, based on how the 40 respondents in Hawaiʻi sorted the 40 statements on average, so prior to dividing the sample in sub-groups. It includes findings on the factors drawing migrants to Hawaiʻi (pull factors) and the issues within the RMI that affected the decision to leave (push factors). Also discussed are respondents' perceptions of climate-induced migration and successful adaptation strategies. This is supplemented by data in the form of top-10 "strongly agree" statements and top-10 "strongly disagree" statements.

- Push and pull factors: In Hawaiʻi, respondents cite access to health care, education, and job opportunities as the prime migration pull factors. Environmental factors and the lack of infrastructure to support educational attainment or economic growth are the primary push factors. Interviewees agreed that environmental change affects local economies and food systems, arguably driving the desire to relocate for health needs and access to employment opportunities.
- Climate-induced migration: A key difference with the Q-findings from the RMI fieldwork is that many respondents in Hawaiʻi do think that Marshallese will be displaced by environmental factors. Interviewees recognize that drought is affecting local food security and access to freshwater. The depreciating health of coral reefs is symptomatic of climate change. Participants question the RMI's strategic ability to cope with climatic shocks and attest that climate change is a driver for migration.
- Successful adaptation strategy: Interviewees stated that there are available job opportunities for the Marshallese in Hawaiʻi and that these are not limited to military assignments. Relocation was largely viewed as positive and not limited to those with relatively higher economic status, the result of having access to remittances to fund relocation costs.

Table 42: Top 10 of "strongly agree" statements (Hawai'i)

Statement that respondents "strongly agreed" with	Frequency
Seeking better health care is one of the main reasons the Marshallese move to the U.S.	21
In the future, more and more Marshallese will be displaced by environmental factors and forced to flee their home atolls	13
Rising sea levels are destroying parts of the Marshall Islands	11
One of our biggest problems in the Marshall Islands is the lack of facilities, such as good schools, clinics, and reliable electricity	9
Marshallese people are scattered, and the survival of our unique culture, lifestyle, and even our language may be lost forever	7
Job opportunities in Hawai'i are one of the main reasons people leave the Marshall Islands	5
Most people who migrate to Hawai'i do so to receive a better education	5
Marshallese people who live in Hawai'i are better-off than when they lived in the RMI	4
Climate change is worsening existing environmental issues caused by nuclear testing	4
Environmental change is damaging the farm crops that people in the RMI depend on for food	3

Table 43: Top 10 "strongly disagree" statements (Hawai'i)

Statements that respondents "strongly disagreed" with	Frequency
Climate change is God's punishment for our sins	24
Our reefs are healthy, so there is no reason to worry about climate change	14
Only wealthy people are able to migrate from the RMI	12
In the RMI, we are quite able to deal with disasters such as droughts, floods, and storms	11
Life in the Marshall Islands is better than in Hawai'i	6
Salinity is not a problem in the Marshall Islands; our drinking water is okay and our crops can grow	6
There is a lack of job opportunities for the Marshallese in Hawai'i	5
The Marshallese government does all it can to improve the living conditions in the country	5
Marshallese receive sufficient welfare (food stamps/health insurance) from the government in the state of Hawai'i	4
The increase of the Marshallese population in Hawai'i is largely due to employment by the U.S. military	4

ii. Description of the two Q-factors and key differences between the groups

As mentioned, Q-analysis uses Principal Component Analysis to find correlations between respondents' ranking of the statements from "strongly agree" to "strongly disagree." We used Principal Component Analysis to extract eight components, followed by Varimax rotations on 2, 3, 4, 5, and 6 factors. For each rotation and set of factors, we carefully compared the results. Through this process, two distinguished groups were identified that represent shared views within the study population. The best results were obtained with these two factors,

explaining 45 percent of variance. Out of 40 sorts, 33 loaded highly on one of the two factors. The other seven respondents were excluded from further Q-analysis.

1. **Habitability pessimists:** These migrants have had their livelihoods affected by climate-related stressors, have experienced discrimination, possess a fatalistic perspective on future island habitability, note the Marshallese government's lack of a resilience strategy, have a neutral position on employability in Hawaiʻi, and have often come to Hawaiʻi to seek health care. The Principal Component Analysis categorized 18 respondents in this group.
2. **Migration optimists:** view migration as a successful adaptation strategy, try to integrate in the U.S. but also value preservation of Marshallese culture, perceive that they have improved livelihoods in Hawaiʻi, and place less importance on climate issues than Factor 1 respondents. The Principal Component Analysis categorized 15 respondents in this group.

Below, the two Q-groups are described in more detail, based on the average ranking of statements for the two Q-groups (see Table 44). The table is sorted in descending order of z-score variance. This means that statements about which the two groups had the most diverging opinions are listed at the top of the table. So-called "consensus statements," about which the two groups had similar views, are listed more toward the bottom of the table. The numbers in Table 44 indicate the groups' average level of agreement on each statement (from -5 "strongly disagree" through 0 "neutral" to +5 "strongly agree"). In the final step of this Q-analysis, a connection will be made between the Q-study results and key variables from the questionnaire survey. This will show us which people have which particular views regarding environmental change, drivers and impacts of migration, and the future habitability of their islands.

Source: Kees van der Geest

Table 44: Differences between Q-groups (Hawai'i)

Statements (in descending order of z-score variance)	Habitability pessimists	Migration optimists
Marshallese people are scattered, and the survival of our unique culture, lifestyle, and even our language may be lost forever	4	-3
Only wealthy people are able to migrate from the RMI	0	-4
Health care in Hawai'i is accessible and affordable	-2	2
Marshallese receive sufficient welfare (food stamps/health insurance) from the government in the state of Hawai'i	-1	4
In the RMI, we are quite able to deal with disasters such as droughts, floods, and storms	-4	-1
Job opportunities in Hawai'i are one of the main reasons people leave the Marshall Islands	0	3
Rising sea levels are destroying parts of the Marshall Islands	5	2
Marshallese experience discrimination in the state of Hawai'i	2	-1
Participation in Marshallese activities in Hawai'i helps me feel connected to home	0	3
Life in the Marshall Islands is better than in Hawai'i	-3	0
I worry our children will lose connection to their Marshallese culture by living in Hawai'i	2	0
Within 50 years it will no longer be possible to live in the Marshall Islands	1	-1
Most people who migrate to Hawai'i do so to receive a better education	1	3
It is difficult to integrate into the "U.S. way of life" due to language barriers	1	0
Climate change is worsening existing environmental issues caused by nuclear testing	1	0
Marshallese fishermen will suffer in the future because there will be almost no fish in the sea	2	0
If people with good educations leave the Marshall Islands, our islands cannot develop	0	1
Climate change is God's punishment for our sins	-4	-5
Environmental changes in the Marshall Islands affect the ability of families back home to make a living	3	1
Our reefs are healthy, so there is no reason to worry about climate change	-5	-4
The food the Marshallese community eats here in Hawai'i is much healthier than what we ate in the Marshall Islands	-1	0
I regret that I moved from the Marshall Islands to Hawai'i	-2	-1
One of our biggest problems in the Marshall Islands is the lack of facilities, such as good schools, clinics, and reliable electricity	3	4

