STAYING AFLOAT:

Climate Migration, Environmental Displacement, and Recommendations to Address Local Marshallese Worker Shortages from 2025 to 2050 for US Army Garrison-Kwajalein Atoll

DEPARTMENT OF THE ARMY

UNITED STATES ARMY WAR COLLEGE AND CARLISLE BARRACKS

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The views expressed are those of the authors and do not necessarily reflect the official policies or positions of the United States Army, the Department of Defense (DOD), or the United States Government.

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“We are first.
But you must understand that you will be next.”

- *Reflections on climate migration by a Marshall Islander*

“It is inevitable…”

- *Local Marshallese native of Ebeye,*
speaking on climate migration of the population

“You can build a wall high enough to keep the seawater out.
But you cannot build it high enough to keep the workers in.”

- *A Pacific engineering specialist speaking metaphorically*
about the climate migration of workers

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SHORT REPORT

ABSTRACT

This report analyzes the pressing issue of climate-amplified out-migration of local indigenous workers who support the US Army Garrison-Kwajalein Atoll (USAG-KA) in the Marshall Islands. Escalating climate impacts, poor economic opportunities in the host nation, limited access to advanced health care, and poor educational opportunities are key drivers of increased Marshallese out-migration to the United States, shrinking the pool of current and future local workers for the USAG-KA. This report emphasizes the real and escalating impacts of climate change on US military installations in terms of both infrastructure damage and the human communities that surround US bases and provide local labor for these facilities. The increasing shortage of local workers due to climate-amplified out-migration presents a significant challenge, now and in future decades, to the USAG-KA, one of the United States' most critical strategic bases for national defense. The Republic of the Marshall Islands is a key US ally in the region. The two nations are partnered through the Compact of Free Association (COFA), which solidifies defense ties between the United States and the Marshall Islands, underscores the need for proactive measures to address climate-related vulnerabilities among the Marshallese, promotes adaptation and resiliency efforts in the local community, and encourages support for the workforce outside the base. This project, therefore, is an important case study for other US military installations around the world that are facing similar environmental challenges to their local workforces. Military installations should be seen as living organisms that exist beyond their walls and extend into the broader social network. Planners must recognize climate change is impacting both the infrastructure inside US military facilities and the vulnerable human communities that surround these bases and support their missions.

PUSH-PULL FACTORS CONTRIBUTING TO MIGRATION BETWEEN THE MARSHALL ISLANDS AND THE U.S.

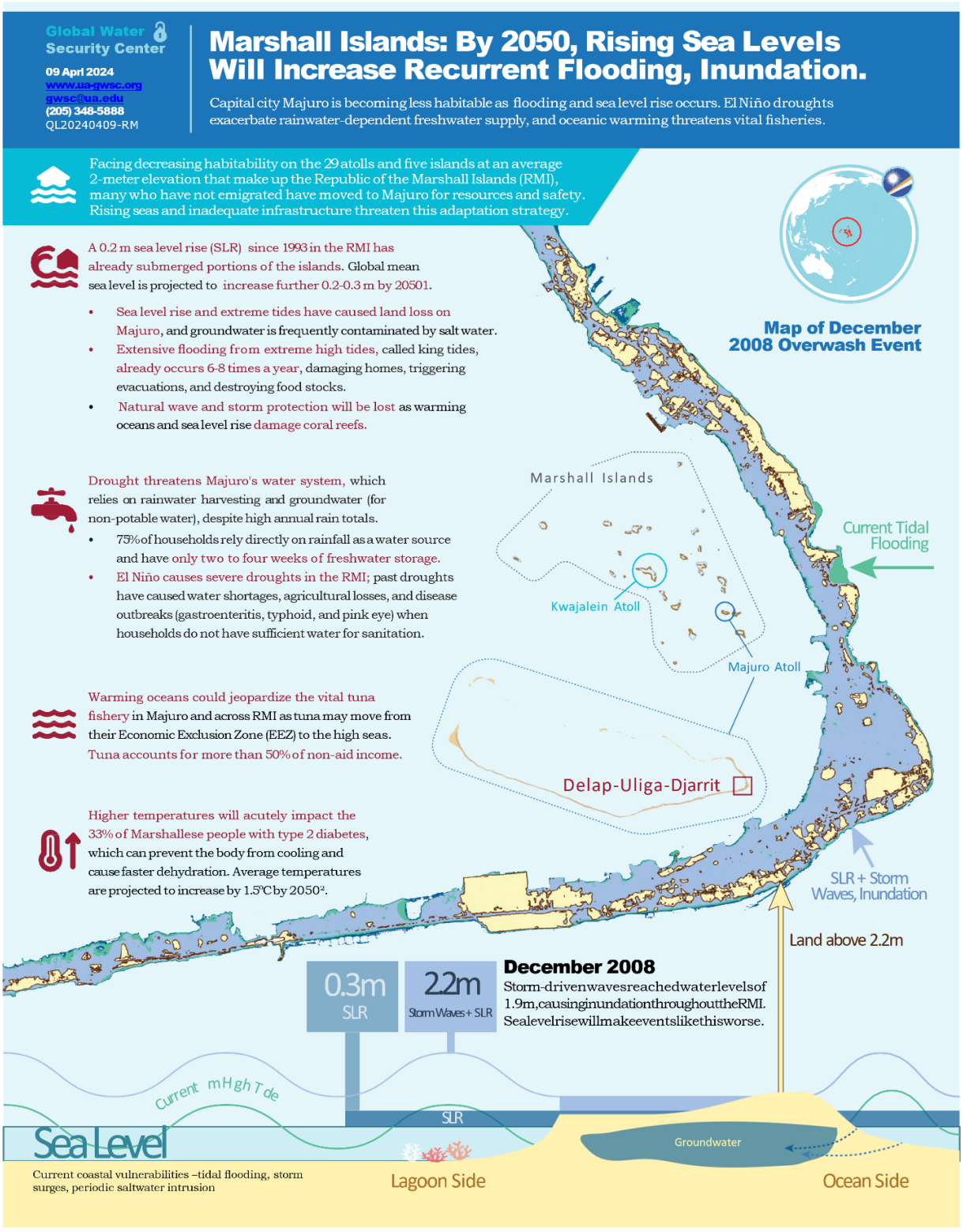
Key Drivers of Resettlement in the U.S

Higher Salaries
Advanced Education Opportunities
Better Medical Care
Climate Impacts at Home
Family Ties
Legal Benefits of the COFA Treaty in the U.S.

Nation of Birth
Proud Ethnic Identity and Tradition
Cultural Heritage and Community
High Migration Costs

Key Drivers of Decisions to Remain in the Marshalls

RISING SEA LEVEL DIAGRAM



Footnotes:

1. Projections are based on the extreme warming scenario, SSP585. Projections that include more complex elements or are locally focused are less developed but project higher sea level rise.

2. The CMIP projections for 2050 under SSP585 do not show a substantial increase in extreme heat days; calculations that account for humidity show elevated heat index, which reflects how hot it feels.

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EXECUTIVE SUMMARY

REPORT TITLE	**STAYING AFLOAT**: *Climate Migration, Environmental Displacement, and Recommendations to Address Local Marshallese Worker Shortages from 2025 to 2050 for US Army Garrison-Kwajalein Atoll*		
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AFFILIATION	Center for Strategic Leadership United States Army War College Carlisle, Pennsylvania	**FUNDING AGENCY**	Assistant Secretary of the Army for Installations, Energy, and Environment

PURPOSE OF THE PROJECT

This project explores the impact of climate change on the out-migration of local indigenous workers from the Marshall Islands who support the mission of the USAG-KA in the Pacific and provides recommendations to increase local unskilled labor from now through 2050.

BACKGROUND

The USAG-KA is a critically important national security asset to the United States. The base is home to the Ronald Reagan Ballistic Missile Defense Test Site (RTS) and the Space Fence. Approximately 1,200 people work at the base. Most of the Marshallese workers at the USAG-KA live outside the walls of the facility on neighboring Ebeye, which is severely impacted by sea-level rise, over wash, subsidence, extreme waves, saltwater intrusion, drought, and other climate hazards. By as early as 2035, many of the Marshall Islands may reliably be under ocean water for at least one day per year, making them uninhabitable.

The Marshallese are increasingly migrating to the United States due to climate change and the desire for better economic opportunities, advanced health care, and greater educational options. The Marshallese may live and work legally in the United States under the COFA. Already, more than half the population of the Marshall Islands (47,000 people) is living in the United States, while only 39,000 remain in their country.

The USAG-KA is increasingly facing significant shortages of local Marshallese workers on Ebeye who are willing and able to perform unskilled labor on the base. This situation is expected to grow exponentially in future years as climate change becomes a greater push factor in sending local Marshallese people away from their country and making their return unlikely.

RESEARCH METHODS

This project involved the use of the following methods.

- In-depth literature review of existing data from peer-reviewed articles, professional journals, official reports, ethnographic accounts, visual resources, and reliable news stories on climate change and human migration in the Marshall Islands.
- Several dozen in-depth meetings with US military leaders, key civilian stakeholders, nonprofit organizations, think tanks, and subject matter experts in social sciences, engineering, climate resiliency, and related fields on the issues of human migration and environmental security in the Marshall Islands.
- Qualitative ethnographic interviews with convenience samples of several dozen Marshallese residents in diaspora communities, conducted in person or virtually, using semistructured, open-ended surveys on the issue of climate migration and their nation's future.
- Site visits to Marshallese diaspora communities in the United States, including in Washington, Arkansas, Hawaii, and Iowa.
- Site visit by the principal investigator to the USAG-KA and Ebeye in the Marshall Islands during a previous university research sabbatical.
- Lessons learned by the principal investigator from more than five years of working with Marshallese migrants who resettled in the Midwest from Ebeye, Majuro, and other communities.

CONCLUSIONS

- Climate change is a migration amplifier for an increasingly large number of Marshallese who leave their nation to work in the United States.
- Although climate change may not have been a direct, linear cause of Marshallese migration during previous years, it currently has significant second- and third-order effects on the underdevelopment of the nation's economic, health care, and educational systems, thus contributing to the need for the Marshallese to seek better opportunities elsewhere today.
- Climate was cited frequently as a reason for the Marshallese living in the United States NOT to return to their country of origin and to remain in the United States. Younger Marshallese were also more likely than their older family members to cite climate change as a reason for their migration.
- Because more Marshallese now live in the United States than in their own nation, family ties and reunification with relatives were increasingly cited as reasons to move *to* the United States rather than remain in the Marshall Islands.
- Because the Marshallese can work and live legally in the United States under the COFA, many are choosing to migrate to the United States as unskilled workers. As such, they may be earning 25 dollars or more with full benefits—which is more than they can earn with the USAG-KA—by working as meatpackers, warehouse employees, ice packers, or retail sales staff in states such as Washington, Iowa, Arkansas, Hawaii, and others.
- The USAG-KA and the Department of Defense are therefore essentially competing with for-profit US corporations for a shrinking pool of unskilled workers, particularly in rural American states that are facing their own labor shortages due to aging populations, low fertility rates, and out-migration due to urbanization.
- Local Marshallese people are usually employed by the USAG-KA to perform unskilled labor on the base. Most of these Marshallese workers live on densely packed Ebeye island, which is severely impacted by climate change. Housing is extremely short for USAG-KA workers on Kwajalein Atoll itself due to the atoll's small size.
- Many of the local Marshallese people living in Ebeye do not have a high school education and will likely not go on to study at colleges or universities. Vocational training programs and pipeline programs that work with the USAG-KA are not currently available on Ebeye. The USAG-KA is already experiencing a significant shortage of both skilled and unskilled workers willing and able to serve in this extremely remote environment. As climate-amplified migration continues in future decades, the USAG-KA will likely experience even more severe shortages of workers that could inhibit its ability to perform its mission.
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RECOMMENDATIONS

- This report provides multiple strategic recommendations the Department of Defense could adopt through 2050 to help mitigate the shortage in local, unskilled labor for the USAG-KA.

- The strategies in this report are provided as options for the US Department of Defense to explore further. They range from low, medium, to higher cost, and include efforts that could be implemented in the near, mid, and long terms.

- Some of these strategies include greater civilian-military support for environmentally displaced workers; adoption of innovative vocational training programs between the base and local schools; new efforts to provide higher salaries and unique benefit packages to local employees; more education for senior leaders on the impacts of climate change on human populations; potential use of foreign workers, augmentation units, and robotics in future years if the Marshallese continue to migrate; building of floating accommodations to house fly-in/fly-out workers; seawall and other infrastructure investments that benefit Ebeye residents and not just Kwajalein Atoll; and eventual consolidation of key labor-intensive activities in other global locations in the long term if unskilled laborers remain limited.

- The US government could recognize the USAG-KA as a leading test site globally for innovative, cutting-edge climate-resiliency research and projects in many sectors.

- The challenge of addressing local worker shortages in the Marshall Islands due to climate migration may be the weakest chain in the complex system of systems engineers and other professionals addressing climate-resiliency issues on military installations often explore. Human variables, such as migration patterns, are often overlooked in long-range climate planning for bases, in favor of focusing on infrastructure development and protection.

- Climate change researchers and senior military leaders must recognize, from a social science perspective, the impact of climate change on the human communities that live outside the walls of bases and support their missions.

- Some of these communities, such as the Marshallese on Ebeye, are profoundly impacted by climate change. This situation contributes to environmental insecurity and vulnerability beyond the walls of the military installation.

- This case study of climate-amplified out-migration of base workers from the USAG-KA can provide important lessons for other domestic and international US military installations that rely on workers who live off-post in environmentally vulnerable communities.

RECOMMENDATION #1

EFFORT: Seek the US federal government's sponsorship of and support for the identification and funding of the USAG-KA as the nation's leading test site for cutting-edge, global innovation in applied climate-resilience research that includes physical engineering strategies, social science perspectives, human community impacts, and other elements of environmental security.

INITIAL TIME FRAME: **Near-Term**

COST: **Moderate**

RISK: **Moderate**

FREQUENCY: **Enduring**

STRENGTHS

- Builds upon existing recognition of the USAG-KA as a leading US Army test site.
- Could provide experiential learning opportunities for teams of military engineers, social scientists, and other specialists on-site.
- Would provide unique opportunities for current and future military leaders to partner with local indigenous populations on climate-resiliency efforts at the USAG-KA.
- Could be a useful test site for military personnel at all levels, ranging from Reserve Officers' Training Corps cadets to senior colonels and generals, as well as civilian personnel.

WEAKNESSES

- Extreme, remote location for conducting research.
- Challenging logistics and high costs for traveling to the USAG-KA.
- Limited viability of the site for long-range research; potentially too difficult in the next 20 to 30 years with climate change impacts.

OPPORTUNITIES

- Recognizes the high level of research on climate issues already being conducted on Kwajalein Atoll.
- Takes advantage of increasing world recognition of Kwajalein Atoll as the tip of the spear of climate issues.

THREATS

- Could be subject to significant funding shifts if political administrations change and are not supportive.
- Could ultimately become very difficult to conduct research on Kwajalein Atoll due to increased climate change.

RECOMMENDATION #2

EFFORT: Promote multigenerational partnerships with professional military education service academies on environmental security, using the USAG-KA as a learning laboratory.

INITIAL TIME FRAME: **Near-Term**

COST: **Lower**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- Builds upon existing environmental security partnerships between service academies, such as the US Military Academy and the US Army War College.
- Could provide experiential learning opportunities for teams of senior leaders with cadets.
- Research, teaching, and service opportunities could vary in scope, depending upon resources.
- Would provide unique opportunities for current and future military leaders to partner with local indigenous populations on climate-resiliency efforts at the USAG-KA.
- Provides opportunities for cadets and senior military leaders to publish, lecture, and study the impact of climate on military infrastructure and local communities.

WEAKNESSES

- Extreme location for field partnerships and learning activities.
- Challenging logistics and high costs for traveling to the USAG-KA.

OPPORTUNITIES

- Provides multigenerational expertise for the Department of Defense in addressing slow-moving climate disaster analysis, mitigation, and resilience.
- Could replace some field learning activities at the USAG-KA with virtual sessions to limit costs.
- Current mandate for professional military education institutions to incorporate climate security in curriculum.
- Capitalizes on younger officers' increased career interest in working on climate studies.

THREATS

- If not funded on a recurring level, partnership efforts could be sporadic and uncoordinated.
- Could be targeted for elimination by administrative entities that are not supportive of environmental security efforts within the Department of Defense.

RECOMMENDATION #3

EFFORT: Educate stakeholders on the social science aspect of climate change impacts on human populations and the connection to national security.

INITIAL TIME FRAME: **Near-Term**

COST: **Lower**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Holistic Approach:** This recommendation helps stakeholders understand the societal impacts of climate change, in addition to the physical impacts beyond infrastructure damage.
- **Lessons**: Lessons learned from Marshallese society can be used to inform educational programs in other nations and organizations dealing with the impacts of climate change.
- **Low Cost:** Relatively lower expenses.

WEAKNESSES

- **Extremely Broad and Difficult Attribution**: The number of social impacts may be very broad and attributing some impacts specifically to climate change may be difficult.
- **Length of Time**: Some of the impacts of climate change on Marshallese society may take a very long time to manifest or are less obvious to the stakeholders than infrastructure damage from climate change.

OPPORTUNITIES

- **Incorporate into Modeling:** The societal impacts could possibly be built into models to understand the holistic impacts of climate change upon an island nation.
- **Educate Organizations outside the Department of Defense**: The social impacts could be shared with other organizations within and outside the US government; for example, they could be shared with the state and local governments of areas where Marshallese people are resettling to provide focused social services and assistance.
- **Incorporate into Climate Change Curricula**: The impacts of climate change on a society should be built into relevant educational curricula, such as into professional military education plans of study.

THREATS

- **Limited Time Frame:** Many Marshallese people are already choosing to immigrate to the United States under the COFA treaty, so many missed opportunities for education and research are already occurring.

RECOMMENDATION #4

EFFORT: Develop mechanisms to pay higher wages to local employees and contractors and provide a greater array of benefits that would be of interest to workers (for example, vacation travel to the United States to see family).

INITIAL TIME FRAME: **Near-Term**

COST: **Moderate**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Enhanced Financial Security**: Higher salaries can provide workers with more resources to safeguard their homes and families against climate impacts.
- **Increased Job Satisfaction**: Better compensation can boost morale, job satisfaction, and retention.
- **Local Economy Support**: Higher wages contribute to the local economy, potentially offsetting some effects of environmental degradation.
- **Attracting Talent**: Competitive salaries might draw skilled professionals to contribute to climate-resilience efforts or drive educational opportunities for residents.

WEAKNESSES

- **Financial Strain on Businesses**: Increased salaries can significantly raise operational costs, especially for small and medium enterprises, potentially leading to downsizing or closure.
- **Wage Inflation**: Higher wages in one sector could lead to demands for increased pay across other sectors, contributing to inflation and potentially negatively impacting wages.
- **Resource Diversion**: Allocating more funds to wages could divert resources from essential investments in infrastructure improvements and climate-adaptation measures, which are crucial for long-term sustainability.
- **Potential for Economic Disparities**: Large wage increases for certain groups of workers could exacerbate social and economic inequalities within the community, leading to social tensions.

OPPORTUNITIES

- **Stimulated Economic Growth**: Higher wages could boost the local economy and businesses.
- **Innovation in Climate Resilience**: Financial stability could enable workers to invest in innovative solutions for climate adaptation, contributing to community-wide resilience.
- **Attracting and Retaining Talent**: Competitive compensation packages could attract skilled professionals to the area, particularly in environmental science and sustainability fields.
- **Enhanced Community Cohesion**: Investing in the local workforce can strengthen community ties and morale.
- **Global Spotlight:** A commitment to worker well-being can attract international attention and goodwill.

THREATS

- **Cost of Living Increase**: Higher wages can drive up the prices of goods and services for the community.
- **Neglect of Comprehensive Climate Solutions**: Focusing primarily on wage increases may divert attention and resources from essential climate adaptation and resilience planning.
- **Labor Market Distortion**: Significant wage disparities can lead to labor shortages in critical but lower-paying sectors, impacting essential services.
- **Financial Sustainability**: The long-term financial viability of significantly higher wages could be challenging for employers, especially in the face of ongoing environmental threats.
- **Dependency on External Funding**: If wage increases rely on external aid or subsidies, a risk of dependency exists, making the local economy vulnerable to changes in funding landscapes.

RECOMMENDATION #5

EFFORT: Strengthen civilian-military relationships between the USAG-KA, the US Army Chaplain Corps, civil affairs command (CACOM), the Public Affairs Offices, US Army medical units, and other relevant groups with the Marshallese government, nonprofits, local community organizations, international aid agencies, and other units.

INITIAL TIME FRAME: **Near-Term**

COST: **Moderate**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Whole of Department of Defense Approach:** Department of Defense (DoD) units, such as the 351st CACOM and the USAG-KA, in coordination with the US Embassy Majuro and other US government agencies, can reach out to governmental and nongovernmental social service organizations supporting Marshallese society.
- **Enables the USAG-KA to Assume a More Active Role**: The USAG-KA can become a hub of information for its local national employees and contractors.
- **Strengthen Relationships between Army, US Government, and Other Agencies:** Establishes and strengthens relationships between US government and other agencies.
- **Improves US Standing:** Improves the perception of the United States among local nationals by increasing the United States' active interest in their resiliency and well-being.

WEAKNESSES

- **USAG-KA Resourcing**: This recommendation would require more manpower for the USAG-KA to establish and build habitual relationships with the array of agencies that can provide assistance to Marshallese local nationals.
- **Turnover of Leadership**: The USAG-KA garrison commander will turn over every several years. A consistent and continuous effort to maintain relationships will be required as part of a new garrison commander's agenda.
- **Identifying All Contributors**: All the various governmental and nongovernmental agencies that provide assistance to the Marshallese may not be clear or evident. A running catalog of these organizations and their points of contact should be maintained.

OPPORTUNITIES

- **Enlarge the USAG-KA Government Affairs Capabilities**: Provide the USAG-KA with resources and the ability to establish relationships with the array of governmental, nongovernmental, and international assistance agencies.
- **Involve Other Army Organizations**: Bring in other Army organizations and commands such as medical, civil affairs, and public affairs units, to assist the USAG-KA in establishing a broad array of information and services.
- **Enable the USAG-KA to Establish Employee Assistance-Type Programs for Local Nationals**: Implement the ability for local national employees to seek information or assistance from the USAG-KA, which can then link them with the appropriate aid organization.
- **Enable the USAG-KA and the Army to Understand How They Can Assist the Marshall Islands**: The USAG-KA and the Army can better understand how the capabilities of the Army could be brought to bear and assist the Marshall Islands in overcoming issues.

THREATS

- **Noncooperation:** Some governmental and nongovernmental organizations (NGOs) may not want to cooperate with the US government or the US Army.
  - **Staying in its Lane:** The intent of this effort is not for the Army to do any work the Department of State or other US interagency organizations would perform.
  - **Lack of Resources**: This effort will require resources (additional manpower) without overtaxing the USAG-KA.

RECOMMENDATION #6

EFFORT: Enhance relationships and partnerships with governmental organizations and NGOs from other nations to reduce redundant efforts and increase synergistic efforts for climate assistance to the Marshall Islands' population.

INITIAL TIME FRAME: **Near-Term**

COST: **Lower**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Potential to Develop Synergistic Aid:** Close coordination among governmental and nongovernmental agencies could produce synergistic efforts to assist the Marshallese.
- **Reduces Redundancies**: Conversely, governmental and nongovernmental agencies could coordinate their efforts to reduce redundant efforts and wasted resources.
- **Broader Understanding:** Close cooperation amongst agencies could result in a broader understanding of issues and the assistance the Marshallese need.
- **Capitalize on Strengths:** Close coordination amongst governmental and nongovernmental agencies could result in agencies playing to their strengths and specialties.

WEAKNESSES

- **Identifying a Coordinator**: A central organization or agency will have to be identified to take the lead and coordinate actions amongst the diverse agencies.
- **Not an Army Effort**: The USAG-KA could be a participating agency but would not be the lead organization coordinating other organizations.
- **Depends upon Willingness to Work Together:** The success of this effort could depend upon the number of governmental organizations and NGOs who agree to cooperate and coordinate their efforts.

OPPORTUNITIES

- **Create a Cohesive, Synergistic Effort to Assist the Marshallese**: Ideally, this effort identifies or creates an organization that could coordinate all agencies and organizations that are providing aid or assistance to the Marshallese to eliminate redundancies and deliver more effective assistance.

THREATS

- **Refusal to Cooperate**: Certain governments or NGOs may refuse to participate or cooperate with the US government or the Army.

RECOMMENDATION #7

EFFORT: Expand secondary or postsecondary educational opportunities, to include vocational training programs and grade school academic pipeline programs, locally on Ebeye to increase the pool of trained workers in key skills such as welding, electrical work, and construction. A component of the vocational training could be a partnership with the USAG-KA in which students receive hands-on training opportunities and the USAG-KA receives labor assistance.

INITIAL TIME FRAME: **Near-Term**

COST: **Lower**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Educational Programs Tailored to the Needs of the Marshallese:** These educational programs, at all levels, should be tailored to the needs of the Marshallese society and workforce.
- **Programs for All Levels**: Enlarging vocational training programs for needed trades and skills may encourage more Marshallese people to seek education and training past secondary school.
- **Accessible:** These educational programs should be available through local educational institutions, such as the College of the Marshall Islands or the University of the South Pacific at campuses in the Marshall Islands, including on Ebeye.
- **Partnerships:** The vocational training programs could be cosponsored by the Marshall Islands, aid agencies, or allies and partners.

WEAKNESSES

- **Economics**: Unless potential students are provided grants, financial aid, or subsidies, these programs may be out of the economic reach of many Marshallese people.
- **Location Challenges**: Even if these programs were offered by local higher education institutions, attending may be a geographical challenge for potential students from outlying atolls and islands.
- **Potential to Go Elsewhere**: Graduates of these programs with degrees or trade skills may be tempted to seek employment in the United States or other locations that may offer higher wages.

OPPORTUNITIES

- **Ensure Educational Programs Are Specific to Marshallese Challenges**: The educational programs must be tailored to the specific challenges encountered in the Marshall Islands due to the physical and social impacts of climate change.
- **Training Partnership with the USAG-KA**: A vocational training program could partner with the USAG-KA to provide students with hands-on experience on real infrastructure projects; the USAG-KA could benefit from the additional labor.
- **Educational Partnerships**: Higher education institutions in the Marshall Islands could collaborate with the world's most renowned institutions within the social sciences and engineering fields to develop educational programs.

THREATS

- **Intellectual and Training Flight:** Students who complete degrees or vocational training could leave for other locations, such as the United States, that offer higher wages. Acceptance of financial benefits for such programs at Ebeye that include training on the USAG-KA should include a mandatory service period in the Marshall Islands before emigration.

RECOMMENDATION #8

EFFORT: Increased recruitment of local Marshallese people into the US military with options for guaranteed duty stations in the Marshall Islands, and/or into a Marshallese nationally run coast guard service that helps address climate change challenges.

