

# MARSHALLESE MIGRATION: THE ROLE OF CLIMATE CHANGE AND ECOSYSTEM SERVICES

 ENVIRONMENTAL LAW PROGRAM  
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 Pacific RISA  
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 PACIFIC ISLANDS  
CLIMATE ADAPTATION SCIENCE CENTER

 MICS  
*Marshall Islands Conservation Society*

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## SUMMARY FOR POLICYMAKERS

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THE MARSHALL ISLANDS  
CLIMATE AND MIGRATION  
PROJECT (MICMP)









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)**

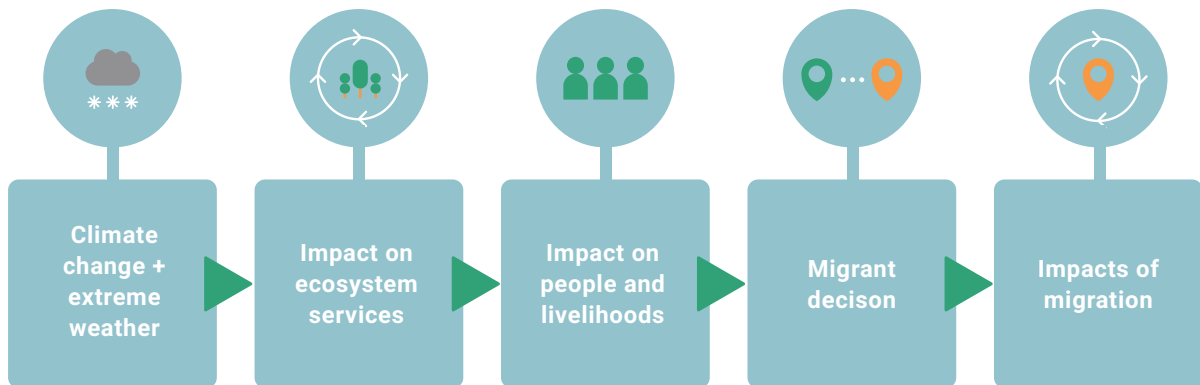
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# Introduction

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.



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:

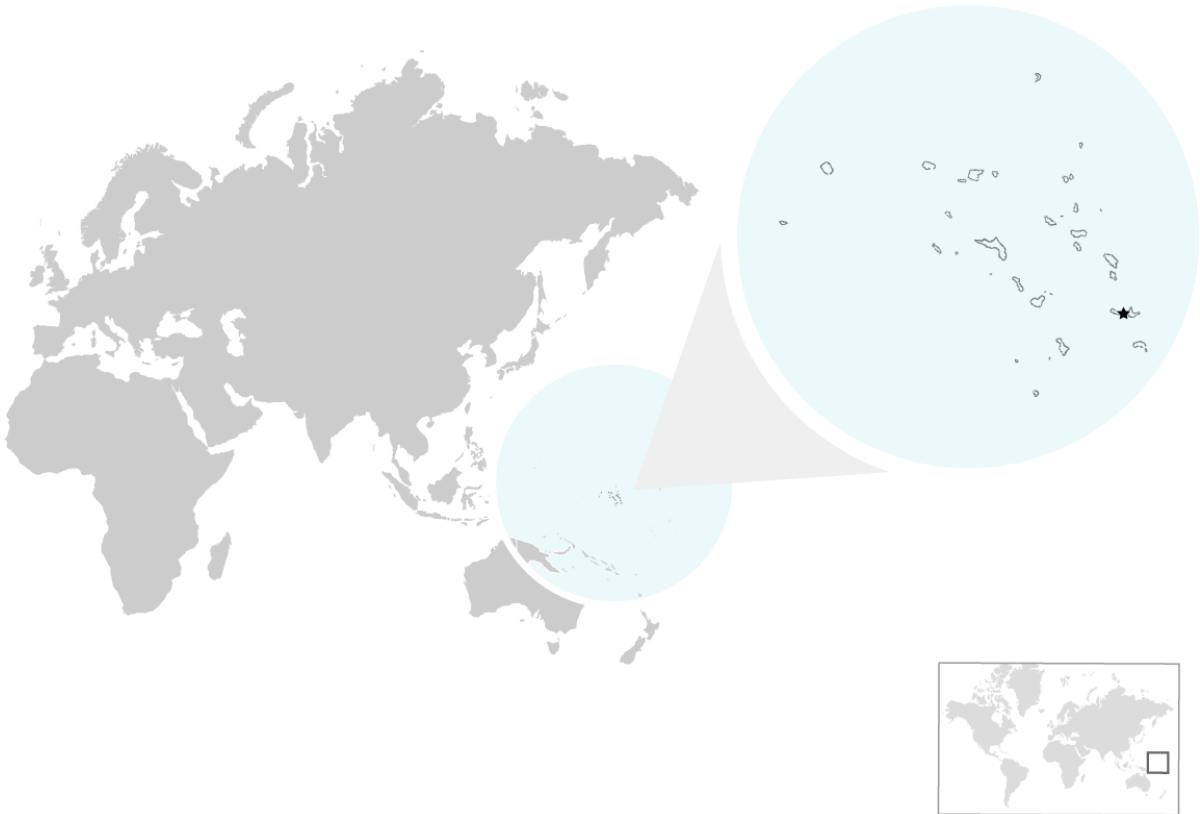
1. *To what extent are climate-related stressors—and their impacts on ecosystems, livelihoods, and habitability—driving migration in the Marshall Islands and from the Marshall Islands to the U.S.?*
2. *What are the impacts of migration on migrants themselves and their home communities?*
3. *Which shared 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<sup>1</sup> —a marked departure from half a century ago, when slightly less than a quarter did.<sup>2</sup> 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/y mh.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/y mh.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 et 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