I have never heard of any Marshallese migrating because of climate change	-3	-2
There is a lack of job opportunities for the Marshallese in Hawai'i	-2	-3
The increase of the Marshallese population in Hawai'i is largely due to employment by the U.S. military	-1	-2
Marshallese people like Hawai'i as a migration destination because its geography and temperature are closest to that of the Marshall Islands	1	2
The state of Hawai'i provides helpful services for Marshallese migrants	0	1
Environmental change is damaging the farm crops that people in the RMI depend on for food	2	1
Lack of freshwater in the Marshall Islands is an important reason Marshallese are relocating to Hawai'i	0	1
In the future, more and more Marshallese will be displaced by environmental factors and forced to flee their home atolls	3	2
Salinity is not a problem in the Marshall Islands; our drinking water is okay and our crops can grow	-3	-3
Without the money migrants send back to their relatives in the Marshall Islands, life on the RMI would be really difficult	-1	-1
In the Marshall Islands, many people depend on government aid	-2	-2
Marshallese people who live in Hawai'i are better-off than when they lived in the RMI	1	0
It is better if people migrate from the Marshall Islands for short periods rather than permanently	-1	-1
Lack of English is a problem when communicating with service providers in Hawai'i	0	1
Seeking better health care is one of the main reasons the Marshallese move to the U.S.	4	5
We, Marshallese, migrate to Hawai'i because we are losing the land to the ocean	0	0
The Marshallese government does all it can to improve the living conditions in the country	-1	-2

Factor 1: Habitability pessimists (Hawai'i)

Respondents that load highly on Factor 1 have strong views on environmental change in the Marshall Islands, with the understanding that rising sea levels are destroying parts of the Marshall Islands. In support of this, Factor 1 respondents are characterized by a belief that, "In the future, more and more Marshallese will be displaced by environmental factors and forced to flee their home atolls." Factor 1 respondents oppose the statement that their "reefs are healthy" and that "salinity is not a problem in the Marshall Islands. Our drinking water is okay and our crops can grow."

The group of habitability pessimists reiterates the effect that climate change is having on Marshallese people's food security, ability to make a living, and ecosystem services. They agree with the statement that changes in fish ecosystems have subsequent detrimental effects on the fishing economy for subsistence fishermen in the Marshall Islands. One interviewee stated:

"Our reefs are our health, climate change affects the reefs, which are dying."
(R-131, Hawai'i)

Factor 1 respondents define the causal link between environmental change and migration as resource depletion. One respondent noted:

"People are migrating because they cannot fish or farm, malnutrition affects quality of life." (R-131, Hawai'i)

This group has a comparatively higher rate of accentuating statements of anxiety about the future of the Marshall Islands regarding loss of territory and culture. Respondents that load highly on Factor 1 attest that their community is scattered, which threatens the survival of their Marshallese culture. Respondents within this group are defined by having a negative perception of the state of service delivery in the RMI, and the government's ability to respond to environmental changes such as droughts, floods, and storms. In connection, Factor 1 respondents disagree with statement 35, "The Marshallese government does all it can to improve the living conditions in the country."

Factor 1 respondents are relatively neutral in regard to the statement "Job opportunities in Hawai'i are one of the main reasons people leave the Marshall Islands." They also mildly disagree that "there is a lack of job opportunities for the Marshallese in Hawai'i." They stress the discrimination Marshallese people face on O'ahu and the Big Island.

Factor 1 respondents agree strongly with statement 1, "Seeking better health care is one of the main reasons the Marshallese move to the U.S." Nonetheless, they feel that health care remains inaccessible and unaffordable. Still, Factor 1 respondents view migration as "successful," in line with the view that they oppose the notion that "life in the Marshall Islands is better than in Hawai'i."

Factor 2: Migration optimists (Hawai'i)
Factor 2 respondents view migration as a successful adaptation strategy. From the way they ranked the statements, it becomes clear that they are "satisfied" migrants and that they evaluate their life in Hawai'i quite positively. They view economic opportunities in the Marshall Islands as limited and they do not regret

Source: Kees van der Geest

their move to Hawaiʻi. The group believes that environmental change is affecting food security and the local economy in the Marshall Islands, and that home communities depend to a large extent on aid. They see Marshallese people who live in Hawaiʻi as "better-off than when they lived in the RMI," and thus view migration as successful in terms of economic gains. Migration optimists load heavily on the statement "Job opportunities in Hawaiʻi are one of the main reasons people leave the Marshall Islands." Besides employment, they also agree strongly that Marshallese migrants come to Hawaiʻi to seek better health care.

A distinguishing element of those loading highly on Factor 2 is confidence in cultural preservation. For respondents in this group, "participation in Marshallese activities in Hawaiʻi helps [them] feel connected to home," conveying that there is a strong Marshallese cultural community among diaspora groups on Oʻahu and the Big Island (Hawaiʻi). This dictum is further expressed in respondents' strong disagreement with statement 40, "Marshallese people are scattered, and the survival of our unique culture, lifestyle, and even our language may be lost forever." Factor 2 respondents are comparatively positive regarding their migration and do not have anxiety surrounding losing ties with Marshallese culture as an externality of their relocation.

In contrast with habitability pessimists, the group of migration optimists are more neutral about statements that centered on climate drivers for migration.

iii. Characteristics of Q-group members

This section takes a closer look at the composition of the two Q-groups identified in Hawaiʻi. Table 45 shows some quite clear patterns in terms of socio-demographic differences. On average, Factor 1 respondents, who we called the habitability pessimists, are more often women, are a bit older, and have lower levels of education than Factor 2 respondents, who we called migration optimists. In terms of income, on average, both groups earn in the low- to middle-income bracket of $25,000–$35,000 per year. However, 40 percent of Factor 2 respondents are in the more than $50,000 income bracket, compared to only 22 percent of those in the Factor 1 group. In the group of migration optimists, fewer respondents received social welfare. Another difference is that members of the second group have been in Hawaiʻi longer than members of the first group.