INITIAL TIME FRAME: **Midterm**

COST: **Moderate**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Local Recruiting:** Recruiting local Marshallese people into the US military and/or a national coast guard service can enhance cultural understanding and community relations.
- **Regional Workforce Stability:** Having Marshallese recruits stay for work in the region can provide a stable and familiar workforce for US military operations.
- **Duty Station of Choice:** Assigning the first duty station back to the Marshall Islands could leverage local knowledge and connections for effective operations.

WEAKNESSES

- **Limited Recruitment Pool**: The recruitment of local Marshallese people may be limited due to population size and eligibility criteria.
- **Limited Military Slots:** Currently a limited number of active-duty military billets are located in the Marshall Islands; the services would have to move billets to the Marshall Islands if a strong desire for the program existed.

OPPORTUNITIES

- **Cultural Exchange:** Increased recruitment can foster cultural exchange and understanding between the US military and the Marshallese community.
- **Local Support:** Recruiting locally can garner support and cooperation with military activities in the region from the Marshallese population.
- **Skill Development:** Training Marshallese recruits can enhance local skills and capabilities for future employment opportunities and could also teach the Marshallese a trade they could later use to work on the USAG-KA when they got out of the military.

THREATS

- **Resistance to Military Service**: Some Marshallese individuals may not be inclined to join the military due to cultural or personal reasons.
- **Retention Challenges:** Retaining Marshallese recruits in the military long term may be challenging due to factors such as family obligations or not wanting to leave the Marshall Islands after their first enlistment.
- **Political Sensitivities:** The recruitment of local Marshallese into the US military may raise political sensitivities or concerns within the community, in light of the history of previous nuclear weapons testing in the area.

RECOMMENDATION #9

EFFORT: Form partnerships between the US government, the USAG-KA, and local Marshallese organizations to educate them on climate change and to incorporate traditional Marshallese and Pacific Islander wisdom into creative resiliency strategies. Include Marshallese youth, when possible, as students in USAG-KA schools.

INITIAL TIME FRAME: **Near-Term**

COST: **Moderate**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Inspire the Youth:** Programs and partnerships with Marshallese youth organizations could help instill a motivation to become part of the solution in overcoming the impacts of climate change; to enter higher education or vocational training programs; and to impact Marshallese society in a positive manner.
- **Recruit for the Department of Defense**: Partnerships with youth organizations may inspire future enlistments for the Department of Defense.
- **Help Locals Take Ownership of Solving Their Issues:** Partnerships may inspire Marshallese youth and families to take ownership of solving the issues within their control.
- **Additional Students in USAG-KA Schools:** If possible, additional Marshallese students could be admitted to the schools in the USAG-KA.

WEAKNESSES

- **Additional School Seats May Not Be Available**: USAG-KA schools may not have additional seats for Marshallese students.
- **Identifying All Youth Organizations and Programs**: Identifying the most appropriate Marshallese youth programs with which to partner may be difficult.
- **Additional Resources**: This may require staffing support for program coordinators and supplies.

OPPORTUNITIES

- **Maximize Partnerships**: Partnerships with as many Marshallese youth programs and organizations should be created, including with those located on outer islands and atolls to maximize participation.
- **Opportunity for Youth on the USAG-KA to Experience Marshallese Life**: A component of a youth partnership program could be the opportunity for American dependents (youth on the USAG-KA) to do reciprocal swaps to experience Marshallese programs and life.

THREATS

- **Additional Resources**: This type of program could not reach its full potential without dedicated program coordinators and assurances of longer-term funding streams.

RECOMMENDATION #10

EFFORT: Enhance information operations to counter the expansion efforts of the People's Republic of China and other adversaries in the region.

INITIAL TIME FRAME: **Near-Term**

COST: **Moderate**

RISK: **Lower**

FREQUENCY: **Enduring**

STRENGTHS

- **Information Superiority:** Enhanced information operations can provide the United States with a strategic advantage in countering Chinese expansion efforts in the Marshall Islands and the Indo-Pacific.
- **Targeted Messaging:** Effective information operations can target specific audiences to shape perceptions and influence behavior in the region.
- **Cyber Capabilities:** Leveraging cyber capabilities can disrupt Chinese expansion efforts and protect US interests in the area.

WEAKNESSES

- **Resource Intensive:** Implementing enhanced influence operations may require significant resources in terms of technology, personnel, and funding.
- **Coordination Challenges:** Ensuring coordination between different agencies and stakeholders involved in information operations can be complex.
- **Ethical Concerns:** Ethical considerations may exist regarding the use of information operations and its potential impact on civilian populations.

OPPORTUNITIES

- **Public Diplomacy**: Information operations can be used for public diplomacy efforts to build support for US policies and actions in the region.
- **Alliance Building:** Enhanced information operations can strengthen alliances with regional partners to counter Chinese expansion efforts collectively.
- **Influence Operations:** Leveraging information operations can influence decision-making processes and perceptions in favor of US interests.

THREATS

- **Countermeasures by China:** China may develop countermeasures to disrupt or counter US information operations in the region.
- **Misinformation Risks**: A risk exists of misinformation or disinformation campaigns undermining the effectiveness of US information operations.
- **Legal and Regulatory Constraints:** Compliance with international laws and regulations regarding information or influence operations may pose challenges in countering Chinese expansion efforts effectively.

RECOMMENDATION # 11

EFFORT: Enhance the use of the logistics civil augmentation program (LOGCAP) by the US Army as a mechanism to augment USAG-KA needs by providing specific service capabilities to meet externally driven, rapid-contingency operational requirements.

INITIAL TIME FRAME: **Near-Term**

COST: **Moderate**

RISK: **Moderate**

FREQUENCY: **Periodic**

STRENGTHS

- **Rapid Deployment**: Designed for rapid response to emerging needs or crises related to the impacts of climate change and priority mission sets.
- **Expertise and Resources**: Has access to a wide range of expertise and resources, including cutting-edge technology and skilled personnel, ensuring high-quality solutions to complex problems.
- **Scalability**: Can be scaled up or down based on the specific requirements of the Kwajalein Atoll, providing flexibility in addressing the varying impacts of climate change or regional and basing needs.
- **Integrated Support**: Offers comprehensive support that includes logistics, engineering, and operational capabilities, providing an all-encompassing approach to maintaining base operations.

WEAKNESSES

- **Dependency on External Support**: May reduce the incentive for local capacity building and self-sufficiency in dealing with climate change impacts.
- **Cost Considerations**: Can have significant financial implications.
- **Bureaucratic Complexity**: Can involve complex bureaucratic procedures, possibly leading to delays in response.
- **Cultural and Social Sensitivity**: May not always align with the cultural and social dynamics of the local community, potentially leading to friction if contractors are outsiders.
- **Environmental Footprint**: Could have adverse environmental impacts, potentially exacerbating the very problems they aim to mitigate, if LOGCAP activities involve construction or other development activities.

OPPORTUNITIES

- **Innovative Climate Adaptation Solutions**: Could facilitate the implementation of innovative infrastructure and technology solutions specifically designed to combat the effects of climate change and rising sea levels, serving as a model for similar at-risk locations.
- **Economic Development**: Could stimulate local economic development by creating jobs and contracting local businesses, contributing to the overall economic resilience of the community.
- **Capacity Building**: Could lead to collaborative knowledge and skill transfer, enhancing the local workforce's ability to manage and mitigate climate change impacts independently.
- **Enhanced Disaster Preparedness**: LOGCAP's involvement can improve disaster response and preparedness capabilities, ensuring both the military base and the surrounding community are better equipped to handle climate-related emergencies.
- **Research and Collaboration Opportunities**: Can catalyze research into climate resilience and adaptation strategies, potentially attracting partnerships with academic institutions, NGOs, and international bodies.

THREATS

- **Resource Diversion**: Prioritizing military infrastructure and operations risks diverting critical resources away from civilian climate-adaptation needs, potentially leaving vulnerable populations inadequately protected.
- **Environmental Degradation**: The construction and operational activities associated with LOGCAP initiatives might lead to unintended environmental consequences, such as habitat destruction, pollution, and increased carbon footprint, which could exacerbate climate change issues.
- **Community Displacement**: Infrastructure projects and expansions to accommodate LOGCAP operations could lead to the displacement of local communities or restrict their access to traditional lands, fisheries, and resources.
- **Dependency Syndrome**: Overreliance on external military assistance for climate adaptation could hinder the development of local governance and community-led solutions, creating a dependency that may be unsustainable in the long term.
- **Perception and Legitimacy Issues**: The military's prominent role in climate-adaptation efforts might raise concerns among local populations and international observers regarding sovereignty, militarization, and the appropriateness of military involvement in civilian climate change initiatives.

RECOMMENDATION #12

EFFORT: Use legal migrant workers or fly-in/fly-out workers from other nations as workers if critical numbers of Marshallese people are no longer available as laborers.

INITIAL TIME FRAME: **Midterm**

COST: **Moderate**

RISK: **Moderate**

FREQUENCY: **Enduring**

STRENGTHS

- **Immediate Availability**: Migrant workers from neighboring islands and other nations can be more readily available to fill labor shortages in future years as the number of local Marshallese people declines.
- **Cultural Adaptability**: Workers may adapt more easily to the region if they are from a similar cultural and geographic background.
- **Economic Benefits for the Region**: Can support economic development of established and potential regional allies and partners in the workers' home islands.
- **Strengthened Regional Ties**: Can foster better relationships through migrants from allies and partner nations.
- **Diverse Skill Sets**: Can bring new skill sets to the area.

WEAKNESSES

- **Cultural Integration Challenges**: May face difficulties integrating into the remote area.
- **Dependency on External Labor**: May cause underinvestment in the development of a local workforce.
- **Language and Communication**: Can make communication more difficult with multiple languages and literacy levels.
- **Labor Rights Concerns**: May experience unfair treatment or lower wages if not ethically employed.
- **Resource Strain**: Can increase social pressures on the need for housing and infrastructure.
- **Social Tensions**: May contribute to social tension with the local population. May be susceptible to influence operations by adversaries to cause social divisions in the nation.

OPPORTUNITIES

- **Cultural Exchange**: Facilitates mutual cultural understanding and enrichment between the local population and migrant workers.
- **Skill Enhancement**: Can introduce new skills and techniques, contributing to local knowledge and practices.
- **Economic Growth**: Can contribute to economic growth in the local community through increased productivity and consumption.
- **Strengthened Regional Collaboration**: Can create stronger regional ties and cooperative initiatives between allies and partners.
- **Innovation**: May lead to greater diversity of ideas regarding resiliency and climate change strategies.

THREATS

- **Social Disparities**: May create or exacerbate inequalities between migrant workers and local populations.
- **Worker Exploitation Risks**: May experience unfair labor practices or conditions.
- **Legal Compliance**: May be difficult to adhere to labor laws and international worker rights issues.
- **Community Tensions**: May lead to increased social tensions due to perceived competition for jobs and resources.

RECOMMENDATION #13

EFFORT: Provide floating housing accommodations (such as barges, floating apartment complexes, and platforms) to local workers unable to be housed on Ebeye or Kwajalein Atoll due to environmental concerns.

INITIAL TIME FRAME: **Midterm**

COST: **Higher**

RISK: **Moderate**

FREQUENCY: **Enduring**

STRENGTHS

- **Flexibility and Mobility**: Can be relocated as needed, providing flexibility in responding to changing environmental conditions and flood risks.
- **Immediate Relief:** Can be a faster solution for emergency housing without the need for lengthy construction processes on the USAG-KA with limited space.
- **Scalability:** Can adjust the capacity and can be increased if needed for emergency disaster displacement.
- **Minimal Land Impact**: Reduces pressure on land resources, which is crucial in areas with limited available land.
- **Dual-Use Potential**: Can be equipped for multiple purposes, such as living spaces, community centers, educational facilities, and medical clinics, making them versatile housing assets for workers.

WEAKNESSES

- **Vulnerability to Weather**: Can be susceptible to severe weather conditions, which could pose safety risks.
- **Limited Access to Services**: May restrict easy access to essential services like health care, education, and supplies unless they can be reached easily through smaller boats, zodiacs, floatplanes, or helicopters.
- **Environmental Impact**: Could impact the local ecosystem by anchoring and operating the facility on a daily basis
- **Cultural and Social Issues**: May not align with the social and cultural norms of the workers.
- **Maintenance and Operational Costs**: Requires ongoing maintenance budget and safety protocols for operation.

OPPORTUNITIES

- **International Support**: Creates a unique model for adaptive living in response to climate change.
- **Community Resiliency**: Fosters community resilience through innovative housing solutions and integrates these communities with research and educational initiatives to combat environmental challenges better.
- **Investment Opportunities**: Stimulates technological and social innovation, supporting broader sustainable development goals.

THREATS

- **Environmental:** May exacerbate environmental degradation, particularly if destroyed during a disaster.
- **Standards of Living**: Must comply with legal and regulatory challenges.
- **Social Isolation:** Could create marginalization among workers and erosion of traditional culture.
- **Cost:** Inflation may significantly raise the cost of operating floating accommodations over time and create its own need for specialized laborers to build floating accommodations in remote areas.

RECOMMENDATION #14

EFFORT: Include Ebeye in physical infrastructure resiliency efforts for Kwajalein Atoll (such as extended seawalls connecting parts of both islands) to extend years of livability for residents.

INITIAL TIME FRAME: **Midterm**

COST: **Higher**

RISK: **Higher**

FREQUENCY: **Enduring**

STRENGTHS

- The Marshallese government and many Ebeye residents are supportive of engineering interventions that will improve Ebeye as well as Kwajalein Atoll.
- Could garner goodwill for the United States for its humanitarian assistance.
- Can provide improved protection for both islands from sea-level rise, over wash, etc.
- Some local Marshallese people could serve as laborers if available.

WEAKNESSES

- **Cost Implications:** Would involve high costs and technical complexities to achieve.
- **Logistics:** Would be time and labor-intensive, due to the remote area and the need to deliver all materials to an extremely remote area.
- **Governance and Decision Making:** Ebeye is not a territory of the United States. Would require a special arrangement to build there.

OPPORTUNITIES

- **International Cooperation:** The World Bank is already leading a multinational effort to help develop a seawall for Ebeye.

THREATS

- **Continuing Needs:** Would require ongoing maintenance and repairs in light of increasingly severe climate change.
- **Environmental Concerns:** May raise environmental concerns in some areas where the extended seawall would be located.
- **Regulatory Challenges:** May face compliance challenges with environmental regulations and permits.
- **Precedence:** Could set a precedent and expectation for the United States to spend billions of dollars on climate-resiliency efforts in foreign countries around American military bases.

RECOMMENDATION #15

EFFORT: Use unique land-reclamation efforts to raise the level of livable land on Ebeye and/or Kwajalein Atoll for workers so they may remain in the Marshall Islands longer.

INITIAL TIME FRAME: **Midterm**

COST: **Higher**

RISK: **Higher**

FREQUENCY: **Enduring**

STRENGTHS

- Could buy time and mitigate damage to the land from coastal erosion and sea-level rise.
- Could provide additional space higher above sea level for worker housing.
- Some local Marshallese people could serve as laborers if available.

WEAKNESSES

- **Cost Implications:** Would involve high costs and technical complexities to achieve.
- **Logistics:** Would be time and labor-intensive, due to the remote area and need to deliver all materials.
- **Governance and Decision Making:** Ebeye is not a territory of the United States. Would require a special arrangement to build there if land were reclaimed on that island.
- **Environmental Damage:** Could result in ecosystem damage to the lagoon floor.
- **Food Security:** Could lead to food insecurity for local residents if coral, fish, and flora and fauna were impacted.
- **Governance:** Ebeye is not a US territory. Special negotiations and permission could be needed from the Marshallese government to pursue this option.

OPPORTUNITIES

- **Similar Efforts by Other Nations:** The Chinese already have an active engineering program to accomplish land reclamation and artificial island-building efforts in the Pacific. May be able to learn from their successes and mistakes from an engineering standpoint.

THREATS

- **Continuing Needs:** Would require ongoing maintenance and repairs in light of increasingly severe climate change.
- **Environmental Concerns:** May raise environmental concerns about the ocean floor being harmed to build up Kwajalein Atoll and/or Ebeye artificially.
- **Regulatory Challenges:** May face compliance challenges with environmental regulations and permits.
- **Public Support:** Global support for artificial islands is mixed. Environmental groups around the world could view these efforts by the United States negatively.

RECOMMENDATION #16

EFFORT: Incorporating artificial intelligence, machine learning, automation, robotics, and mechanization to support the base in Kwajalein Atoll amid the departure of workers.

INITIAL TIME FRAME: **Longer-Term**

COST: **Higher**

RISK: **Higher**

FREQUENCY: **Enduring**

STRENGTHS

- **Labor Efficiency**: Can perform tasks that would otherwise require human labor, mitigating the impact of a reduced workforce.
- **Continuous Operation**: Can ensure essential base operations can continue around the clock, even without a large human workforce.
- **Adaptability:** Can quickly adapt to changing conditions and requirements, providing flexibility in response to environmental challenges.
- **Safety:** Can take over hazardous tasks, reduce the risk to human workers, and make the remaining jobs safer and potentially more appealing.
- **Attractiveness to Talent**: May make the base more attractive to tech-savvy professionals and specialists through the adoption of cutting-edge technology, helping to retain and attract skilled workers.

WEAKNESSES

- **High Initial Costs**: Can be expensive, requiring significant up-front investment in equipment, software, and training.
- **Technical Challenges**: Can be difficult to ensure the reliability and effectiveness of automated systems in a remote and challenging environment like Kwajalein Atoll, which may present technical difficulties.
- **Skill Gaps**: Can have shortages of workers with the necessary skills to operate and maintain advanced technological systems, requiring training or external experts.
- **Depersonalization**: Can create an overreliance on automation that does not include enough human oversight that can be crucial in unpredictable environments.
- **Cybersecurity Risks**: Can create a heightened risk of cyber threats on digital technologies.

OPPORTUNITIES

- **Innovative Climate Adaptation**: Can drive the development of innovative solutions to climate adaptation, improving resilience to rising waters and extreme weather.
- **Global Leadership**: Can position the base to be a global leader in technological adaptation to climate change in extreme, remote areas.
- **Collaborative Partnerships**: Can foster partnerships with tech companies, academic institutions, and other military bases to share knowledge and resources.
- **Economic Diversification**: Can stimulate local economic diversification in the high-tech sector, reducing dependence on traditional labor-intensive activities.
- **Education and Training Programs**: Can prompt the establishment of educational and training programs that build local expertise in high-demand tech sectors.
- **Research and Collaboration Opportunities**: Can catalyze research into climate resilience and adaptation strategies, potentially attracting partnerships with academic institutions, NGOs, and international bodies focused on climate change.

THREATS

- **Technological Dependence**: Can create an overreliance on complex technologies that could make the base vulnerable to technical failures or malfunctions, potentially crippling operations.
- **Job Displacement**: Can lead to job displacement, exacerbating unemployment issues and potentially causing social unrest among the local population, an increase in information operations by adversaries to cause civil unrest, and related issues.
- **Cultural and Social Impact**: Can disrupt the local community's social fabric and cultural practices, leading to resistance or social divisions.
- **Cybersecurity Vulnerabilities**: Can expose the base and its operations to cyber threats, requiring significant resources to manage cybersecurity risks.
- **Obsolescence Risks:** Can result in some technologies becoming obsolete quickly, requiring expensive updates and modifications.

RECOMMENDATION #17

EFFORT: Relocate or consolidate labor-intensive areas of the base to other sites less impacted by climate issues.

INITIAL TIME FRAME: **Longer-Term**

COST: **Higher**

RISK: **Higher**

FREQUENCY: **Enduring**

STRENGTHS

- **Risk Mitigation:** Can reduce future climate damage through relocating labor-intensive operations to other facilities around the world to mitigate risks associated with water incursion, drought, and sea-level rise.
- **Operational Continuity:** Helps ensure operations in areas less impacted by climate issues can enhance the operational continuity and resiliency of the base.
- **Resource Optimization:** Can optimize resources and reduce vulnerability to climate-related disruptions.

WEAKNESSES

- **Logistical Challenges:** May pose logistical challenges in terms of infrastructure, transportation, and workforce transition.
- **Cost Implications:** Would likely involve high costs for restructuring, relocating, or consolidating labor-intensive operations initially; although, the costs would ultimately likely be less expensive than doing nothing.
- **Community Impact:** Relocation may impact local communities and workforce dynamics, potentially leading to social and economic disruptions.
- **Security Clearance Issues:** May be difficult to relocate key elements of base operations to other facilities around the world due to the need for certain kinds of security clearances to operate.

OPPORTUNITIES

- **Adaptation Strategies**: Presents an opportunity to implement adaptation strategies and build resilience against climate issues through collaboration.
- **Efficiency Improvements:** Can lead to efficiency improvements in operations and resource management.
- **Long-Term Sustainability:** Can contribute to the long-term sustainability of base operations.

THREATS

- **Resistance to Change:** May encounter resistance to relocating or consolidating efforts from the workforce or stakeholders.
- **Environmental Concerns:** May raise environmental concerns in new sites, impacting ecosystems and biodiversity.
- **Regulatory Challenges:** May face compliance challenges with environmental regulations and permits for relocation, causing delays or disruptions.

FULL REPORT

PROJECT RATIONALE

The purpose of this project is to identify strategies for the USAG-KA to consider over the next several decades, between 2025 and 2050, to address the increasingly severe shortage of local indigenous base workers from the Marshall Islands as a result of out-migration due to climate change, economic, and related factors.

Environmental scientists widely consider the Marshall Islands to be on the front lines of severe global climate change damage from sea-level rise, over wash, extreme waves, saltwater intrusion, water insecurity, drought, food insecurity, and subsidence. The USAG-KA is located in the Marshall Islands and is considered a critically important base for national security for the United States, its allies, and its partners. The USAG-KA is home to the Ronald Reagan Ballistic Missile Defense Test Site. But the USAG-KA is already experiencing significant shortages in Marshallese skilled and unskilled labor, as 40 percent of the residents have already migrated to the United States and other nations for better economic opportunities in less environmentally vulnerable areas. The labor shortage is expected to worsen significantly in future decades due to climate migration unless efforts are adopted to mitigate the exodus.

Although the USAG-KA has been the site of numerous climate-security studies for decades, these projects have typically focused on infrastructure vulnerabilities and disaster-mitigation strategies against sea-level rise and other risks. Few, if any, projects, have looked at what is possibly the most vulnerable climate challenge in base operations at the USAG-KA: the shrinking availability of local workers who live outside the base on neighboring atolls and are migrating, in part, due to significant

environmental threats to their nation and the second- and third-order effects of environmental damage. Most of the atolls in the Marshall Islands are only six to 10 feet above sea level. As early as 2035, the main island of Ebeye, which provides most of the local Marshallese workers for the USAG-KA, is expected to be submerged under the Pacific Ocean for at least one day per year. Parts of the Kwajalein Atoll are already experiencing more regular and potentially life-threatening extreme-wave and over wash events that make life difficult for the Marshallese workers residing on these islands.

As such, this project represents a unique opportunity to understand the impact of climate change on US military bases from a social science perspective, as the project focuses on environmental insecurity among the humans who surround such bases and provide much of the civilian and contractual labor.

METHODS

This project was supported by the Center for Strategic Leadership at the US Army War College as well as the Office of the Assistant Secretary of the Army (Installations, Energy, and Environment), under the Honorable Rachel Jacobson. The lead authors on the report include the US Army War College professor of environmental security and a team of four US Army War College students who participated in a group strategic research project for their graduation requirement. A US Army environmental engineer reservist with the Pentagon also contributed to the writing of the report, as did a US Army War College environmental-security research assistant. Contractual funding to the US Army War College helped support travel costs and the hiring of two temporary contractors to assist with the project: one with doctoral-level ethnographic expertise, and the other with professional wargaming design experience. Several environmental-security war games were ultimately produced as well, as supplements to the report. These simulation games focused on environmental security from a social science standpoint, particularly on the climate migration of base workers impacting generic Pacific atolls in future decades.

This report was produced using mixed methods, including both qualitative and quantitative techniques, as follows.

- a thorough literature review of existing secondary data in peer-reviewed journals on climate migration, the Marshall Islands, and related topics;

- a review of existing DoD reports addressing climate change, the USAG-KA, the Marshall Islands, and related topics;

- numerous qualitative interviews with key DoD, governmental, and nonprofit organizations charged with addressing various aspects of climate change in the Marshall Islands;

- multiple meetings and site visits with key Marshallese organizations and individuals in their diaspora communities, as well as with other vulnerable Pacific Islander populations at cultural meetings;

- the principal investigator's site visits to the USAG-KA and Ebeye in the Marshall Islands through a previous research sabbatical on Marshallese climate migration; and

- more than five years of field experience by the principal investigator in working with Marshallese migrants in resettlement communities in the Midwest.

LITERATURE REVIEW

Climate Change and Environmental Security

In the twenty-first century, the US Department of Defense faces the rapidly growing challenge of addressing the complex, systemic impact of climate change on environmental security and national defense. In the 2022 *National Security Strategy*, climate change is cited as the greatest existential risk facing the country, with far-reaching implications for global stability and security.[1] Understanding this complex relationship between climate change and environmental security is crucial to formulating effective response and mitigation strategies to ensure a sustainable future for generations to come.[2] This section will broadly define environmental security, the risks posed by climate change that can manifest in environmental security, and real-world examples of climate change directly impacting environmental security.

Although no single, universally accepted definition of environmental security exists, the premise goes beyond simply protecting the environment and natural resources such as water, soil, air, vegetation, and biodiversity, which form the foundation of a nation's environment. Environmental security encompasses a broad range of efforts to address environmental challenges—such as climate change, pollution, resource depletion, threats to sustainability and livelihood, public health, and the global economy—to safeguard the well-being of populations by preventing instability and conflict.[3] Environmental security involves engendering cooperation among nations

[1] White House, *National Security Strategy* (Washington, DC: White House, October 2022).
[2] Tackling the Climate Crisis at Home and Abroad, 86 Fed. Reg. 7619–23 (February 1, 2021).
[3] African Ministerial Conference on the Environment [AMCEN], Sixteenth Session, *Environmental Security*, AMCEN/16/EGM/1 (June 12–14, 2017), https://wedocs.unep.org/bitstream/handle/20.500.11822/20922/AMCEN16EGM5Environmental%20security_E.pdf?sequence=1&amp%3BisAllowed=.

and regions to solve environmental challenges and mitigate the impacts caused by climate change. A continuous, cooperative, and integrated approach focused on joint actions by governments, international institutions, and the private sector is essential to the future of environmental security.[4]

Climate change's direct influence on environmental security is multifaceted and far-reaching. The escalating and immediate risks posed by climate change hazards commonly manifest as extreme-weather events, environmental degradation, rising sea levels, and resource scarcity; all of which can threaten our global environmental security.[5] The UN Command has taken it one step further and delineated seven key climate change hazards or "climate-fragility" risks that can impact environmental security.[6]

- ***Extreme-Weather Events and Disasters***: The increased frequency and intensity of natural disasters like floods, droughts, hurricanes, and wildfires cause widespread devastation, displacement, and loss of life. These events overwhelm national and regional capacities, resulting in humanitarian crises and economic instability.
- ***Livelihood Insecurity and Migration/Environmental Degradation***: Deforestation, land degradation, and biodiversity loss further exacerbate climate

[4] "Environmental Security," Rowan University (website), n.d., accessed December 3, 2023, https://chss.rowan.edu/centers/inter_majors/interdisciplinary_programs/internationalstudies/global_security_resource/global-security-problems-folder/environmental-security.html.
[5] Department of Defense, *Department of Defense Climate Risk Analysis* (Washington, DC: Department of Defense, October 2021).
[6] "Climate Change Poses Increasing Risks to Global Stability," UN Framework Convention on Climate Change (website), February 21, 2017, https://unfccc.int/news/climate-change-poses-increasing-risks-to-global-stability.

change impacts and weaken ecosystems' resilience. These factors contribute to food insecurity, water scarcity, and the spread of infectious diseases, undermining public health and well-being and leading to migration.

