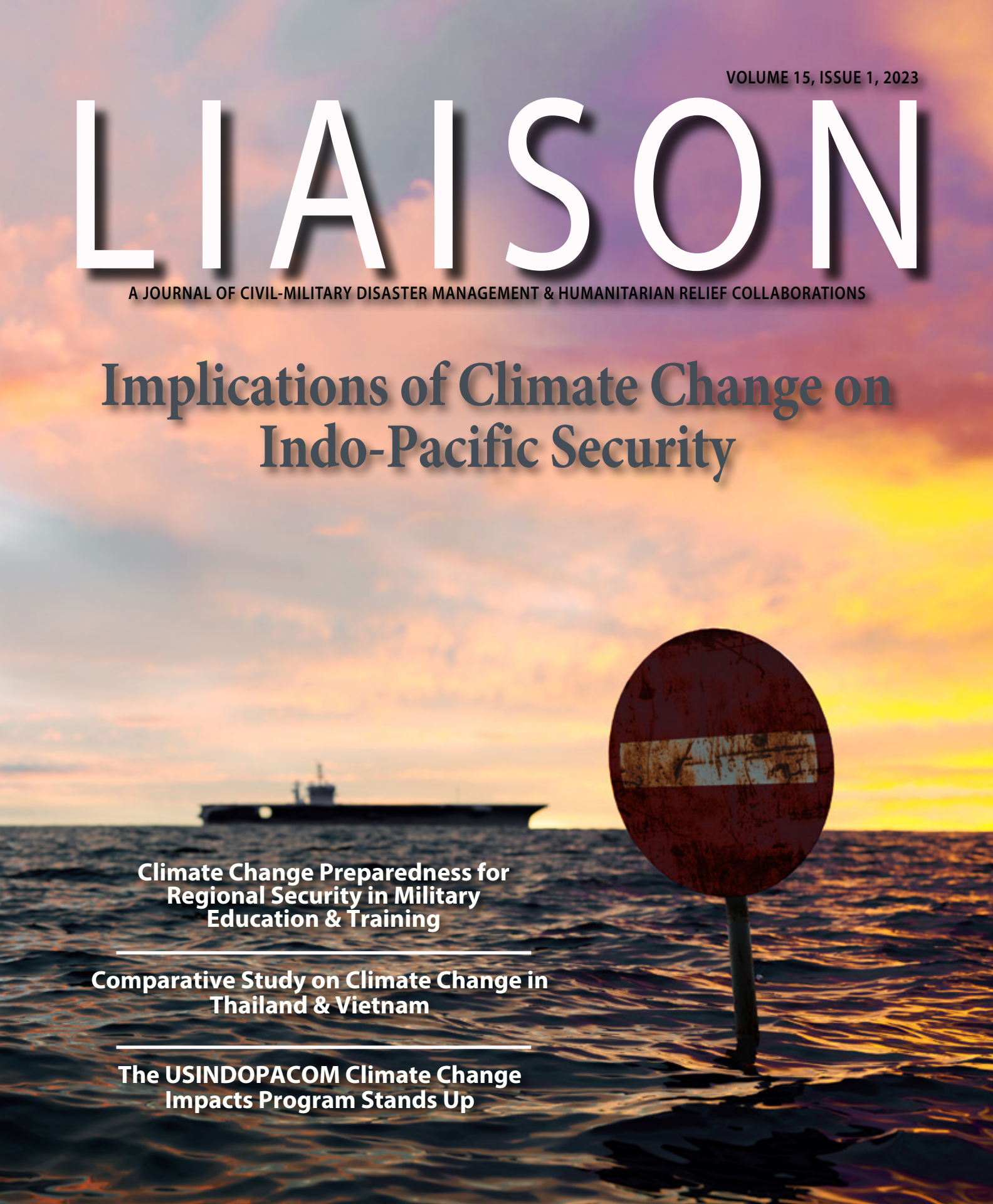
VOLUME 15, ISSUE 1, 2023

LIAISON

A JOURNAL OF CIVIL-MILITARY DISASTER MANAGEMENT & HUMANITARIAN RELIEF COLLABORATIONS

Implications of Climate Change on Indo-Pacific Security



Climate Change Preparedness for Regional Security in Military Education & Training

Comparative Study on Climate Change in Thailand & Vietnam

The USINDOPACOM Climate Change Impacts Program Stands Up

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ON THE COVER Photo illustration by Rufino E. Ballesteros

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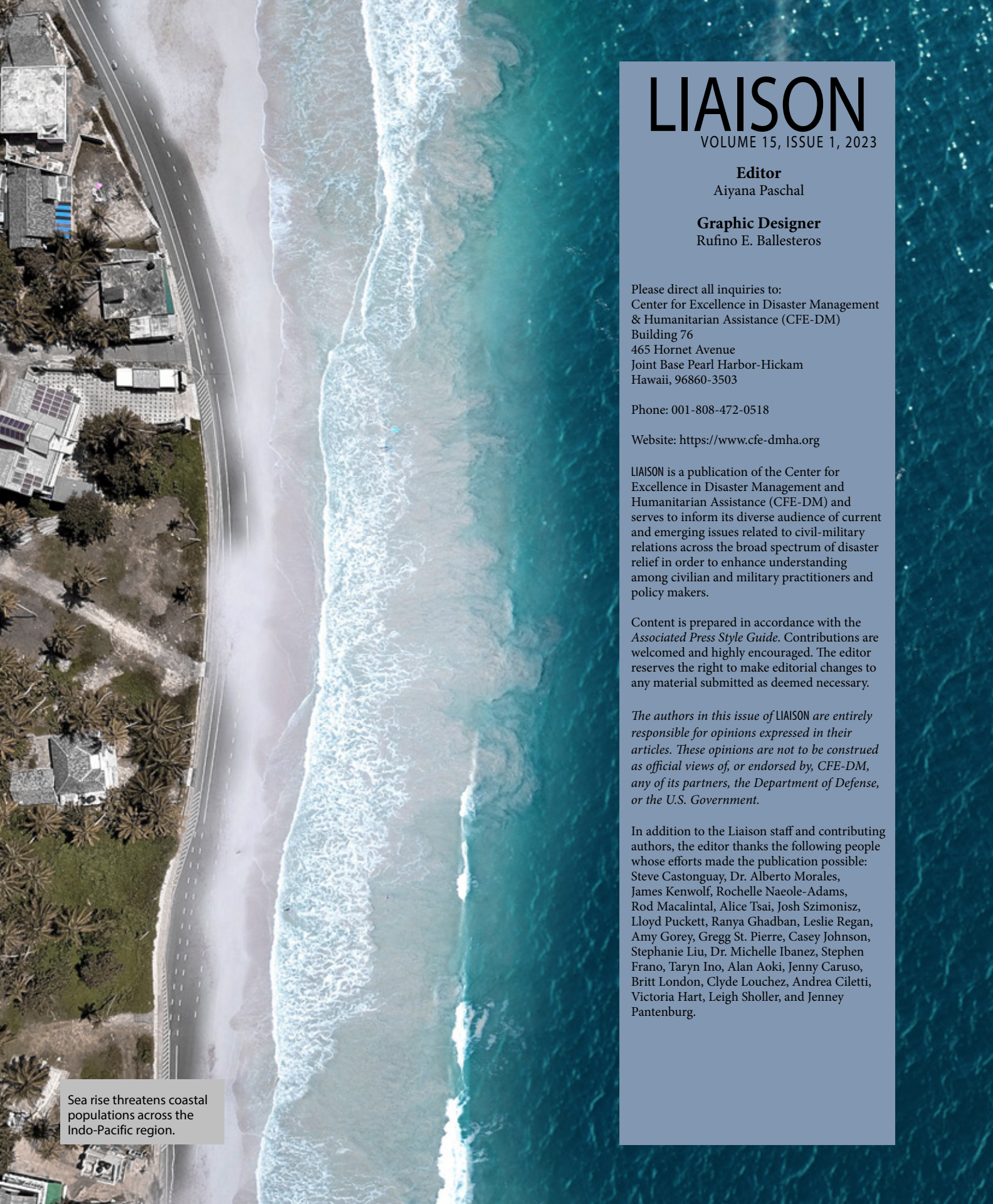

Sea rise threatens coastal populations across the Indo-Pacific region.

LIAISON

VOLUME 15, ISSUE 1, 2023

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LIAISON is a publication of the Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM) and serves to inform its diverse audience of current and emerging issues related to civil-military relations across the broad spectrum of disaster relief in order to enhance understanding among civilian and military practitioners and policy makers.

Content is prepared in accordance with the *Associated Press Style Guide*. Contributions are welcomed and highly encouraged. The editor reserves the right to make editorial changes to any material submitted as deemed necessary.

In addition to the Liaison staff and contributing authors, the editor thanks the following people whose efforts made the publication possible: Steve Castonguay, Dr. Alberto Morales, James Kenwolf, Rochelle Naeole-Adams, Rod Macalintal, Alice Tsai, Josh Szimonisz, Lloyd Puckett, Ranya Ghadban, Leslie Regan, Amy Gorey, Gregg St. Pierre, Casey Johnson, Stephanie Liu, Dr. Michelle Ibanez, Stephen Frano, Taryn Ino, Alan Aoki, Jenny Caruso, Britt London, Clyde Louchez, Andrea Ciletti, Victoria Hart, Leigh Sholler, and Jenney Pantenburg.

LETTER FROM THE DIRECTOR

JOSEPH MARTIN, SES

The Department of Defense, humanitarian and international organizations, and world leaders have increasingly started discussing the critical issue of climate change and its implications on security. In fact, the 2022 National Security Strategy of the United States explicitly states that climate change is the greatest and potentially existential shared problem for all nations. The effects of climate change are already being felt throughout the Indo-Pacific region, which is home to over half of the world's population.

This issue of the Liaison Journal offers diverse perspectives and potential solutions to the evolving challenges posed by climate change. It assesses the complex role of climate change as it relates to economic, physical, and societal impacts that substantially alter political stability, human security, and national security infrastructure. We examine how governments, militaries, and nongovernmental organizations implement these considerations into their decision-making, and how these organizations can best collaborate to better understand and adapt to a future security environment influenced by a changing climate.