Table 45: Socio-demographic indicators of the two Q-groups in Hawai'i

	FACTOR 1: Habitability pessimists	FACTOR 2: Migration optimists
Number of persons	18	15
Gender	67% female	47% female
Current location	O'ahu: 12; Big Island: 6	O'ahu: 11; Big Island: 4
Entry years to Hawai'i (range)	1993–2017	1986–2016
Average entry year	2003	1999
Years in Hawai'i	14.1 years	16.9 years
Birth year (range)	1940–1996	1956–1994
Average age	1971 (46 years)	1973 (44 years)
Mode education	33% Level 5	80% Level 5-8
Average level of education	"High school diploma"	"Some college"
Marital status	55% married	66.66% married
Average income	$25,000–$35,000	$25,000–$35,000
Welfare	44%	36%
Environmental factors played a role in migration decision	44%	47%
Climate change affects return migration	72%	67%

While the group of habitability pessimists were more worried about the impact of climatic and environmental stresses in the RMI than the migration optimists, the proportion of respondents who migrated to some extent because of environmental factors was more or less the same for both groups (44 percent and 47 percent, respectively). Of the habitability pessimists, 72 percent indicate that environmental factors will affect their decision to return to the Marshall Islands, against 67 percent for the migration optimists.

c. Q-analysis: The Pacific Northwest

This section provides the results of the Pacific Northwest Q-study analysis, which depicts complex discourses on climate change, displacement, and relocation in Oregon and Washington. Our results reveal a plurality of subjective understandings of climate change and mobility, highlighting the importance of access to services, culture, environmental change, and religion in the rationales for migrating to the Pacific Northwest.

i. Descriptive analysis of the whole sample in the Pacific Northwest

This section provides findings from the Q-analysis, based on how the 39 respondents in the Pacific Northwest sorted the 40 statements on average, so prior to dividing the sample into sub-groups. It includes findings on the factors drawing migrants to the U.S. (pull factors) and the issues within the RMI that affected the decision to leave (push factors). Also discussed are respondents' perceptions of how life changes after migrating from the RMI to the Pacific Northwest. This is supplemented by data in the form of top-10 "strongly agree" statements and top-10 "strongly disagree" statements.

Drivers of migration: The Oregon and Washington cohort think that migration from the Marshall Islands is predominantly for health care reasons. Thirteen of the 39 respondents felt "strongly" (+5 or +4) that "seeking better health care is one of the main reasons the Marshallese move to the U.S." Respondents placed weight on statements that account for failing infrastructure acting as a motivator for relocation, as well as the pull of better economic and education opportunities in the U.S.

Climate change: The second-strongest statement accounts for future trends in displacement due to environmental change: "In the future, more and more Marshallese will be displaced by environmental factors and forced to flee their home atolls" (see Table 46). Pacific Northwest–based respondents arguably have a weighted focus on environmental push factors in relation to the nuclear legacy, given the demographics of the atolls most affected. Interviewees recognize that drought is affecting local food security and access to freshwater. An interviewee stated, "We cannot grow food like our ancestors. Our soil is salty." Respondents also disagreed strongly with the statement that the coral reefs are healthy and that we do not need to worry about climate change. Participants attest that climate change is a driver for migration. A community member declared, "My reef is not healthy. This is why the fish are dying—they only eat garbage from the human." The cohort also questions the capacity of the Marshallese government to provide proficient climate response initiatives.

Successful adaptation strategy: Interviewees stated that there are available job opportunities for the Marshallese in Oregon. Relocation was largely viewed as positive, and not limited to those with relatively higher economic status due to access to remittances and strong familial ties that aid relocation. Twelve of the 39-person cohort based in the Pacific Northwest strongly disagreed that "there is a lack of job opportunities for the Marshallese in Oregon." A pull toward the Pacific Northwest is the demand for low-skilled labor in canning and food-packing industries such as NORPAC Foods, which do not require high levels of fluency in English. Religion: Similarly, across all surveyed groups, respondents strongly disagreed with the statement that "climate change is God's punishment for our sins." Religion is a strong cultural force in the RMI. Among the cohort, 43.5 percent identified as Protestant. Interviewees were confident in placing culpability for climate change with U.S. nuclear forces and human-induced land and ocean pollution.

Access to the migration option: Similarly to migrant groups in Hawai'i, diaspora groups in the Pacific Northwest disagreed with the notion that "only wealthy people are able to migrate from the RMI." Remittances and yearly tax refunds are allotted for plane tickets to diaspora communities across the continental U.S.

Table 46: Top 10 "strongly agree" statements (Pacific Northwest)

Statement	Frequency
Seeking better health care is one of the main reasons the Marshallese move to the U.S.	13
In the future, more and more Marshallese will be displaced by environmental factors and forced to flee their home atolls	9
Rising sea levels are destroying parts of the Marshall Islands	7
Job opportunities in Oregon are one of the main reasons people leave the Marshall Islands	6
Climate change is worsening existing environmental issues caused by nuclear testing	6
Environmental changes in the Marshall Islands affect the ability of families back home to make a living	5
Most people who migrate to Oregon do so to receive a better education	4
One of our biggest problems in the Marshall Islands is the lack of facilities, such as good schools, clinics, and reliable electricity	4
I have never heard of any Marshallese migrating because of climate change	3
Participation in Marshallese activities in Oregon helps me feel connected to home	3

Table 47: Top 10 "strongly disagree" statements (Pacific Northwest)

Statement	Frequency
There is a lack of job opportunities for the Marshallese in Oregon	13
Our reefs are healthy, so there is no reason to worry about climate change	12
Climate change is God's punishment for our sins	11
Only wealthy people are able to migrate from the RMI	9
The Marshallese government does all it can to improve the living conditions in the country	7
Salinity is not a problem in the Marshall Islands; our drinking water is okay and our crops can grow	7
Within 50 years, it will no longer be possible to live in the Marshall Islands	7
In the Marshall Islands, many people depend on government aid	6
We, Marshallese, migrate to Oregon because we are losing the land to the ocean	5
I regret that I moved from the Marshall Islands to Oregon	4

ii. Description of the three Q-factors and key differences between the groups

As in the previous two Q-analyses, Principal Component Analysis was used to find correlations between respondents in the Pacific Northwest in terms of how they rank the statements from "strongly agree" to "strongly disagree." The strongest distinction between respondents was obtained with three factors, explaining 45 percent of variance. Of the 39 sorts, 33 loaded highly on one of the three factors. The remaining six respondents were excluded from further Q-analysis. Through this process, three groups were identified that

represent shared views within the study population: health care migrants, climate-concerned migrants, and community supporters.