- ***Transboundary Water Management***: Competition over water is expected to intensify in areas where nations share the management of water supplies. This could lead to significant interstate tension or even armed conflict.
- ***Sea-Level Rise and Coastal Degradation***: Coastal communities and infrastructure are threatened by rising sea levels, leading to land loss, displacement, and damage to critical infrastructure. This can disrupt entire economies and displace or force communities to migrate, adding pressure to already vulnerable regions.
- ***Local Resource Competition/Resource Scarcity***: Rising temperatures, erratic precipitation patterns, and melting glaciers lead to water scarcity, agricultural decline, and food insecurity. This competition for vital resources can exacerbate existing inequalities and social tensions, potentially leading to conflict.
- ***Volatile Food Prices and Provisions***: Climate change is expected to reduce yields and disrupt food production in many areas of the world, especially those in poorer regions. This could lead to increased food prices and market volatility, which could cause public unrest, democratic breakdown, and civil and local conflict.
- ***Unintended Effects of Climate Policies***: The implementation of policies may have added consequences if not coordinated or implemented correctly. This

could lead to increased insecurities, the marginalization of minority groups, or increased degradation and loss of biodiversity.[7]

The intensification of climate fragility and climate hazards is anticipated to have far-reaching implications, including heightened competition over territories and resources, amplified demands on and altered functionality of military operations, and an increase in the frequency and severity of humanitarian crises that will jeopardize global stability and security.[8] Although climate change is just one of numerous factors contributing to instability and conflict, the likelihood of climate-related hazards having security implications can be mitigated through resilient and robust responses at all levels.[9]

The following real-world examples highlight examples of the interconnectedness of climate change and environmental security from a military standpoint.

- ***Sahel Region***: Recurring droughts and desertification in the Sahel region have led to competition over scarce resources, creating fertile ground for conflict between herder and farmer communities. This instability has contributed to the rise of extremist groups and threatens regional security.[10]

[7] "A New Climate for Peace," Climate Diplomacy (website), n.d., accessed December 7, 2023, https://climate-diplomacy.org/magazine/conflict/new-climate-peace.
[8] White House, *National Security Strategy.*
[9] "Climate Change and Security Risks," UN Environment Programme (website), n.d., accessed December 3, 2023, https://www.unep.org/explore-topics/disasters-conflicts/what-we-do/disaster-risk-reduction/climate-change-and-security.
[10] Melinda Jones, "The Sahel Faces 3 Issues: Climate, Conflict & Overpopulation," Vision of Humanity (website), n.d., accessed November 26, 2023, https://www.visionofhumanity.org/challenges-facing-the-sahel-climate-conflict-and-overpopulation/.

- ***Pacific Islands***: Pacific Island nations face existential threats due to rising sea levels, saltwater intrusion, and extreme-weather events. These impacts threaten Pacific Island nations' very existence, displacing communities and jeopardizing their cultural heritage and economic livelihoods.[11]
- ***The Arctic:*** The warming of the Arctic and the increased melting of sea ice due to climate change has opened new opportunities for resource extraction and shipping routes. This has led to increased geopolitical competition for control over these resources, raising concerns about environmental impacts, territorial disputes, and potential military tensions.[12]

These are just a small number of the current real-world examples that demonstrate how climate change and environmental security are inextricably linked and pose significant threats to global peace and stability. The complex interplay of environmental factors and human security creates a vicious cycle, making sustainable peace and development difficult to achieve. Addressing these complex challenges requires a multifaceted approach encompassing mitigation, adaptation, and robust international cooperation.[13] Without an all-in effort, climate change will continue to be a

[11] Lieutenant Colonel Angela Smith, Major Gavin Devries, and Captain Liza Berry, *Republic of the Marshall Islands, 351 CACOM FXSP Civil Assessment – Phase 1* (Majuro, MH: 351st Civil Affairs Command, September 2023), 2.
[12] "The Geopolitics of Climate Change in the Arctic," University of Cambridge Centre for Science and Policy (website), June 19, 2023, https://www.csap.cam.ac.uk/news/article-geopolitics-climate-change-arctic2/.
[13] Erica Gaston et al., *Climate-Security and Peacebuilding: Thematic Review* (Tokyo: UN University, April 2023).

"threat multiplier" exacerbating existing social, economic, and political vulnerabilities across the globe.[14]

Climate Change and Impact on US Military Bases

The impacts of climate change on the Department of Defense are no longer hypothetical or deniable. The spectrum of effects related to climate change is having greater impacts upon the department's installations, in turn impacting budgets, operations, and ultimately our nation's military readiness. The severity of these impacts will most likely only increase going forward.

The Department of Defense submitted its *Report on Effects of a Changing Climate to the Department of Defense*, to Congress in 2019. In the report, the Department of Defense categorized the effects of climate change as: recurrent flooding, drought, desertification, wildfires, and permafrost thawing. Recurrent flooding could be either riverine flooding or coastal flooding caused by sea-level rise, land subsidence, storm surge, and weather events. Drought conditions reduce the moisture content in surface vegetation, which leads to higher occurrences of wildfires and reduces the water available to installations and communities. Desertification leads to the loss of vegetation and surface cover, resulting in erosion and environmental concerns due to silt and stormwater runoff issues. Containing wildfires on or near installations requires base and community resources, and if uncontained, wildfires pose significant threats to

[14] "Climate Change Poses Increasing Risks to Global Stability," UNFCCC, accessed November 25, 2023, https://unfccc.int/news/climate-change-poses-increasing-risks-to-global-stability.

life and infrastructure. Permafrost thawing causes land subsidence and undermines the integrity of the buildings and infrastructure built upon it. Of the 79 installations surveyed for this report, the Department of Defense predicted by 2039, 60 installations would be vulnerable to recurrent flooding, 48 would be vulnerable to drought, six would be vulnerable to desertification, 43 would be vulnerable to wildfires, and one would be vulnerable to melting permafrost.[15]

The US Army Corps of Engineers generated a report for the Office of the Deputy Assistant Secretary of Defense (Environment and Energy Resilience) in 2021, *DoD Installation Exposure to Climate Change at Home and Abroad*, which used categories like the 2019 DoD report, but with additional refinement. The categories used within the 2021 report were drought, coastal flooding, riverine flooding, heat, energy demand, wildfire, land degradation, and weather extremes. Drought, driven by rising temperatures and/or reduced precipitation, affects installations by reducing water supply and quality, and dries or kills vegetation, leading to increased soil erosion and wildfire risks.[16]

Coastal flooding, most commonly caused by storm events and exacerbated by rising sea levels, affects installations by damaging infrastructure and transportation facilities, overflowing operational and training areas, affecting wildlife habitats, and salinizing aquifers.[17] Coastal flooding will become more impactful as sea levels continue to rise and weather events become more intense; the Fourth National Climate

[15] Department of Defense, Office of the Undersecretary of Defense for Acquisition and Sustainment, *Report on Effects of a Changing Climate to the Department of Defense* (Washington, DC: Department of Defense, January 2019), 5–7.
[16] A. O. Pinson et al., *DoD Installation Exposure to Climate Change at Home and Abroad* (Washington, DC: US Army Corps of Engineers, 2021), 85.
[17] Pinson et al., *DoD Installation Exposure*, 87.

Assessment estimates global sea levels could rise by between 0.5 and 1.2 feet by 2050, and by between one and three feet by 2100 relative to 2000 levels.[18] One study of 18 coastal DoD installations predicted three of the 18 surveyed installations—Naval Air Stations Key West and Oceana Dam Neck Annex, and Naval Support Facility Anacostia—could lose up to 15 percent of their land area to flooding by 2050; by 2100, half of the 18 installations could lose 25 percent or more of their land in an intermediate sea-level-rise scenario.[19]

Riverine flooding is typically caused by excessive precipitation events caused by rising temperatures or the melting of deeper snowpacks (due to increased precipitation) and are increasing in frequency and magnitude. Like coastal flooding, riverine flooding affects installations by damaging infrastructure and buildings, overflowing operational and training areas, affecting wildlife areas, and causing land erosion. Compound flooding, where precipitation falls on already saturated ground, can cause flooding in areas that have not historically flooded.[20] In March 2019, a flooding event caused by rainfall over already-frozen ground at Offutt Air Force Base, home of United States Strategic Command, put nearly a third of the base and a portion of a runway underwater. Recent estimates for repairing or reconstructing damaged structures are in the $1 to $1.2 billion range.[21] In addition to the damage the floodwaters caused, the standing water that remained afterward attracted significant numbers of waterfowl and

[18] D. R. Reidmiller et al., eds., *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (Washington, DC: US Global Change Research Program, 2018), 85.
[19] The intermediate scenario is defined as a 3.7-foot sea-level rise by 2100. Union of Concerned Scientists, *The US Military on the Front Lines of Rising Seas* (Cambridge, MA: Union of Concerned Scientists, July 2016), 4–5.
[20] Pinson et al., *DoD Installation Exposure*, 89.
[21] Greg Hadley, "Cost of Rebuilding Offutt Will Top $1B, Congressman Says," *Air & Space Forces Magazine* (website), January 5, 2022, https://www.airandspaceforces.com/rebuilding-offutt-cost-1-1-1-2-billion-congressman/.

created a safety risk to aircraft, which further affected operations.[22] Going forward, climate change is expected to cause significantly greater precipitation in the Midwest United States and Alaska by the end of the twenty-first century relative to the beginning of the twentieth century.[23]

Heat impacts installations in multiple manners, both directly and indirectly. Rising temperatures contribute to increased precipitation, more intense weather events, warmer oceans (causing thermal expansion), and melting ice packs, leading to rising sea levels—in turn leading to greater riverine and coastal floods. Conversely, rising heat levels in arid locations may lead to additional droughts, causing soil erosion and increasing wildfire risks. Heat directly impacts readiness when high temperature risks have to be mitigated by limiting training, or when fire risks have to be mitigated by limiting firing-range activities.[24] Even if atmospheric greenhouse gas concentrations could be stabilized at current levels, global temperatures could rise by at least 1.1 degrees Fahrenheit by 2100 relative to the early twenty-first century.[25] Heat is disproportionately expected to affect installations where Initial Entry Training occurs—trainees are particularly vulnerable to heat injuries—such as Fort Jackson, South Carolina; Fort Moore, Georgia; Fort Sill, Oklahoma; and Fort Leonard Wood, Missouri. If carbon emissions are not reduced and current trends continue, estimates suggest the annual number of days that exceed a heat index of 100 degrees Fahrenheit could more

[22] Christopher M. Hobza and Kellan R. Strauch, *Floodwater Drainage Assessment of Offutt Air Force Base, Nebraska, 2020–22* (Reston, VA: US Geological Survey, 2023).
[23] Reidmiller et al., *Impacts, Risks, and Adaptation*, 88.
[24] Pinson et al., *DoD Installation Exposure*, 91.
[25] Reidmiller et al., *Impacts, Risks, and Adaptation*, 80.

than triple at Fort Sill, more than quadruple at Forts Jackson and Moore, and more than sextuple at Fort Leonard Wood by midcentury compared to historical averages.[26]

Energy will have greater and more intense demand peaks due to climate change. Although rising temperatures may lead to milder winters and lower heating demands, they will also lead to hotter summers and create greater demand peaks. These peaks will strain the nation's and installations' energy infrastructure and lead to greater budget outlays for utilities.[27]

Effects attributed to climate change increase the risk of wildfires at DoD installations. Rising temperatures create conditions for droughts and reduce moisture content in vegetation, increasing potential fuel loads for fires and prolonging the wildfire season. Forty-three of the 79 installations surveyed for the 2019 DoD report to Congress were predicted to be potentially at risk of wildfires by 2040.[28]

Land degradation refers to changes in land use, land cover, soil moisture, permafrost, and other processes that result in land loss, reduced soil fertility, coastal erosion, land subsidence, reduced ability to support vegetation and wildlife, and reduced agricultural yields.[29] Permafrost thawing in the Arctic, desertification of installations in the south and southwest United States, and erosion of installation areas along coastlines are examples of land degradation. Surface temperature increases have been most acute in the Arctic regions, where the average temperatures have risen twice as fast as average global temperatures.[30] The resulting permafrost thaw, and

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[26] Kristy Dahl, "US Military on the Front Lines of Extreme Heat," *Union of Concerned Scientists: The Equation* (blog), November 10, 2019, https://blog.ucsusa.org/kristy-dahl/military-extreme-heat/.
[27] Reidmiller et al., *Impacts, Risks, and Adaptation*, 93.
[28] Department of Defense, Office of the Undersecretary of Defense for Acquisition and Sustainment, *Report on Effects*, 5.
[29] Pinson et al., *DoD Installation Exposure*, 92.
[30] Reidmiller et al., *Impacts, Risks, and Adaptation*, 91–92.

associated land subsidence, threatens the integrity and stability of infrastructure, foundations, buildings, and training areas.[31]

Historical weather extremes reflect the increasing frequency and intensity of weather events due to climate change. These events include hurricanes, tornadoes, ice storms, and wildfires whose effects are expected to worsen going forward.[32] The most impactful example occurred in 2018, when Hurricane Michael rapidly intensified from a Category 2 to a Category 5 hurricane the day before it made landfall and struck Tyndall Air Force Base—home of the headquarters of First Air Force (the air component for United States Northern Command), the Florida Air National Guard, and at the time two squadrons of F-22 Raptor fighter jets and associated training programs. Hurricane Michael caused catastrophic damage across the installation and significantly impacted one-third of all Air Force F-22 operations, maintenance, and training.[33] The US Air Force's commitment to rebuilding Tyndall Air Force Base, and to enabling it to withstand future Category 5 hurricanes, will cost nearly $5 billion and will not be complete until 2027.[34]

Even if greenhouse gas emissions are stabilized or reduced in the near future, the Department of Defense must expect climate change to continue. Drought, coastal flooding, riverine flooding, heat, energy demand, wildfire, land degradation, and historic weather extremes will all affect the department's installations, significantly affecting budgets and military readiness.

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[31] Department of Defense, Office of the Undersecretary of Defense for Acquisition and Sustainment, *Report on Effects*, 7.
[32] Pinson et al., *DoD Installation Exposure*, 99–100.
[33] Benjamin Silliman, "Climate Change Is a Threat to Military Security," Council on Foreign Relations (website), January 23, 2019, https://www.cfr.org/blog/climate-change-threat-military-security.
[34] David Roza, "Tyndall Rises Again," *Air & Space Forces Magazine* (website), August 31, 2023, https://www.airandspaceforces.com/article/tyndall-rises-again/.

Climate Change, Environmental Displacement, and Human Migration

The consequences of climate change have precipitated a profound reshaping of the world, fundamentally altering landscapes, ecosystems, and human livelihoods. Among its myriad effects, one of the most pressing and complex issues has been the surge in environmental displacement and human migration. As temperatures rise, sea levels escalate, and extreme-weather events become more frequent and severe, communities worldwide find themselves grappling with the daunting reality of displacement, forced relocation, and migration due to the profound disruptions to their environments.

To look at climate migration, understanding the environmental triggers of human displacement is important. Meteorologically, two principal drivers of climate change are impacting migration: climate events and climate processes.[35] Climate events like flooding and storms are temporary, whereas climate processes such as sea-level rise, salinization of agricultural land, desertification, and growing water scarcity are enduring climate impacts on the population.

Climate-related disasters impact populations around the world annually, displacing people fleeing from affected areas for safety. In 2022, 33 million people were displaced due to disasters, most seeking refuge within their own countries.[36] Most of these temporary migrants return home over time.

The long-term impacts associated with climate processes are of even greater concern to populations. Hotter temperatures can threaten agriculturally based

[35] Oli Brown, *Migration and Climate Change* (Geneva: International Organization for Migration, 2008), 9.
[36] Lawrence Huang, "Climate Migration 101: An Explainer," Migration Policy Institute (website), November 16, 2023, https://www.migrationpolicy.org/article/climate-migration-101-explainer.

communities, sea-level rise can increase flooding in coastal communities, and desertification creates water-security concerns, all of which can cause human migration.[37] In Northern Africa's Sahel region, the rapid desertification, water shortages, and deforestation have led to a loss of 65 percent of farmable land.[38] Increasing ocean temperatures have caused some fish stocks to migrate toward the colder waters, impacting communities that rely on fish for subsistence.[39] The reduced access to food and water has resulted in migrants leaving their rural communities for the securities of populated cities.

Over time, the enduring effects of gradual climate change emerge as contributing factors to climate migration, albeit not the primary cause. Environmental influences undeniably play a role, although not a straightforward one. They are often the triggering or amplifying factors that contribute to economic deterioration or insecurity in a region. For instance, in 2021, only 6 percent of the migrant population in El Salvador, Guatemala, and Honduras directly cited climate or environmental reasons as the primary, direct reason for their migration.[40] Similarly, in Central Africa, only 5 percent of migrants pointed directly to environment-related factors as the reason for their migration in 2022.[41] Climate change is currently an amplifier of human migration that is not always cited as the primary cause of displacement. Instead, climate change today can cause a

[37] Huang, "Climate Migration 101."
[38] Abrahm Lustgarten, "The Great Climate Migration," *New York Times Magazine* (website), July 23, 2020, https://www.nytimes.com/interactive/2020/07/23/magazine/climate-migration.html.
[39] Brown, *Migration and Climate Change*, 16.
[40] Huang, "Climate Migration 101."
[41] Huang, "Climate Migration 101."

number of second- and third-order effects that later become the primary reasons for human migration, such as food insecurity and poor economic development.

The impacts of climate change are felt across the planet, giving rise to climate migration experiences around the world. These impacts, though, are not uniformly distributed. The most severe cases of migration and displacement unfold in low- to middle-income countries, where those most urgently needing to leave climate-affected areas often lack the financial means or resources to do so.[42] Remaining in perilous conditions often poses greater harm to these individuals than migration. Those who manage to leave encounter challenges in the countries in which they seek refuge. The substantial influx of migrants in Europe has strained the EU, yet predictions suggest the number of individuals seeking safety due to climate-related migration will triple by the end of the century.[43] Even high-income countries are grappling with the effects of climate migration, placing strain on the host communities. In the United States alone, 3.2 million adults experienced displacement or evacuation in 2022, with 500,000 still not having returned as of the beginning of 2023.[44]

The impact of climate-induced displacement resonates profoundly within the world's indigenous communities, comprising 370 million individuals whose livelihoods bear the adverse effects of climate change.[45] Throughout history, these communities have exhibited remarkable resilience, relying on their indigenous local knowledge to

[42] Huang, "Climate Migration 101."
[43] Jeff Turrentine, "Climate Change Is Already Driving Mass Migration around the Globe," Natural Resources Defense Council (website), January 25, 2019, https://www.nrdc.org/stories/climate-change-already-driving-mass-migration-around-globe.
[44] Huang, "Climate Migration 101."
[45] Walter Leal Filho et al., "Impacts of Climate Change to African Indigenous Communities and Examples of Adaption Responses," *Nature Communications* 12 (October 2021).

adapt their subsistence lifestyles to a world in constant flux, but the accelerating pace of climate change poses challenges these communities struggle to match.[46] Faced with the daunting choice to stay or to flee, indigenous people opting to migrate from their traditional lands often confront dual discrimination, both as migrants and as indigenous individuals.[47] In Alaska, indigenous communities have witnessed their villages erode over decades as permafrost thaws alarmingly.[48] Moreover, their subsistence practices, centered around hunting polar bears, walruses, seals, and caribou and fishing, face challenges due to diminishing numbers attributed to rising temperatures. For Alaska Natives, the connection between their culture, social identity, and the land and its animals is inseparable, and the prospect of losing it signifies a profound loss of identity.[49] This is a sentiment many other indigenous communities around the world share.

Climate migration also yields economic consequences, both positive and negative, affecting communities on a global scale. Notably, nearly 20 percent of the overall impact of climate on agricultural output in the Caribbean, Central America, Panama, and the Dominican Republic stems from climate-induced labor migration.[50] Similar impacts due to displacement of the labor force are being felt around the world, but migrants leaving climate-impacted communities who move to places where they

[46] Filho et al., “Impacts of Climate Change.”
[47] UN Permanent Forum on Indigenous Issues, *Climate Change and Indigenous Peoples* (New York: UN Permanent Forum on Indigenous Issues, n.d.).
[48] Nicole Greenfield, “Climate Migration and Equity,” Natural Resources Defense Council (website), May 9, 2022, https://www.nrdc.org/stories/climate-migration-equity.
[49] UN Permanent Forum on Indigenous Issues, *Indigenous Peoples*.
[50] Paula Beltran and Metodij Hadzi-Vaskov, “How Climate Shocks Are Linked to Cross-Border Migration in Latin America and the Caribbean,” International Monetary Fund (website), December 8, 2023, https://www.imf.org/en/News/Articles/2023/12/08/cf-how-climate-shocks-are-linked-to-cross-border-migration-in-latin-america-and-the-caribbean.

earn higher wages can eventually help their origin communities adapt through the financial remittances they send back.[51] For example, in 2021, remittances made up 46 percent of Tonga's gross domestic product (GDP).[52] Furthermore, many of these migrants benefit their destination communities by providing affordable labor and essential skills to their employers, thereby bolstering economic stability.[53]

Legal barriers to climate migration remain, as no international category for climate refugees exists, and climate change is not a grounds for international protection.[54] The 1951 Convention Relating to the Status of Refugees recognizes refugees as those who are fleeing persecution and seeking asylum based on race, religion, nationality, and political opinion and does not recognize environmental factors.[55] Barriers such as this often create an insurmountable challenge for climate migrants, particularly the most vulnerable in Central and South America, Southern Asia, and Sub-Saharan Africa. The World Bank estimates these regions altogether could produce 143 million climate migrants by 2050.[56] These future trends will require mitigation strategies to ensure the protection of the vulnerable.

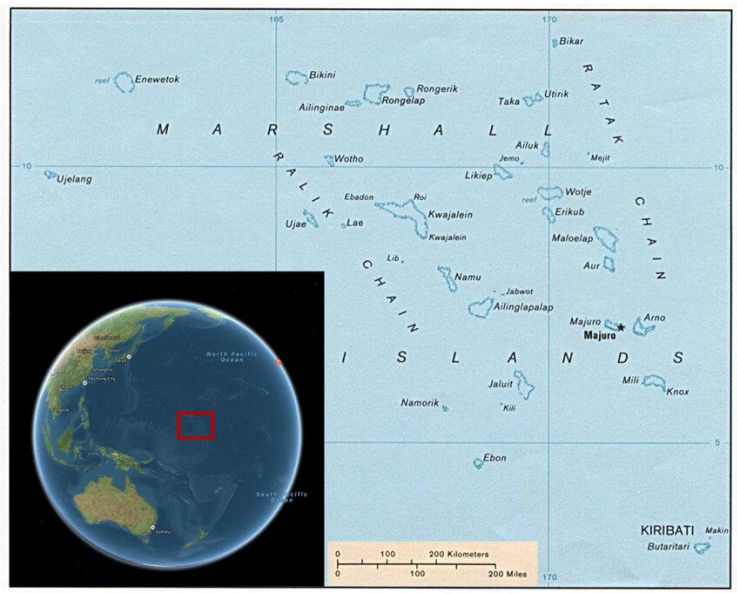
Climate change and climate migration are inextricably linked. As our world grapples with rising temperatures, sea levels, and extreme-weather events, vulnerable

[51] Huang, "Climate Migration 101."
[52] Huang, "Climate Migration 101."
[53] Dilip Ratha, "Leveraging Migration and Remittances for Development," *UN Chronicle* (website), September 2013, https://www.un.org/en/chronicle/article/leveraging-migration-and-remittances-development.
[54] Huang, "Climate Migration 101."
[55] "The 1951 Refugee Convention," UN High Commissioner for Refugees (website), n.d., accessed January 3, 2024, https://www.unhcr.org/about-unhcr/who-we-are/1951-refugee-convention.
[56] Mia Prange, "Climate Change Is Fueling Migration. Do Climate Migrants Have Legal Protections?," Council on Foreign Relations (website), updated December 19, 2022, https://www.cfr.org/in-brief/climate-change-fueling-migration-do-climate-migrants-have-legal-protections.

communities bear the brunt of these changes, often facing the choice between staying in increasingly inhospitable environments or seeking refuge elsewhere. The intricate web of challenges, from economic disparities to legal and ethical dilemmas, necessitates a global commitment to proactive solutions. Collective efforts across nations and continents are needed to help navigate the challenges posed by climate-induced displacement and pave the way toward a more sustainable and equitable future.

Marshallese Geography

The Marshall Islands is located in the central Pacific Ocean, positioned between the Philippines and Hawaii. The country comprises 29 atolls and five isolated islands spread over 750,000 square miles of ocean. The two leading island chains are the Ratak (Sunrise) Chain and Ralik (Sunset) Chain.[57]



ResearchGate. "Figure 3. Map of the Marshall Islands and Their Two Main Coral Chains . . ." Accessed January 24, 2024. https://www.researchgate.net/figure/Map-of-the-Marshall-Islands-and-their-two-main-coral-chains-Ralik-and-Ratak-The-inlet_fig3_366099523.

Atolls are the primary geographical feature of the Marshall Islands, and they consist of coral islands encircling a lagoon. Atolls are among the most unique geographic features on earth, occurring only in a few parts of the Pacific and Indian Oceans where ancient volcanoes have collapsed and the old coral rings around them have grown higher into flat, island-like structures. The total land area of these atolls and

[57] "Marshall Islands (01/10)," US Department of State (website), n.d., accessed January 24, 2024, https://2009-2017.state.gov/outofdate/bgn/marshallislands/144559.htm.

islands in the Marshall Islands is only about 70 square miles, making the nation one of the world's smallest in terms of landmass. Due to their location, the islands are susceptible to rising sea levels caused by climate change, with the highest point just 10 meters above sea level.[58] However, many of the atolls in the Marshall Islands are only two meters (approximately six feet) above sea level.

 [1]

US Department of Commerce, National Oceanic and Atmospheric Administration. "NOAA CoRIS - Regional Portal - Republic of the Marshall Islands." Accessed January 24, 2024. https://www.coris.noaa.gov/portals/marshall_islands.html.