U.S. Indo-Pacific Command (USINDOPACOM) has started to address this complex issue by standing up the Climate Change Impacts Program at The Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM). You can read more about how climate change impacts drive security challenges for the U.S. and the entire Indo-Pacific in "The USINDOPACOM Climate Change Impacts Program Stands Up" on page 16.

As highlighted by Robyn Battles in her article on climate migration in Oceania on page 30, security impacts can present in a multitude of ways, including migration and sovereignty of vulnerable and impacted nations. Our goal at CFE-DM is to investigate and understand how climate change influences the security of the Indo-Pacific region, ensure climate change considerations are included in planning processes by USINDOPACOM, and offer insights and support to partner nations that are most impacted.

It is crucial for the humanitarian and disaster response community to collaborate and implement climate change considerations into decision-making to ensure the security of vulnerable and impacted nations. We hope this magazine provides practitioners and academics involved in the humanitarian assistance and disaster response community insight into the different problem sets and possible solutions to these complex issues. By working collaboratively, governments, militaries, and nongovernmental organizations can better understand and adapt to a future security environment influenced by a changing climate.

Thank you for your attention to this important issue.

Aloha,

CONTRIBUTORS

Robyn Battles

Robyn Battles is a Foreign Affairs Specialist in the Palace Acquire program at the Air Force Security Assistance Training (AFSAT) Squadron. Her work contributes to AFSAT's mission to "train the world" by coordinating Air Force-sponsored training and education for international partners. Robyn earned her Master of International Affairs from the Bush School of Government and Public Service. Her studies specialized in Intelligence, the Middle East, and American Foreign Policy and Diplomacy. She also holds a Bachelor of Science degree in Maritime Public Policy and Communication from Texas A&M at Galveston. While completing her education, she interned at the Center for Excellence in Disaster Management & Humanitarian Assistance, increasing her experience and knowledge of the Indo-Pacific region. **See article, page 30.**

Maj. Afua O. Boahema-Lee

Maj. Afua O. Boahema-Lee was born in Atlanta, Ga., but spent her formative years in Ghana, West Africa, where she became fluent in Twi. In 2004, she enlisted in the U.S. Army Reserve as a food specialist and commissioned into the Army Reserve as a Medical Service Corps Officer in 2009. Over the years, she has amassed extensive experience in Medical Planning and Operations, Humanitarian Assistance, and Team Building. Maj. Boahema-Lee has held several leadership positions throughout her career, including as a recruiter with Auburn University, as a commander, medical operations officer, and a branch chief for Total Army School System (TASS) Branch at a two star and three star-level command. She holds a Bachelor of Science in Biology Education, a Masters in Health Care Administration from Trident University, and a Master of Arts in Defense and Strategic Studies from the Navy War College. She joined the Daniel K. Inouye Asia-Pacific Center for Security Studies (DKI APCSS) in July 2022. **See article, page 21.**

Andrea Ciletti

Andrea Ciletti joined the Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM) as a research analyst in 2015. In her eight years at CFE-DM, her research and writing has focused on disaster risk and vulnerabilities of countries in the Indo-Pacific Region. Beyond her research role, she has supported various civil-military engagements, exercises, and partner nation capacity building in Malaysia, Thailand, Indonesia, Australia, and New Zealand. Andrea's background in technical report writing and program management has supported multiple DoD contracts. She served as a Technical Editor for AECOM's Comprehensive Long-Term Environmental Action Navy contract, and as a Technical Writer for CSC's Defense Information Systems-Pacific contract where she developed civil-military communication materials. She brings with her eleven years teaching as a faculty member for the University of Phoenix ground campuses in Hawaii and also served as Lead Faculty Area Chair for the College of General Studies. Andrea holds a B.A. in English from Syracuse University, and a M.A. in Communication from Hawaii Pacific University. **See article, page 16.**

Stephen Frano

Stephen Frano is an employee with Valiant Integrated Services and works as the Climate Change Impacts (CCI) Program Manager at the Center for Excellence in Disaster Management and Humanitarian Assistance. He leads the CCI team responsible for establishing a robust INDOPACOM capability to anticipate and respond to the security impacts of climate change. The CCI program is dedicated to working across the DOD, interagency, and partner nations to increase resilience, reduce fragility, and enhance climate security for the Indo-Pacific region. Stephen obtained his bachelor's degree in integrated science and technology from James Madison University and his master's degree in environmental management from Duke University. Stephen earned his Project Management Professional certification and was an AILA Fellow with the Center for Strategic and International Studies (CSIS) in 2020. **See article, page 16.**

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Col. Pongpun Juntakut

Col. Pongpun Juntakut is an assistant professor of the Civil Engineering Department at the Chulachomklao Royal Military Academy in Thailand. He earned a bachelor and master's degree at the Bundeswehr University in Munich, Germany and a doctorate in civil engineering (water resources) at the University of Nebraska-Lincoln. His research focuses on surface and ground water, climate change and disaster management. **See article, page 10.**

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Leslie Regan-Fessenden

Leslie Regan-Fessenden is an employee with Valiant Integrated Services and works in the Climate Change Impacts (CCI) Branch at the Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM). She serves as the climate change impacts specialist on the CCI team. Prior to joining the Center in 2021, Leslie worked on a diverse set of issues for various clients including such topics as: climate change, environmental science and management, water law, water resources, impact investing, grants and funding, groundwater management solutions, community building, and environmental education in higher institutions. Most recently she managed, planned and implemented climate adaptation projects for municipalities and communities in California. Leslie earned a Master of Science in Environmental Science & Management with an emphasis in Water Resources Management from the Bren School of Environmental Science & Management, and she holds a Bachelor of Science in Environmental Science with an emphasis in Hydrology from UC Santa Barbara. **See article, page 16.**

Col. Parskorn Yasawute

Col. Parskorn Yasawute is the Deputy Director of Disaster Relief Training Center, Royal Thai Armed Forces. He earned a bachelor of Civil Engineering from Chulachomklao Royal Military Academy and master of Politics (International Relations) from Chulalongkorn University. Prior to his current position, he has experiences in Humanitarian Assistance and Disaster Response (HADR) management, academics and HADR exercise planning such as the Pacific Partnership Project and the Cobra Gold exercise. **See article, page 10.**

Monica Bennett, Luis Lopez, Nicholas Sakamoto, Shelly Ueda & Staci Sakoda Yoshihara

Monica Bennett, Luis Lopez, Nicholas Sakamoto, Shelly Ueda, and Staci Sakoda Yoshihara are 2022 MPA graduates of the University of Hawai'i Public Administration Program. Advised by Professor David Nixon, they collaborated with the Indo-PACOM Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM) on their capstone project to contribute to the body of knowledge around climate security in Oceania. Monica, Luis, Nicholas, Shelly, and Staci are public servants currently working for various State of Hawai'i agencies. The team thanks Dr. Michelle Ibanez and Dr. Alberto "Mo" Morales, Jr. for their guidance throughout the capstone project. **See article, page 46.**

LIAISON welcomes article submissions

LIAISON provides an open forum for stimulating discussion, exchange of ideas and lessons learned – both academic and pragmatic– and invites active participation from its readers.

If you would like to address issues relevant to the disaster management and humanitarian assistance community, or share comments or thoughts on articles from past issues, please submit them to: cfe.dmha.fct@pacom.mil

LIAISON reserves the right to edit submissions for clarity, language, and accuracy.

Format - Email submissions in an unformatted Microsoft Word file. Footnotes are the preferred method of citation, if applicable. Email images separate from the word document as JPG files.

Provide original research - We prefer original submissions, but if your article or paper is being considered for publication elsewhere, please note that with the submission. Previously published articles will be considered if they are relevant to the issue topic.

Copyrights or licenses - All work remains the property of the author or photographer. Submission of an article or photograph to LIAISON magazine implies authorization to publish with proper attribution.

Supporting imagery - Original imagery supporting any and all articles is welcome. Ensure the images are high-resolution and can be credited to the photographer without license infringement. Images should be attached to the submission separately, not embedded within the Microsoft Word document.

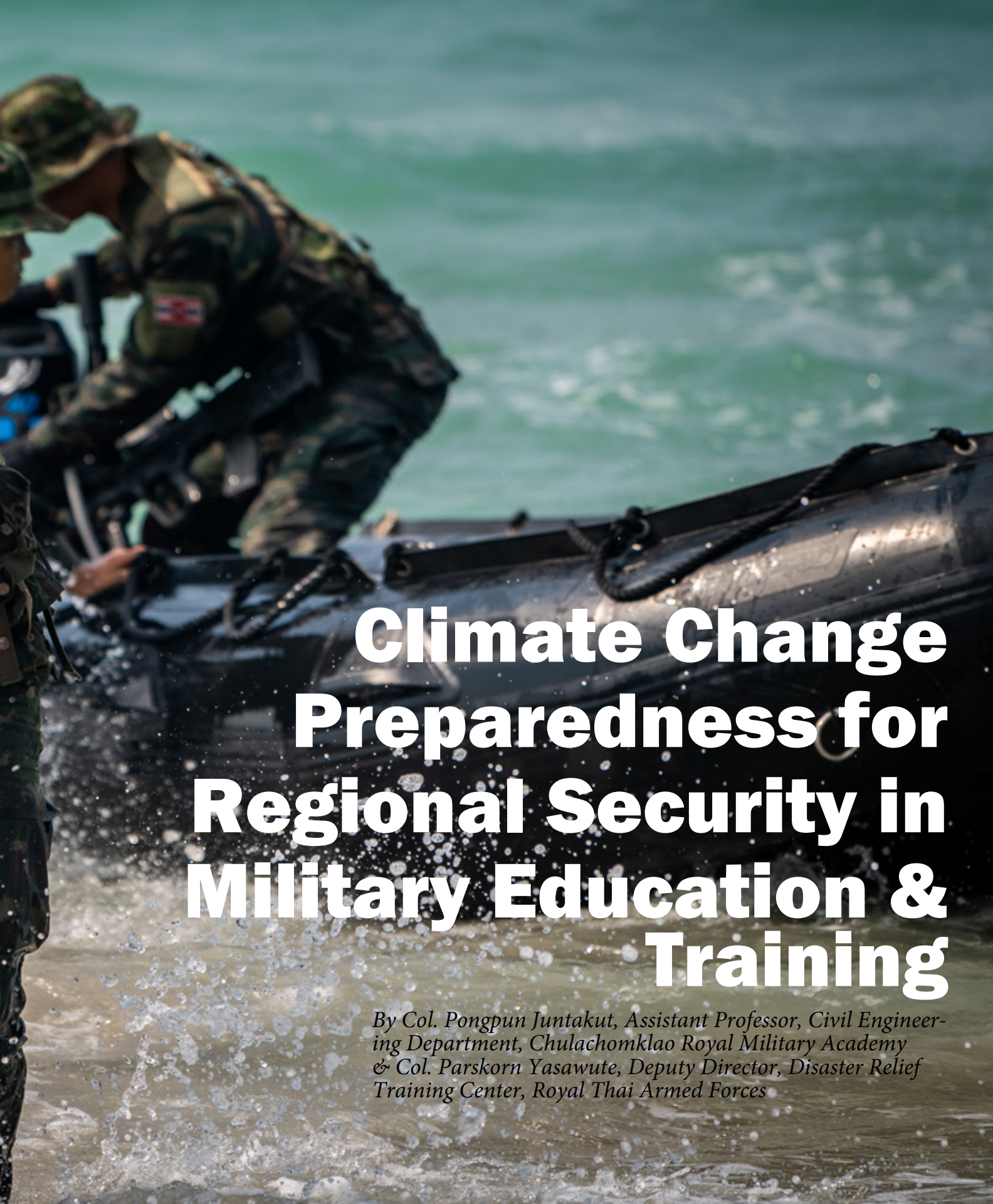
Biography and photo - When submitting an article, include a short biography and high-resolution photo of yourself for the contributor's section.