Below, the three Q-groups are described, based on the average ranking of statements per Q-group (see Table 48). As in the Q-analysis for Hawai'i, the table is sorted in descending order of variation in the way the groups sorted the statements. The numbers in Table 48 indicate the groups' average level of agreement on each statement (from -5 "strongly disagree" through 0 "neutral" to +5 "strongly agree"). The group descriptions also include socioeconomic characteristics of the groups, based on data from the questionnaire survey (see Table 49).

Table 48: Differences between Q-groups (Pacific Northwest)

Statements (in descending order of z-score variance)	Health care migrants	Climate-concerned migrants	Community supporters
Marshallese fishermen will suffer in the future because there will be almost no fish in the sea	4	0	-4
The Marshallese government does all it can to improve the living conditions in the country	-4	-4	1
I regret that I moved from the Marshall Islands to Oregon	-3	2	-1
It is better if people migrate from the Marshall Islands for short periods rather than permanently	3	-2	0
Job opportunities in Oregon are one of the main reasons people leave the Marshall Islands	2	-2	4
I have never heard of any Marshallese migrating because of climate change	1	4	-2
Participation in Marshallese activities in Oregon helps me feel connected to home	0	0	5
Climate change is worsening existing environmental issues caused by nuclear testing	0	4	2
There is a lack of job opportunities for the Marshallese in Oregon	-5	-1	-3
Marshallese people are scattered, and the survival of our unique culture, lifestyle, and even our language may be lost forever	-2	2	-1
I worry our children will lose connection to their Marshallese culture by living in Oregon	-2	1	3
Seeking better health care is one of the main reasons the Marshallese move to the U.S.	5	2	4
In the future, more and more Marshallese will be displaced by environmental factors and forced to flee	2	5	1
Our reefs are healthy, so there is no reason to worry about climate change	-1	-5	-2
Within 50 years, it will no longer be possible to live in the Marshall Islands	1	-4	-1
Without the money migrants send back to their relatives in the Marshall Islands, life on the RMI would be really difficult	3	0	-1

The state of Oregon provides helpful services for Marshallese migrants	0	-1	3
Marshallese experience discrimination in the state of Oregon	0	3	0
Marshallese people dislike Oregon as a migration destination because of its geography and temperature	-3	0	-4
In the Marshall Islands, many people depend on government aid	-4	-3	0
Lack of freshwater in the Marshall Islands is an important reason Marshallese are relocating to Oregon	1	0	-2
Environmental change is damaging the farm crops that people in the RMI depend on for food	0	3	2
If people with good educations leave the Marshall Islands, our islands cannot develop	1	-2	1
It is difficult to integrate into the "U.S. way of life" due to language barriers	-1	2	0
Life in the Marshall Islands is better than in Oregon	-3	-1	0
Most people who migrate to Oregon do so to receive a better education	4	1	1
Climate change is God's punishment for our sins	-1	-3	-3
Lack of English is a problem when communicating with service providers in Oregon	0	1	2
Marshallese people who live in Oregon are better-off than when they lived in the RMI	1	3	0
One of our biggest problems in the Marshall Islands is the lack of facilities, such as good schools, clinics, and reliable electricity	2	1	2
Rising sea levels are destroying parts of the Marshall Islands	3	1	3
The food the Marshallese community eats here in Oregon is much healthier than what we ate in the Marshall Islands	1	-1	0
The increase of the Marshallese population in Oregon is largely due to employment by Truitt Bros	0	0	-2
Environmental changes in the Marshall Islands affect the ability of families back home to make a living	2	1	1
Salinity is not a problem in the Marshall Islands; our drinking water is okay and our crops can grow	-1	0	-1
We, Marshallese, migrate to Oregon because we are losing the land to the ocean	-2	-2	-5
Marshallese receive sufficient welfare (food stamps/health insurance) from the state of Oregon	-1	-1	0
Only wealthy people are able to migrate from the RMI	-2	-3	-3
Health care in Oregon is accessible and affordable	0	-1	1
In the RMI, we are quite able to deal with disasters such as droughts, floods, and storms	-1	0	-1

Factor 1: Health care migrants

Seeking health care: Respondents who load highly on Factor 1 most strongly agreed with the statement, "seeking better health care is one of the main reasons the Marshallese move to the U.S." For Factor 1 interviewees, health care is a statistically significant driver for relocation from the Marshall Islands to the continental U.S. Factor 1 has the largest concentration of English speakers, potentially aiding in their access to employment, social services, and ability to navigate the welfare system in the Pacific Northwest.

Employment and education: This group prioritizes migrating for access to services such as health care, education, and employment opportunities. Respondents disagreed strongly with the statement that "there is a lack of job opportunities for the Marshallese in Oregon." Migrants surveyed in Oregon and Washington are in line with the average earners among Pacific Northwest respondents, with 50 percent of the cohort earning under $25,000 a year. In the Factor 1 group, 92 percent of respondents send remittances back to the RMI, and 50 percent receive welfare from the states of Oregon or Washington. On average, Factor 1 respondents indicated a significant improvement in the level of education, access to social services, and health care between the RMI and Oregon. Comparatively, Factor 1 respondents see the greatest improvement in access to education from the RMI to the continental U.S., thus aligning with their view that "most people who migrate to Oregon do so to receive a better education." After migrating, 95 percent of the cohort perceive having an improved economic status.

Food insecurity and livelihoods affected by a changing climate: Climate change plays a central role in Factor 1 respondents' statement sorting, which has a focus on environmental change and livelihoods. Half of the respondents stated that their previous employment was affected by environmental factors. Respondents agreed that "Marshallese fishermen will suffer in the future because there will be almost no fish in the sea," "rising sea levels are destroying parts of the Marshall Islands," and "environmental changes in the Marshall Islands affect the ability of families back home to make a living." Given the group's weighted focus on migration for employment, the salinity of agricultural land, and the depletion of fish resources, the need to migrate to the continental U.S. to access alternative livelihoods may arise.

Unresponsive government: Factor 1 respondents placed weight on the household aid that remittances provided to home communities to make up for the lack of welfare assistance from the Marshallese government. This statement is in line with the view that the Marshallese government does little to improve the living conditions in the country. As such, Factor 1 respondents have comparatively higher rates of sending remittances to the RMI, at 92 percent.

Factor 2: Climate-concerned migrants

Future displacement: Participants who load highly on Factor 2 see climate as a future driver of migration. Factor 2 respondents agree strongly with the statement "in the future, more and more Marshallese will be displaced by environmental factors and forced to flee their home atolls. Factor 2 respondents do not currently view climate change as the primary driver for the out-migration of Marshall Islanders. They rate "sea-level rise" and "ocean pollution" as high risks to their previous living situation in the Marshall Islands.