"AsiaPacific Destinations," Natalie Carter, A Life Mapped

"Majuro in the Marshall Islands," ©Christopher Michel, 2004, used under a Creative Commons Attribution License

Majuro Atoll is the capital and the most populous island, housing the government and infrastructure. Other significant atolls include Kwajalein Atoll, home to a large US military base, and Bikini Atoll, known for its nuclear testing.[59]

The climate of the Marshall Islands is tropical, with a wet season from May to November and a dry season from December to April. The islands are prone to natural disasters such as typhoons and droughts, which are becoming more severe due to climate change.[60]

The waters surrounding the Marshall Islands are rich in marine biodiversity, including coral reefs, fish, and other sea life. This biodiversity is essential to the Marshall Islanders' way of life, and they depend on it for their food, livelihoods, and

[59] *The World Factbook*, s.v. "Marshall Islands," updated August 8, 2024, https://www.cia.gov/the-world-factbook/countries/marshall-islands/.
[60] Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organization, *Climate Change in the Pacific: Scientific Assessment and New Research* (Aspendale, AU: Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organization, 2011).

cultural practices. Overfishing, pollution, and global warming threaten the marine ecosystem and the Marshall Islanders' way of life.[61]

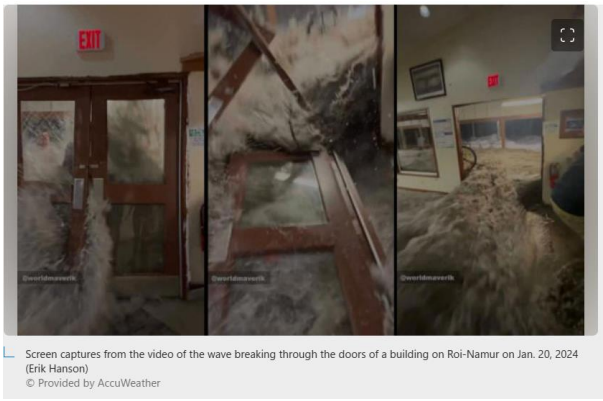
The location of the Marshall Islands makes it pivotal for military and transportation routes across the Pacific, providing a strategic vantage point and access for defense and logistics operations. Its proximity to Asia-Pacific regions adds to its geopolitical importance, making it a key area for maintaining regional stability and influence for the United States and Western allies. This strategic value has historically influenced US interests and presence in the region.

Marshallese Weather and Risks

The Marshall Islands boasts a tropical climate characterized by warm temperatures, high humidity, and significant rainfall. But this seemingly idyllic weather exposes the region to substantial risks. The average temperature in the Marshall Islands hovers between 80 degrees Fahrenheit and 86 degrees Fahrenheit, tempered by trade winds from the east. Rainfall varies from 80 to 160 inches annually across different atolls, with higher levels in the northern atolls.[62] The region experiences two main seasons: the wet season from May to November, marked by heavy rainfall, and the dry season from December to April, ideal for tourism.[63]

[61] "Marshall Islands Makes Waves for Ocean Biodiversity at Global Negotiations," Secretariat of the Pacific Regional Environment Programme (website), December 17, 2022, https://www.sprep.org/news/marshall-islands-makes-waves-for-ocean-biodiversity-at-global-negotiations.
[62] "Climate and Monthly Weather Forecast Marshall Islands," Weather Atlas (website), n.d., accessed January 31, 2024, https://www.weather-atlas.com/en/marshall-islands-climate.
[63] "Climate and Monthly Weather."

Despite its welcoming climate, the Marshall Islands confronts numerous weather-related challenges. Among these are tropical cyclones, particularly during the wet season, which bring strong winds, heavy rains, and devastating flooding. The islands stand at two meters at their highest point, leading to increased susceptibility to climate change effects; the islands are particularly vulnerable to sea-level rise, as it will lead to several cascading effects such as salinization of drinking water.[64] Additionally, occasional droughts, often associated with El Niño patterns, can lead to water shortages, impacting drinking water and agriculture. King tides, which are exceptionally high, pose further threats to coastal communities and infrastructure. Coral bleaching, resulting from increased sea temperatures, imperils marine ecosystems essential for protecting the islands and supporting the local economy and food security.[65]



Flooding from rogue wave on US military base, courtesy USAG-KA/DVIDS

[64] Secretariat of the Pacific Regional Environment Programme, “Sea Level Rise Threatens the Existence of the Marshall Islands,” press release, July 10, 2023, https://reliefweb.int/report/marshall-islands/sea-level-rise-threatens-existence-marshall-islands.

[65] World Bank Group, “Marshall Islands: New Climate Study Visualizes Confronting Risk of Projected Sea Level Rise,” press release no. 2022/029/EAP, October 29, 2021, https://www.worldbank.org/en/news/press-release/2021/10/29/marshall-islands-new-climate-study-visualizes-confronting-risk-of-projected-sea-level-rise.

These challenges affect the daily lives of Marshall Islands residents and cast a long shadow over the islands' sustainability and resilience. Rising sea levels exacerbate these risks, driven by low elevation, the geographical nature of atolls, global sea-level rise due to climate change, more frequent storm surges and high tides, coral reef degradation, limited adaptive capacity, socioeconomic impacts, and environmental changes. Together, these factors make the Marshall Islands one of the countries most vulnerable to the effects of global sea-level rise, with dire consequences for its people, land, and culture.[66]

Marshallese History

The Marshall Islands, located in the Pacific Ocean, have a fascinating and complex history shaped by various colonial powers and their strategic geopolitical location. Micronesians initially settled the islands around 2,000 years ago and Europeans discovered them in the sixteenth century. The Spanish were the first to colonize the islands in the late 1500s, the Germans in the late 1800s, and the Japanese in the early 1900s.[67]

During World War II, the Marshall Islands were occupied by the Japanese, who heavily fortified the islands and used them as a base for their military operations. in 1944, the United States launched a major campaign to retake the islands, which

[66] "In the Marshall Islands, Climate Change Is Already Influencing Decisions to Move," Yale Climate Connections (website), January 1, 2021, http://yaleclimateconnections.org/2021/01/in-the-marshall-islands-climate-change-is-already-influencing-decisions-to-move/.
[67] *Encyclopedia Britannica*, s.v. "Marshall Islands," updated August 29, 2024, https://www.britannica.com/place/Marshall-Islands.

resulted in a brutal battle that lasted several months and caused considerable damage to the islands and many casualties on both sides.[68]

Battle of Kwajalein Marines, courtesy of worldwarphotos.info/gallery

After the war, the United States administered the islands as a Trust Territory of the Pacific Islands. It conducted nuclear testing on the islands, which profoundly impacted the islands' environment and the health of the inhabitants.[69] The United States worked on over 60 nuclear tests between 1946 and 1958, including the most significant atmospheric nuclear test in history, which caused widespread radioactive contamination and long-term health effects for the Marshallese people.[70]

[68] C. Peter Chen, "Marshall Islands Campaign," World War II Database (website), updated September 2006, https://ww2db.com/battle_spec.php?battle_id=73.
[69] Benetick Kabua Maddison, "The Ongoing Consequences of the U.S. Nuclear Testing Program on the Marshall Islands," Heinrich Böll Stiftung (website), October 9, 2023, https://boell.org/en/2023/10/09/ongoing-consequences-us-nuclear-testing-program-marshall-islands.
[70] Matthew Gutwald, "Marshall Islands Nuclear Testing and Health Effects," Stanford University (website), March 23, 2017, http://large.stanford.edu/courses/2017/ph241/gutwald2/.

The fireball and subsequent mushroom cloud from the 15-megaton explosion of Operation Castle Bravo.

(Source: Wikimedia Commons)

In 1986, the Marshall Islands gained independence but entered into the Compact of Free Association (COFA) with the United States. This agreement ensured economic aid, defense, and the right for the Marshallese to work in the United States. The relationship between the two nations reflects a complex mix of dependency, historical ties, and strategic interests.[71]

But independence in 1986 brought new challenges for the Marshall Islands, including balancing traditional culture with modernity, dealing with the legacy of nuclear testing, and facing the existential threat of climate change due to rising sea levels.[72]

Despite these challenges, the Marshall Islands' location continues to give it geopolitical significance in the Pacific. The islands are strategically located between

[71] "U.S.-Marshall Islands Policy and History," US Embassy in the Republic of the Marshall Islands (website), n.d., accessed February 1, 2024, https://mh.usembassy.gov/u-s-marshall-islands-policy-and-history/.

[72] "A Guide to the United States' History of Recognition, Diplomatic, and Consular Relations, by Country, since 1776: Republic of the Marshall Islands," US Department of State Office of the Historian (website), n.d., accessed February 1, 2024, https://history.state.gov/countries/marshall-islands.

Asia and the Americas and are home to vital shipping lanes and military bases. As a result, the Marshall Islands play an essential role in regional security and diplomacy.[73]

Marshallese Culture and Economy

The culture of the Marshall Islands is rooted in its maritime heritage, with skilled navigation being a central aspect of its traditional culture. This strong connection to the sea influences many facets of Marshallese life, from folklore to daily activities.[74] The Marshallese language is vital to communication and cultural preservation, alongside oral traditions like storytelling and chants. The society is matrilineal, with significant clan and family ties and community cooperation playing a central role. Handicrafts, dance, and music are essential cultural practices, with dance and music expressing stories and social values. Despite the influence of modern globalization, traditional culture remains strong, although lifestyle, education, and entertainment have changed.[75]

[73] Pete McKenzie, "Marshall Islands, Feeling Neglected by the U.S., Enjoys New Leverage," *Washington Post* (website), January 27, 2023, https://www.washingtonpost.com/world/2023/01/27/us-marshall-islands-china-pacific-power/.
[74] *World Culture Encyclopedia*, s.v. "Marshall Islands," n.d., accessed February 1, 2024, https://www.everyculture.com/Ma-Ni/Marshall-Islands.html.
[75] *World Culture Encyclopedia*, s.v. "Marshall Islands," n.d., accessed February 1, 2024, https://www.everyculture.com/Ma-Ni/Marshall-Islands.html.

US Embassy Majuro – "My Culture, Ao Manit"

Economically, the Marshall Islands relies heavily on the COFA compact with the United States, which provides substantial financial aid and is a primary source of national revenue.[76] The agricultural sector is small, with copra production being the primary focus, while fishing is crucial for local consumption and export revenue. Dependency on imports presents economic challenges, particularly regarding trade balance and food security.[77] The potential for a tourism industry exists due to the islands' natural beauty and marine biodiversity, though growth is hindered by their remote location and lack of infrastructure.[78]

[76] "U.S., Marshall Islands Finally Seal a New Deal under COFA," *Islands Business* (website), October 19, 2023, https://islandsbusiness.com/news-break/marshalls-compact-1/.
[77] "RMI Agriculture Sector Plan (2021-2031)," Republic of the Marshall Islands Environment Data Portal (website), updated February 11, 2022, https://rmi-data.sprep.org/dataset/rmi-agriculture-sector-plan-2021-2031.
[78] Kathleen Wong, "Talk about 'Hidden Gems': One of the Least-Visited Countries Wants You to Check It Out," *USA Today* (website), August 14, 2023, https://www.usatoday.com/story/travel/2023/08/14/marshall-islands-travel-destination/70546644007/.

The Marshall Islands comprise over a thousand low-lying atolls. Courtesy of Sawyer Products

Climate change poses significant economic risks for the Marshall Islands, impacting agriculture, fisheries, and overall island habitability. Many Marshallese people migrate to the United States for education and employment, contributing to the economy through remittances.[79] International aid and development projects further support the nation's economic development, health care, education, and climate change mitigation efforts.[80] Balancing traditional ways of life with modern economic growth while addressing environmental challenges remains a crucial focus for the Marshall Islands and international supporters.

Strategic Ties and Enduring Challenges under the COFA Treaty

The Compact of Free Association between the United States and the Marshall Islands originated in 1986, shortly after the Marshall Islands gained independence from its status as a UN Trust Territory of the Pacific Islands under US administration. This

[79] Michael R. Duke, "Marshall Islanders: Migration Patterns and Health-Care Challenges," Migration Policy Institute (website), May 22, 2014, https://www.migrationpolicy.org/article/marshall-islanders-migration-patterns-and-health-care-challenges.
[80] "The Republic of the Marshall Islands (RMI): Climate Change Country Profile," US Agency for International Development (website), April 23, 2021, https://www.usaid.gov/climate/country-profiles/republic-marshall-islands.

agreement was later renegotiated and renewed in 2003 and 2023.[81] The COFA treaty serves multiple purposes, including granting the United States the authority to defend the Marshall Islands and operate military bases on Marshallese territory. Kwajalein Atoll hosts a significant US missile-detection and testing range. In return, the United States offers substantial financial assistance to the Marshall Islands, supporting various sectors such as government operations, education, health care, and infrastructure development. Additionally, the COFA treaty provides Marshallese citizens with the unique privilege of living, working, and studying in the United States without requiring a visa. Indeed, Marshallese citizens have established significant Marshallese diaspora communities in the United States, particularly in Washington, Iowa, Arkansas, and Hawaii.[82]

USAG-KA Commander Visits Ebeye, Furthering US-Marshallese Relations courtesy pacom.mil

[81] "President Biden Transmits Compacts of Free Association-Related Agreements to U.S. Congress," White House (website), December 5, 2023, https://www.whitehouse.gov/briefing-room/statements-releases/2023/12/05/president-biden-transmits-compacts-of-free-association-related-agreements-to-u-s-congress/.

[82] US Department of State, *Integrated Country Strategy: The Republic of the Marshall Islands* (Washington, DC: US Department of State, 2018).

The legacy of nuclear testing by the United States in the Marshall Islands between 1946 and 1958 is a significant aspect of the Marshall Islands' history. The United States conducted dozens of atomic tests, primarily on Bikini and Enewetak Atolls.[83] These tests devastated the local environment and the islanders' health. The fallout from the nuclear tests led to long-term health issues, displacement of communities, and environmental contamination. The United States has provided compensation through the Nuclear Claims Tribunal to address these issues.[84] But the matter remains a source of contention, with ongoing discussions and negotiations regarding additional compensation and remediation efforts to address the enduring impacts of the nuclear tests on the Marshall Islands and its people.[85]

Key US Strategic Interests in the Marshall Islands

For many compelling reasons, the United States holds a significant stake in the Marshall Islands. Firstly, the strategic location in the central Pacific Ocean is paramount to the US military. The Kwajalein Atoll houses the RTS, which is critical in missile testing and space operations and enhances US national security and defense capabilities.[86] The defense and security interests of the United States are also deeply intertwined with the Marshall Islands. The COFA solidifies the US-Marshallese relationship by granting

[83] "Marshall Islands," National Museum of Nuclear Science and History (website), n.d., accessed February 1, 2024, https://ahf.nuclearmuseum.org/ahf/location/marshall-islands/.
[84] Dick Thornburgh, Glenn Reichardt, and Jon Stanley, *The Nuclear Claims Tribunal of the Republic of the Marshall Islands: An Independent Examination and Assessment of Its Decision-Making Processes*, DC-547064 (Washington, DC: Kirkpatrick & Lockhart LLP, January 2003).
[85] "Marshall Islands Calls for US to Pay More Compensation over Nuclear Tests," *Guardian* (website), July 13, 2023, https://www.theguardian.com/world/2023/jul/13/marshall-islands-pacific-us-nuclear-bomb-test-payment.
[86] US Army Space and Missile Defense Command, *Ronald Reagan Ballistic Missile Defense Test Site at Kwajalein Atoll (RTS)* (Huntsville, AL: US Army Space and Missile Defense Command, n.d.).

the United States exclusive military access to a significant area in the Pacific. This access is pivotal for regional stability, deterring potential adversaries, and ensuring freedom of navigation.[87]

In a broader geopolitical context, the Marshall Islands counterbalances the growing influence of other global powers in the Pacific region, most notably China. Additionally, the historical legacy of nuclear testing conducted by the United States in the Marshall Islands necessitates ongoing responsibilities for health, environmental remediation, and compensation for affected Marshallese populations.

Moreover, the United States provides substantial economic assistance to the Marshall Islands, promoting financial stability and development in the region. This assistance serves as a strategic tool to counter the influence of other major powers in the Pacific and reflects the US commitment to supporting its allies and partners in the region. The US interests in the Marshall Islands are a complex interplay of strategic, defense, geopolitical, humanitarian, and economic factors, which underscore this relationship's importance in the Pacific.

[87] "President Biden Transmits Compacts of Free Association-Related Agreements to U.S. Congress," White House (website), December 5, 2023, https://www.whitehouse.gov/briefing-room/statements-releases/2023/12/05/president-biden-transmits-compacts-of-free-association-related-agreements-to-u-s-congress/.

Pacific Partnership 2019; multinational humanitarian assistance and disaster response capabilities to the Pacific. Marshall Islands, 2019. Photo by MC1 Tyrell K. Morris

US Military Assets in the Marshall Islands

The historical ties between the United States and the Marshall Islands are rich and date back to the end of World War II, when the United States gained control of the Marshall Islands from Japan. The COFA solidified the defense relationship between the two nations, granting the United States authority and responsibility for security and defense matters in the Marshall Islands.

Kwajalein Atoll is home to the RTS, which is operated by the US Army Space and Missile Defense Command. This is the largest and most sophisticated missile test range in the world, with the site serving as a crucial testing and evaluation facility for the United States' defense and space programs, supporting ballistic missile testing and space operations. A wide range of missile-defense systems are tested here, including the Terminal High Altitude Area Defense system and the Patriot Advanced Capability-3 system, which are critical to our ability to defend against ballistic missile threats; RTS is also used to test other advanced military technologies, including unmanned aerial

vehicles and hypersonic weapons.[88] The most advanced radar system in the world, known as the Space Fence radar system, is also located on the atoll and is overseen by the US Space Force.[89] The atoll's remote location and large test range make it an ideal location for testing these types of systems, which require large amounts of airspace and are often too dangerous to test on land. The strategic location of the Marshall Islands and Kwajalein Atoll in the Pacific provides the United States with a vital vantage point for monitoring and responding to regional security challenges, and the critical capabilities RTS and the Space Fence bring to the Department of Defense, other government agencies, and our allies are essential to national security.

The Marshall Islands is a sovereign nation, but the COFA treaty grants the United States military access to operate in the Marshall Islands, facilitate military construction projects aimed at enhancing air and maritime infrastructure, and provide economic assistance which helps support the infrastructure and development of the Marshall Islands.[90] The Marshall Islands is situated in a region that is of critical importance to the United States, as the region is home to some of the world's busiest shipping lanes and is a key transit point for US military forces traveling to and from Asia.[91] The Marshall Islands is also located near several potential hot spots, including

[88] US Army Space and Missile Defense Command, *Reagan Ballistic Missile Defense*.
[89] Erica Blanton, "Swinging for the Space Fence," US Space Force (website), April 7, 2020, https://www.spaceforce.mil/News/Article/2142648/swinging-for-the-space-fence/.
[90] "Congressional Research Service Issues in Focus White Paper on Compacts of Free Association," ProQuest (website), November 14, 2023, https://www.proquest.com/wire-feeds/congressional-research-service-issues-focus-white/docview/2889595185/se-2.
[91] Adele Berti, "Marshall Islands: Profiling a Key Shipping Player," Ship Technology (website), August 22, 2019, https://www.ship-technology.com/features/marshall-islands-and-the-shipping-industry/.

North Korea, China, and Russia, making it an important location for monitoring and responding to potential threats.

The Marshall Islands' high military service per capita and its contributions to US operations underscore the depth of security and defense cooperation between the two nations. From a geostrategic perspective, the Marshall Islands and Kwajalein Atoll are significant, as they lie within the Indo-Pacific region and serve as the cornerstone for US security architecture in Oceania; the Marshall Islands serves as a link between the United States, the Pacific, and Southeast Asia. This positioning enhances the US military's ability to project power and influence in a region of increased geopolitical importance.[92] The US military's presence in the Marshall Islands contributes to its broader regional defense posture in the Indo-Pacific. The ability to operate from and deny any third-country militaries access to the Marshall Islands underscores the strategic leverage the United States maintains in the region, particularly in the context of evolving security dynamics and power competition.

Overall, the Marshall Islands, with a particular focus on the strategic military value of Kwajalein Atoll, holds immense importance for US security and defense interests in the Indo-Pacific. The COFA agreements, the presence of the RTS, and the broader security cooperation between the two nations underscore the depth of the US military's engagement in the Marshall Islands. As the geopolitical landscape continues

[92] US Army Pacific, *United States Army Pacific: America's Theater Army for the Indo-Pacific* (Honolulu: US Army Pacific, September 2023).

to evolve, the strategic significance of the Marshall Islands is likely to remain a critical component of US military strategy in the Indo-Pacific region.

Marshallese Society from a Civil Affairs Perspective

The United States invaded the Marshall Islands and wrested control of them from Japan in early 1944. In the 80 years since, the Marshall Islands have played a strategic role in the United States' national security. They occupy an ideal location between Hawaii and Papua New Guinea in the South Pacific Ocean which gives the United States a strategic advantage in the United States Indo-Pacific Command area of responsibility. But climate change threatens the existence of this island nation, and unless actions are taken to increase this island nation's resiliency, its long-term viability and the strategic advantage provides to the United States may be in doubt.

The strategic value of the Marshall Islands grew following the end of World War II, as the United States recognized the islands' sparse population and geographic isolation presented an ideal location for atomic weapons testing. The trajectory of Marshallese society would be altered in February 1946 when Commodore Ben Wyatt, US Navy, persuaded the residents of Bikini Atoll to relocate to enable American testing there.[93] Operation Crossroads' shot Able began a series of atomic tests on July 1, 1946, when a B-29 bomber dropped a 23-kiloton nuclear bomb over a target fleet of 90 vessels moored at Bikini Atoll. Shot Baker, the second Operation Crossroads

[93] Lisa Perry, David Perry, and Maggie Fischer, hosts, *At the Brink*, podcast, season 2, episode 4, "Marshall Islands: Paradise Interrupted," Come Alive Creative, December 5, 2023, https://atthebrink.org/podcast/marshall-islands/#:~:text=Several%20months%20later%2C%20on%20Feb,new%20weapon%2C%20the%20atomic%20bomb.

detonation, followed three weeks later, on July 25, and was the first underwater test of an atomic weapon.[94] Operation Crossroads was followed by multiple operations (series of tests) until 1958; a total of 67 atomic tests were conducted. Of note, Operation Castle's shot Bravo was a 15-megaton thermonuclear detonation—equivalent to 1,000 of the Little Boy atomic bombs dropped on Hiroshima—which vaporized three of the islands within Bikini Atoll and spread radioactive fallout throughout several of the inhabited Marshall Islands. March 1, the day of the Operation Castle Bravo detonation, is a Marshallese national holiday, Nuclear Victims Remembrance Day.[95]

Shortly after World War II, the Marshall Islands became part of the UN Trust Territory of the Pacific Islands, administered by the United States. The United States and the Marshall Islands ratified the COFA in 1985, creating a sovereign Republic of the Marshall Islands in 1986 that was closely linked to the United States. Under the COFA, and succeeding pieces of legislation, the United States provides the Marshall Islands with economic aid and federal programs and services. Of significance for the United States Indo-Pacific Command, the United States is obligated to defend the Marshall Islands, has the right to establish military facilities (but pays leases for them), and has the right to reject third-party strategic use of or access to the Marshall Islands. Marshallese citizens are permitted to travel, reside in, and hold employment (including

[94] "Operation Crossroads," Atomic Heritage Foundation (website), July 1, 2014, https://ahf.nuclearmuseum.org/ahf/history/operation-crossroads/.
[95] "Nuclear Legacy," Marshallese Education Initiative (website), n.d., accessed January 5, 2024, https://www.mei.ngo/nuclear#:~:text=MEI%20Videos%20about%20the%20Nuclear%20Legacy&text=From%201946%20through%201958%20the,Atolls%20in%20the%20Marshall%20Islands.

service in the armed forces) in the United States as lawful nonimmigrants or habitual residents.[96]

The strategic value of the Marshall Islands to the United States continues to this day. On March 27, 2020, the US Space Force declared the Space Fence radar to be at initial operational capability. The $1.5 billion Space Fence enables the US Space Force to catalog and track items as small as a marble in various levels of Earth orbit, a significant evolution in the United States' ability to maintain awareness and dominance in the contested and congested space domain.[97] As noted previously, in addition to the Space Fence, Kwajalein Atoll in the Marshall Islands is home to the RTS. The RTS's facilities, ranges, sensors, and capabilities enable the United States Missile Defense Agency and the US Army Space and Missile Defense Command to support space launches, operations, and surveillance and missile launches and testing. The USAG-KA, or USAKA to locals, supports all the tenant organizations within Kwajalein Atoll.

Approximately 1,000 of the Marshall Islands' 42,000 citizens, mostly from the island of Ebeye within the Kwajalein Atoll, work in the USAG-KA footprint to support these critical missions.[98] But climate change is threatening these low-lying islands in a variety of manners—rising temperatures; rising sea levels causing the interrelated effects of higher king tides, coastal erosion, and flooding; typhoons causing damage from high winds and storm surges; and rising ocean temperatures contributing to sea-

[96] Thomas Lum, *The Marshall Islands and Micronesia: Amendments to the Compact of Free Association with the United States*, Congressional Research Service Report RL31737 (Washington, DC: Congressional Research Service, May 3, 2004), 1–2.
[97] Kristen Shimkus, "USSF Announces Initial Operational Capability and Operational Acceptance of Space Fence," US Space Force (website), March 27, 2020, https://www.spaceforce.mil/News/Article/2129325/ussf-announces-initial-operational-capability-and-operational-acceptance-of-spa/.
[98] Colette Mortreux et al., *National Adaptation Plan Community Engagement Summary Report: Kwajalein Atoll* (Geneva: International Organization for Migration, 2023), 1.

level rise and affecting fisheries—which are all endangering Marshallese society. These climate-driven changes in turn magnify the shortcomings of the infrastructure of the Marshall Islands, further stressing the society. A discussion of the resiliency of the Marshall Islands must not be limited to the physical buildings and infrastructure; it must also include the human domain—the Marshallese people and society. The Marshallese people's resiliency will be key to determining their ability to survive and continue to support the critically important US operations within the Marshall Islands.

Two recent assessments of the RMI illustrate the nation's challenges. In 2023, the 351st CACOM Functional Specialty Team conducted a phase one assessment of the Marshall Islands. The team, out of Mountain View, California, assessed the island nation's climate change resiliency and progress toward Women, Peace, and Security (WPS) goals. Another report, the *National Adaptation Plan Community Engagement Summary Report*, produced by the UN's International Organization for Migration under the Community Engagement for the Republic of the Marshall Islands National Adaptation Plan project, identified multiple areas of vulnerability and desired mitigation actions from the perspective of the Marshallese through surveys of representative samples.