Clarity and scope - Avoid technical acronyms and language. The majority of LIAISON readers are from the Asia-Pacific nations and articles should be addressed to an international audience. Articles should also be applicable to partners in organizations or nations beyond that of the author. The aim is for successful cases to aid other partners of the disaster management and humanitarian community.

Email articles to: cfe.dmha.fct@pacom.mil

Royal Thai Marines storm a beach during an amphibious assault exercise as part of Exercise Cobra Gold at Hat Yao Beach, Sattahip, Thailand, Feb. 16, 2019.

Staff Sgt. Matthew J. Bragg/ U.S .Marine Corps



Climate Change Preparedness for Regional Security in Military Education & Training

By Col. Pongpun Juntakut, Assistant Professor, Civil Engineering Department, Chulachomklao Royal Military Academy & Col. Parskorn Yasawute, Deputy Director, Disaster Relief Training Center, Royal Thai Armed Forces

The impact of climate change on stability and security is not a risk of the future but one of today. Climate change poses major challenges to environmental stability, economic growth, and human health in many regions around the world including the Indo-Asia Pacific region.[1] More frequent and extreme weather (floods, drought, wildfire, and desertification), sea level rise, and air pollution will create a serious threat and increase the complex security environment in the region. Evidently, climate change is likely to give rise to new and potentially catastrophic risks, which are difficult to predict.

At present, there are already examples of catastrophic risks in many places all over the world. In the southeast of Turkey near the border with Syria, in February 2023, a 7.8-magnitude earthquake left a trail of unprecedented devastation and a death toll surpassing 25,000 people.[2] In fact, we do not know for sure what triggered this natural disaster, but we know there is growing scientific evidence that climate change increases the risk of volcanic eruptions, tsunamis, and rising sea levels, etc.

According to the report of the United Nations International Panel on Climate Change (IPCC),[3] the global surface temperature from 2090 to 2099 will be warmer, with an expected average temperature of 1.1 to 6.4 degrees higher than between 1980 and 1999. The sea level is expected to rise by 18 – 59 centimeters. These changes of temperature and sea level will create a threat of natural disaster such as desertification, shrinking freshwater, flooding, and soil erosion for the lives and livelihoods of more than one million people by 2080.[4] Moreover, this is likely to lead to greater migratory movements, which can increase the likelihood for conflicts both within and between countries. This environmental migration may cause a new category of refugees leaving lands due to the severity of extreme disaster risk. This event will be a direct result of global warming and changing climate.[5] In addition, the emergence and ongoing consequences of the COVID-19 pandemic is currently a useful and significant reminder of global interdependencies. The result has been an understanding of the vulnerabilities, and serious social, economic, political, and security consequences, which may be exacerbated by a changing climate, including supply chain disruptions, cascading natural disasters, and controlling disease.

As we have already mentioned above, the effects of climate change are a high-probability and high-impact threat and will be a driver of future regional instability in the Indo-Asia Pacific. Considering climate change preparedness for the region, the abilities of civil and military institutions for humanitarian operations are required to have roles in disaster relief with multinational, multi-agency, and global cooperation. Security communities across the Indo-Asia Pacific region should work together to comprehensively address the risks of climate change. Significantly, the capability of civil and military institutions should be considered in order to strengthen and improve the comprehensive responses and shift to a more efficient posture in disaster response.

Role of the Military in Disaster Relief

Commonly, the primary mission of the military is conflict prevention or war fighting. However, militaries have an essential role to play in disaster relief and humanitarian operations because militaries have the unique capability to move large numbers of people, as well as critical supplies and equipment. Moreover, in many cases of severe disasters, both national and international militaries play a critical role in coordinating and providing disaster relief. For example, earthquakes in Turkey and Syria in 2023, Nepal in 2015, Haiti in 2010, or super typhoons like Haiyan which hit the Philippines in 2013, militaries were essential to the response. With this new role for the military, it becomes clear that to support more humanitarian operations military units need more specialized education and training at all levels.

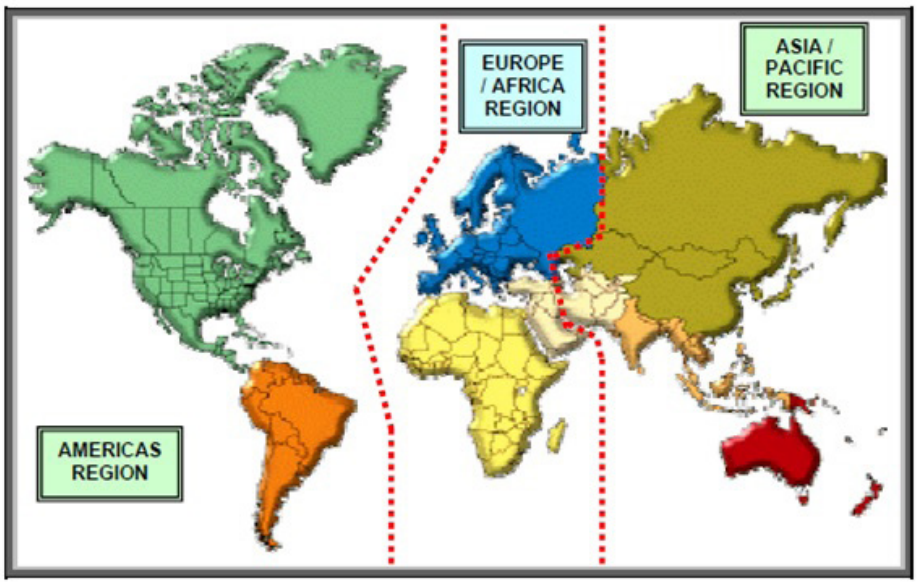
The Military Education for Climate Change Awareness

Thailand is located in the Indo-Asia Pacific region

as reported by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) (Figure 1). The Chulachomklao Royal Military Academy (CRMA) is the service academy of Royal Thai Army (RTA). Each class of 200 cadets complete an intense five-year-long education program. At the end of the fifth year, cadets graduate with bachelor's degrees in their chosen field of study and are commissioned as second lieutenants in the Royal Thai Army. During the education at the CRMA, cadets in the department of civil engineering are educated about climate change and natural disasters through classes (Figure 2). Fifth-year students are required to conduct a research project; for example, wildfires, flooding, drought, and soil erosion monitoring by analyzing remote sensing in the Google Earth Engine (GEE) platform. This project helps cadets learn and understand the current movement of climate trends and disasters all over the world, particularly in the Indo-Asia Pacific region. After cadets graduate, they are prepared to support disaster responses.

Climate change instruction at the military academy is important to raise understanding of the effects of climate change on the stability and security of nations. In fact, military academies in many countries are educational institutions tasked with educating and training candidates to support a military mission. Due to more complex military missions, the education and training systems of military academies should be updated to include teaching scientific research with advanced technologies in order to prepare cadets with the broader mission and enhance regional security.