Experience discrimination: Factor 2 respondents believe the Marshallese experience discrimination in the continental U.S., and they prioritized statements regarding the barriers to integration in their host communities. Most notable was the lack of English as a problem when communicating with service providers in Oregon. The discrimination experienced could arguably relate to interviewees' self-selection as a marginalized minority in

Oregon. This group perceives that the Marshallese receive insufficient support from the state, disagreeing with the statement that "Marshallese receive sufficient welfare (food stamps/health insurance) from the government in the state of Oregon." In this cohort, 50 percent are relatively low earners at under $25,000, with 60 percent receiving welfare. In turn, 70 percent report sharing remittances with family located back on home atolls. Despite their circumstances, Factor 2 respondents see a significant improvement in health care and social services in their transition from the RMI to the Pacific Northwest. The majority of Factor 2 respondents have lived at their current residence for less than eight months, indicating a community in transition. The fact that they move frequently could be symptomatic of weaker social ties to the host state. This argument is further evident in the group's view that the "Marshallese people are scattered, and the survival of our unique culture, lifestyle, and even our language, may be lost forever."

Factor 3: Community supporters

Non-environmental migrants: Factor 3 respondents ardently disagreed that the motivation for migration is a loss of territory due to sea-level rise. Their top-three "agree" statements indicate that the group views "job opportunities" and "seeking better health care" as primary drivers of relocation. In addition, the group agreed that "the state of Oregon provides helpful services for Marshallese migrants."

Environmental threats in the RMI: While Factor 3 respondents do not think that Marshallese migrate because of sea-level rise, they did evaluate environmental conditions as comparatively higher threats to their previous living situations in the Marshall Islands compared to other groups, ranking lack of drinking water and ocean pollution as the highest level of risks to remaining in situ on the RMI. Interestingly, both Factor 2 and Factor 3 groups view food security in the RMI as more stable than in the Pacific Northwest. This could arguably be due to respondents' rural home atolls across the Marshall Islands (namely Aur, Ailuk, Kili, Mejit, and Ujlan), which support subsistence agriculture.

Strong cultural ties: Factor 3 respondents selected statements that indicate a self-supporting diaspora community, with an emphasis on cultural ties to Marshallese culture. These respondents believe that participation in Marshallese activities in Oregon "helps" with creating a connection to home. While only 55 percent of the group are fluent in English, and roughly 80 percent have experienced discrimination in relocating to the mainland U.S., the group could arguably be comparatively insular in their socialization in the U.S. Respondents are relatively neutral regarding the perception that "Marshallese people are scattered, and the survival of our unique culture, lifestyle, and even our language may be lost forever." On average, Factor 3 respondents have resided in the continental U.S. for less than 10 years.

Not economically successful: Factor 3 respondents see low levels of improvement in their economic and housing situations between the RMI and the continental U.S., with 36.36 percent noting improvements. Despite being comparatively low earners, 85.7 percent do send remittances home.

Table 49: Socio-demographic indicators of the three Q-groups in the Pacific Northwest

	Health Care migrants	Climate-concerned migrants	Community supporters
Number of persons	12	10	11
Gender	66.67% female	50% female	54.5% female
Birth year (range)	1955–1990	1960–1992	1950–1993
Average age	40	42	47
Current location	Oregon: 11 Washington: 1	Oregon: 8 Washington: 2	Oregon: 11
Entry years	1993–2017	1989–2017	1994–2015
Average entry years	2001	2002	2006
Average years in the continental U.S.	13	14	10
Marital status	55% married	50% married	45% single
Born in the RMI	83%	100%	73%
Average education	High school	High school	Some college
Improved economic situation after migration	95%	66%	36%
Average annual income	$35,000–$45,000	$35,000–$45,000	$15,000–$25,000
Receive government welfare	50%	60%	43%
Environmental factors played a role in migration decision	44%	40%	50%
Climate change affects return migration	72%	80%	45%

8. Conclusions

In a newspaper interview[39] about climate change and migration, IPCC author Dr. Saleemul Huq emphasized the need to distinguish between migration today and future population movements. While climate hazards currently still play a modest role in driving migration, it is almost certain that climate change will have substantial impacts on mobility patterns in the next few decades. This, according to Dr. Huq, means that "*we have to enable people living in the most vulnerable areas to cope with the climate hazards in the near term, while preparing to enable their children to move when the adaptation strategies can no longer keep up.*"

This view of how climate change will impact migration in the short and longer term resonates well with the findings of our research. Indeed, the Marshall Islands are among the most vulnerable areas in the face of climate hazards, but Marshallese migrants do not cite climate change as a major driver of migration from the islands. At the same time, the high mobility of the Marshallese population could become a vital resilience asset in a climate-changed future.

In this concluding chapter, we return to the three guiding questions of this research project:

1. To what extent are climatic stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands?
2. What are the impacts of migration on migrants themselves and their home communities?
3. Which shared views on climate change, environment, migration, and future habitability exist within the study population?

The final chapter is structured as follows. First, it summarizes how respondents in the different study sites perceive the impacts of climate change on the ecosystem, their livelihoods, and habitability. The second section looks at migration drivers and whether climate change and impacts of extreme events already play a role in driving migration. The last section looks at impacts of migration. In the three sections, different views that exist within the study population are highlighted in response to the third research question.

a. Perceptions of climate threats and habitability

Survey findings from the RMI and the destination areas in the U.S. show that respondents are concerned about impacts of climate threats and environmental change. In the problem-ranking exercise in the RMI, for example, they ranked drought, lack of freshwater, and sea-level rise as the second-, third-, and fourth-most pressing problems out of 12.

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39   Saleemul Huq, "Climate Change and Migration: Making a Solution Out of a Problem," The Daily Star, December 17, 2016, http://www.thedailystar.net/opinion/politics-climate-change/making-solution-out-problem-1331014.

Most respondents in the RMI perceive that their island ecosystem is still partly intact and able to provide services, such as provision of food, water, and fuelwood, as well as protection against floods and storms, but not enough and less than in the past. Respondents in our three study sites in the RMI did not yet perceive coastal flooding as frequent or severe. They perceived drought to currently pose a bigger problem, affecting availability of freshwater, health, and agricultural productivity. While people in the RMI are presently concerned about climate change and its effects, including drought, heat waves, and increased exposure to inundation, the questionnaire and Q-study findings also indicate that for most respondents, climate change impacts are not yet a threat to habitability. In the Q-methodology interview, for example, very few respondents agreed with the statement that their island would no longer be habitable in 50 years.

b. Migration drivers

The results of this study show that respondents primarily cite education, health care, work, and family as motivations for migration. Almost none of the respondents in the RMI mention environmental problems as drivers of migration. This was the case for past migrations (of the respondents), current migrations (of siblings and children), and future migrations (of household members).