The International Organization for Migration report categorized the climate changes observed by individuals in the sampled local population as rising air temperatures, rising sea levels, droughts, erratic rainfall, and rising ocean temperatures.[99] At the community level, the most numerous concerns in the various community Hazard Vulnerability and Capacity Mapping reports were droughts,

[99] Mortreux et al., *National Adaptation Plan*, 5.

typhoons, king tides, and flooding.[100] The CACOM assessment took a generalized look at the effects of climate change; Women, Peace, and Security (WPS) initiatives in the Marshall Islands; emergency operations; food security and agriculture; solid-waste management; water access; stormwater and sewers; electrical systems; transportation; education; public health; and the USAG-KA as an organization. Although each assessment viewed the issues affecting the Marshall Islands through different lenses and viewpoints, they shared some commonalities amongst their observations and conclusions.

The most acute and existential threat facing the Marshall Islands today is the climate change-induced rising sea level and resulting extreme over wash. Ninety-six percent of the population of the Marshall Islands is estimated to live below a height of 10 meters above sea level, and the entire population lives within one kilometer of the ocean.[101] The sea level could rise by between 1.6 to 5.9 inches by 2030, by 4.3 to 12.6 inches by 2055, and by 8.3 to 23.6 inches by 2090, jeopardizing most of the infrastructure on the nation's islands.[102] A 19.7-inch (0.5-meter) rise in sea level (compared to 2020) would permanently inundate 8.5 percent of the capital Majuro's buildings; a 39.4-inch (one-meter) rise increases the percentage to 37.1 percent of

[100] Hazard Vulnerability and Capacity Mapping was completed by each RMI community; the objective of each was to increase community members' awareness of disaster risk and impacts of climate change to reduce vulnerabilities and increase resilience. International Organization for Migration, "Hazard Vulnerability Capacity Mapping Final Report: Kwajalein Atoll Communities," in *National Adaptation Plan Community Engagement Summary Report: Kwajalein Atoll*, Colette Mortreux et al. (Geneva: International Organization for Migration, 2023), 7.
[101] UN Women, *Gender Equality Brief for the Republic of the Marshall Islands* (New York: UN Women, 2022), 11.
[102] Sea-level rises are measured against a 20-year average of sea levels from 1980-1999. These rises are forecasted under the UN Intergovernmental Panel on Climate Change A1B (medium) emissions scenario. Marshall Islands National Weather Service Office and Pacific Climate Change Science Program, *Current and Future Climate of the Marshall Islands* (Canberra, AU: Marshall Islands National Weather Service Office and Pacific Climate Change Science Program, 2011).

buildings.[103] A wide range of engineering solutions exist, such as land reclamation and land raising, construction of seawalls and revetments, and raising buildings, but all require significant amounts of capital. For comparison, one land-reclamation project in the Maldives—another low-lying atoll nation threatened by rising sea levels—will reclaim 480 acres at a cost of $147 million.[104] Physically protecting the atolls is vital to preserving (and creating) living space, and to protecting the nation's fresh water.

Multiple effects resulting from climate change have complicated the Marshallese's access to fresh water. Sea-level rise, storm surges, and king tides have caused saltwater intrusion into the islands' freshwater wells and aquifers, and increased droughts have decreased rainfall yields in catchments—the main sources of fresh water for residences and communities. Access to fresh water in the urbanized areas of Majuro and Ebeye is already strained; fresh water is provided by the local utility during limited windows, or residents can purchase water from vending locations. The fresh water in the most populated areas is created by reverse osmosis desalinization units. Although rising sea levels may submerge the nation in the future, a lack of fresh water may impact livability sooner.[105] A 2020 survey revealed 22 percent of households surveyed in Ebeye and Gugegwe (two islands within the Kwajalein Atoll) did not have access to consistently running water.[106] Actions must be taken to increase freshwater production

[103] "Adapting to Rising Sea Levels in Marshall Islands," World Bank (website), October 22, 2021, https://storymaps.arcgis.com/stories/8c715dcc5781421ebff46f35ef34a04d.
[104] Senay Boztas, "Sinking Maldives Plans to Reclaim Land from the Ocean," *Guardian* (website), May 23, 2022, https://www.theguardian.com/environment/2022/may/23/maldives-plan-to-reclaim-land-for-tourism-could-choke-the-ecosystem.
[105] Josh McDaniel, "Rising Oceans, Disappearing Waters," Hawaii Sea Grant (website), n.d., accessed January 27, 2024, https://seagrant.soest.hawaii.edu/rising-oceans-disappearing-waters/.
[106] Republic of the Marshall Islands National Disaster Committee, *Republic of the Marshall Islands Household Rapid Vulnerability Assessment: Ebeye and Gugeegue—Preliminary Report* (Majuro, MH: Republic of the Marshall Islands National Disaster Committee, July 11, 2020), 7.

capabilities, both at the individual residence and community levels. Communities, like Gugegwe, must be provided with additional freshwater production capabilities, such as reverse osmosis desalinization units and hydropanel water-production units.[107] Concurrently, water storage and distribution capacity must be expanded and the resiliency of the system as a whole improved. Residences and communities with no running water must be serviced. Additional catchment capabilities, and even hydropanel units, should be provided wherever possible at the residential level.

Reduced freshwater access and multiple effects of climate change have reduced the amount of arable land and have impacted fisheries. Thus, food insecurity has increased. Limited access to fresh food has, in turn, led to a reliance on highly processed food, impacting both the quality and quantity of the foods in the Marshallese diet. The average Marshallese person consumes only 146 grams of fresh fruits or vegetables per day (significantly less than the World Health Organization's daily recommendation of 400 grams), has a diet consisting of significant amounts of fats and carbohydrates (on average, 84 percent of the energy consumed in the diet), and less than one household in three sustains a balanced diet. More than 72 percent of the adult population is considered overweight or obese, yet 11.5 percent of children up to the age of five years old are considered underweight and more than a third (35.3 percent) are stunted in height.[108] The sedentary lifestyle adopted by Marshallese society today, and

[107] A hydropanel is a panel visually like a solar panel but produces fresh water; potable water is the byproduct of a dehumidification process. The UN, in cooperation with the Kwajalein Development Authority, is expected to complete the installation of 1,050 hydropanels to produce an additional 400,000 gallons of water annually by February 2024. "Marshall Islands Kwajalein Atoll Water Project," UN Department of Economic and Social Affairs (website), n.d., accessed January 27, 2024, https://sdgs.un.org/partnerships/marshall-islands-kwajalein-atoll-water-project.

[108] Food and Agriculture Organization of the UN, Economic Policy Planning and Statistics Office, and Pacific Community, *Republic of the Marshall Islands Food Security Profile* (Majuro, MH: Food and

its reliance upon canned and processed food, have caused a high incidence rate of type 2 diabetes—about 28 percent of the Marshallese population has this disease (compared to 9 percent of the US population).[109] Programs to cultivate and provide access to fresh foods and produce must be energized to reduce the population's reliance upon imported and processed foods. Diversification into heat-, drought-, and salt water-tolerant crops should be done. Farming solutions that require less arable land, such as vertical farming with hydroponics, aeroponics, and aquaponics, must be widely adopted and spread to outlying islands to overcome their transportation barriers to accessing fresh food (islanders from less populated islands typically travel to the more populated islands such as Ebeye to purchase food, sometimes by boat). In addition to agricultural changes, investments in agricultural education, food preservation, and storage capabilities must also be made.

Investments in education for the long-term benefit of Marshallese society ought to be examined and undertaken. Primary education for the first eight years is compulsory, but students must take an examination to enter secondary education for another four years. Tertiary education is provided by the College of the Marshall Islands or the University of the South Pacific, Marshall Islands Campus. Only 56 percent of appropriately aged children are enrolled in secondary education, compared to a regional average of 72 percent.[110] Although the Marshallese literacy rate (percentage of citizens ages 15 and over who can read and write) is high at 98.3 percent, the school life

Agriculture Organization of the UN, Economic Policy Planning and Statistics Office, and Pacific Community, 2022).

[109] Holly Felix et al., "Diabetes Self-Care Behaviors among Marshallese Adults Living in the United States," *Journal of Immigrant and Minority Health* 20, no. 6 (December 2018): 1500–1507.

[110] World Bank, *Marshall Islands Human Capital Index 2020* (Washington, DC: World Bank, October 2020).

expectancy (the number of years of schooling a child could expect to receive) is only 10 years in the Marshall Islands—compared to 16 years and 21 years in the United States and Australia, respectively.[111] An opportunity clearly exists to improve the completion rates of secondary (high school) education; and incentivizing attending a college or university to earn a degree that would directly benefit the island nation (such as a degree in agricultural science, food science, aquaculture, early child development, nutrition, or health care) should be considered.

Women, Peace, and Security (WPS) is a policy framework within the US Department of Defense that recognizes women must be critical actors in efforts to achieve sustainable peace and security.[112] Marshallese society has traditionally been a matrilineal one, with women being the decisionmakers, landowners, and contributors to the development and well-being of families and communities, but their place was often viewed as being in the home. Men are expected to be in the public space and to be the breadwinners of families; thus, public leadership and decision making came to be viewed as men's roles.[113] Women consequently now play an undersized role in the leadership of the nation—as of April 2022, only two of the 33 national senators were women, and only one of the 13 executive branch leadership positions was held by a woman.[114] Both genders are recognized as equals constitutionally, and laws exist that

[111] *The World Factbook*, s.v. "Marshall Islands," updated August 8, 2024, https://www.cia.gov/the-world-factbook/countries/marshall-islands/.
[112] "Women, Peace and Security," United States Institute of Peace (website), n.d., accessed February 5, 2024, https://www.usip.org/programs/advancing-women-peace-and-security.
[113] UN Office of the High Commissioner for Human Rights, "Committee on the Elimination of Discrimination against Women Reviews Marshall Islands' Reports," press release, March 2, 2018, https://www.ohchr.org/en/press-releases/2018/03/committee-elimination-discrimination-against-women-reviews-marshall-islands#:~:text=The%20Marshall%20Islands%20was%20a%20traditionally%20matrilineal%20society%3A%20women%20were,and%20society%20as%20a%20whole.
[114] UN Women, *Gender Equality Brief*, 3.

prohibit various forms of discrimination and protect children and people with disabilities. Domestic violence and marital rape have also been criminalized.

Despite these protections, social trends and effects of climate change are placing additional stressors upon the women and families of the Marshall Islands. Increasing heat, droughts, and salinization of soils have impacted the production of copra (the dried meat of the coconut), reducing the incomes of households that rely upon this crop. Women have traditionally contributed to their household incomes by creating and selling handcrafts made from local materials, including copra and pandanus trees, which are becoming scarcer. The increasing temperatures also discourage women from searching for their needed resources. Rising ocean temperatures and dying coral reefs make subsistence fishing more difficult, contributing to food insecurity and a downward spiral in which it becomes necessary for families to purchase more food to live, but in which the families have less income to purchase more food.[115] These stressors may contribute to increased instances of domestic violence and gender-based abuse.[116] A 2014 Family Health and Safety Study found over 50 percent of Marshallese women have experienced physical and/or sexual violence from their partners.[117] Measures must continue to be implemented at the national level to strengthen existing laws and enforced at the local level to protect women. Actions should be undertaken to inform and protect women who live in outlying islands that are especially vulnerable to

[115] International Organization for Migration, Jo-Jikum, Marshall Islands Conservation Society, The University of Melbourne, and Women United Together Marshall Islands, *My Heritage Is Here: Report on Consultations with Communities in the Marshall Islands in Support of the Development of the National Adaptation Plan* (Majuro, MH: International Organization for Migration, 2023), 18–19.
[116] International Organization for Migration, Jo-Jikum, Marshall Islands Conservation Society, The University of Melbourne, and Women United Together Marshall Islands, *My Heritage Is Here*, 22.
[117] UN Women, *Republic of the Marshall Islands Summary Report: Costing the Impact of Intimate Partner Violence and the Resources Required to Address It* (New York: UN Women, 2023), 2.

domestic violence. The 351st CACOM is prepared to assist in formulating WPS strategies going forward.

The USAG-KA is the fundamental organization that enables military activities in support of US strategic objectives in the Marshall Islands. The garrison is the municipal government of the American presence within the Kwajalein Atoll and provides base operations such as public works, housing, law enforcement, fire protection, food service, and airfield operations either through organic resources, local contracts, or a LOGCAP contract. On Kwajalein Atoll, the LOGCAP contract provides additional life-support services, such as contractor-operated schools and medical services. The USAG-KA plays a more central role in the lives of its supported servicemembers and their families than a typical CONUS garrison—the American residents on Kwajalein Atoll or Roi-Namur are not surrounded by the conveniences, services, and stores an installation in the United States would be (the nearest Walmart is 2,500 miles away.). Therefore, residents on the base facilities rely upon the garrison for virtually everything. Several Marshallese communities mentioned in their Hazard Vulnerability and Capacity Mapping exercise USAG-KA was also a source of early warning for king tides and other predictable climate events, and a source of assistance during emergencies.[118]

Despite these critical tasks the USAG-KA must accomplish, its table of distribution and allowances only authorizes 13 soldiers and 49 Army civilians. This small cadre performs all the inherently governmental tasks of the garrison and oversees the LOGCAP contract which provides most of the base operations support services.

[118] International Organization for Migration, “Hazard Vulnerability.”

Federal employment statutes and guidelines constrain effective succession planning.[119] Actions must be taken to increase the garrison's workforce: either a permanent increase in its table of distribution and allowances, or a short-term increase by Army Reserve component personnel on Active Duty for Operational Support orders.

The US bases are vulnerable to the effects of the climate as well. This was recently illustrated on January 20, 2024, when extreme waves damaged buildings and injured US personnel on Roi-Namur. A real property master plan, laying out the strategic vision for the base's real property, and that considers mission requirements and force protection, should be completed. A comprehensive area development plan, using military construction, and Sustainment, Restoration, and Modernization projects, should be developed to improve the installation's resiliency and survivability against the effects of climate change. Projects to protect the islands and their infrastructure physically, such as revetments, seawalls, raising buildings, and cyclone-proof buildings, must also be included.

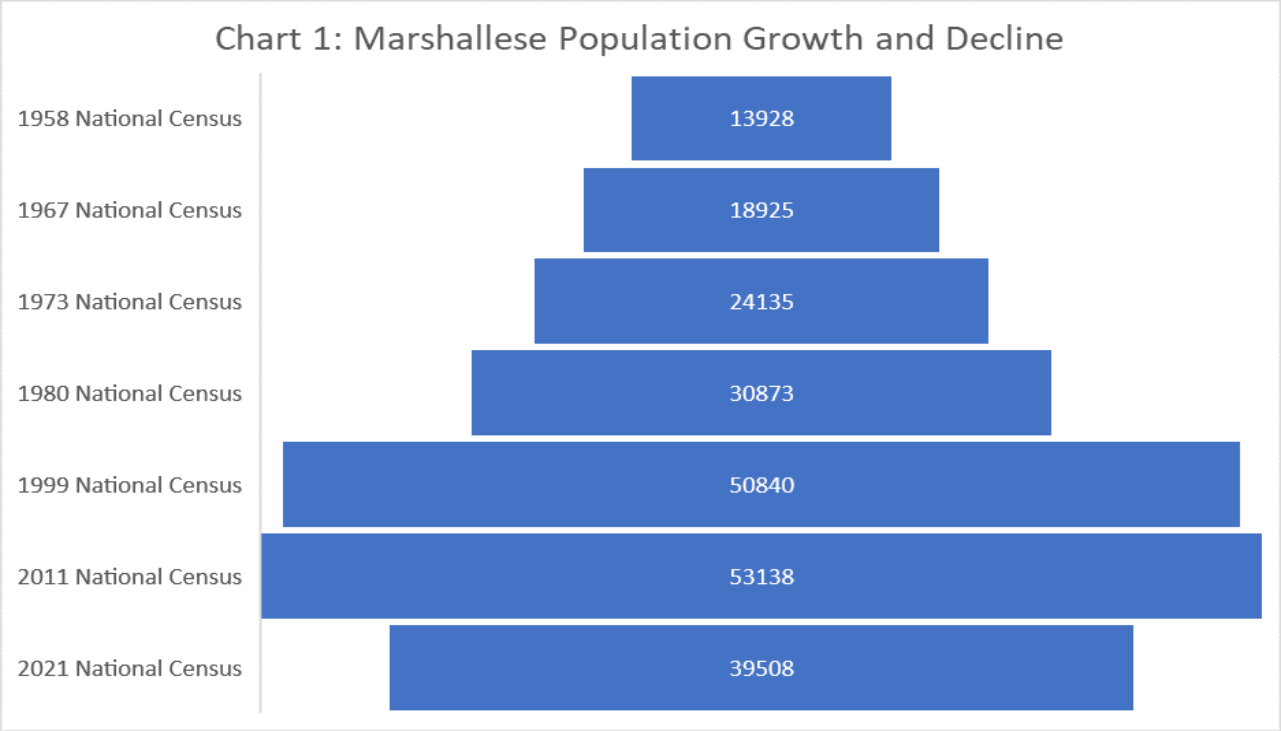
The Marshall Islands has been strategically important to the United States since the end of World War II. Its strategic value has only increased over time and will continue to do so as the United States emplaces additional strategic capabilities in Kwajalein Atoll and the United States and the People's Republic of China vie for influence amongst the Pacific Island nations. But for the Marshall Islands to remain a viable nation in the twenty-second century, steps must be taken to mitigate the effects of climate change and build the resiliency of the nation and its people.

[119] For example, if a director were to move (PCS) or retire, his/her deputy could not be preselected for promotion into the director's position. Prohibited Personnel Practices are contained in 5 U.S.C. § 2302(b) and Merit System Principles are contained in 5 U.S.C. § 2301.

Marshallese Migration Patterns and Demographic Trends

The Marshall Islands is one of the world's nations most severely impacted by climate change and many social scientists consider it to be on the front lines of the increasing phenomena of forced climate migration or environmental displacement among humans. The islands are increasingly being impacted by rising sea levels, over wash, subsidence, extreme waves, and other environmental threats, leaving less and less land available for the roughly 40,000 Marshallese people still living in the Marshall Islands. The Marshallese have been leaving their nation for many years now, whether moving from less populated outer atolls to the urban islands and atolls of Ebeye or Majuro Atoll, or to a completely different country like the United States. The capital city of Majuro now houses 23,156 people, or almost half the total population of the Marshall Islands.

The Marshall Islands is experiencing a demographic decline due to out-migration to the United States. Results of the 2021 Marshall Islands national census indicate the Marshall Islands' population peaked at 53,000 in 2011, though over the next decade it subsequently declined 26 percent by 2021. Estimates of the Marshallese population still on the island nation in recent years have been as low as 39,500. More Marshallese people now live in the United States than in the Marshall Islands.



Source: Marshall Islands 2021 National Survey

The 2021 Marshall Islands national survey shows both the number of people living on outer islands declined, and the population centers of both Majuro and Ebeye have experienced losses, underscoring a dramatic reversal of the decades of post-World War II population growth. Population losses are directly related to Marshallese out-migration to the United States. The states of Hawaii, Arkansas, Washington, Oregon, Iowa, and California have all been powerful attractors of Marshallese emigrants seeking economic opportunity, enhanced health care, and higher-performing public schools.

The primary cause of the dramatic population declines in the Marshall Islands is significant out-migration to the United States. This migration surge, in turn, is due to

antecedent causal variables and/or enabling conditions present in various locations throughout the United States. These factors are described below.

Economic Opportunities, Health Care, and Education: Interviews and surveys with Marshallese immigrants to the United States consistently indicate the Marshallese have, at least until recently, moved to the United States for three primary reasons: superior health care, enhanced economic opportunities that are consistent with Marshallese workers' skills, and educational opportunities.[120] Of the three primary attractors, economic opportunity appears to be the primary causal equivalent of *first among equals*.

The COFA Treaty: The COFA agreement between the United States and Micronesia, Palau, and the Marshall Islands constitutes a powerful enabler of ongoing out-migration between the Marshall Islands and United States. The COFA guarantees easy mobility between the Marshall Islands and the United States. Marshallese citizens can live and work in the United States permanently without a visa or green card.[121]

Many Marshallese people in the United States ultimately gain citizenship either through the birth of children, marriage to US citizens, or other family ties. Under the

[120] Access to high-quality, affordable health care is critically important to Marshall Islanders, given the wide range of health problems suffered by this population, including tuberculosis, diabetes, hypertension, thyroid tumors, alcoholism, depression, and Hansen's Disease/leprosy, as well as higher rates of suicide. Life expectancy in the RMI is 60 years, compared with 69 years and 72 years for residents in the Federated Republic of Micronesia and Palau, respectively. (Life expectancy in the United States is 79 years). Additionally, the coconut harvesting and processing skills of Marshallese residing in remote atolls appears to match with the skills necessary to process chickens, which is a major industry in Northwestern Arkansas. Information provided by Arkansas Coalition of the Marshall Islands (Coalition), February 9, 2024.

[121] COFA was signed in 1985 by the United States and three Pacific microstates—the Federated States of Micronesia, Palau, and the RMI—the COFA treaty grants the United States exclusive military rights over the more than two million square miles of ocean encompassing these three countries. In exchange, these nations receive much-needed financial aid and their citizens are permitted to live and work in the United States without a visa or green card (and thus technically are not immigrants). Additionally, the US government concluded COFA renewal talks with the Marshall Islands in 2023. Congress has yet to renew funding for specific programs withing COFA.

current COFA agreement, the path to citizenship requires economic or familial sponsorship. Most significantly, adult children of Marshallese parents born in the United States can sponsor their resident parents for citizenship. Marshallese people who become US citizens are allowed to maintain dual citizenship.[122] Although the COFA provides significant relocation opportunities for Marshallese citizens, it also produces unintended consequences, including undermining long-term demographic stability in the Marshall Islands through incentivizing migration to the United States and discouraging returns to the islands. According to the Arkansas Coalition of the Marshallese, a new Marshallese family moves to the United States every day.[123] The primary drivers of Marshallese out-migration have been in transition over the last several years. Although education and economic opportunity remain important, climate change, which is causing high tides and increasingly destructive rogue ocean waves—is rapidly becoming a sufficient cause of out-migration from the Marshall Islands to the United States.

Climate Change: Climate change is growing in relevance for those Marshallese citizens seeking to move to the United States, as well as those considering whether or not to move back to the Marshall Islands after a stay in the United States.[124] The perceived relevance of climate change to Marshallese out-migration to the United States appears to be generational in nature, with older Marshallese people focusing on economic opportunities and better health care as their primary reasons to move to the United States. For example, during an informal meeting with Republic of the Marshall Islands consular staff in Springdale, Arkansas, a senior staff member remarked she had

[122] Carolina Edwin, interview by the authors, February 8, 2023.
[123] Arkansas Coalition of the Marshallese staff, interview by the authors, February 9, 2024.
[124] Kees van der Geest et al., "Climate Change, Ecosystem Services and Migration in the Marshall Islands: Are They Related?," *Climatic Change* 161, no. 1 (2020): 109–27.

never heard of climate change being used as the rationale for moving from the Marshall Islands to the United States.[125] Younger Marshallese people under 40 years of age tend to place more emphasis on the relevance of climate change in making decisions to move to the United States or return to the Marshall Islands after living the United States.[126] Staff members of the coalition identified climate change as a major driver of out-migration and the core reason many Marshallese residing in the United States are deciding not to return to the Marshall Islands.[127]

Marshallese Out-Migration Trends

Every Marshall Islands national census conducted since the end of World War II reflected at least some population growth until 2005. The rate of decline has been even more significant in recent years, with the 2021 Marshall Islands national Census showing a 26 percent drop in its population over the previous decade.[128] According to the director of the Marshall Islands Economic Policy, Planning and Statistics Office, one major "contributing factor is the migration rate" to the United States.[129] The Marshall Islands Fiscal Year 2021 Statistical Appendices, prepared by the Graduate School USA (formally known as the US Department of Agriculture Graduate School) as part of an annual economic report on the country, documents out-migration doubled in the five-year period from 2017 to 2021 compared to the 2007–11 period, the last period for

[125] Arkansas Marshallese Consulate, interview by the authors, February 8, 2024.
[126] Arkansas Marshallese Consulate, interview by the authors, February 8, 2024; and Arkansas Coalition of the Marshallese, interview by the authors, February 9, 2024.
[127] The Arkansas Coalition of the Marshallese, interviews by the authors.
[128] Giff Johnson, "Marshall Islands Census Numbers Show Heavy Out-Migration," *RNZ News* (website), November 26, 2021, https://www.rnz.co.nz/international/pacific-news/456630/marshall-islands-census-numbers-show-heavy-out-migration.
[129] Johnson, "Marshall Islands Census."

which out-migration data is available.[130] This out-migration data correlates directly to the steep decline in the Marshall Islands' population between the 2011 and 2021 national censuses.

Out-Migration as a Multicausal Process

A stagnant economy with a 10.1 percent unemployment rate, subpar public schools, a medical system lacking the capabilities to meet the health needs of its population, and severe weather events due to climate change have created the perfect storm for spurring out-migration to the United States, particularly when the COFA treaty provides legal means for the Marshallese to do so. Increasingly frequent droughts contributing to water insecurity, as well as food insecurity, also contribute to out-migration. Indeed, preliminary information from the 2021 national census shows nearly half of all families in the Marshall Islands are concerned about not having enough food to eat, while one in three households report they sometimes "go without eating for a whole day."[131]

Periods of political uncertainty regarding the future status of the COFA also tend to increase Marshallese out-migration. For instance, a new record was set in 2001 with out-migration increasing to 2,029. This spike in out-migration occurred as the first compact's funding agreement was ending and the United States and the Marshall Islands had started negotiations for a second Compact funding arrangement with the US

[130] Johnson, "Marshall Islands Census."
[131] Giff Johnson, "Heavy Out-Migration Underlines Economic Conditions in Marshall Islands," *RNZ News* (website), November 22, 2022, https://www.rnz.co.nz/international/pacific-news/479206/heavy-out-migration-underlines-economic-conditions-in-marshall-islands.

government. In 2024, the COFA has again entered a period of uncertainty due to Congress's delay in ratifying the funding elements for a new COFA agreement the Joe Biden administration and the Marshallese government successfully negotiated in 2023.

Although residents of the Marshall Islands infrequently mention climate change and environmental problems as the direct reasons for out-migration, recent survey research shows climate-stressed households have higher out-migration rates. For example, through surveys of the residents of the three islands and atolls of Majuro, Mejit, and Maloelap Atoll, researchers found those island households that reported having felt the climate-related impacts of storm surges and heat waves such as health impacts, agricultural losses, or ocean damage to properties had higher migration rates. Moreover, once people migrated to the United States, a significant 62 percent felt, due to environmental factors, a future return to the Marshall Islands might not be possible.[132] Given the continuing interplay of COFA uncertainty; economic, health, and food-security deficits; increasing numbers of climate-related severe-weather events and impacts; as well as the attractive power of the US economy, high out-migration from the Marshall Islands is likely to continue for the foreseeable future. Likewise, severe-weather events related to climate change are likely to become the dominant causes of Marshallese out-migration to the United States.