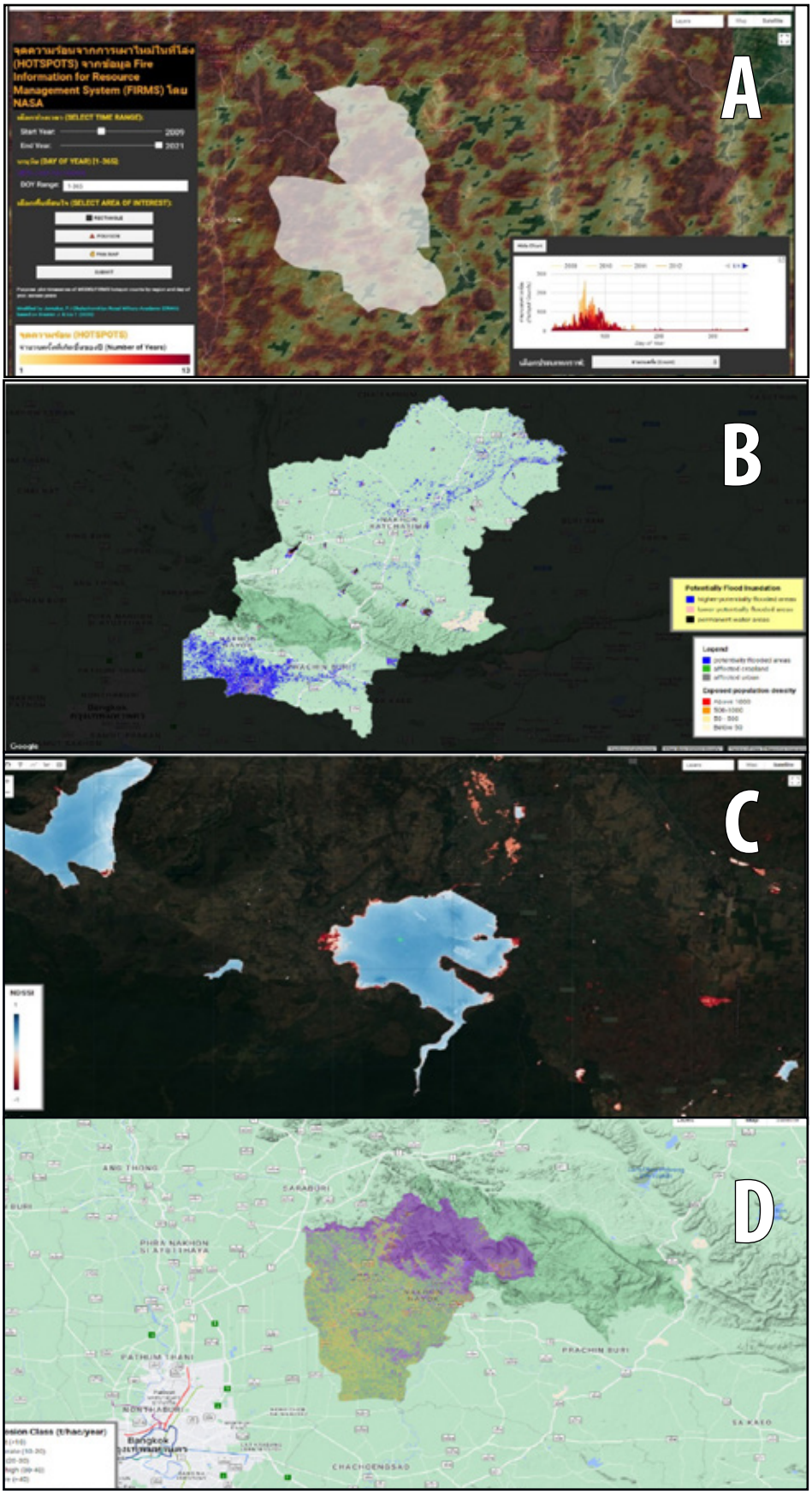
Figure 1: The regional groups include Europe/Africa Region, Americas Region, and Asia/Pacific Region.



The Military Training for Disaster Preparedness

To increase the readiness of the military for disaster response, the military must develop a disaster rescue team. The rescue team must be able to carry out operations at the standard of the Urban Search and Rescue (USAR) and the International Search and Rescue Advisory Group (INSARAG). The INSARAG is a cooperative effort by countries that are vulnerable to disasters, such as earthquakes, that may cause structural collapse. The INSARAG was created in 1991 and has significantly improved the standards for USAR assistance.[6] Significant achievements of the INSARAG for disaster response include the establishment of a worldwide network of stakeholders and the development of guidelines. The INSARAG guidelines have been prepared by USAR teams around the world to guide disaster response operations during disaster events. The guidelines have improved the methodology of disaster-prone and responding countries to coordinate and be more effective in assisting the victims of disasters.

According to the INSARAG guidelines,[7] all USAR teams determine the components of the capacity classification and operational involvement into five skills including 1) management, 2) search, 3) rescue, 4) medical, and 5) logistics. In the USAR development cycle (Figure 3), the system of the INSARAG team is classified in three levels of the operational capability for technical search and rescue operations including light,



medium, and heavy USAR teams.

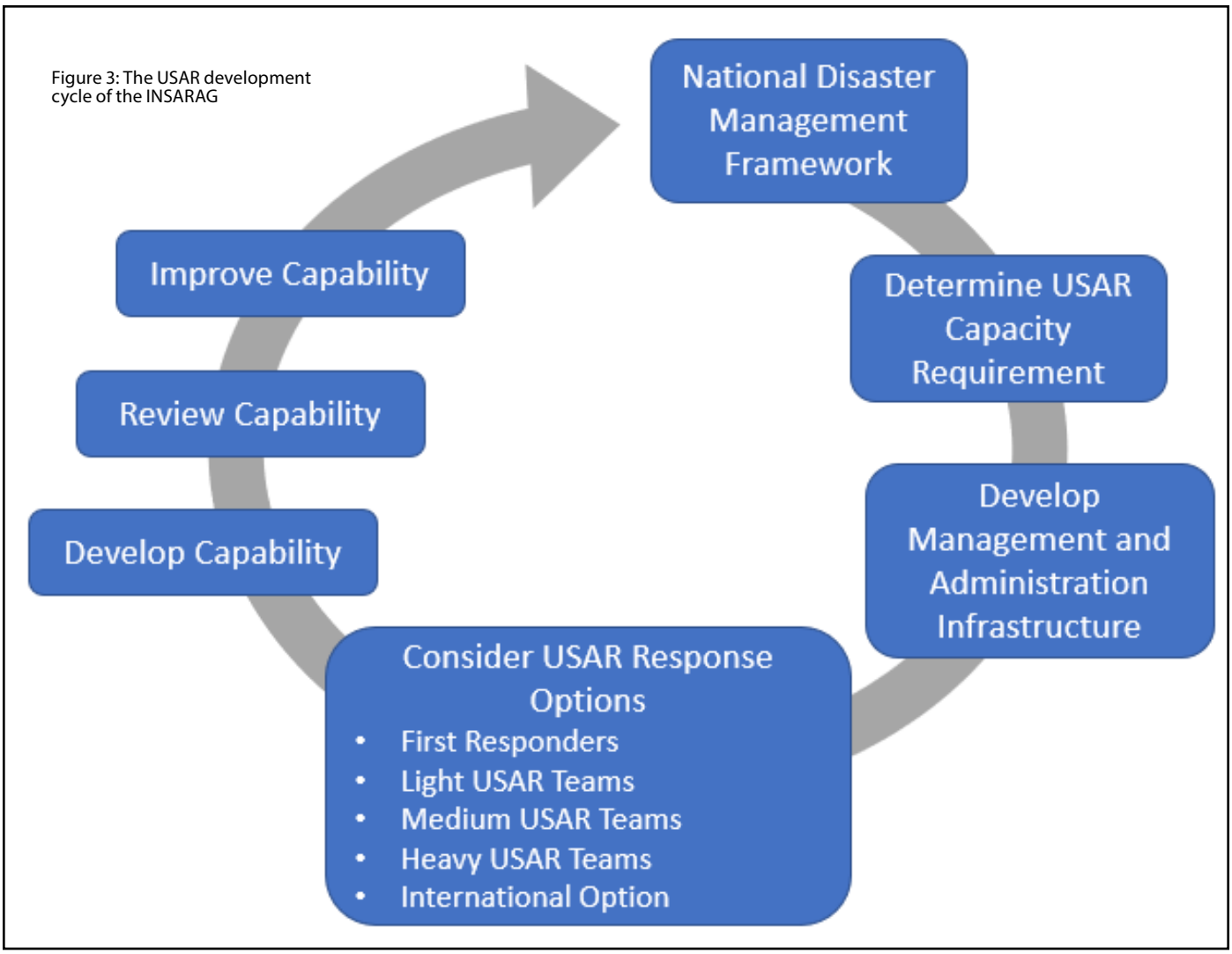
In Thailand, the military training for disaster preparedness focuses on the medium USAR team, which is the target of the Royal Thai Armed Forces and the policy of the Royal Thai government for disaster relief. The medium USAR team includes the minimum personnel requirements. Basically, medium USAR teams have the operational capability for technical search and rescue operations in structure collapse incidents. Medium USAR teams are capable of breaking, breaching, and cutting concrete, typically found in suburban areas, but medium USAR teams are not expected to have an ability to cut, break and breach concrete reinforced with structural steel. International Medium USAR Teams travelling to an affected country should be operational in the affected country within 32 hours of the posting of the disaster on the Virtual On-Site Operations Coordination Center (OSOCC).

Climate change is already impacting the role of military missions and operations such as education, training, equipment, supply chains, construction, maintenance, and deployments. In many current cases of severe disaster, both national and international militaries have come to play a critical role in coordinating and providing disaster relief. Climate change awareness in military education and training is important to raise understanding of the effects

Figure 2: The research projects of Thai cadets are about monitoring of (a) wildfires, (b) flooding, (c) drought, and (d) soil erosion as case studies by analyzing remote sensing in the Google Earth Engine (GEE) platform.

of climate change on the stability and security in the region. Thus, the education and training system of the Thai military academy needs to be improved and developed in terms of teaching scientific research with advanced technologies in order to achieve the mission. In Thailand, military training for disaster preparedness focuses on the medium USAR team to carry out humanitarian operations within the USAR standard and follows the guidelines of the INSARAG. Finally, military education and training for climate change awareness and preparedness are necessary for readiness. The methodology taught must be more effective in assisting the victims of disasters by highlighting lessons in cooperation with both domestic and international allies and therefore enhance regional security.

Figure 3: The USAR development cycle of the INSARAG



THE USINDOPACOM CLIMATE CHANGE IMPACTS PROGRAM STANDS UP

By Andrea Ciletti, Research Analyst
Stephen Frano, Climate Change Impacts Program Manager
Leslie Regan, Climate Change Impacts Specialist
Taryn Ino, Climate Policy and Diplomacy Analyst

This article is not about carbon emissions or atmospheric chemistry. While it is important to recognize the drivers of climate change and the global need to change course, our program focuses on how climate change impacts drive security challenges for the U.S. and the entire Indo-Pacific. Climate change is a threat multiplier impacting everything from infrastructure, freshwater access, and food security to the potential for an increased need in humanitarian assistance and disaster response missions by militaries. Our recent efforts have centered around integrating climate change considerations and approaches into strategy, planning, and training to help build stronger policy and operational solutions. While there are no "one size fits all" solutions for every location, our analysis of risk and vulnerability coupled with targeted partnerships and collaboration is aimed at improving climate resilience and adaptation across the region. These focused efforts have illuminated the need and urgency for climate security discussion with allies and partners.