Arguably, simply asking respondents why they or their relatives migrated does not provide a full and reliable picture of migration drivers (Bilsborrow and Henry, 2012). In the case of Marshallese migration, the dominant discourse is that people migrate for work, education, and health care, and this may be replicated in the answers (see e.g., Graham, 2008). In a questionnaire interview setting, respondents may prefer to give the "expected answer" even though they know that the reality is more complex. This study sought to provide a more complete picture of environmental and other drivers of migration by triangulating the findings on cited reasons to migrate with (1) participatory research approaches such as fuzzy cognitive mapping (see methods chapter), to study the underlying causes of migration; (2) Q-methodology; and (3) a statistical analysis of correlations between environmental factors and migration propensities. These findings mostly confirm that climate-related and other environmental threats are not yet perceived to be important drivers of migration in and from the RMI. However, the picture that emerges is more complex than that.

For example, the study finds an interesting divergence in the reasons cited for migration among respondents in the RMI and in the U.S. Many more respondents in the U.S. cite environmental problems at home as drivers for moving to the U.S.

The analysis of correlations between climate impacts and migration further shows that households of respondents who report heat wave and storm surge impacts, and who perceive that these climate stressors are worsening, have higher migration propensities. Similarly, household members of respondents who perceive negative trends in ecosystem services are more like to intend to migrate within the next 10 years. Another finding that illustrates that the reality is more complex comes from the focus group discussions conducted in the RMI. Here, participants mentioned as an underlying cause the lack of income opportunities—an important driver of migration—and describing the deterioration of "island productivity" because of, among other things, increasing soil salinity and more frequent droughts and heat waves.

Respondents identified impacts of climate change on their livelihoods, health, and safety, and the majority thought that they are not prepared for more severe climate change impacts in the future. However, respondents also strongly resisted the idea that their islands could become uninhabitable and that they might be forced to leave someday. The majority believed that between now and a future in which climate change poses a more existential threat to them, there will be solutions. The findings of this research illustrate an existential dilemma of the Marshallese people, their government, and the international community: On the one hand, it is important to be prepared for a future in which islands may become uninhabitable, and to make sure that migration and resettlement can take place in an orderly manner that minimizes losses and damages. On the other hand, suggesting migration and resettlement as a solution is extremely sensitive as it implies giving up on the islands. Many survey respondents and several authors (e.g., Kench et al., 2018; Barnett, 2017) think that putting too much emphasis on resettlement is inappropriate as there is still much uncertainty about the future extent and impacts of climate change and the capacity to adapt locally.

c. Migration impacts

This section summarizes the research findings on migration impacts, both from the perspective of migrants in the U.S. and from the perspective of the home community.

Marshallese respondents in the U.S. reported positive migration outcomes in the economic domain on account of having higher incomes. Roughly half of the respondents in each of the destination states also felt that migration had "quite a positive" influence on the economic situation and well-being of family members in the RMI. Among respondents in Hawai'i, 70 percent send remittances home, while roughly 85 percent from the Pacific Northwest do so, primarily for the purchase of food, daily needs, and, in the case of Hawai'i, the purchase of passports or plane tickets. When people in the RMI are faced with economic shocks or natural hazards, many can contact relatives in the U.S. and request support, which makes them more resilient to such adversities.

Respondents in the U.S. also report substantial improvements in health care after migrating from the RMI. Improved health outcomes for Marshallese migrants include a consideration of ecological, economic, and social factors affecting the Marshall Islands and its people. The loss of traditional subsistence and the further effects of the nuclear legacy have affected health in the RMI, and the cost of health care in Hawai'i and Oregon have resulted in numerous changes to the coverage that Marshallese migrants are entitled to receive.

Yet, migration also comes with significant non-economic losses, such as weakened conservation of language and cultural ties. A majority of respondents in the U.S. face barriers or challenges in relocating from the Marshall Islands. Relatively "newer" migrant communities face barriers in establishing an official presence in host states. The lack of official identity documents problematizes accessing health care and other services. Documents establishing place of residence may be unavailable if the immigrant is living in a multi-generational housing situation or without accommodation. Marshallese society's emphasis on "collectivism," extended families across multiple households, and adherence to a traditional hierarchy based on hereditary chiefs runs counter to U.S. cultural norms of "individualism, status equality, and the nuclear family" (Duke, 2014).

Source: Kees van der Geest

Respondents in the RMI were on average slightly more positive than negative about the impacts of migration upon the economic situation and well-being of their households. Impacts of respondents' own migrations (in the past) were assessed more positively than current migrations of siblings and children. The positive impacts respondents mentioned centered primarily on improved education, finding employment, receiving better health care, gaining life experience, connecting to relatives, and reducing pressure on resources, such as foodstuffs and living space. Another positive impact that respondents highlighted was that having migrant relatives makes it easier for them to migrate themselves, should the need arise. This is an indication that migration can improve resilience and share risk across households.

Negative impacts of migration that respondents mentioned most frequently involved lack of care for children and the elderly, brain drain, adverse effects on development, homesickness and being separated from loved ones, negative experiences in migrant destination areas (such as unemployment, alcoholism, and lack of mobility), and negative social effects related to social cohesion and the loss of Marshallese culture and language. Many traditional activities in the RMI are under pressure from increased out-migration because there are fewer people to perform them.

The Q-analysis in the RMI resulted in two groups ("migration critics" and "island pessimists") that had opposing views on migration impacts, and a third group ("adaptation optimists") that had less pronounced views on migration. Migration critics were skeptical about migration and concerned about its consequences for the migrants themselves and for the home community. This group was quite satisfied with life on their island. This view contrasted sharply with island pessimists, for whom "emigration is the best option." This group emphasized the benefits of migration and had a very positive view of life in the U.S. They hardly perceived any negative effects of migration. In current and future discussions about migration in the context of climate change impacts, it is important for national policy-makers and staff of NGOs and international organizations to know that such diverging views about migration exist within the population.

The research team of the Marshall Islands Climate and Migration Project would like to emphasize one benefit of migration in light of the large uncertainties that exist in the projections of sea-level rise and impacts of climate change. The current experience Marshallese are gaining and the migrant networks they are building can become important assets in the future. Migration outcomes tend to be much more negative when people are forced to migrate than when they move voluntarily.

References

Adger, W., Adams, H., Kay, S., Nicholls, R., Hutton, C., Hanson, S., Rahman, M., & Salehin, M. (2018). "Ecosystem services, well-being and deltas: Current knowledge and understanding." In Nicholls, R. J., Hutton, C. W., Adger, N., Hanson, S. E., Rahman, M. M., & Salehin, M. (eds). *Ecosystem Services for Well-Being in Deltas*, pp 3-27. Cham, Switzerland: Springer Nature.