[132] van der Geest, "Ecosystem Services and Migration," 109–27; and David Krzesni and Laura Brewington, "What Do Climate Impacts, Health, and Migration Reveal about Vulnerability and Adaption in the Marshall Islands?," *Climate Action* 1, no. 22 (2022).

Marshallese Resettlement in the United States

The Marshallese have been emigrating from their nation for several decades for a variety of reasons, including economic opportunities, the need for specialized medical care, climate degradation and limited development of the Marshall Islands, family ties, educational opportunities, and other interrelated factors. Small populations of Marshallese immigrants can be found in Pacific nations such as Australia, Fiji, Guam, New Zealand, and Micronesia, primarily in urban centers like Sydney, Brisbane, and Auckland. Canada also has a small Marshallese population.

The majority of Marshallese people now live in the United States, and not in the Marshall Islands or other countries. The United States has become the primary resettlement nation for the Marshallese. According to the 2020 US census, 47,300 Marshallese are living in the United States. Under the COFA, the Marshallese can live and work in the United States wherever they wish legally, although they are not citizens. As such, several notable states have communities of Marshallese that are growing every year. According to the 2020 census, 8,295 were living in Arkansas; 7,642 in Hawaii; 4,543 in Washington; 3,283 in Oklahoma; 2,477 in Oregon; 1,809 in California; 1,592 in Arizona; and 1,016 in Iowa. The rest are spread throughout the United States in smaller groups. These populations can be notoriously difficult to track in the census, as they are often categorized generically as Asian and Pacific Islanders, with little recognition of their unique ethnic background as Marshallese people. Marshallese community organizations in some of these key states tend to keep more detailed, thorough track of these individuals through community rosters and other mechanisms.

For instance, Arkansas estimates more than 12,000 Marshallese live in Springdale alone as of 2023.

In terms of resettlement, many Marshallese have been drawn for years by economic opportunities for unskilled workers in areas with declining populations in the United States. For instance, many of the Marshallese in the United States are working in rural areas in the meatpacking, ice packing, and warehousing industries where little knowledge of English is needed and skills can be taught easily. Some of these jobs, such as those in the agricultural processing fields, are paying 22 dollars per hour with full benefits, which can be 200 to 300 percent the salaries they are making back in the Marshall Islands. The Marshallese have joined other COFA Pacific Islanders, as well as legal refugees from Myanmar, Ethiopia, South Sudan, the Congo, and many other nations who can work legally in the United States. These unskilled laborers are often recruited by for-profit American companies in areas of the country where unskilled workers are in short supply. For example, in many rural parts of the United States, local fertility rates are well below replacement levels, the population is aging, and United States-born young people are leaving for other states with large cities. Rural areas are essentially depopulating and are increasingly relying on legal foreign workers to serve as unskilled laborers, which is now creating a demographic reality of rapid ethnic diversification and microdiversity in many rural states and small towns. For instance, the state of Iowa now has more than 180 languages spoken in its school districts, primarily driven by the need for unskilled, foreign-born legal laborers in the state. The Marshallese, with their two dialects, make up part of those 180 languages.

Marshallese resettlement in the United States has been positive for both the immigrants and the receiving communities, but certainly not without its challenges. On the positive side, the Marshallese have primarily come to the United States intact as families, rather than just as single males, because they can live and work legally in the country. They tend to cluster around anchor employers, such as meatpackers or warehousing companies, often in lower-income apartment buildings. In general, the Marshallese in the United States tend to reside as groups in communities and are not necessarily well dispersed throughout the states. They may live in densely populated housing units, with larger family sizes. In some cases, particularly in small rural communities with declining populations, the Marshallese and other legal migrants have helped revive declining school districts, churches, and downtowns that were struggling with the loss of United States-born residents over the past few decades. The Marshallese in the United States have access to free or low-cost public education that is better than that which they had back home. Marshallese young adults are increasingly pursuing college education and doing well at universities. Some young people are even becoming climate activists and advocates for small island nations that are experiencing the world's worst climate crisis. Marshallese access to health care, particularly specialty care, is much higher than access back in the Marshall Islands, particularly if they have health insurance from their employers. Medicaid provides care to many Marshallese people if they have lower incomes or no health insurance. The Marshallese themselves, as well as other residents of COFA nations, have been active in developing their own cultural associations in trying to maintain their ethnic identities here in the United States. Social media venues like Facebook connect many of them. Festivals, cultural

celebrations, Marshallese churches, Pacific Island health programs, and ethnic markets can be found in a number of their communities in the United States. Many travel back and forth to the Marshall Islands to visit relatives, and their extended family members will fly to the United States to see them as well. Elders, including older women, play an important social role in the culture, even in the United States.

Marshallese resettlement in the United States, particularly in smaller rural states, has not been without its challenges, though. For instance, interpreters and translators for the two main Marshallese dialects tend to be difficult to find. These rare languages present challenges to receiving health care, education, social services, and other programs, at least initially when Marshallese people resettle. Even those who speak English may have lower literacy levels in English, let alone in one of their native Marshallese dialects. Marshallese communities, such as those in Arkansas, are undertaking efforts to try to keep their rare languages from completely disappearing. Cultural misunderstandings can be common as well in resettlement communities. Common Marshallese communication styles can be more reserved, quieter, and less direct than those in some host communities, sometimes resulting in misunderstandings. Some Marshallese children have inadvertently become part of state child welfare systems and foster-family networks, due to misunderstandings about US or local laws on the use of child seats, seat belts, physical punishment, and the like. Marshallese families tend to live in extended kinship residences, thereby resulting in higher human density in housing units. During times of illness, such as during the coronavirus disease 2019 (COVID-19) pandemic, diseases could spread relatively quickly and easily among some residents. In Iowa, morbidity and mortality rates for COVID-19 among the

Marshallese were among the highest of any population. Some rates of mental health issues like depression and anxiety can be high among pockets of the Marshallese. Even with higher incomes than back home, many remain lonely, isolated, and sad to be separated from other family members and their country of origin.

ANALYSIS

Current Marshallese Workforce Patterns at the USAG-KA

The USAG-KA faces a workforce challenge as it heads into the future. As has already been touched on, the local Marshallese population is out-migrating at an alarming rate, seeking better job opportunities in the face of a dwindling local economy due to climate change. This out-migration is increasing due to climate-related factors. The USAG-KA's authorized 62 military and Department of the Army civilian personnel are augmented by a contracted workforce. The preponderance of this 1,535-person workforce is contracted through LOGCAP, and consists of 1,038 Marshallese local nationals, with the remainder composed primarily of expatriates and a few other country nationals.[133]

The Marshallese workforce primarily serves as unskilled labor performing roles such as grounds maintenance, janitorial services, infrastructure and housing maintenance, and sanitation.[134] They also work in the dining facility; morale, welfare, and recreation; and Army and Air Force Exchange Service. These positions demand no specialized training or security clearances, making them easily filled, while also fostering a transient nature. Ultimately, these low-skill tasks are necessary for the existence of the garrison, and because they cannot be replaced with automation, will always require a workforce to do them.

With only a few exceptions who have quarters on the garrison, this labor force must ferry daily to and from the USAG-KA from nearby Ebeye.[135] This is a logistical

[133] Robert Rideout, e-mail message to author, February 15, 2024.
[134] Daekwong Choi, e-mail message to author, February 22, 2024.
[135] Daekwong Choi, e-mail message to author, February 22, 2024.

strain for fuel and boats in a resource-constrained environment, but many make this daily trip for consistent paying jobs in a challenged economy. With many Marshallese leaving their nation, the diminishing available local workforce will continue to challenge the USAG-KA now and in future decades. At present, the USAG-KA predicts the need for a similar-sized unskilled workforce in the future, regardless of any currently proposed future requirements on the island.

In interviews and meetings with key stakeholders that were conducted as part of this project, some of the other frequently cited challenges related to the workforce shortage of local Marshallese include the following.

- Housing for workers is extremely limited, even for current needs. Most local workers live on the neighboring island of Ebeye, which is one of the most densely packed communities on earth. Little housing can be built for new workers on Kwajalein Island itself due to the small size of the island.
- No significant vocational training program currently exists on Ebeye. The number of Marshallese students that go on to high school, let alone vocational colleges or universities, is relatively small. Very few currently have skills that would be of value to the USAG-KA, such as in construction or electrical work.
- The Marshallese government can sometimes cap salaries paid by foreign employers like the US Department of Defense and its contractors so they more closely mirror those paid by local companies, to minimize economic disparities.

- Some Marshallese people on Ebeye feel USAG-KA contractors want to hire more foreign workers such as Filipinos and Fijians, rather than local Marshallese, as a way to keep salary costs down for personnel. The locals can sometimes resent the presence of foreign workers in the Marshall Islands.
- The USAG-KA is already facing a serious challenge with recruiting and retaining unskilled, as well as skilled, workers due to its extreme remoteness and isolation. This challenge will only grow in future decades as climate issues increase and more human migration away from the area is likely to happen. The local Marshallese people on Ebeye primarily fall into the unskilled labor pool because of limited enrollment in college or limited degree completions.

Climate Migration and USAG-KA Workers: A Systems-Based Conceptual Model

Migration from the islands surrounding Kwajalein Atoll to the United States threatens the USAG-KA and the security services it has provided for the past 75 years. The multiple factors underlying migration from the Marshall Islands are complex, interconnected, and reinforcing. They are increasingly the consequence of climate change (for example, sea-level rise and increasingly harsh Pacific storms), in concert with economic uncertainty, environmental degradation, chronic health conditions (for example, diabetes), and a lack of the fundamentals of a quality lifestyle (that is, access to quality housing, educational resources, advanced health care, and nutritious food).

General Systems Theory

The out-migration of local Marshallese workers from the Marshall Islands to the United States is a significant environmental security challenge for the USAG-KA. This out-migration must be understood from an interrelated systems standpoint to develop strategies that can be used in the short, medium, and long terms to address the growing shortage of local workers for USAG-KA. The first step in correctly developing and evaluating such strategies is an understanding and appreciation of general-system theory (GST). The theory is based on several fundamental concepts.

- Physical and social phenomena are viewed as a network of interacting relations between system (and/or subsystem) elements.
- All systems, whether biological, cybernetic, or social, have analogous patterns, behaviors, and properties researchers and observers can use to frame testable insights (hypotheses) necessary to evaluate the behavior of complex, interactive systems.
- Applying GST involves moving the unit of analysis from studying the individual elements of a system to evaluating the organization of the parts of the system and how they influence each other.
- Key elements of GST are system inputs, throughputs, and outputs as well as positive and negative feedback. Positive feedback sustains a particular system whereas negative feedback undermines or transforms a system.

Systems, including national security systems, operate through physical, biospheric, sociotechnical, socioeconomic, policy, and cultural subsystems and environments. Therefore, exploring how these subsystems impact the socioecological system (SES) under investigation is important. Momentous systems change is also often

precipitated by forcing events external to the system in question. Exogenous forces range from severe-weather events, dramatic increases in sea levels, and the presence of environmental contaminants and contagious diseases. Exogenous factors contributing to change also include the entrance of new military assets from hostile nations.

But change is not always created by exogenous factors. Endogenous factors also precipitate change within a particular system. These include the failure of a particular system to innovate, a significant reduction in political will, changes in the political governing coalition, breakdown of cultural norms and values, social media effects, and the abandonment of core principles.

Negative and positive feedback can help create an equilibrium, or conversely, force a system into new states of being. During the past 10 years, the integration of GST with SES concepts has enhanced the value of systems analysis. The application of an SES approach is particularly useful in exploring problems that are both physical and socioeconomic in nature, such as climate change.

Over the past 15 years, GST has increasingly been infused with the science of ecology—which focuses on the adaptive integration of organisms (for example, humans and societies) within natural and social environments—and how a dynamic equilibrium (stasis) often occurs via incremental or punctuated processes of change.[136] Drawn primarily from biology, ecology incorporates the transactional processes that exist in

[136] Punctuated equilibrium theory posits evolution occurs primarily through short bursts of intense speciation, followed by lengthy periods of stasis or equilibrium. The model postulates 99 percent of a species' time on earth is spent in stasis, and the 1 percent of change happens very quickly. Of course, the scales of geologic time are far different than those within which humans live.

nature and provides useful explanatory metaphors for human adaptation involving relations between social, political, and natural SESs (local, regional, or global), and social and physical forcing conditions and transformations.

Actions take place at the microscopic level, the individual level, the species level, and the SES level.[137] In SESs, some changes can be random, such as the mutation of genes into a receptive or nonreceptive environment, while others are the result of purposeful actions by individuals, organizations, subsystems, and competing SESs.

Although GST focuses on the role of inputs, throughputs, and outputs in maintaining stasis, SES theory introduces additional concepts that explain system instability, and even transformation.

Resilience: Resilience reflects an ability to respond successfully to new environmental conditions and circumstances through experimentation, learning, and innovation. Resilient SESs have the ability to manage the influx of negative feedback while maintaining critical functions, structures, and identities. Some systems have the capacity to transform negative feedback into positive feedback. For instance, the increasing rate of sea-level rise in the Pacific could lead to an increase in the amount of US financial and technological support necessary to sustain local national security assets (both human and technological), including the USAG-KA. In this case, additional aid due to rising sea levels may increase the stability of the SES. Additional resources could be used to mitigate the effects of sea-level rise, as well as to enhance educational

[137] Exosystemic refers to the structural factors that define the entire policy ecosystem. For example, you can evaluate individual elements of an ecosystem (such as governance, health, environmental contamination, or availability of food) or you can look at the ecosystem as a whole, including enablers and constraints from key subsystems and how they influence the entire ecosystem.

and job opportunities for Marshall Islands residents, thereby increasing the attractiveness of living in the Marshall Islands. The primary consequences of this positive feedback could be the long-term stabilization of the indigenous workforce. Nevertheless, all systems and subsystems have resilience limits that are defined through four concepts.

- Latitude: The maximum force a system can respond to before losing the ability to recover. Once this threshold is breached, the system cannot simply bounce back to a prior state. Or, once entangled, it cannot simply unentangle itself.
- Resistance: The initial ease (or difficulty) of changing the current state of a system.
- Vulnerability: How close the current state of the system is to a threshold or environmental boundary from which one cannot turn back after crossing it. This is like the concept of a tipping point.
- Panarchy: The resilience (and adaptability) of a subsystem or entire SES will depend on the influences (constraints or enablers) of variables at other levels of analysis (that is, individual, group, society, national, or international levels).[138]

To recognize resilience is not always good is important. Sometimes distributive change, especially at larger scales, is a positive outcome. For instance, the resilience of the Kwajalein Atoll's SES could undermine the transition to space-based systems that provide security benefits at a lower cost. The COFA and historic connections between the United States and the Marshall Islands, which make the SES more resilient, may actually result in a suboptimal set of future outcomes.

[138] Brian Walker et al., "Resilience, Adaptability and Transformability in Social-Ecological Systems," *Ecology and Society* 9, no. 2 (2004): 5.

***Adaptability*:** Adaptability is the capacity of individuals or organizations to influence resilience. In SESs, it amounts to the capacity of humans to control the trajectory of the SESs (and/or subsystems) collectively, or to change processes in response to dynamics at other scales. No SES can be adequately examined through one scale or level of analysis. A characteristic of a highly adaptable system is the capability of self-organization. The overall adaptability of a subsystem and/or SES is its ability to organize collectively to resolve an outstanding threat or challenge to the stability or adaptability of subsystems and the SES.

Socioecological System Attractors

On the one hand, the USAG-KA SES and other SESs and subsystems have a number of elements in common, including attributes that attract energetic inputs (for example, the influx of economic and/or social investments) and other human and natural resource inputs conducive to system resilience, durability, and stability. On the other hand, economic opportunities in various states, including Arkansas, Washington, Oregon, and Southern California are powerful attractors stimulating emigration from the Marshall Islands. These external forces of attraction (for example, better standards of living, or United States-based relatives) may be sufficient to overcome long-standing conditions that have stabilized local populations, including fundamental cultural norms and familial relationships. Interestingly, the stability of the Marshall Islands SES will depend on the relative strength of local endogenous attractors versus the strength of competing exogenous attractors in the United States. When significant numbers of attractors (or enablers) coexist in a particular location, they constitute “basins of

attraction." Multiple basins of attraction are typically present in an SES. The initial conditions in a particular basin (or an entire SES) constitute an equilibrium state.

The concept of "basins of attraction," which can help evaluate the stability and characteristics of SESs, originates in the mathematical theories of phase space, first studied by mathematicians in the 1870s and 1880s. Basins of attraction (for a policy SES) can be defined mathematically or qualitatively through an expression that denotes the relation between measure(s) or indices that delineate the initial state of an SES and a measure of its momentum toward a new basin of attraction/policy SES. A stable policy SES would have strong intrinsic attractors that balance or neutralize exogenous (pull) attractors. Again, the transition from one basin of attraction or to another takes place gradually—through an influx of incremental changes—or suddenly as the result of major, extreme events (that is, punctuated change).

Notably, the current basin of attraction associated with Kwajalein Atoll portrays indigenous worker support that is increasingly unstable due to push and pull factors internal and external to the SES. Critical push factors include rising sea levels and declining local living conditions and pull factors are economic opportunities available throughout the western and central United States.

Socioecological Constraints

In addition to attractors and enablers, identifying the role of SES constraints and inhibitors that influence SES adaptation and resilience is important. With regards to the

Marshallese local worker SES, inhibitors that would work against stability could include the following elements.

- Long-standing patterns of relations and interactions between the United States and the Marshallese
- Advances in space-monitoring technology (innovations) that are attenuating the connection between Kwajalein Atoll and the national security of the United States
- The current COFA agreement that includes powerful incentives for Marshall Islanders to move to the United States as well as an absence of countervailing incentives to remain in the Marshall Islands
- The potential for a change in US political will to invest heavily in the USAG-KA or view the site as one with extreme national security import
- Any future unwillingness in the United States to invest heavily in climate change mitigation

Tipping Points

Basins of attraction in an SES can remain stable for significant periods of time despite significant sources of negative feedback (for example, sea-level rise, out-migration, or declining local quality of life) only to experience a massive tipping point suddenly, where change is immediate, catastrophic, and transformative. Tipping points constitute the convergence of physical, political, demographic, security, and cultural forces sufficient to transform or redirect an SES.

In some cases, tipping points can force an SES toward greater and greater levels of entropy (that is, randomness, chaos) or the transition to new basins of attraction.[139] As the following graphic illustrates, basins of attraction are often represented in topographic terms. Movement from one set of basins of attraction (that together comprise an SES) to others can be smooth or linear, nonlinear, or hysteretic and/or discontinuous. In the Kwajalein Atoll's local workforce SES, change is currently linear and incremental. This could easily change, though, because of expected or unexpected perturbations. A dramatic series of events or tipping points, which may include an acceleration in sea-level rise, a dramatic increase in aggressive Chinese military behaviors, and other unspecified nonlinear forces, could transform the entire SES. Hysteretic transitions involve lags or delays in the transition from attractor state A to attractor state B that cannot be undone simply by reversing the transition steps from state B to state A. Once a transition in a basin of attraction or an entire SES occurs, it usually cannot be undone by reverse engineering.

Tipping points vary between SESs and are often unpredictable. Tipping points can be analogous to hidden corrosive and fatiguing processes working on a steel and concrete bridge, where the bridge appears stable and safe for years before one day experiencing an immediate and tragic failure as the consequence of some random, incremental increase in load factors interacting with other structural stressors. In this

[139] Entropy is a scientific concept that is most commonly associated with a state of disorder, randomness, or uncertainty. The term and the concept are used in diverse fields, from classical thermodynamics, where the concept was first recognized, to the microscopic description of nature in statistical physics, and to the principles of information theory. Entropy has found far-ranging applications in chemistry and physics, in biological systems and their relation to life, and in cosmology, economics, sociology, weather science, climate change, and information systems including the transmission of information in telecommunication. Alfred Wehrl, "General Properties of Entropy," *Reviews of Modern Physics* 50, no. 2 (April 1978): 221–60.

case, metal fatigue and corrosion could have been held in check for years until efforts to remove and replace the top deck caused the entire structure to collapse.

Likewise, elements of the national security SES, such as the USAG-KA, could successfully fulfill critical national security functions for decades only to face an intractable series of tipping points. On the one hand, the interplay of technological innovation, workforce dynamics, and climate change could push the entire subsystem into a new state where the military installation becomes ecologically unproductive relative to the variety of historical national security services it once provided for the United States.

Conversely, an SES that starts from an unstable position due to an unrelenting influx of exogenous and endogenous forces, can be rebalanced or redirected toward a greater level of productivity and stability. For instance, an escalating Chinese national security threat in the western Pacific could make the local workforce supporting the USAG-KA even more valuable to the United States. The US government could, in turn, suddenly become more willing to invest the resources necessary to make the Marshall Islands more attractive or livable.

The response of the US government would be to increase the attractiveness of the Marshall Islands through the provision of added resources to increase the local standard of living, including new housing, new educational incentives, desalinization of local water supplies, and the enhanced ability to travel between the United States and the Marshall Islands. Absent dramatic levels of technological innovation or a cataclysmic sea-level rise, Kwajalein Atoll’s importance and future is hypothesized to be directly tied to the security threat China and North Korea present.

The USAG-KA could remain viable until the end of the twenty-first century through policy changes that increase the relative power and influence of local *attractors* versus exogenous *pull* factors. The addition of high-paying jobs and enhancements to the quality of life in Kwajalein Atoll would mitigate the economic pull of the continental United States. Of course, managing the effects of climate change would also be a necessary but not a sufficient factor for maintaining the physical and social viability of Kwajalein Atoll and the surrounding atolls.

Spillovers

Because of the permeable, leaky nature of SESs, subsystems, and associated boundaries, processes, and behaviors, moving from one subsystem to another is quite easy. For example, the technological innovation subsystem is subject to spillovers that can affect the viability of other subsystems or even entire SESs. For example, given the emphasis US military planners place on space-based defense, conventional land-based warfare is likely to decline in relevance throughout this century. In both a conceptual and a practical sense, progress in space research and the innovation subsystem spills into other subsystems, including the USAG-KA's local Marshallese workforce.

Another potential spillover could be related to the high-level radioactive waste repository on Runit island. The location of this repository and its interaction with the surrounding ocean environment could affect the overall viability of the USAG-KA's indigenous workforce SES. The repository is particularly vulnerable to sea-level rise and significant storm events. Spillovers are important precursors to systemic transformations.

Subsystems Affecting the Viability of the Marshallese Workforce

The first step in conducting an analysis of the USAG-KA's local workforce SES is to identify the individual subsystems that comprise the overall SES. To reiterate an earlier point, understanding what constitutes a subsystem or the overall SES is not as important as determining how all units affect each other in terms of stability or instability and attractiveness or unattractiveness. Depending on the policy issue under review, a subsystem in one analysis could become the SES in another situation, and vice versa.

Another key step in evaluating subsystems associated with the USAG-KA's indigenous worker support SES is to identify and evaluate factors that are either stabilizing or destabilizing to the SES. Push factors can either be stabilizing or destabilizing, whereas pull factors are usually destabilizing in nature. One explanation is pull factors are typically moving an SES toward a tipping point that can result in the transition to new basins of attraction and/or an SES with a different set of fundamental characteristics and behaviors. Most factors can be labeled as either push or pull factors, and in some cases, a combination of both push and pull characteristics. The analyst is responsible for deciding whether a particular factor is best characterized as a pull or a push factor given the policy issue under investigation. Technological innovation exemplifies a factor that has both push and pull characteristics. If technological innovations are multiple and reinforcing, they are legitimately considered to be pull factors emanating from basins of attraction. Singular or incremental innovations are often best considered to be push factors. Table 1 provides a sampling of push and pull factors, as well as enablers and inhibitors or system constraints.

Table 1

Categorization of Variables

If a critical strategic goal is to stabilize the indigenous worker population in the Marshall Islands supporting the USAG-KA, specific factors/variables can be characterized in the following manner.

Factor	Push Factor	Pull Factor	Dynamic Enabler	Constraint or Inhibitor	Explanation
Rate of local climate change and associated changes in sea level, mean and variable air and water temperatures, relative dryness of underbrush, subsidence, over wash, etc.	X	X	X	X	Local climate change is increasingly acting as both as a push factor encouraging out-migration and a pull factor (attractor) for emigration to a specific state in the United States.
Global climate change	X	X	X		To date, global climate change has energized the Marshallese government to be a leading advocate for policies that mitigate climate change.
COFA	X	X		X	Whether the COFA acts as a push or pull factor depends on whether the treaty incentives are geared toward incentives for those residing in the Marshall Islands or for those relocating to the United States. Ironically, current COFA incentives appear to pull the Marshallese to the United States.

Technological innovation	X	X	X (mid to long-term)	X (short-term)	In the short to midterm, technology acts as a constraint on stabilizing the indigenous USAG-KA workforce. Over the mid and long terms, technological innovation could help stabilize the workforce in the Marshall Islands or make USAG-KA far less important to national security. For example, significant innovations in space-based monitoring and intercept technologies are likely to lower the importance of the USAG-KA. On the other hand, the absence of a US presence would create a political vacuum the Chinese would be motivated to fill. This reality will not diminish as a consequence of technological innovation.
National security threat from China and North Korea in the western Pacific	X			X	The growing Chinese threat in the western Pacific and the specific geographic location of Kwajalein Atoll are critical push factors for continuing to support and upgrade USAG-KA in the short to midterms as well as for sustaining the current indigenous worker support system. Over the long term, the omnipresent threat of the Chinese developing a relationship with the Marshall Islands will constrain the United States from abandoning the USAG-KA.

Economic attractors in various states throughout the United States	X		X	X	Economic opportunities in states such as Washington, Oregon, Arkansas, and Southern California are powerful attractors for Marshallese citizens to migrate to the United States. Economic opportunities are further synergistically supported by the COFA, which makes movement to the United States easy. American multinational corporations are actively recruiting for unskilled workers who can work legally in the United States, like the Marshallese, thus competing with the Department of Defense for this kind of labor force.
Kinship and culture		X	X		Historically, kinship and culture inhibited out-migration from the Marshall Islands. But over time, COFA-related incentives have encouraged significant populations of Marshallese people to move to the United States. The net result is local kinship is no longer a critical factor in stabilizing indigenous populations in the Marshall Islands. Countervailing kinship connections in the United States provide a powerful attractor for out-migration to the United States.

Marshallese government	X			X	The Marshallese government has intensified efforts to stabilize its populations by identifying new funding and investment opportunities. But its efforts are compromised by the lack of trust on the part of the Marshall Islands' population due to the domination of the government by specific kinship relationships that have divided the population into insiders and outsiders.
Health care	X	X	X	X	Specialty health care in the Marshall Islands is significantly less available than in the United States. This serves as a powerful pull factor to the United States. The availability of US health care is especially made true by revisions that now allow the Marshallese to qualify for health care programs (for example, Medicaid, Patient Protection and Affordable Care Act) in the United States. Marshallese people working for major US corporations often qualify for medical care through their employers.
Global and social connections	X	X	X		Over the last 35 years, an explosion in global interconnectivity has occurred. The consequence is rural youth in the United States and the Marshallese are less isolated than ever before.