Following the signing of Executive Order (EO) 14008 "Tackling the Climate Crisis at Home and Abroad" in January 2021, the U.S. Department of Defense (DoD) began in earnest to examine how to best align existing efforts to tackle the climate crisis head-on with our allies and partners, and place the climate crisis at the forefront of foreign policy and security planning.[1] In response to this EO, the DoD released a Climate Adaptation Plan (CAP)[2] in September 2021 outlining the steps the DoD is taking to tackle the climate crisis, including strengthening the DoD's ability to adapt to climate change by building national resilience, undertaking mitigation measures, and addressing key vulnerabilities.[3] The DoD's CAP outlines a strategic framework (summarized in Figure 1) for achieving climate change adaptation and resilience. The plan contains five major lines of efforts (LOE), each with an intended strategic outcome, all working toward one desired end state. Four key enablers cut across and integrate actions of each LOE. The DoD acknowledges that it is difficult to portray the magnitude of its efforts, as no set of five actions or a discrete list of methodologies would be adequate to guide the totality of DoD's required adaptation and resilience efforts.[4] This CAP is intended to help the DoD integrate climate considerations into operations, planning, and business and decision-making processes. This includes how U.S. Forces are trained and equipped and it incorporates new measures to strengthen the resilience of our infrastructure.[5]

Not long after the DoD's Climate Adaptation Plan was identified, the U.S. Indo-Pacific Command (USINDOPACOM) stood up a dedicated Climate Change Impacts (CCI) program at the Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM). The Center was created in 1994 to focus on improving civil and military coordination in the face of disasters. The Center's ability to examine aspects of non-traditional security with both civilian and military partners in the U.S. and abroad became the foundation upon which to build the CCI program. The CCI program is designed to align with the goals of the department, support the objectives of the combatant command, and seek out synergies with the international community to enhance resilience and adaptation to the impacts of climate change in support of a "Free and Open Indo-Pacific." Other key policy documents that led to the implementation of the CCI Program include *the Department of Defense Climate Risk Analysis,* and the *Climate Change and International Response Increasing Challenges to U.S. National Security Through 2040.*[6]

Including the newly established CCI program, CFE-DM is made up of five branches. These foundational branches used their expertise to help establish the CCI program and they continue to support and work synergistically together with the CCI program. Similar to the DoD's Climate Action Plan insurance on a whole-of government response to climate change, CFE-DM approached the development of the new CCI program the same way, presenting an opportunity to enhance existing efforts and open

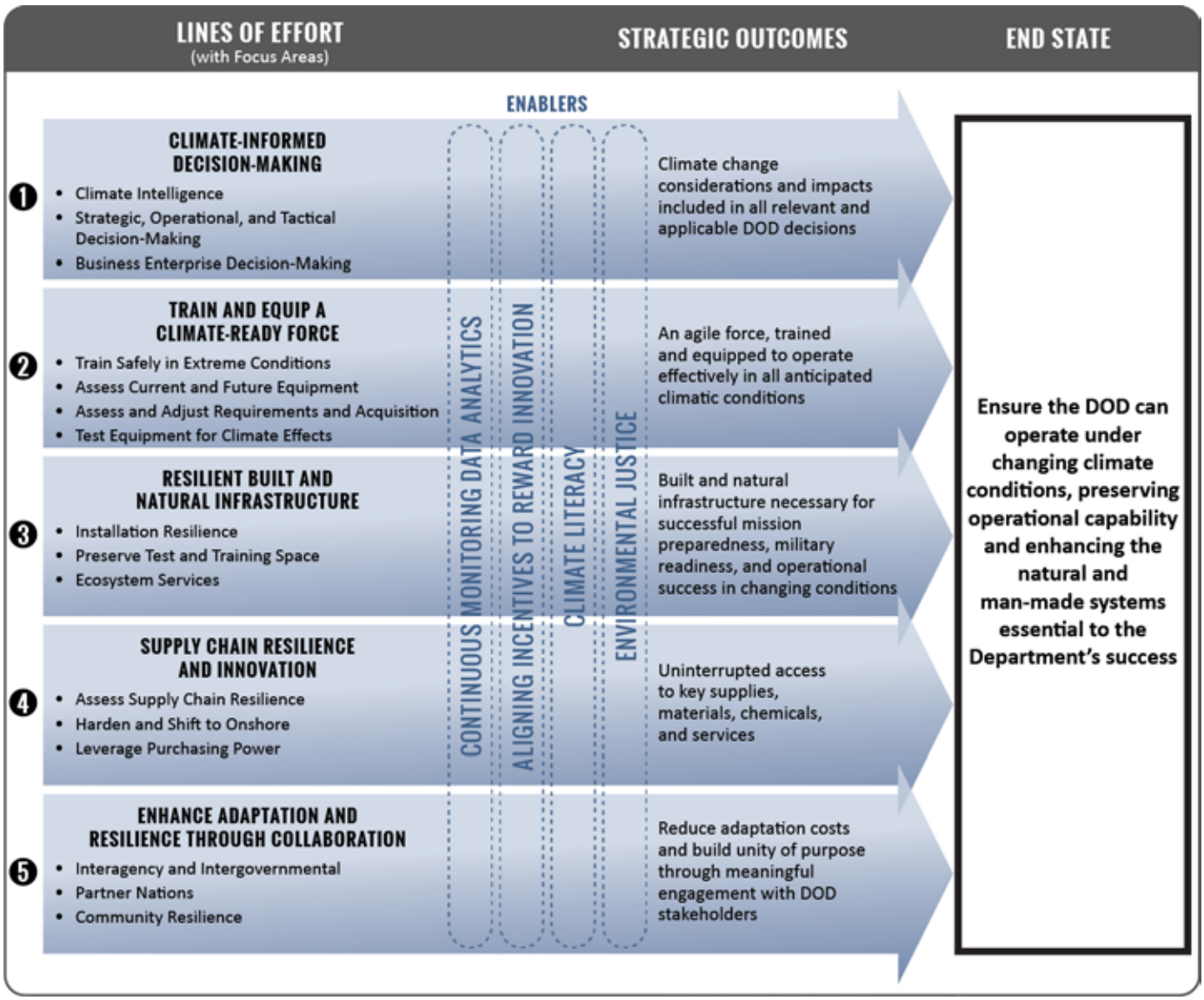


Figure 1: DoD Climate Adaptation Strategy Framework for Current and Future Force Decisions

doors for continued partnerships.

Before the start of the CCI program the leadership engaged in research and analysis on current climate change security efforts by the U.S. and allied and partner nations across the globe. The Center's *Applied Research and Information Sharing (ARIS) Branch* led these efforts that informed leadership with ideas for the CCI's content and structure. The ARIS Branch performed initial research on how the DoD and the U.S. government think about climate change and climate security. This initial research helped to guide CFE-DM Director Joe Martin on the structure and design of the program and its objectives. Their research helped to articulate the climate and security nexus and tie them to USINDOPACOM priorities and look at the implications for Indo-Pacific Security Cooperation. ARIS continues to produce key products that have guided the CCI program development and opened doors for the Center to build new partnerships. Since CCI's inception, the collaborative efforts between ARIS and CCI have only grown and the two branches work together to co-produce key climate change impacts products, for example.

Climate change will only increase the frequency and severity of extreme weather events, which is a

driving factor behind much of the military's preparedness work. Whether climate change affects livelihoods at home or abroad, there is a growing urgency to promote a greater understanding within our service members and have them understand the mounting expectations of responding to ever more complicated crises. The CFE-DM CCI team recently collaborated with the *Training and Education Branch* to incorporate climate change training into the flagship Humanitarian Assistance Response Training-Disasters (HART-D) course. The HART-D course is an operational-level training course focusing on applying the military planning and decision-making process to the unique humanitarian circumstances during Foreign Humanitarian Assistance (FHA) operations following natural disasters. This training course has become the hallmark for the Center and its content is constantly evolving and being updated to reflect the current requirements for the international community and militaries in terms of their response to humanitarian crises around the world. In addition, CFE-DM has responded to a growing request to thread climate security into regional exercises, training events and security cooperation programs.

Another one of the Center's main branches is the *Plans, Programs, and Analysis* group that is fully integrated within the combatant commands strategic and regional planning processes. This group was able to carry the message for incorporating climate change into the USINDOPACOM decision-making process and integrate new ideas on how changes in the natural environment need to be considered starting at the theater level. Their efforts have opened pathways into our posture initiatives and linked directly to our new foreign humanitarian assistance plan. Linking these efforts, we see emerging requirements to enhance supply chains for more agile disaster response capabilities for the U.S. and that of our allies and partners. Building capability for future efforts will be in areas of more follow-on bilateral engagements to bring in civilian and international organization partners. We are building engagement capability and developing new partnerships to enhance our collective understanding of climate predictions and the development of new solutions, including what can be done by the U.S. DoD.

The CCI team has collaborated with groups outside of the internal CFE-DM branches to align DoD objectives and integration into USINDOPACOM. Our partnership with the Pacific Disaster Center Global (PDC) has helped to enhance all of the capabilities across the CFE-DM staff. The PDC is a data science organization focused on developing and delivering tools that enhance decision making across the disaster preparedness, response, and recovery spectrum. They have assisted partners in enhancing disaster management capacity through the application of their advanced tools and technologies, evidence-based research, and analytical information.