Ayeb-Karlsson, S., Smith, C. D., & Kniveton, D. (2018). "A discursive review of the textual use of 'trapped' in environmental migration studies: The conceptual birth and troubled teenage years of trapped populations." *Ambio* 47(5): 557-573.

Barnett, J. (2017). "The dilemmas of normalising losses from climate change: Towards hope for Pacific atoll countries." Asia Pacific Viewpoint 58(1): 3-13.

Black, R., Adger, W. N., Arnell, N. W., Dercon, S., Geddes, A., & Thomas, D. (2011). "The effect of environmental change on human migration." Global environmental change 21: S3-S11.

Bilsborrow, R. E., & Henry, S. J. (2012). "The use of survey data to study migration–environment relationships in developing countries: Alternative approaches to data collection." Population and Environment 34(1): 113-141.
Bureau of East Asian And Pacific Affairs. (2015). "Factsheet: U.S. relations with the Marshall Islands." Available at http://www.state.gov/r/pa/ei/bgn/26551.htm.

Chambers, R. (2008). Who counts? The quiet revolution of participation and numbers. IDS Working Paper, No. 296. Brighton, UK: Institute of Development Studies.

Connell, J. (2005). "A nation in decline? Migration and emigration from the Cook Islands." Asian and Pacific Migration Journal 14(3): 327-350.

Constable, A. L. (2017). "Climate change and migration in the Pacific: Options for Tuvalu and the Marshall Islands." Regional Environmental Change 17(4): 1029-1038.

Danielson, S. (2009). "Q method and surveys: Three ways to combine Q and R." Field Methods 21(3): 219-237.

de Groot, R. S., Wilson, M. A., & Boumans, R. M. (2002). "A typology for the classification, description and valuation of ecosystem functions, goods and services." Ecological Economics 41(3): 393-408.

Díaz, S., Fargione, J., Chapin, F. S., & Tilman, D. (2006). "Biodiversity loss threatens human well-being." PLOS Biology 4(8): 1300-1305.
Dickenson, W. R. (2003). "Impact of mid-Holocene hydro-isostatic highstand in regional sea level on habitability of islands in Pacific Oceania." Journal of Coastal Research 19(3): 489-502.

Dietz, T., Bymolt, R., Bélemvire, A., van der Geest, K., de Groot, D., Millar, D., Obeng, F., Pouw, N., Rijneveld, W., & Zaal, F. (2013). PADev Guidebook: Participatory Assessment of Development. Amsterdam: KIT Publishers.

Duke, M. R. (2014). "Marshall Islanders: Migration patterns and health-care challenges." Migration Information Source, May 2014. Migration Policy Institute.

Dykstra, C. L., & Brander, K. (2018). Ecosystem Service Assessment and Cost-Benefit Analysis of Ecosystem Based Adaptation Options for Mejit Island, Republic of the Marshall Islands. Majuro: MICS.

Eden, S., Donaldson, A., & Walker, G. (2005). "Structuring subjectivities? Using Q methodology in human geography." Area 37(4): 413-422.

Eklund, L., Romankiewicz, C., Brandt, M., Doevenspeck, M., & Samimi, C. (2016). "Data and methods in the environment-migration nexus: A scale perspective." DIE ERDE–Journal of the Geographical Society of Berlin 147(2): 139-152.

Foresight. (2011). Migration and Global Environmental Change: Future Challenges and Opportunities. Final Project Report. London: The Government Office of Science.

Gemenne, F. (2018). "Qualitative research techniques: It's a case-studies world." In McLeman, R., & Gemenne, F. (eds). Routledge Handbook of Environmental Displacement and Migration, pp 117-124. London & New York: Routledge.

Graham, B. (2008). "Determinants and dynamics of Micronesian emigration." Background paper to the Micronesian Voices in Hawaii Conference, April 2008.

Hess, D., Hwang, D., Fellenius, K., Robertson, I., Stege, M., & Chutaro, B. (2015). The Homeowner's Handbook to Prepare for Natural Hazards: Republic of the Marshall Islands. Honolulu: University of Hawai'i, Sea Grant College Program.

Hezel, F. X. (2002). Taking Responsibility for Our Schools: A Series of Four Articles on Education in Micronesia. Honolulu: Pacific Resources for Education and Learning.

Ionesco, D., and Chazalnoël, M. T. (2015). "The role of the international organization for migration in the international governance of environmental migration." In Rosenow-Williams, K., & Gemenne, F. (eds) Organizational Perspectives on Environmental Migration, pp 108-125. London & New York: Routledge.

IPCC. (1990). Climate Change: The IPCC Impacts Assessment. Report from Working Group II to the First Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York: Cambridge University Press.

IPCC. (2012). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge and New York: Cambridge University Press.

IPCC. (2014). Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York: Cambridge University Press.

Keener, V. W., Marra, J. J., Finucane, M. L., Spooner, D., & Smith, M. H. (2012). Climate Change and Pacific Islands: Indicators and Impacts. Report for the 2012 Pacific Islands Regional Climate Assessment (PIRCA). National Climate Assessment Regional Technical Input Report Series. Washington, DC: Island Press.

Kench, P. S., Ford, M. R., & Owen, S. D. (2018). "Patterns of island change and persistence offer alternate adaptation pathways for atoll nations." Nature Communications 9(1): 605.

Marra, J. J. & Kruk, M. C. (coordinating authors), Abecassis, M., Diamond, H., Genz, A., Heron, S. F., Lander, M., Liu, G., Potemra, J. T., Sweet, W. V., Thompson, P., Widlansky, M. W., & Woodworth-Jefcoats, P. (contributing authors). (2017). State of Environmental Conditions in Hawaii and the U.S. Affiliated Pacific Islands under a Changing Climate: 2017. NOAA NCEI.

MEA (Millennium Ecosystem Assessment). (2005). Ecosystems and Human Well-Being: Current State and Trends. Washington DC: Island Press.

MICS (Marshall Islands Conservation Society). (2017). Mejit Local Early Action Plan. Report prepared by the Marshall Islands Conservation Society in consultation with the Mejit community and with support from Micronesia Conservation Trust, the Green Grants Fund, and The Nature Conservancy. Majuro: MICS.

Milan, A. (2016). Rural Livelihoods, Location and Vulnerable Environments: Approaches to Migration in Mountain Areas of Latin America. PhD Thesis, University of Maastricht (Maastricht Graduate School of Governance).