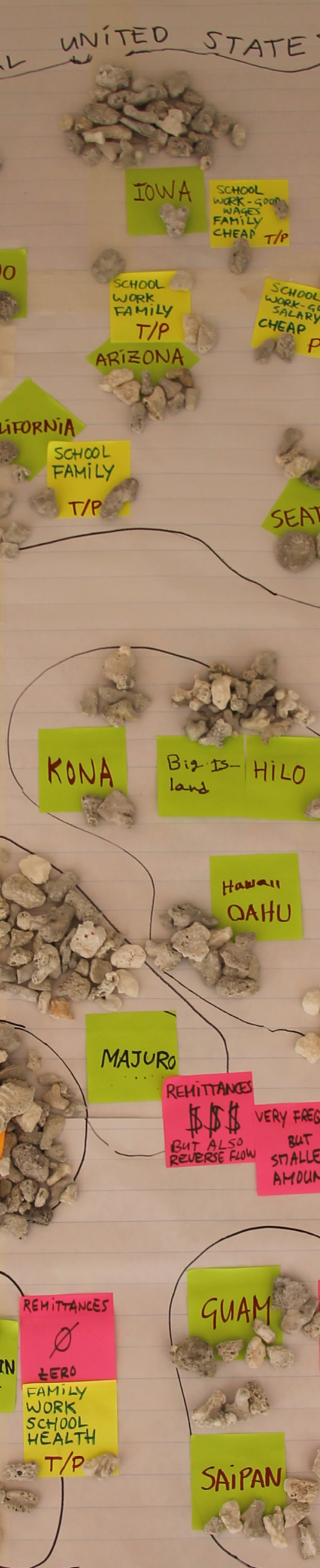
The MICMP used two primary research methods—a household survey and 40-question Q-methodology—both of which were undertaken with the same research populations in the RMI and the U.S. The methodology built on and expanded the methods used in the Pacific Climate Change and Migration project (Oakes et al.,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

- **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 Hawai'i, 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 Hawai'i 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 Hawai'i 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 Hawai'i (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.

## 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%)<sup>3</sup>:** 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%):** These 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



## About the authors



### Kees van der Geest

is a human geographer who studies the impacts of climate change, human mobility, environmental change, adaptation and livelihood resilience. Key features of his work are the people-centred perspective and the mixed-method approach combining quantitative and qualitative research tools. His work has contributed substantially to expanding the empirical evidence base on migration–environment linkages and impacts of climate change beyond adaptation (“loss and damage”). He is currently Head of the ‘Environment and Migration: Interactions and Choices’ (EMIC) Section at United Nations University Institute for Environment and Human Security in Bonn.



### Maxine Burkett

is a Professor of Law at the William S. Richardson School of Law, University of Hawai‘i and a Global Fellow at the Woodrow Wilson International Center for Scholars. She is also Co-Founder and Executive Director of the non-profit Institute for Climate and Peace. Burkett is an expert in the law and policy of climate change, with a specific focus on climate justice, climate-induced migration, and climate change, peace, and conflict. Prof. Burkett is a member scholar of the Center for Progressive Reform, the Lancet Commission for Reparations and Redistributive Justice, and the American Law Institute. She is also Co-Rapporteur for the International Law Association’s Committee on International Law and Sea Level Rise.



## Juno Fitzpatrick

is the Social Responsibility Programme Manager within Conservation International's Center for Oceans. Her work supports Conservation International's global effort to address human rights violations in the fishing industry. A development practitioner and political ecologist, she has over seven years of experience in international development and human rights, implementing natural resource governance projects on ground in sub-Saharan Africa, South Asia and the Pacific. Juno has an MSc from the University of California, Berkeley's College of Natural Resources.



## Mark Stege

is a consultant based in Majuro with over 17 years of research and professional experience in a broad range of Micronesian island affairs. He also leads research on atoll habitability thresholds at the Marshall Islands Conservation Society. His research approach is to develop and pilot participatory frameworks for ecosystem services monitoring to assess an atoll community's exposure to various climate risks, as these increase exponentially in the coming decades, and strengthen an atoll community's capacity to self-determine "How much flood risk is too much?", "What amount of groundwater and rainwater is adequate?", "What constitutes potable water?" and others.



## Brittany Lauren Wheeler

works and researches at the moral-legal interfaces of migration in the field of geography. She holds an MA in Forced Migration (University of the Witwatersrand, South Africa) and is completing her PhD at the Graduate School of Geography at Clark University. Her previous work has focused most extensively on matters of human and object-based repatriation processes and dialogues, and the historical and social-environmental interpretation of materiality and cultural space. She has engaged her concern with matters of reparation, historical justice, death-and-dying work, and the future of environmental migration in various research, editing, teaching and project-based work.

# References

- Danielson, S. (2009). "Q method and surveys: Three ways to combine Q and R." *Field Methods* 21(3): 219-237.
- 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.
- 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.
- Oakes, R., Milan, A., & Schindler, M. (2017). *Research Methods for the Pacific Climate Change and Migration (PCCM) Project*. Bonn: UNU-EHS.
- 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.
- 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.
- 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 Hawai'i at Mānoa. Available at [www.rmi-migration.com](http://www.rmi-migration.com)





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