As part of the CCI program, PDC has created a climate change impacts assessment and model that is heavily focused on risk and vulnerability and more closely aligned to the security environment. The information has proved to be instrumental and illuminating, and has been integrated across our efforts in training, planning, and analysis and informa-

A 16-year-old child swims in the flooded area of Aberao village in Kiribati. The Pacific island is one of the countries worst affected by sea-level rise.
UNICEF/Sokhin

tion sharing. Additionally, the PDC climate change impacts assessment has become our own foundation for understanding potential future impacts of climate change. Specifically, the assessment looks at five climate hazard areas: extreme heat, precipitation, dry days, cyclones, and sea level rise. As USINDOPACOM undertakes new posture initiatives, we are working with the planning staff to integrate climate change considerations into their decision-making processes. Trying to build new mechanisms to institutionalize the integration of climate change impacts information is bringing in a new perspective on our considerations of the future natural environment that can have a positive impact meeting future military objectives.

An important element of partner engagement is supporting improved disaster-response capabilities in a hazard-affected Indo-Pacific region. Our efforts which integrate across planning and posture are directly contributing to better information being used to enhance resilience of new infrastructure as well as developing new ideas around enhancing logistics for disaster response capabilities. The most important effort being drawn out is enhancing resilience and adaptation through collaboration with the U.S. interagency, allied and partner nations, and international organizations. The CCI program has launched an effort called the *Community for Indo-Pacific Climate Security (CIPCS).* CIPCS is our program's attempt to engage all of the countries in the Indo-Pacific through either their military and/or civilian agencies looking at climate change and to exchange information on national efforts and consider opportunities for international cooperation to enhance climate security. This effort has already grown into some great relationships, not only with us, but also between other nations that may not have interacted in a common forum.

Increasing climate change discussions with allies and partners is shaping U.S. DoD's approach to how we can strengthen partnerships and alliances by addressing the impacts of climate change. In the shared region, New Zealand has recently demonstrated engagement efforts and notable leadership on promoting global recognition of climate change.[7] Similarly Australia recognizes climate risk in their Defence Policy. The ASEAN State of Climate Change Report (ASCCR) by the Association of Southeast Asian Nations (ASEAN) outlines regional targets for ASEAN and recommendations for climate change adaptation and mitigation.[8] In addition, the North Atlantic Treaty Organization (NATO) and others are making similar significant progress with a Climate Change and Security Action Plan. NATO's Plan states that "Climate change makes it harder for militaries to carry out their tasks. Greater temperature extremes, sea level rise, rapid changes in precipitation patterns, and an increasing frequency and intensity of extreme weather events test the resilience of our military installations and critical infrastructure, impair the effectiveness of our capabilities, and may create harsher conditions for our military operations and missions."[9] A commitment to climate change dialogue is especially vital to the Indo-Pacific which encompasses the most diverse set of nations that will experience the multitude of impacts such as droughts, flooding, landslides, fires, soil erosion, salt-water intrusion, sea-level rise, and other hazards that will affect millions of people every year. Nevertheless, climate change should not just be broadly understood as something that will influence disaster response, but also how the impacts will influence the myriad of security challenges we contend with in this region. We hope that by bringing together all of the components of the Center for Excellence we can do more to share tools, analysis, and solutions for addressing climate change and security, and a forum for engagement which can support allied and partner countries' efforts to manage climate-security risks.

Sign up by visiting our website at https://www.cfe-dmha.org/climate-change-impacts for climate security reports and case studies.

Mangrove forests are a crucial component of Thailand's coastal ecosystems.

Nishanth Jois/ Flickr

Comparative Study on Climate Change in Thailand & Vietnam

The impact of climate change will be substantial and wide-ranging on the humanitarian situation worldwide

Maj. Afua O. Boahema-Lee, Army Fellow, Daniel K. Inouye Asia-Pacific Center for Security Studies

The Indo-Pacific is one of the world's most highly militarized regions, with seven of the world's ten largest standing militaries and five of the world's declared nuclear nations. Given these conditions, the strategic complexity facing the region is unique. United States Indo-Pacific Command (INDOPACOM) is one of six geographic combatant commands and is responsible for American military operations in the Indo-Pacific region. It covers more of the globe than any other combatant command and shares borders with all five of the others. It is imperative for INDOPACOM to focus on the Southeast because it is, regrettably, one sector of the world that has been most negatively affected by climate change. Climate change has continuously progressed over the last decade and is now considered one of humanity's most essential and crucial challenges. Climate change tends to impact a country's natural systems significantly. Based on data

collected over the last two decades, the International Monetary Fund (IMF) included Thailand and Vietnam alongside the Philippines and Myanmar in the list of countries severely affected by climate change.[1] This is because the Southeastern part of Asia has been recording rising average temperatures since 1960. This article aims to contribute to our understanding of how climate change affects Vietnam and Thailand, as well as the solutions being developed to combat this threat. First, it investigates the effects climate change has on Thailand and Vietnam, as well as the responses that the respective governments, the armed forces, and non-governmental organizations have taken to mitigate those effects. Then, it investigates how climate change effects will manifest in safeguards and protections provided by the organizations above. Finally, the article suggests various ways in which Thailand, Vietnam, and the U.S. might collaborate to effectively remedy the issues of climate change.

Continuous torrential rains and storms worsened the floods in Thailand, including many parts of Bangkok.

Daniel Julie/Flickr

The Effects on Climate Change in Thailand

Climate change is becoming a significant security concern for Thailand. Thailand, like many other countries in Southeast Asia, is struggling with the challenges posed by climate change. Despite having 23% of its land in protected areas, Thailand remains vulnerable to the effects of climate change on its environment and communities.[2] One example of this vulnerability was the 2011 flood, which stands out as one of the most devastating natural disasters in Thailand's recent history. The flood caused widespread damage to infrastructure, agriculture, and people's livelihoods, highlighting the urgent need for greater efforts to address the impacts of climate change in the country. The 2011 flood was caused by heavy monsoon rains that began in July 2011 and continued for several months, leading to widespread flooding across the country. The flood affected 65 out of Thailand's 77 provinces and caused over 800 deaths, with an estimated economic cost of around $46.5 billion.[3] The outcomes of these effects gave rise to security weaknesses, such as population displacement, societal unrest, and conflicts over natural resources.

The Mekong River is a matter of concern that deserves attention. The Mekong River is one of the longest rivers in Asia, flowing through six countries: China, Myanmar, Thailand, Laos, Cambodia, and Vietnam. It is the lifeblood of the region, providing water for drinking, irrigation, and transportation, as well as supporting the livelihoods of millions of people who depend on its resources for their survival. The Mekong River Basin is currently experiencing severe climate change issues, such as floods, droughts, and rising temperatures, due to ecological pressures resulting from urbanization, coastal erosion, and deforestation.[4] Thailand's location makes it vulnerable to severe impacts of climate change. The country is in the low-elevation coastal zones of the Asian continent, which are known for their suscep-

tibility to extreme weather events. Some notable climate change impacts experienced by Thailand citizens include food shortage, water quality issues, plant and animal extinction, and famine. Considering these factors, the Mekong River's importance to Thailand highlights the need for effective climate change adaptation and mitigation strategies. It is crucial for Thailand to monitor and manage the river's water resources, protect its ecosystems, and collaborate with neighboring countries in the Mekong River Basin to address the shared challenges posed by climate change.

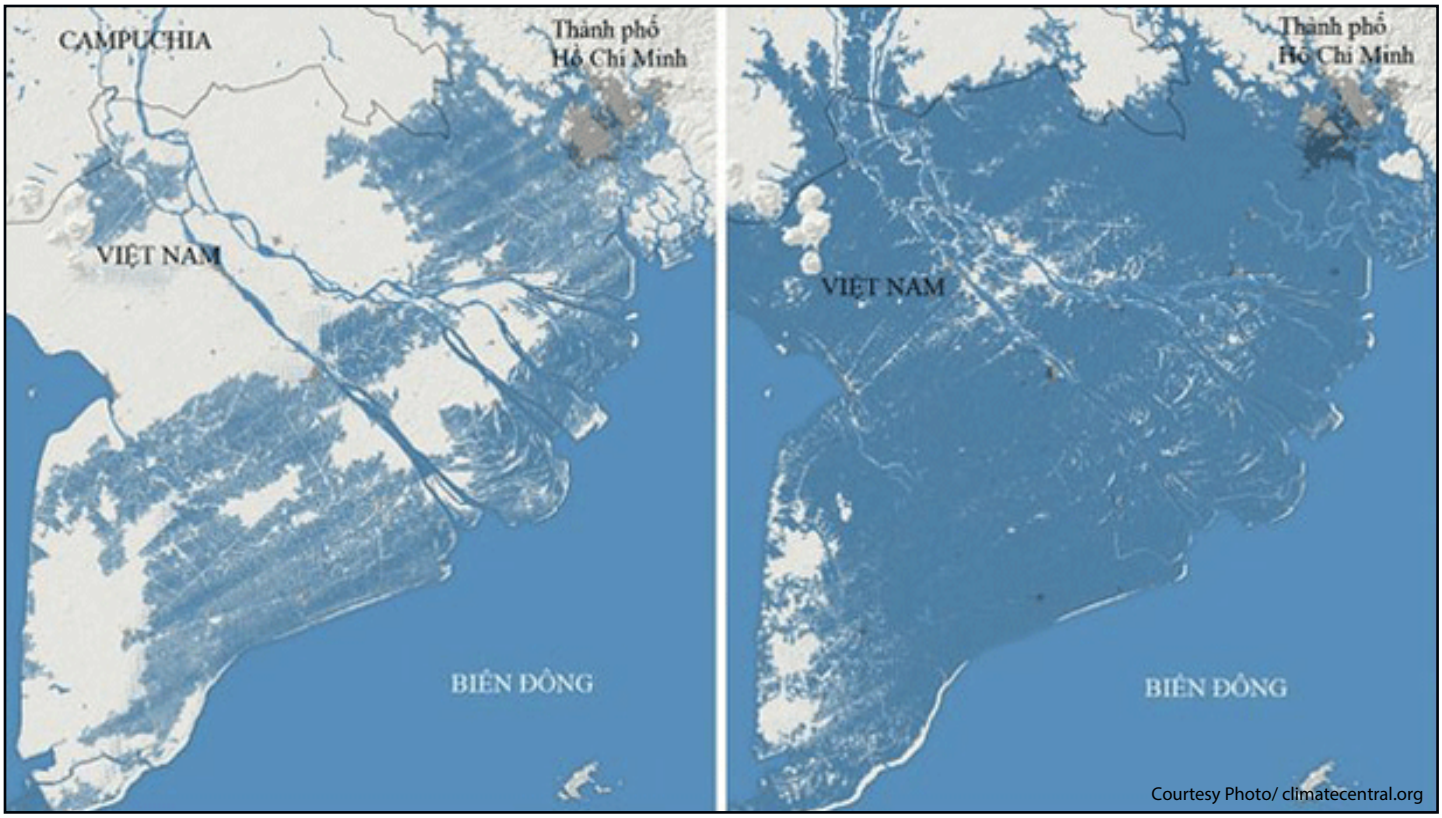
Climate change also causes health security challenges in Thailand, with various infectious diseases such as leptospirosis linked to flooding. Research suggests that flooding is a significant environmental factor associated with the transmission of leptospirosis.[5] It is also worth noting that global warming can be a catalysis for pandemics.