NOAA (2015). "El Niño and its impacts on the Republic of the Marshall Islands." NOAA Factsheet. Retrieved from: http://www.pacificrisa.org/wp-content/uploads/2015/11/Pacific-Region-EL-NINO-Fact-Sheet_RMI_2015-FINAL-v2.pdf.

Oakes, R. (2019). "A subjective understanding of climate change and mobility in Pacific SIDS." Population & Environment 40(4): 480-503.

Oakes, R., Milan, A., & Schindler, M. (2017). Research Methods for the Pacific Climate Change and Migration (PCCM) Project. Bonn: UNU-EHS.

Owen, S. D., Kench, P. S., & Ford, M. (2016). "Improving understanding of the spatial dimensions of biophysical change in atoll island countries and implications for island communities: A Marshall Islands' case study." Applied Geography 72: 55-64.

Pacific Climate Change Science Program (2011). Current and Future Climate of the Marshall Islands. Marshall Islands National Weather Service Office, Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation.

Piguet, E. (2010). "Linking climate change, environmental degradation, and migration: A methodological overview." Wiley Interdisciplinary Reviews: Climate Change 1(4): 517-524.

Pobutsky, A. M., Buenconsejo-Lum, L., Chow, C., Palafox, N., & Maskarinec, G. G. (2005). "Micronesian migrants in Hawaiʻi: Health issues and culturally appropriate, community-based solutions." Californian Journal of Health Promotion 3(4): 59-72.

Pouw, N., Dietz, T., Belemvire, A., de Groot, D., Millar, D., Obeng, F., Rijneveld, W., van der Geest, K., Vlaminck, Z., & Zaal, F. (2017). "Participatory assessment of development: Lessons learned from an experimental approach in Ghana and Burkina Faso." American Journal of Evaluation 38(1): 47-59.

Republic of the Marshall Islands. (2017). Post Disaster Needs Assessment of the 2015-2016 Drought. Retrieved from https://www.gfdrr.org/sites/default/files/publication/pda-2017-marshall-islands.pdf.

Shek, D., & Yamada, S. (2011). "Health care for Micronesians and constitutional rights." Hawaiʻi Medical Journal 70(11, Suppl 2): 4-8.
Spennemann, D. (2004.) Typhoons in Micronesia. A History of Tropical Cyclones and Their Effects until 1914. Saipan, Commonwealth of the Northern Mariana Islands: Division of Historic Preservation.

Spennemann, D., & Marschner, I. (1994). Stormy Years: On the Association between the El Niño/Southern Oscillation Phenomenon and the Occurrence of Typhoons in the Marshall Islands. Report to the Federal Emergency Management Agency. Region IX, San Francisco—Albury, NSW.

Staudinger, M. D., Grimm, N. B., Staudt, A., Carter, S. L., Stuart III, F. S., Kareiva, P., Ruckelshaus, M., & Stein, B. A. (2012). Impacts of Climate Change on Biodiversity, Ecosystems, and Ecosystem Services: Technical Input to the 2013 National Climate Assessment. Washington, DC: United States Global Change Research Program.

Stege, M. H. (2018). "Atoll habitability thresholds." In Leal Filho, W., & Nalau, J. (eds). Limits to Climate Change Adaptation, pp 381-399. Cham, Switzerland: Springer.

Storlazzi, C. D., Gingerich, S. B., van Dongeren, A., Cheriton, O. M., Swarzenski, P. W., Quataert, E., ... & McCall, R. (2018). "Most atolls will be uninhabitable by the mid-21st century because of sea-level rise exacerbating wave-driven flooding." Science Advances 4(4): eaap9741.

Thomas, A. (2014). "Protecting people displaced by weather-related disasters and climate change: Experience from the field." Vermont Journal of Environmental Law 15: 803-808.

UNDRO: United Nations Disaster Relief Organisation. (1991). Marshall Islands – Typhoon Zelda. UNDRO Situation Reports 1-3.
United Nations Population Division. (2018). "World population prospects, 2017." Online tool: https://esa.un.org/unpd/wpp/.

van der Geest, K., Burkett, M., Fitzpatrick, J., M. Stege, and Wheeler, B. (2019). Marshallese migration: The role of climate change and ecosystem services. *Case study report of the Marshall Islands Climate and Migration Project*. University of Hawaiʻi at Mānoa. Available at www.rmi-migration.com

van der Geest, K., de Sherbinin, A., Kienberger, S., Zommers, Z., Sitati, A., Roberts, E., & James, R. (2019). "Impacts of climate change on ecosystem services and resulting losses and damages to people and society." In Mechler, R., Bouwer, L., Schinko, T., Surminski, S., Linnerooth-Bayer, J. (eds). Loss and Damage from Climate Change: Concepts, Methods and Policy Options, pp 221-236. Heidelberg: Springer.

Van der Land, V., Romankiewicz, C., & van der Geest, K. (2018). "Environmental change and migration: A review of West African case studies." In McLeman, R., & Gemenne, F. (eds). Routledge Handbook of Environmental Displacement and Migration, pp 163-177. London & New York: Routledge.

Weisler, M. I. (1999). "Prehistoric farmers of the Marshall Islands." Discovering Archaeology 1(1): 66-69.

Weisler, M. I. (2001). "Life on the edge: Prehistoric settlement and economy on Utrõk Atoll, northern Marshall Islands." Archaeological Oceania 36(3): 109-133.

Weisler, M.I., Yamano, H., and Hua, Q. (2012). "A multidisciplinary approach for dating human colonization of Pacific atolls." The Journal of Island and Coastal Archaeology 7(1): 102-125.

Woodroffe, C. D., & Webster, J. M. (2014). "Coral reefs and sea-level change." Marine Geology 352: 248–267.

Woodward, A., Hales, D., & Weinstein, P. (1998). "Climate change and human health in the Asia Pacific Region: Who will be most vulnerable?" Climate Research 11(1): 31-38.

Zografos, C. (2007). "Rurality discourses and the role of the social enterprise in regenerating rural Scotland." Journal of Rural Studies 23(1): 38–51.

Zommers, Z., van der Geest, K., De Sherbinin, A., Kienberger, S., Roberts, E., Harootunian, G., Sitati, A., & James, R. (2016). Loss and Damage: The Role of Ecosystem Services. Nairobi: UNEP.

Other publications from this research

Van der Geest, K., Burkett, M., Fitzpatrick, J., Stege M. & Wheeler, B. (2019). Marshallese perspectives on migration in the context of climate change. *IOM Policy Brief* 5 (1): 1-12.

Van der Geest, K., Burkett, M., Fitzpatrick, J., Stege, M. and Wheeler, B. (in press). Climate change, ecosystem services and migration in the Marshall Islands: Are they related? Accepted for publication in *Climatic Change*.