The presence of a high-level radioactive waste repository built as a consequence of past nuclear weapons testing in the Marshall Islands that is leaking plutonium into the surrounding ocean waters		X		X	This unsecured repository for high-level radioactive waste in the Marshall Islands is leaking plutonium into seawaters. Consequently, the situation will require a long-term US presence in the Marshall Islands until a permanent solution is found. Evidence of measurable amounts of plutonium contamination have been found as far away as the South China Sea.
The new bipolar structural relationship between China and the United States		X		X	Prior to the dissolution of the Soviet Union, the United States and the Soviet Union were locked in a bipolar structural relationship. In recent decades, due to the dissolution of the Soviet Union and the comparative weakness of Russia, the bipolar relationship with the Soviet Union no longer exists. Because Russia does not have the power of the Soviet Union, the relationship between Russia and United States can no longer be categorized as bipolar. Although Russia is weak in both military and economic terms, China has quickly transitioned into a significant economic and military power that is competitive with the United States.

					The new bipolar relationship globally involves the People's Republic of China and the United States. This new systemic relationship requires constant vigilance on the part of both nations. Consequently, for the United States to abandon its relationship with the Marshall Islands is structurally difficult, given the likelihood China would quickly move to fill the ensuing power vacuum in the western Pacific.

Using a Systems Model to Weigh Options

Key Steps

1. Select working hypotheses regarding the relative priority of specific subsystems and/or exogenous and endogenous variables now destabilizing the USAG-KA SES from a local worker standpoint. These hypotheses must be subject to falsification consistent with existing scientific practices.
2. Characterize the USAG-KA's local worker SES by identifying component subsystems, the nature of the relationships between the subsystems, and the interactions between each subsystem and the identified policy SES.
3. Identify critical push and pull factors (variables, system enablers, and system constraints) within each system and the designated policy SES based on known-knowns, known-unknowns, unknown-unknowns, and unknown-knowns.

4. Determine what factors (constraints, constraints, inhibitors, and attractors) are pushing or pulling the SES toward an irreversible tipping point, thereby causing a series of spillovers destabilizing the current indigenous worker SES and creating a distinctly new one.
5. Assess whether push and pull elements constitute necessary or sufficient conditions for destabilizing the indigenous subsystem. (For example, the rapid intensification of near-term national security threats in the absence of breakthrough space-monitoring technologies stabilizes the indigenous worker support system). Likewise, consider if omnibus space technological innovation would be sufficient to negate the need for the USAG-KA and its indigenous workforce. (This would assume a significant US presence in the Marshall Islands has no value beyond providing a unique site for monitoring China and North Korea.)
6. Evaluate whether interactions between priority push and pull factors are accelerating or inhibiting the destabilization of the USAG-KA's indigenous worker SES.
7. Highlight strategies for mitigating or adapting to spillovers and/or destabilizing exogenous attractors that would enable the indigenous worker SES to avoid irreversible tipping points (or spillovers) that have significant negative intended and unintended consequences.
8. Estimate the likelihood of reaching tipping points (for example, punctuated advances in space-based monitoring systems) that could reduce the dependence of the United States on the USAG-KA as well as avoid the possible unintended consequences of identified tipping points.

9. Document how many working hypotheses have been falsified or require modification or revision.
10. Provide short-term, midterm, and long-term policy recommendations based on completing the prior steps.

Working Hypotheses:

1. The near-term viability and stability (in the next one to 10 years) of USAG-KA indigenous workers and associated facilities will depend on providing additional financial, housing, education, international transportation, and health incentives to islanders that balance attractors created by the COFA and emanating from US mainland sources of basins of attraction in select states.
2. Over the next 10 years, kinship in Marshallese communities located in the continental United States will increase its power of attraction, accompanied by an equivalent decline in the attraction power of kinship patterns in the Marshall Islands.
3. The midterm viability and stability (in the next 10 to 20 years) of the USAG-KA's indigenous worker SES depends on accelerating technological innovations that enable living and national security facilities to adapt to rapidly increasing sea levels with minimal disruptions via flooding or facility overtopping.
4. The rapidity and extent of sea-level rise and other environmental risks from climate change will significantly increase the rate of migration from the Marshall Islands to the continental United States over the next 20 years.

5. The long-term viability and stability (over the next 20 to 50 years) of the USAG-KA's indigenous worker SES depends partially on advancements in space-based observational and missile-interception technologies.

Level and Nature of Information

The extent and nature of the information available is an important input in determining the strategy for evaluating factors and providing strategic options critical to the stability of the USAG-KA's indigenous worker ecosystem. The USAG-KA's indigenous worker SES can be categorized in terms of four basic categories of knowledge.[140]

Known-Knowns (things that are understood)

- Current rate of Marshall Islands out-migration to the United States
- Current rate of sea-level rise above the global average rate of sea-level rise in the Marshall Islands
- Scope of near-term economic opportunities in the United States
- State of the Marshall Islands' medical system

[140] The origin of the four categories of knowledge is derived from the *Johari window*, which is a technique[1] designed to help people better understand their relationship with themselves and others. The technique was created by psychologists Joseph Luft (1916–2014) and Harrington Ingham (1916–1995) in 1955, and is used primarily in self-help groups and corporate settings as a heuristic exercise.[2][3] Luft and Ingham named their model "Johari" using a combination of their first names. These categories are widely used throughout various physical science disciplines. J. Luft and H. Ingham, "The Johari Window, a Graphic Model of Interpersonal Awareness," *Proceedings of the Western Training Laboratory in Group Development* (1955). This categorization methodology is now widely used throughout several scientific disciplines and the management sciences.

- Current in-country living conditions (for example, health; per capita GDP; death rates per 1,000 citizens; and average life expectancies) for US civilians, local indigenous workers, and contractors
- Rate of increase in average year-round air temperatures
- Quality and quantity of potable water supplies
- Water and air quality per US Environmental Protection Agency standards
- Extent and degree of mental illness
- Nature and quality of education
  - Graduation rates in the Marshall Islands and the United States
  - Percentage of high school students pursuing higher education among Marshall Islands residents and Marshallese people in the United States
  - Percentage of Marshallese indigenous students and US residents pursuing two- or four-year degrees
  - Percentage of indigenous high school students pursuing college abroad
  - Percentage of indigenous Marshall Islander students with college degrees returning to Kwajalein Island
  - Relative opportunities of Marshall Islands students with opportunities to study in the United States versus number (percentage) of students in US territories with opportunities to study abroad
  - Number of Pell Grants awarded to Marshall Islands students
  - Overall quality of life for Marshall Islands citizens
  - Level of nostalgia for island life and culture and its relative influence on residents of the United States

Known-Unknowns (things that are not known and may not be fully understood)

- Future North Korean and Chinese actions vis-à-vis the United States and the Marshall Islands
- The future of the COFA treaty under changing security and climate regimes and environments
- Long-term environmental and health impacts of the leaky high-level radioactive waste repository on Runit island in the Enewetak Atoll within the Marshall Islands (note: this repository does not correspond to the environmental and safety requirements for proposed geological repositories in the United States under the Nuclear Regulatory Commission and is vulnerable to sea-level rise and storms)
- Future strength of economic attractors in the United States (for instance, the United States could enter a recession), and to what level new economic treaties with other nations may lower corporate interest in recruiting the Marshallese to work in the United States
- Future strength of kinship attractors in the United States
- Rates of future sea-level rise and the potential for other serious climate change threats in the Kwajalein Atoll
- Chinese influence in the Marshall Islands over the next 10 years

Unknown-Unknowns (unexpected or unforeseeable conditions)

- Breakthroughs in space-based observational and intercept technology

- Future security environment facing the United States in the western Pacific
- World technological and economic leadership
- Impacts of a complete breach of the high-level radioactive waste repository on Runit island
- War between China and Taiwan
- Impact of social media (for example, China-based TikTok) and other information operations and gray-zone activities by adversaries that could influence the USAG-KA's local workforce

Unknown-Knowns (information that is restricted to a few decisionmakers)

- Extent of plutonium dispersion from the high-level radioactive waste repository on Runit island with worsening climate change
- The US government's commitment to the USAG-KA in 10 years
- Impact on the USAG-KA if hostilities break out between China and the United States over Taiwan
- Likelihood China will fill the political vacuum if the United States reduces or eliminates its presence on Kwajalein Atoll and surrounding islands
- Future costs of building desalinization facilities in the Marshall Islands
- Future costs of building advanced seawalls in the Marshall Islands
- Costs of relocating waste on Runit to a long-term storage facility in the United States

RECOMMENDATIONS

Using the conceptual, systems-based model previously discussed in the analysis section of this report, the push and pull factors that contribute to Marshallese migration are complex, interwoven, and multifaceted. Climate change and environmental degradation are currently serving as human-migration amplifiers in the Marshall Islands, and increasingly contributing to the growing exodus of the local population to the United States, Guam, and other resettlement areas around the world. The extent to which climate change will become an even larger push factor in Marshallese out-migration will likely increase in upcoming years as more frequent and severe over wash disasters occur, saltwater intrusion increases, and sea-level rise impacts infrastructure and housing security for workers on Ebeye.

From a social science and systems-modeling perspective, predicting exact trends and patterns in local base employees' out-migration can be more difficult and nebulous than predicting sea-level rise and other changes in the physical environment that impact the infrastructure on military bases. Exact tipping points in human migration can be difficult to determine. But at this point, the Marshall Islands has already lost approximately 40 percent of its residents to other nations. Short of significant mitigation and adaptation efforts in the Marshall Islands, this exodus of local residents is almost certain to continue to grow substantially in upcoming years, particularly as climate change negatively impacts the local economy and future of the Marshall Islands.

To that end, for the US Army Corps of Engineers, the Engineer Research and Development Center, and other similar organizations to incorporate social sciences into

their modeling of climate change impacts on bases will be important in future years. Indeed, the impact of climate change on the human migration of local indigenous base workers could be the most vulnerable chain in the support system and resiliency capabilities of the USAG-KA and other similar bases trying to function in isolated, remote areas around the world that are disproportionately affected by environmental emergencies.

Fundamentally, a military base must be viewed like a living organism. The impact of climate change extends beyond infrastructure damage within the walls of the base. Climate change can impact the human community that exists around the installation and provides many of the local workers needed to meet the facility's mission. If the local community is deeply impacted by environmental risks and vulnerabilities, workers may pursue employment and better economic opportunities elsewhere and migrate away from the area around the base.

This section, therefore, provides a summary of 17 recommendations the US Army and the Department of Defense should explore in greater depth to address the climate-amplified migration of local indigenous workers away from the USAG-KA and to other regions around the world. (A full set of these recommendations is included in the Short Report section near the beginning of this document.) These recommendations draw upon the systems-based approach to understanding the complexities of human climate migration as explored in this report and analyzed in the previous section. Human migration is a complex process made up of systems of systems, where individual causal factors rarely operate in a vacuum. As such, recommendations to

address the impact of the climate on the human migration of USAG-KA indigenous workers must be equally interwoven and strategic in nature to be impactful. The variables contributing to the out-migration of workers must also be monitored regularly over time, as they are subject to changes that were discussed in the previous analysis section. Therefore, the recommendations in this section are provided with the following caveats.

- These strategies are designed to be long-term and strategic in nature and should occur over the next several decades from 2025 through 2050.
- Each recommendation is meant to be an option for the Department of Defense to further explore for more precise consideration of viability, cost, effectiveness, and other factors.
- The recommendations are separated into near-, mid, and long-term strategies over the next several decades, and at lower, moderate, or higher costs. Again, the viability of most of these recommendations requires the Department of Defense's further study beyond the scope of this report, prior to any adoption or implementation, particularly for those that are the most costly and complex.
- Because population migration occurs within a system of complex push, pull, mitigating, and confounding factors within social environments that can be volatile, uncertain, complex, and ambiguous, numerous strategies need to be adopted simultaneously, operated over time, and evaluated on an ongoing basis to ensure effectiveness.

Summary of Recommendations

Recommendation 1: Seek US government support for the identification and funding of the USAG-KA as a leading test site for climate-resilience studies. This can be initiated in the near term, with lower costs and risks, as an enduring project.

Recommendation 2: Promote partnerships with professional military education service academies on environmental security with the USAG-KA as a learning laboratory. This can be initiated in the near term, with lower costs and risks, as an enduring project.

Recommendation 3: Educate stakeholders on the social science aspect of climate change's impacts on human populations and the impact on national security. This can be initiated in the near term, with lower costs and risks, as an enduring project.

Recommendation 4: Develop mechanisms for higher wages and greater benefits that would incentivize Marshallese workers to stay in the Marshall Islands. This can be initiated in the near term, with moderate costs and lower risks, as an enduring project.

Recommendation 5: Develop enhanced civilian-military relationships between the USAG-KA and other relevant military groups, such as civil affairs teams, the US Army Chaplain Corps, the Marshallese government, and nonprofits, to support the Marshallese during environmental displacement. This can be initiated in the near term, with lower costs and risks, as an enduring project.

Recommendation 6: Enhance relationships with governmental organizations and NGOs from other nations to improve synergistic efforts. This can be initiated in the near term, with lower costs and risks, as an enduring project.

Recommendation 7: Provide educational opportunities on Ebeye to increase the pool of trained workers. This can be initiated in the near term, with lower costs and risks, as an enduring project.

Recommendation 8: Increase the recruitment of Marshallese people into the US military with a guaranteed duty station in the Marshall Islands. This can be initiated in the midterm, with moderate costs and lower risks, as an enduring project.

Recommendation 9: Form partnerships between the US government and Marshallese organizations to educate and incorporate local groups into strategies. This can be initiated in the near term, with moderate costs and lower risks, as an enduring project.

Recommendation 10: Enhance information operations to counter adversaries' expansion efforts in the region, particularly efforts by the People's Republic of China, that turn locals away from supporting the United States. This can be initiated in the near term, with moderate costs and lower risks, as an enduring project.

Recommendation 11: Enhance the US Army's use of LOGCAP to augment USAG-KA capabilities. This can be initiated in the near term, with lower costs and risks, as a shorter-term or periodic effort.

Recommendation 12: Use legal migrant or fly-in/fly-out workers if local Marshallese workers become unavailable. This can be initiated in the midterm, with moderate costs and risks, as a periodic effort, as needed.

Recommendation 13: Provide floating accommodations to house local workers unable to remain on Ebeye due to climate change. This can be initiated in the midterm, with higher costs and moderate risks, as an enduring project.

Recommendation 14: Include Ebeye in Kwajalein Atoll infrastructure resiliency efforts through enhanced US investment in the Marshall Islands. This can be initiated in the midterm, with higher costs and risks, as an enduring project.

Recommendation 15: Use land-reclamation efforts to raise the level of livable land on Ebeye and Kwajalein Atoll. This can be initiated in the midterm, with higher costs and risks, as an enduring project.

Recommendation 16: Incorporate artificial intelligence, machine learning, and robotic technologies as appropriate to support the work conducted on Kwajalein Atoll and reduce the need for human labor if necessary. This can be initiated in the long term, with higher costs and risks, as an enduring project.

Recommendation 17: Relocate or consolidate labor-intensive areas of the base to other sites around the world that are less impacted by climate change. This can be initiated in the longer term, with higher costs and risks, as an enduring project.

CONCLUSION

Lessons Learned for Other US Military Bases

This report provides valuable insights into the challenges facing US military bases that are increasingly affected by climate impacts on the human communities that support their operations. Lessons learned from this report on the case of the USAG-KA can be applied to other military installations grappling with similar issues. Strategic planning, human resources management, civil-military relationships, and garrison-command functions can benefit from considering the factors influencing the migration decisions of local base workers in climate-affected areas.

Moreover, the adaptability of the recommendations provided in this report allows for customization to reflect the unique conditions and future projections at specific military installations. By leveraging these insights and tailoring strategies to local contexts, other US military bases can proactively address climate-related challenges, mitigate workforce shortages, and enhance the resilience of their operations in the face of environmental changes.

As such, a rapid assessment tool is included in this section, which military planners can use to help understand the system of systems and the unique mix of complex push and pull factors that contribute to human climate migration when attempting to analyze its potential impact on military bases. The appendices in this report also provide in-depth information and resources on climate change, the Marshall Islands, human environmental displacement, and other factors of increasing importance to military installations around the world that are increasingly challenged to understand

the physical, ecological, human, and social impacts of climate change on environmental-security considerations at their bases.

RAPID ASSESSMENT TOOL

FOR DRIVERS OF CLIMATE-AMPLIFIED HUMAN MIGRATION OF LOCAL WORKERS SUPPORTING US MILITARY INSTALLATIONS

- This tool should be used on an ongoing basis, at least annually, to assess a variety of factors that can influence the availability of local workers for military bases that may be faced with increased migration of workers due to environmental vulnerabilities in their home communities.

- This tool may also be used strategically to explore factors that may influence the climate-amplified human migration of base workers in future years on a long-range basis.

- This document can assist military professionals involved in strategic planning, human resources, civilian-military relationships, civil affairs, garrison command, and other key functions in considering a wide array of factors that can influence the migration decisions of local base workers in climate-impacted areas.

- Particular US military installations can modify this tool as needed so it reflects current and future conditions at the local level.

- The variables in this tool are not meant to be all-inclusive. The list of variables in each category can be modified, expanded, or deleted as appropriate for a particular military installation.

STAKEHOLDERS

To what extent do these stakeholder entities influence the opinions of local indigenous workers about staying on a base for work or migrating away?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Department of Defense		
Military Garrison Base Leadership		
Indigenous Local Workers		
Host National Government		
Host Local Government		
Key Community Leaders (Informal and Formal)		
Host Nation Families and Community Members		
Allies and Partners		
Adversaries		
First Responder Groups (Fire, Emergency Medical Services, Disaster Relief, Search and Rescue, etc.)		
Resettlement Communities		
The Broader Society		

Corporations or Other Organizations Competing for Workers		
Others:		

ASSETS TO SUPPORT CLIMATE MIGRANTS

To what extent are these resources available to help base workers in the local community deal with climate and other factors that contribute to their migration? To what extent are these resources also available in resettlement communities to aid with migrant resettlement?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Civil Affairs Units		
Military Chaplain Corps		
Faith Institutions in Sending and Receiving Nations		
Interpreters		
Foreign Area Officers		
Community Liaison Officers		
Local Nonprofits		
International Aid and Relief Agencies		
Non-Governmental Organizations in Resettlement Countries		
National Host Government		
US Federal Agencies (Department of State, Department of the Interior, etc.)		
Others:		

CLIMATE MIGRATION ADAPTATION STRATEGIES FOR WORKERS

What does “coping” with climate change look like for families in the local worker community outside the base if they do not migrate away?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Mitigation		
Resiliency		
Innovation		
Expansion of Support Services (Housing, Benefits, etc.)		
Changes in Compensation Patterns		
Collaboration with Allies and Partners		
Collaboration with NGOs		
Collaboration with Local Community and National Leadership		
Technological Innovation		
Changes to Immigration Policies for Temporary Workers		
Mechanization and Automation of Labor		
Base Closure or Consolidation		
Others:		

CLIMATE PATTERNS CONTRIBUTING TO DISPLACEMENT (BOTH SLOW AND FAST ONSET)

Are the workers around the base experiencing any of these environmental issues? Are these issues becoming more frequent, volatile, and dangerous? Do these climate issues have a fast onset or a slow onset? Do they impact the local economy and standard of living badly enough that workers are moving?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Over Wash and Extreme Waves		
Sea-Level Rise		
Flooding		
Subsidence		
Saltwater Intrusion		
Weather Volatility		
Extreme Heat		
Extreme Cold		
Changes in Wind and Water Currents		
Wildfires		
High Humidity		
Droughts		
Erosion		
Acidification of Ocean		
Others:		

CLIMATE IMPACTS ON COMMUNITIES OF LOCAL WORKERS

How is climate change impacting the local communities outside the base where workers live? Is the quality of life improving or worsening over time due to these factors? Are these factors enough to drive out-migration of workers away from the base?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Infrastructure Damage		
Changes in Ecosystem		
Crop Failures		
Supply-Chain Impacts		
Logistical Challenges		
Food Insecurity		
Water Insecurity		
Economic Impacts		
Education Disruptions		
In-Migration		
Out-Migration		
Growing Conflict and Instability		
Changes in Health Patterns		
Social Unrest		
Potential for Involvement and Influence from Adversary Nations		
Others:		

BASE WORKER CONSIDERATIONS

To what extent do the factors below influence the availability of local workers for the base? Can these factors be modified reasonably to address base worker shortages if they migrate away?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Ethnic and Cultural Factors		
Beliefs, Practices, Knowledge, and Attitudes of Workers		
Ethical Operations and Worker Rights		
Language Issues		
Age and Gender Patterns		
Skilled vs. Unskilled Needs		
Availability of Other Workers/Contractors		
Salaries and Benefits Needed to Retain Local Workers		
Options for Legal Migration of Workers		
Host Nation Regulations, Expectations, and Support		
Community and Key Leader Involvement		
Union Regulations, Contractual Requirements for Workers, etc.		
Worker Preferences and Desires		
Labor Needs to Meet Mission of Base		

Ability to Recruit Workers into the Military		
Ability to Mechanize, Automate, or Consolidate Jobs if Short on Labor		
Support Services for Displaced Workers in Sending and Receiving Communities		
Quality of Life and Standard of Living Issues in Local Community		
Others:		

CONFOUNDING OR SUPPORTING ISSUES

How do these factors complicate the ability of the military base to recruit and retain local workers at the skilled and unskilled levels? Can these factors be modified easily in the short term to make migration more or less likely? What would it take to modify these factors in the long term to support a viable pool of local workers?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Political Will of Host Nation		
Political Will of Resettlement Nation		
Critical Nature of Base		
DoD Budgets		
Contracting Options and Requirements		
Changing Global Demographics (Declining Fertility Rates, Aging, Urbanization, etc.)		
Information Operation Campaigns by Adversaries		
Rate of Severe Impacts of Climate Change		
Speed at Which Jobs Can Be Mechanized If Labor Is Limited through Technology and Innovation		
Others:		

PULL FACTORS FOR LOCAL WORKERS TO MIGRATE TO NEW RESETTLEMENT COMMUNITIES

To what extent do these factors exist in resettlement communities for local workers around bases? Do they contribute to the out-migration of local base workers for better opportunities elsewhere?

VARIABLE	CONSIDERATIONS	NOT APPLICABLE
Options for Legal Employment		
Skilled vs. Unskilled Labor Opportunities		
Transportation		
Recruitment of Workers by Other Companies		
Housing		
Household Food, Supplies, and Shopping		
Availability of Jobs in Resettlement Communities		
Schooling for Children (PreK through 12)		
Continuing Education, Advanced Training for Workers, and High School Diploma Programs		
College Education Opportunities		
Medical Care, Public Health Services, and Costs		
Mental Health Services		
Ability to Maintain Cultural Identity		
Faith Institutions		

Leisure and Recreation Options		
Resettlement Community Mentality toward Newcomers		
Law Enforcement and Legal Assistance		
Social Services		
Language Barriers, Interpretation Services, and English as a Second Language Programs		
Cultural Liaisons		
Level of Diversity in Resettlement Community		
Rapid Ethnic Diversification Level in Resettlement Community		
Human Rights and Ethical Treatment		
Political Disenfranchisement and/or Discrimination		
Others:		

APPENDICES

APPENDIX 1:
NATIONAL SECURITY AND CLIMATE CHANGE REPORTS

SUBTOPICS	DOCUMENTS	HYPERLINKS
Fifth National Climate Assessment 2023	US Global Change Research Program, *Fifth National Climate Assessment 2023* (Washington, DC: US Global Change Research Program, 2023).	https://nca2023.globalchange.gov/
2022 National Defense Strategy	US Department of Defense, *2022 National Defense Strategy of the United States of America* (Washington, DC: US Department of Defense, 2022). Includes the 2022 Nuclear Posture Review and the 2022 Missile Defense Review.	https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF
2021 National Intelligence Estimate on Climate Change	Office of the Director of National Intelligence, *National Intelligence Estimate: Climate Change and International Responses Increasing Challenges to US National Security through 2040*, NIC-NIE-2021-10030-A (McLean, VA: Office of the Director of National Intelligence, 2021).	https://www.dni.gov/files/ODNI/documents/assessments/NIE_Climate_Change_and_National_Security.pdf
DoD Climate Adaptation Plan	Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment), *Department of Defense Draft Climate Adaptation Plan* (Washington, DC: US Department of Defense, 2021). Report Submitted to National Climate Task Force and Federal Chief Sustainability Officer.	https://media.defense.gov/2021/Oct/07/2002869699/-1/-1/0/DEPARTMENT-OF-DEFENSE-CLIMATE-ADAPTATION-PLAN-2.PDF
2021 DoD Climate Adaptation Plan Highlights and Examples	Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment), *Highlights and Examples for the Department of Defense Climate Adaptation Plan* (Washington, DC: US Department of Defense, 2021).	https://media.defense.gov/2021/Nov/03/2002886171/-1/-1/0/HIGHLIGHTS-AND-EXAMPLES-FOR-DOD-CLIMATE-ADAPTATION-PLAN.PDF
DoD Climate Risk Analysis	Department of Defense, Office of the Undersecretary for Policy (Strategy, Plans, and Capabilities), *Department of Defense Climate Risk Analysis* (Washington, DC: US Department of Defense, 2021). Report Submitted to National Security Council	https://media.defense.gov/2021/Oct/21/2002877353/-1/-1/0/DOD-CLIMATE-RISK-ANALYSIS-FINAL.PDF
2022 DoD Climate Adaptation Plan 2022 Progress Report	Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment), *Department of Defense Climate Adaptation Plan 2022 Progress Report* (Washington, DC: US Department of Defense, 2022). Report Submitted to National Climate Task Force and Federal Chief Sustainability Officer.	https://media.defense.gov/2022/Oct/06/2003092213/-1/-1/0/2022-DOD-CAP-PROGRESS-REPORT.PDF
2023 DoD Plan to Reduce Greenhouse Gas Emissions	Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment), *Department of Defense Plan to Reduce Greenhouse Gas Emissions* (Washington, DC: US Department of Defense, 2023).	https://media.defense.gov/2023/Jun/16/2003243454/-1/-1/1/2023-DOD-PLAN-TO-REDUCE-GREENHOUSE-GAS-EMISSIONS.PDF
2023 DoD Operational Energy Strategy	Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment), *Department of Defense Operational Energy Strategy* (Washington, DC: US Department of Defense, 2023).	https://www.acq.osd.mil/eie/Downloads/OE/2023%20Operational%20Energy%20Strategy.pdf