Several economic security issues in Thailand, especially among farming communities, are the result of frequent and severe droughts and floods. Impacts on crop yields and agricultural production have resulted in lower income for farmers and increased food prices for consumers. Moreover, climate change has resulted in water and food insecurities in the region. Farmers have been recording low yields from their farms in recent years, resulting in food shortages and scarcity countrywide. Lastly, research indicates that by 2070, a significant decline is projected for most modeled species of mammals, birds, and plants.[6]

The Effects on Climate Change in Vietnam

Climate change poses substantial security challenges in Vietnam, particularly in coastal areas where more than half of the population lives. The country, located in a tropical zone of the northern hemisphere, has already experienced the harmful effects of floods, droughts, and heat waves, which have resulted in damage to infrastructure, agriculture, and human health. The International Monetary Fund reported that the country is highly vulnerable to sea-level rise and the increased frequency and intensity of storms and typhoons,[7] which can cause significant damage to infrastructure, property, and loss of life. For example, in 2017, Typhoon Damrey caused considerable damage in Vietnam's central region, killing over 100 people and creating damage worth more than $1 billion. These consequences may result in new security vulnerabilities such as displacement, societal instability, and fighting over natural resources.[8] It is anticipated that between now and 2050, the Earth's average temperature will increase by 1-2 degrees Celsius, causing more frequent and severe droughts as well as increased rainfall. As a result, coastal regions will experience a rise in sea levels by about one meter, which will have a significant impact on low-lying areas that lack adaptation measures.[9] Almost half of the Mekong Delta region, which is crucial for both food security and Vietnam's economy, will be particularly vulnerable to these changes, which could have life-altering consequenc-

Typhoon Damrey in Vietnam impacted an estimated 4.3 million people. Ly Phat Viet Linh/ UNICEF



Map on right shows areas in southern Vietnam predicted to flood by 2050.

es.[10] According to the Global Climate Index 2018, Vietnam was the sixth country severely affected by climate change between 1999 and 2018.[11] Currently, Vietnam is one of the Asian countries experiencing severe effects of climate change with intense storms, floods, and rising sea levels being prevalent. Despite ongoing efforts to mitigate its effects, climate change still poses a significant threat to Vietnam's security.

One major concern is the risk to the country's agricultural sector, which could jeopardize both domestic and global food security.[12] Agriculture is a critical sector of Vietnam's economy, and the nation plays a significant role in the global food market by exporting large quantities of rice, seafood, and coffee. This contribution helps to ensure global food security and promote economic development.

Climate change is the number one factor behind health security challenges in Vietnam. The rising sea levels and extreme weather have increased the prevalence of people at risk of climate-sensitive diseases. Lastly, climate change is associated with migration. The intensifying climate has forced many Vietnamese to flee and migrate for better living conditions.

Policy Regarding Climate Change in Both Thailand and Vietnam

Thai and Vietnamese governments have enacted legislation to combat the adverse consequences of climate change. Thailand has implemented several policies and made different international pledges to help deal with climate change locally. During the Paris Agreement, Thailand pledged to reduce greenhouse gas emissions to the bare minimum of approximately 20% by 2030.[13] This pledge was made in 2015 with several outlined climate change adaptation and mitigation strategies. The country has been working toward achieving this goal by implementing other policies and taking necessary actions to mitigate the effects of climate change. Thailand released a Disaster Prevention Plan Prevention and Mitigation Act 2007 (DPM Act) and a National Master Plan on climate change in 2007, which mainly identified and

highlighted the critical areas for intervention. The country recently adopted the National Adaptation Plan (NAP), a policy aimed at achieving sustainability within different sectors, including the public health, water resource management, agriculture, food security, and natural resource management sectors. Thailand's Climate Change Master (CCMP) 2015-2050 is the highest-level policy document guiding the national climate response.[14] The Climate Change Master Plan has been put into action by the Thai government with the objectives of lowering greenhouse gas emissions, increasing energy efficiency, and bolstering support for the utilization of renewable energy sources.[15] The plan also includes actions that will improve water management and lessen the country's susceptibility to floods.

The private sector, especially non-governmental organizations (NGOs), also manages climate change effects and impacts. NGOs have been active and at the forefront of addressing climate change in Thailand. One notable NGO is the Thai Climate Justice Working Group (TCJWG). This organization's fundamental goal is to raise public awareness among Thailand citizens regarding climate change issues. It has also been involved in national policy advocacy. The TCJWG's mission is to advocate for policies and actions that promote climate justice in Thailand and the wider region, and to raise awareness about the impacts of climate change on vulnerable communities.[16] The group focuses on issues such as sustainable energy, climate finance, and climate adaptation. Additionally, the Thai Climate Justice Working Group is helping the government achieve the goal of transitioning toward a low-carbon society. The other NGO of interest is the Thailand Environmental Institute (TEI). This non-profit and non-governmental environmental organization in Thailand focuses on environmental issues. It often works closely with the private sector, local communities, and the government to help formulate environmental directives that can help encourage meaningful environmental progress within the country. For years, Thailand Environmental Institute (TEI) has been researching climate change and providing key essential policy recommendations to the government.[17] Even with these efforts, both countries require significant international support to develop their adaptive capacity and resilience to the effects of climate change on security. This includes assistance in creating and executing climate change adaptation strategies, expanding access to climate funding, and developing climate risk management expertise.[18] Militaries should also be involved in evaluating the effects of climate change, offering security, and implementing powerful strategies regarding climate change. There are several ways the military can address climate change in Thailand. Other than protecting Thailand's sovereignty and territorial integrity, the Thai military also takes part in helping citizens affected by drought and floods. They often provide the affected communities with transportation, food, and security services. Since climate change also affects military operations, the Thailand military has also been at the forefront in proposing and implementing essential strategies to help address the significant threats to national security. Consequently, adverse climate conditions can potentially cause violence and political instability. Therefore, addressing climate change is a priority for the military.

While the National Disaster Risk Management (NDRM) Plan in Thailand recognizes the significance of addressing displacement in its various forms, it does not have a specific policy that explicitly emphasizes the integration of displacement concerns. Although the Plan mandates relevant agencies to develop additional guidelines and procedures for evacuation and shelter management, it does not expressly advocate for the mainstreaming of displacement issues within the broader frameworks of Disaster Risk Reduction and Management (DRRM) or Climate Change Adaptation (CCA).[19]

The Vietnamese authorities now consider climate change a priority and number one issue of interest. In conjunction with other private sector organizations, the national government has formulated and implemented several policies and strategies to help achieve a sustainable future for the next genera-

tions. In order to make Vietnam's communities and infrastructure more resistant to the effects of climate change, the Vietnamese government has created the National Target Program to Respond to Climate Change. This program's overarching goal is to reduce the country's carbon footprint. The program involves initiatives to enhance water management, reduce emissions of greenhouse gases, and increase the utilization of alternative energy sources.[20]

First, the country's national safety on climate change policy is meant to ensure a reduction in greenhouse gas emissions in the next seven years. The policy aims for zero emissions in Vietnam by 2050. Vietnam also brought in a new law on environmental protection in 2022.[21] The law introduced carbon taxes, which will likely help the country reduce carbon emissions. In addition, the country recently joined the Just Energy Transition Partnership (JETP) program. This partnership will support Vietnam's ambitious net-zero 2050 goal, accelerate the peaking of its greenhouse gas emissions, and transition from fossil fuels to clean energy. The other policies used by the Vietnamese government include the eighth power development plan and the national energy development strategy. On May 15, 2023, Vietnam reached a momentous milestone by approving the Eighth National Power Development Plan (PDP-8). This noteworthy accomplishment showcases Vietnam's unwavering dedication to sustainable development and environmentally friendly progress while charting a clear course toward achieving economy-wide net-zero emissions by 2050. USAID has been actively involved in assisting Vietnam throughout the development of PDP-8 and continues to steadfastly support the country as it implements this plan.[22]

USAID supports a tree plantation event in Hoa Binh province, Vietnam in March 2023.

The Vietnamese government has involved several NGOs in aiding in the nation's battle against climate change. Climate Change Working Group (CCWG) Vietnam is a collaborative committee focused on addressing the challenges and impacts of climate change. For years, CCWG has been projecting its efforts toward lessening how vulnerable people with low incomes are to the effects of climate change. The organization believes it will achieve its sustainability goals by encouraging community development initiatives and providing financial and environmental support to citizens. The Center for Environment and Community Research (CECR) is the other notable NGO in Vietnam. The mission of CECR is to promote gender equity and climate change adaptation. Some of its programs include water pollution control and plastic waste reduction. These are projected to manage climate change impacts. The main objectives of these and other NGOs in the country include coordination, policy dialogue, adaptation, mitigation, capacity building, and advocacy.

Comparative Analysis

The discussion above emphasizes the similarities between Thailand and Vietnam with regards to climate change issues. Firstly, both countries are in Southeast Asia and are severely impacted by climate change. This has resulted in similar economic, politi-

cal, and environmental consequences due to extreme weather conditions. For instance, both countries have experienced significant property damage and losses due to climate change impacts, surpassing other regions. It is projected that failure to address climate change could result in a potential 11% decrease in GDP for the region by the end of the century. Both governments, in collaboration with NGOs and military organizations, have developed well-defined policies and action plans to combat climate change. However, it is important to note that there are differences between the two nations.