DoD Directive 4715.21 Climate Change Adaptation and Resilience	DoD Directive 4715.21, "Climate Change Adaptation and Resilience," August 31, 2018.	https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/471521p.pdf
US Army Climate Strategy	Department of the Army, Office of the ASA-IE&E, *United States Army Climate Strategy* (Washington, DC: Department of the Army, 2022).	https://www.army.mil/e2/downloads/rv7/about/2022_army_climate_strategy.pdf
US Army Climate Strategy Implementation Plan Fiscal Years 2023 to 2027	Department of the Army, Office of the Assistant Secretary of the Army for Installations, Energy and Environment, *United States Army Climate Strategy Implementation Plan* (Washington, DC: Department of the Army, September 2022).	https://www.army.mil/e2/downloads/rv7/about/2022_Army_Climate_Strategy_Implementation_Plan_FY23-FY27.pdf
US Navy Climate Action 2030	Department of the Navy, Office of the Assistant Secretary of the Navy for Energy, Installations, and Environment, *Department of the Navy Climate Action 2030* (Washington, DC: Department of the Navy, May 2022).	https://www.navy.mil/Portals/1/Documents/Department%20of%20the%20Navy%20Climate%20Action%202030%20220531.pdf
US Air Force Climate Action Plan	Department of the Air Force, Office of the Assistant Secretary for Energy, Installations, and Environment, *Department of the Air Force Climate Action Plan* (Washington, DC: Department of the Air Force, October 2022).	https://www.safie.hq.af.mil/Portals/78/documents/Climate/DAF%20Climate%20Action%20Plan.pdf?ver=YcQAZsGM_Xom3DkNP_fL3g%3d%3d
US Air Force Climate Campaign Plan	Department of the Air Force, Office of the Assistant Secretary for Energy, Installations, and Environment, *Department of the Air Force Climate Campaign Plan* (Washington, DC: Department of the Air Force, July 2023).	https://www.safie.hq.af.mil/Portals/78/documents/Climate/DAF%20Climate%20Campaign%20Plan.pdf
NATO Climate Change and Security Action Plan	"NATO Climate Change and Security Action Plan," NATO (website), June 14, 2021, https://www.nato.int/cps/en/natohq/official_texts_185174.htm.	https://www.nato.int/cps/en/natohq/official_texts_185174.htm
2022 NATO Climate Change & Security Impact Assessment	NATO, *2022 NATO Climate Change & Security Impact Assessment* (Brussels: NATO, 2022).	https://www.nato.int/nato_static_fl2014/assets/pdf/2022/6/pdf/280622-climate-impact-assessment.pdf

APPENDIX 2:
RECOMMENDED READING LIST

CLIMATE-RELATED DEMOGRAPHIC IMPACTS			
Data	**Key Words**	**Description**	**Links**
UN Human Climate Horizons is a data and insights platform providing localized information on the future impacts of climate change across several dimensions of human development and human security. Human Climate Horizons is an open-access and scalable digital public good—a window to alternative futures—fed by an evolving stream of multidisciplinary frontier research. Human Climate Horizons is the result of the joint work of the **Climate Impact Lab** and the **UN Development Program's** Human Development Report Office. Providing hyperlocal coverage for more than 24,000 regions worldwide; multiple policy scenarios; and time horizons through the end of the twenty-first century, Human Climate Horizons provides everyone with empirically grounded data and information on the potential human costs of climate change, so everyone can play a role in choosing the path forward and helping to design adaptation and accelerate mitigation. In the latest release, Human Climate Horizons brings forward the effects of climate change on coastal land and flooding. This builds upon available research and data on climate change's effect on mortality, labor, and energy demand. Additional impacts are forthcoming, including research on climate change's potential to disrupt food production systems.			
UN Development Program	Sea-level Rise Scenarios Median Projections Marshall Islands Hazard Data Impact Data Temperature Data	Localized information on the future impacts of climate change across several dimensions of human development and human security. Human Climate Horizons is an open-access and scalable digital public good—a window to futures—fed by an evolving stream of multidisciplinary frontier research. Explores temperature and new sea-level rise projections and the associated impacts on human development under different emission scenarios and time horizons.	UN Development Program Human Climate Horizons
World Bank Data	Marshall Islands Demographics Poverty and Inequality Income Shares of Lowest 20 Percent Gini Index Life Expectancy CO2 Emissions Per Capita Land Area That Is below Five Meters above Sea Level Internally Displaced Persons Temperature Rainfall	World Bank Data Catalogue	Marshall Islands | Data (worldbank.org)

The World Bank.			
World Bank Data	Summarizes the climate risks faced by the Marshall Islands, including climate change's impacts on communities, livelihoods, and economies.	Climate Risk Country Profile: Marshall Islands	https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15817-WB_Marshall%20Islands%20Country%20Profile-WEB.pdf
World Bank	The *World Bank Climate Change Action Plan 2021–2025* aims to advance the climate change aspects of the World Bank's green, resilient, and inclusive development approach, which pursues poverty eradication and shared prosperity with a sustainability lens.	*World Bank Climate Change Action Plan: 2021-2025*	https://openknowledge.worldbank.org/server/api/core/bitstreams/19f8b285-7c5b-5312-8acd-d9628bac9e8e/content
World Bank Knowledge Portal The Marshall Islands faces a variety of social vulnerabilities, much like many other small island developing states. Issues of geographical remoteness, a small, sparsely distributed population, distance to international import and export markets and associated high costs of transportation, a small domestic market, the challenges of achieving economies of scale of production, and remarkably high energy costs, as well as few natural resources, all hinder economic development potential. The Marshall Islands is heavily reliant on imports—agricultural production is primarily subsistence-based—and small-scale industry is limited to handicrafts, tuna processing, and copra.			
World Bank Data		Critical social, economic, environmental, institutional, and climate statistics	https://climateknowledgeportal.worldbank.org/country/marshall-islands
World Bank Group The World Bank Group is the largest multilateral provider of climate finance for developing countries and has increased financing to record levels over the past two years. Building on our long-standing support for climate action, we intend to go further and faster to help countries integrate climate into their development agendas. The context today is vastly different from 2016, when the World Bank Group launched its first *Climate Change Action Plan 2016–2020*.			
World Bank Data		Comprehensive current and projected climate data for the Marshall Islands	https://climateknowledgeportal.worldbank.org/country/marshall-islands

Demographic data on Marshallese people living in Arkansas: Marshallese people have been migrating from their remote and beautiful north Pacific archipelago to the **Ozark Mountains** of Arkansas since the 1980s to earn money, educate their children, and seek medical care. The second-largest US continental population of Marshallese is concentrated in Springdale (Washington and Benton Counties)			
Only in Arkansas Blog Post	Migration	Marshallese in Arkansas: from the islands to the Ozarks—demographic, economic, financial, hydrogen bomb tests, and cultural data.	https://onlyinark.com/culture/marshallese-in-arkansas-from-the-islands-to-the-ozarks/
Development plan for the Marshall Islands: The Center for Nation Reconstruction and Capacity Development's mission is to research and inform developing countries on methods to improve infrastructure and partner capacity. The Marshall Islands has a strong need to improve its ability to sustain its densely populated islands. The Center for Nation Reconstruction and Capacity Development has looked at what resources it has access to and the plan it can move forward with using these resources.			
Center for Nation Reconstruction and Capacity Development	Resiliency	A master plan framework on what the Marshall Islands needs to ensure self-sufficiency.	Ryder Cleary et al., *Ebeye 2023: Comprehensive Capacity Development Master Plan*. *Center for Nation Reconstruction and Capacity Development*, Report 2012-4 (West Point, NY: Center for Nation Reconstruction and Capacity Development, July 2012).
FINANCIAL AND TRADE DATA			
Financial data on the Marshall Islands is supplied by International Monetary Fund: Marshall Islands Country Data • 2024 Projected Real GDP (% Change): 3.0 • 2024 Projected Consumer Prices (% Change): 5.2 • Country Population: 0.045 million • Date of Membership: May 21, 1992 • Article IV/Country Report: October 16, 2023 • Special Drawing Rights (SDR): 7.71 million • Quota (SDR): 4.9 million			
International Monetary Fund Data	External Trade Marshall Islands United States	Access to monetary and financial statistics pertaining to the Marshall Islands	International Financial Statistics - External Trade - IMF Data https://www.imf.org/en/Countries/MHL https://data.census.gov/table/IDB5YR.IDB5YEAR?q=Marshall%20islands mf.org/en/Publications/CR/Issues/2023/10/16/Republic-of-the-Marshall-Islands-2023-Article-IV-Consultation-Press-Release-Staff-Report-540607 (put in browser)

US DATA ON MARSHALLESE IMMIGRANTS			
This section provides US census data on Marshallese immigrants, including detailed demographic and wellbeing data on Marshallese people living in the United States			
US Census Data	American Community Citizens	Selective characteristics of native and foreign-born populations	https://data.census.gov/table/IDB5YR.IDB5YEAR?q=Marshall%20islands%20immigrants https://data.census.gov/table/ACSST1Y2022.S0501?g=040XX00US53_W140000WOMH https://data.census.gov/table/IDBSINGLEYEAR.IDBSINGLEYEAR?q=Marshall%20Islands
US Census Data		Census-based maps of states with significant Marshallese populations	https://www.census.gov/library/visualizations/interactive/detailed-race-ethnicities-2020-census.html
US Census Data	American Community Citizens	Selective characteristics of native- and foreign-born populations	https://data.census.gov/table/ACSST1Y2022.S0501?g=040XX00US53_W140000WOMH
US Census Data		Detailed look at native Hawaiian and other Pacific Islander groups	https://www.census.gov/library/stories/2023/09/2020-census-dhc-a-nhpi-population.html
Encyclopedia of Arkansas Data		Marshallese residents in Arkansas	https://encyclopediaofarkansas.net/entries/marshallese-5972/

MIGRATION POLICY INSTITUTE: DATA ON VARIOUS MARSHALLESE IMMIGRATION CHARACTERISTICS			
The following references provide information on Marshallese out-migration to the United States			
The Marshall Islands Climate and Immigration Project Data	Living Standards in the Marshall Islands vs. the United States	Marshallese immigrants: comparative Well-Being in US destination states	https://collections.unu.edu/eserv/UNU:7781/Well-BeingBrief_2020_META.pdf
State-by-state immigration profiles data	Migration Policy Institute, Washington, DC	State-by-state immigration profiles	Program: U.S. Immigration Trends | migrationpolicy.org
Data assessment tool	Migration Policy Institute, Washington, DC	Tool allows you to view the trends in the size of the immigrant population from a given country between 1960 and 2022.	https://www.migrationpolicy.org/programs/data-hub/charts/immigrants-countries-birth-over-time?width=900&height=850&iframe=true

Migration and health care data	Migration Policy Institute, Washington, DC	Marshall Islanders: migration patterns and health care challenges	https://www.migrationpolicy.org/article/marshall-islanders-migration-patterns-and-health-care-challenges
Immigration data	Migration Policy Institute, Washington, DC	US immigration trends	https://www.migrationpolicy.org/programs/data-hub/us-immigration-trends#history
Migration and adaption data	Migration Policy Institute, Washington, DC	Migrate or adapt? How Pacific Islanders respond to climate change	https://www.migrationpolicy.org/multimedia/changing-climate-changing-migration-pacific-islanders-respond-climate-change
Listing of key data sources	Migration Policy Institute, Washington DC	Comprehensive listing of information and data sources related to migration	Research: Immigration Data Matters | migrationpolicy.org
Marshallese immigrants in Arkansas and Washington	Migration Policy Institute, Washington, DC	Number of Marshallese immigrants in Washington and Arkansas	https://www.migrationpolicy.org/data/state-profiles/state/demographics/AR/WA/
Discussion of the relative role of climate in Marshallese immigration	Migration Policy Institute, Washington, DC	A Note of Caution about Exaggerating the Climate-Migration Link (Podcast)	https://www.migrationpolicy.org/multimedia/changing-climate-changing-migration-caution-exaggerating-climate-migration
Data map of the most important immigrant languages spoken	Migration Policy Institute, Washington, DC	Map of the United States shows the most important language of immigrants in Arkansas is Marshallese	https://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states#demographic-educational-linguistic
Legal Immigration to the United States	Office of Homeland Security Statistics	Yearbook of Immigration Statistics	https://www.dhs.gov/ohss/topics/immigration/yearbook
COFA-related data	Migration Policy Institute, Washington, DC	Role of the COFA in encouraging climate change migration from Micronesia	https://www.migrationpolicy.org/article/federated-states-micronesia-push-migrate
Immigration	Migration Policy Institute, Washington, DC	Frequently requested statistics on immigrants and immigration in the United States	https://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states#immigrant-destinations

MISCELLANEOUS MARSHALLESE IMMIGRATION DATA SOURCES			
Statistics on Lawful Immigration	Office of Homeland Security Statistics	Yearbook of Immigration Statistics	https://www.dhs.gov/ohss/topics/immigration/yearbook https://www.dhs.gov/ohss/topics/immigration/lawful-permanent-residents
Migration Dynamics	Public Broadcasting Service Podcast	Marshall Islands: A third of the nation has left for the US *Podcast*	https://www.pbs.org/newshour/show/marshall-islands-a-third-of-the-nation-has-left-for-the-us
Immigration to Arkansas	USAFacts	Arkansas: Marshallese Population	Arkansas population by year, county, race, & more | USAFacts
Immigration to US states	USAFacts	Washington: Marshallese Population	https://usafacts.org/data/topics/people-society/population-and-demographics/our-changing-population/state/washington/?endDate=2022-01-01&startDate=2010-01-01
Immigration to US states	USAFacts	Hawaii: Marshallese Population	https://usafacts.org/data/topics/people-society/population-and-demographics/our-changing-population/state/hawaii/?endDate=2022-01-01&startDate=2010-01-01#racial-ethinic-population-change
States with a Marshallese population	Zip Atlas	States with the highest percentage of Marshallese population: interactive map	https://zipatlas.com/us/state-comparison/percentage-marshallese-population.htm

HEALTH STATISTICS			
Miscellaneous Health Data for Marshall Islands Citizens and Marshallese US Residents/Communities			
COVID-19 statistics	Worldometer	Marshall Islands COVID-19 data	COVID - Coronavirus Statistics - Worldometer (worldometers.info)
Health Data for the Marshall Islands	World Health Organization	Health data overview for the Marshall Islands	Marshall Islands (who.int)[141]
Health statistics for Marshallese	World Health Organization	Health-related indicators for the Marshall Islands relative to other countries and the World	https://data.who.int/indicators
Health investment climate	World Health Organization	Investment climate in the Marshall Islands	Marshall Islands - United States Department of State
World Population Review[142]	Demographic data	Statistics on states, counties, and nations	Washington Population 2023 (Demographics, Maps, Graphs) (worldpopulationreview.com)
COFA-related data	Migration Policy Institute, Washington, DC	Role of COFA in encouraging climate change migration from Micronesia	https://www.migrationpolicy.org/article/federated-states-micronesia-push-migrate
Marshall Islanders: Migration Patterns and Health Care Challenges	Migration Policy Institute, Washington, DC	Marshall Islanders: migration patterns and health care challenges	https://www.migrationpolicy.org/article/marshall-islanders-migration-patterns-and-health-care-challenges
Maps and associated data regarding the population of Marshallese people in US states.	Zip Atlas[143]	States with the highest percentage of Marshallese population: interactive map	https://zipatlas.com/us/state-comparison/percentage-marshallese-population.htm

[141] Worldometer, formerly Worldometers, is a reference website that provides counters and real-time statistics for diverse topics. Worldometer is owned and operated by a data company, Dadax, which generates revenue through online advertising.

[142] WorldPopulationReview.com is an independent, for-profit organization committed to delivering up-to-date global population data and demographics.

[143] The Zip Atlas ZIP code database consists of a comprehensive collection of ZIP code characteristics, including social, demographic, economic, education, transportation, commute, and housing data, as well as optional boundary data and city, county, and state datasets.

APPENDIX 3:
VISUAL RESOURCES ON THE MARSHALL ISLANDS AND CLIMATE CHANGE

Operation Roi Recovery Army.mil Page

https://www.army.mil/article/273134/operation_roi_recovery_assesses_damages_to_kwajalein_atoll_infrastructure

World Bank Marshall Islands Population Data 1960–2022

https://data.worldbank.org/indicator/SP.POP.TOTL?end=2022&locations=MH&start=1960

World Bank Marshall Islands GDP 1981–2022

https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=MH

Library of Congress Marshallese Seafaring Charts

https://blogs.loc.gov/maps/2021/11/the-unique-seafaring-charts-of-the-marshall-islands/

UN Educational, Scientific, and Cultural Organization Bikini Atoll Gallery

https://whc.unesco.org/en/list/1339/gallery/

Satellite View of Kwajalein Atoll

https://www.usgs.gov/media/images/kwajalein-island-kwajalein-atoll-republic-marshall-islands

Climate Change in the Marshall Islands

https://www.amnh.org/explore/videos/research-and-collections/climate-change-in-the-marshall-islands

Country Reports: Marshall Islands

https://www.countryreports.org/country/MarshallIslands/facts.htm

The Pacific Islands Losing a Way of Life to Climate – in Pictures

https://www.theguardian.com/environment/gallery/2015/mar/17/pacific-islands-losing-way-of-life-to-climate-change-in-pictures

Marshall Islands Religious Demographics

https://www.thearda.com/world-religion/national-profiles?u=144c

APPENDIX 4:
MARSHALLESE STORIES IN THE POPULAR PRESS AND PROFESSIONAL JOURNALS

News Articles

Arkansas news channel interview about the Arkansas Coalition of the Marshallese

https://www.4029tv.com/article/arkansas-group-helps-marshallese-community/43893043.

US Department of the Interior grant approved

https://www.doi.gov/oia/press/interior-supports-marshallese-community-arkansas-grant-marshallese-resource-and.

Arkansas Traveler article on Marshallese in northwest Arkansas

https://www.uatrav.com/news/article_cf736962-8409-11ee-8fec-8b85529647ff.html.

Joshua Project overview of the Marshall Islands

https://joshuaproject.net/people_groups/13554/us.

University of Arkansas article about Marshallese pandemic response

https://news.uams.edu/2022/04/19/uams-study-finds-marshallese-in-u-s-mobilized-to-address-pandemic-hardships/.

Asia Matters for America short article on Marshallese in the United States

https://asiamattersforamerica.org/articles/the-united-states-recognizes-the-marshallese-community-as-arkansas-leads-the-way-in-cultural-connections.

World on the Move article about views on Marshallese by health care workers

https://understandingmigration.org/resources/research-summaries/impacts-of-culture-and-social-structures-on-marshallese-health/.

PBS report on Marshallese migration to the United States

https://www.pbs.org/newshour/show/marshall-islands-a-third-of-the-nation-has-left-for-the-us.

Honolulu Civil Beat article on the 2023 renewal of the COFA

https://www.civilbeat.org/2023/10/us-marshall-islands-renew-cofa-treaty-for-another-20-years/.

Arkansas Advocate article on ongoing COFA renegotiation in 2023

https://arkansasadvocate.com/2023/09/08/arkansas-marshallese-community-concerned-about-ongoing-treaty-renegotiation-with-u-s/.

Cross Church article about opening Marshallese group

https://www.arkansasonline.com/news/2010/nov/06/springdale-church-marshallese-opens-20101106/.

The Encyclopedia of Arkansas: Marshallese

https://encyclopediaofarkansas.net/entries/marshallese-5972/.

Two Degrees: You're Making This Island Disappear

https://www.cnn.com/interactive/2015/06/opinions/sutter-two-degrees-marshall-islands/.

Mapping Out What's Next for the Marshall Islands

https://ocean.si.edu/conservation/climate-change/mapping-out-whats-next-marshall-islands.

Journal Articles

Effect of US health policies on health care access for Marshallese migrants

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4358182/

Health beliefs of Marshallese regarding type 2 diabetes

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5304418/

Diabetes and Hypertension in Marshallese Adults: Results from Faith-Based Health Screenings

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5426989/

Adverse Pregnancy and Neonatal Outcomes Among Marshallese Women Living in the US

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7239320/

Wave Navigation in The Marshall Islands: Comparing Indigenous and Western Scientific Knowledge of the Ocean

https://tos.org/oceanography/article/wave-navigation-in-the-marshall-islands-comparing-indigenous-and-western-sc

Adapting to rising sea levels in Marshall Islands

https://storymaps.arcgis.com/stories/8c715dcc5781421ebff46f35ef34a04d

Water: Marshall Islands

https://storymaps.arcgis.com/stories/5111544ba69442b185d519b17959103d

APPENDIX 5:
MARSHALLESE COMMUNITY RESOURCES

Marshall Islands Groups

Iakwe Project

Research group looking at how the Marshallese culture is thriving and/or surviving in different areas of the United States. They are focused on Arkansas, Honolulu and Hilo in Hawaii, and Oregon.

Iakwe Project

Interpreters Unlimited

https://www.interpreters.com/marshallese-interpretation-services/

United Church of Christ - Congregational in the Marshall Islands

The self-governing Marshallese branch of the United Church of Christ that split off from the main church but maintains its relations.

https://www.oikoumene.org/member-churches/united-church-of-christ-congregational-in-the-marshall-islands

Arkansas

Marshallese Education Initiative (MEI)

Arkansas-based nonprofit that promotes the culture and history of the Marshall Islands.

https://www.mei.ngo/

Arkansas Coalition of the Marshallese

Organization that seeks to strengthen Marshallese communities by focusing on the history and culture of the islands.

https://www.arkansasmarshallese.org/

Arkansas National Consortium for Teaching about Asia (AR-NCTA)

Initiative focused on promoting the teaching of East Asian history and culture in schools.

https://www.arncta.com/aapi-histories-south/marshallese

University of Arkansas Library

Brief history and list of books available that include the history of the Marshall Islands and links to other group sites.

https://uark.libguides.com/Marshallese/Today

https://uark.libguides.com/Marshallese/Resources_Arkansas

Marshall Islands Story Project

Student-based organization seeking to preserve the stories and tales of the Marshallese elders.

https://mistories.org/index.php

Marshallese clinics or clinics with translators

https://healthynwa.org/find-health-care/

https://nwa.uams.edu/chr/north-street-clinic/

Arkansas Department of Human Services Marshallese health care page

ADHS resources for Marshallese people.

https://humanservices.arkansas.gov/learn-about-programs/healthcare-programs/injuren-nan-an-ri-majel-takto/

Hawaii

University of Hawaii Micronesians resources page

Links with descriptions to groups that are affiliated or based around Micronesian groups in Hawaii.

https://guides.library.manoa.hawaii.edu/c.php?g=105631&p=683061

Rural Health Information Hub: Marshallese Resources

Links to groups that deal with health care for Pacific Islanders in the United States.

https://www.ruralhealthinfo.org/states/marshall-islands/organizations

East Hawaii Health Clinics

Health care providers that have language services available, including Marshallese.

https://www.easthawaiihealthclinics.org/

Hawaii Department of Health Patient Education

Tuberculosis awareness and health program for Marshallese people.

https://health.hawaii.gov/tb/patient-education/

Department of Health Home Page

https://health.hawaii.gov/

University of Hawaii resources for serving the Marshallese

Resources for church and translator services in Hawaii.

https://www.hawaii.edu/cpis/mi_workshop/files/resources_serving_mars.htm

Washington

Pacific Islander Community Association of Washington

Nonprofit that seeks to promote the indigenous values of the Pacific Islander communities to other groups and local leaders.

https://www.picawa.org/

Washington State Commission on Asian Pacific American Affairs (CAPAA)

State agency that promotes Asian American and Pacific Islander issues.

https://capaa.wa.gov/

Washington State Health Care Authority. Medicaid programs for COFA islanders in Washington.

https://www.hca.wa.gov/about-hca/programs-and-initiatives/apple-health-medicaid/cofa-islander-programs

Bethany Christian Assembly (Everett, WA)

https://bcachurch.com/marshallese/

Iowa

Monsoon Asian and Pacific Islanders in Solidarity (AAPI)

Organization that aims to protect and help Asian and Pacific Islanders who suffer domestic/physical abuse and human trafficking.

https://monsooniowa.org/

Oklahoma

Rural Health Information Hub: Oklahoma Marshallese

Article on community health workers in Oklahoma with links to organizations.

https://www.ruralhealthinfo.org/rural-monitor/marshallese-chws

Integris Health

Resources to assist health care providers working with Marshallese people in Oklahoma.

https://integrisok.libguides.com/Marshall_Islands

Missouri

Missouri Asian American Youth Foundation

Nonprofit that promotes Asian and Pacific Islander culture among their youth to keep the culture going.

https://www.maayfoundation.com/

St. Louis Asian American Chamber of Commerce

Organization seeking to connect Asian business owners in the St. Louis area as well as in Asia.

https://aaccstl.org/index.php

California

Pacific Islander Health Partnership

Organization promoting health and wellness among native Hawaiian and Pacific Islander groups.

https://pihpoc.org/

Oregon

Oregon Marshallese Community Association

Nonprofit advocacy group for Marshallese people living in Oregon.

https://www.oregonmarshallese.org/home

Marshallese American Network for Interacting Together

Organization focused on the community building, advocacy, and education of the Marshallese people.

https://manit.org/

Living Islands

Nonprofit cultural and educational network advocating for the culture of Micronesian people.

https://livingislands.org

Micronesian Islander Community

Nonprofit that aims to strengthen and develop community bonds among and between Micronesian groups.

https://www.micoregon.org/

APPENDIX 6:
ENVIRONMENTAL-SECURITY SIMULATION GAMES AVAILABLE FROM THE US ARMY WAR COLLEGE

The US Army War College in Carlisle, Pennsylvania, has several simulation games that address climate change and environmental-security issues in various regions around the world, such as the Arctic, Antarctica, Pacific atolls, and others.

Two environmental-security games were developed specifically through this project that explore the impact of climate change on the human populations of the Pacific. These two simulation games help introduce players to environmental threats such as sea-level rise, over wash, subsidence, flooding, drought, and saltwater intrusion, and how these climate threats impact the human populations of local workers that support US military bases. These games are described below.

Staying Afloat: A survival-based solitaire card game designed to introduce participants to the varied complexity of climate change. The game contextualizes the challenges faced by the islanders as their vulnerable population is steadily lost to climate-induced migration. The player takes the role of the Army base commander who must engage the social community bonds of his native workers to improve the island and meet steadily increasing climate-based challenges. The player wins if he or she can build longer-term solutions that will allow the island and its people to survive in the coming decades.

Final Tide: A resource management board game incorporating modular, three-dimensionally printed board tiles. Each player leads a faction of islanders and must build the infrastructure of their island to survive the ravages of an oncoming ecological collapse. Final Tide will launch with two separate editions which can be played by different target audiences.

Basic Edition – A two- to four-person game which can be completed within a couple hours. The game consists of nine tiles representing a small island beset by an increasingly severe climate crisis. Each player controls one of four unique factions of islanders and must survive five turns while preventing the drowning of the island. The basic edition of the game is designed as a starting primer for players who have little experience with war games or climate change.

Advanced Edition – Players negotiate with each other to manage, profit, or survive in the face of a rapidly changing island. The Advanced Edition is a four- to six-person game that can be experienced completely within three hours and uses 19 modular, interconnected tiles.

For more information on accessing these environmental-security games, please contact the Department of Strategic Wargaming at the US Army War College in Carlisle, Pennsylvania, USA, at (717) 245-3131 or visit www.armywarcollege.edu.