First, the low latitudes in the south make Thailand hotter than Vietnam. This implies that Thailand is more prone to heatwaves, lack of water, and drought than Vietnam. Secondly, it is essential also to note that Thailand's steps to address climate change tend to be less comprehensive than those of Vietnam. Despite having climate change management goals, the country has been slow in implementing actual actions. Unlike Thailand, Vietnam is more exposed and prone to experiencing storms, floods, and typhoons. However, more severe household impacts result from floods compared to storms.[23] The sea level in Thailand and Vietnam is expected to rise by 25-30 centimeters by 2050. This will lead to coastal erosion, flooding, and saltwater intrusion, which will affect agriculture, aquaculture, and tourism.

Like Thailand, the Vietnamese military has also been involved in climate change response efforts. They perform that same role as the Thailand military, especially when there is a need for disaster relief and recovery. For example, Vietnam military personnel are known for participating in government projects, including those projected to address climate change. Notably, the United States and other European nations can play vital roles in helping these two countries deal with climate change challenges. The Southeast Asian countries and the U.S. can work together to address the region's climate change. The United States can provide economic, educational, advocacy, and environmental support to Vietnam and Thailand to help them achieve their climate change management goals.

Thailand is more prone to heatwaves, lack of water, and drought than Vietnam. About half of the major reservoirs in the country stand below 50 percent of capacity.
Courtesy Photo/ USAID Vietnam

Measures taken to address the issue and security provided by the government, military, and NGOs

Climate change will affect the interventions and security given by governments, militaries, and NGOs. To begin, it is anticipated that the demand for humanitarian aid and disaster relief will rise due to climate change. Thailand and Vietnam are particularly vulnerable to the adverse impacts of extreme weather conditions, making it crucial for governments, militaries, and NGOs to be prepared to respond to emergencies and provide aid to affected communities.[24]

Second, due to climate change, water and land resources may become scarcer and, therefore, more valuable, which could lead to conflicts over these resources. This could result in tensions and even bloodshed between different countries and groups, especially in areas where these resources are already in short supply.[25] In order to lessen the severity of these conflicts and encourage collaboration and the equitable distribution of resources, governments, armies, and NGOs will need to collaborate.

Finally, climate change may also affect national

Top: Sailors from the U.S. Navy and Royal Thai Navy stand at attention during the opening ceremony for Cooperation Afloat Readiness and Training (CARAT) Thailand 2019. Bottom: Emergency responders from Vietnam participate in Gobi Wolf 2022 in Bayankhongor, Mongolia, with the U.S. and six other allied nations.

security since it raises the likelihood of natural disasters and food and water shortages, both of which may result in societal unrest and instability. To mitigate these threats and make communities more resilient and prepared to handle the effects of global warming, governments, militaries, and NGOs will need to collaborate to succeed.[26]

Collaborative Strategies to Combat Climate Change: Prospects for Cooperation between the U.S., Thailand, and Vietnam

Thailand, Vietnam, and the United States can pull efforts together in combating climate change. Firstly, through collaboration to advance eco-friendly forms of energy and eliminate greenhouse gas emissions into the ecosystem. As the world's foremost innovator in renewable energy technologies, the United States is in a better position to offer Thailand and Vietnam its knowledge and help as they switch to more environmentally friendly energy sources.[27] With the United States leading the way as the global frontrunner in agricultural technology, it is uniquely positioned to provide valuable assistance to Thailand and Vietnam in boosting agricultural output

while strengthening their ability to withstand natural disasters like floods and droughts. This collaboration aims to enhance productivity, promote sustainable practices, and build resilience in the agricultural sectors of both countries. Furthermore, this collaboration holds the potential to foster regional stability by promoting the equitable distribution of resources, particularly water, and land. By working together, these nations can lessen the likelihood of conflicts arising from resource scarcity and contribute to a more harmonious regional environment. Through knowledge sharing, cooperation, and the implementation of sustainable practices, the United States, Thailand, and Vietnam aspire to create a framework that ensures the responsible use and fair allocation of vital resources. In this regard, the collaborative efforts between the United States, Thailand, and Vietnam signify a transformative approach toward enhancing agricultural resilience and regional stability. By embracing eco-friendly practices and striving for equitable resource distribution, these nations can not only address common challenges but also pave the way for sustainable development and a more balanced future.[28]

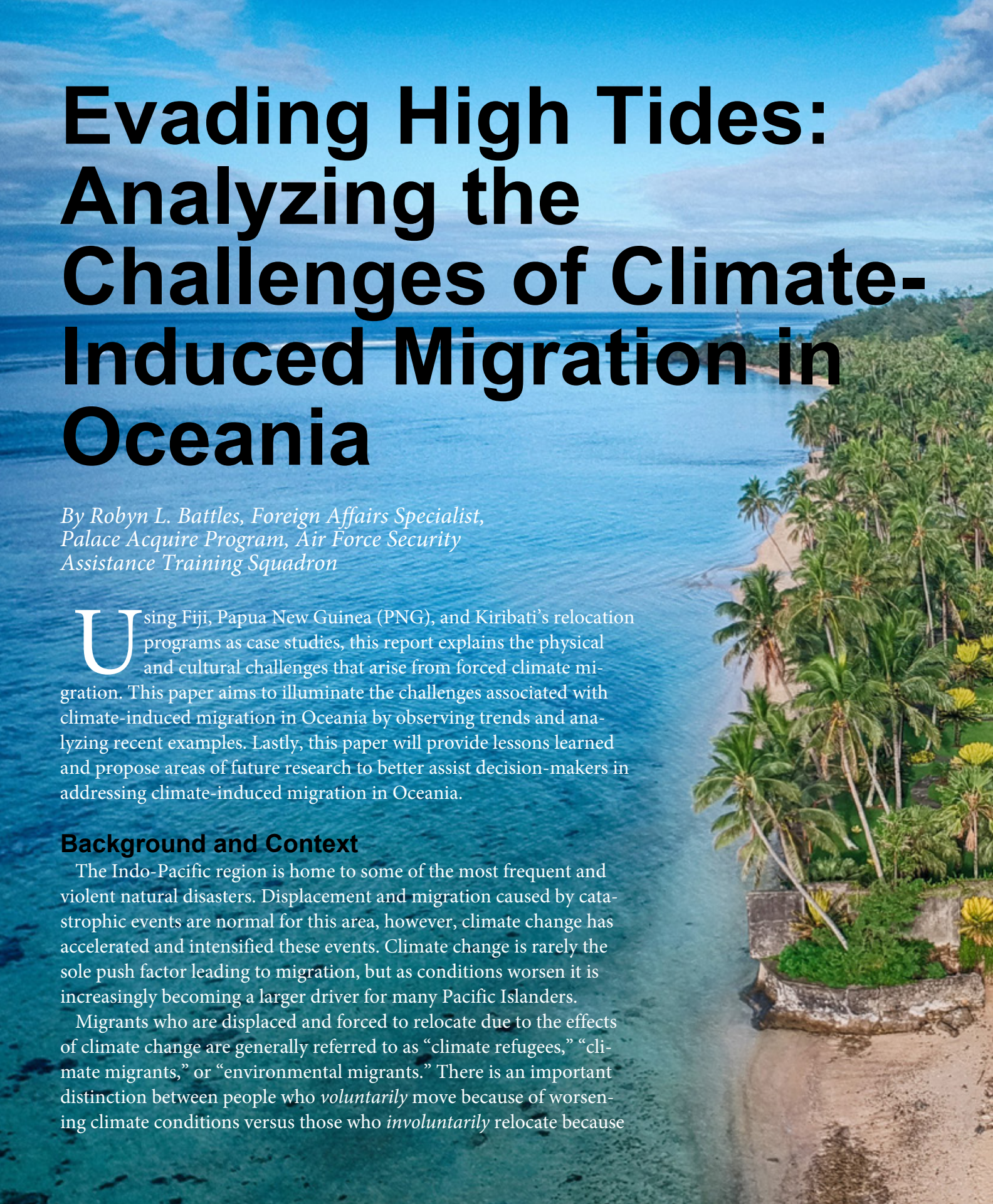
In conclusion, it is evident that climate change poses substantial challenges to both Thailand and Vietnam, with wide-ranging impacts on their humanitarian situations. Both countries have experienced severe consequences, including property damage, loss of life, and economic instability due to extreme weather conditions. The effects of climate change have been particularly pronounced in coastal areas, where a significant portion of the population resides. Thailand has implemented various policies and international pledges to address climate change, including commitments to reduce greenhouse gas emissions and enhance water management. NGOs, such as the Thai Climate Justice Working Group and the Thailand Environmental Institute, have played a crucial role in raising awareness and advocating for climate justice. Similarly, the Vietnamese government has recognized climate change as a top priority and has established the National Target Program to Respond to Climate Change. Efforts are focused on reducing the country's carbon footprint, enhancing water management, and promoting the use of alternative energy sources. NGOs like the Climate Change Working Group Vietnam and the Center for Environment and Community Research have been actively engaged in community development initiatives and climate change adaptation.

While both countries have taken steps to address climate change, there are some differences. Thailand faces challenges such as heatwaves, water scarcity, and drought due to its location in low latitudes. In contrast, Vietnam is more vulnerable to storms, floods, and typhoons. The countries' approaches to climate change also differ, with Vietnam demonstrating a more comprehensive and proactive stance in implementing policies and strategies. Considering the shared vulnerabilities and the need for international support, collaboration between Thailand, Vietnam, and other countries, such as the United States, is crucial in effectively mitigating the impacts of climate change. Such collaboration should focus on developing adaptive capacity, resilience, and climate risk management expertise, as well as expanding access to climate funding. The involvement of the military in addressing climate change is also essential, considering the potential security implications associated with adverse climate conditions.

In the end, climate change presents significant challenges to Thailand and Vietnam, necessitating concerted efforts from governments, NGOs, and international collaborations to combat its adverse effects. The impacts of climate change go beyond environmental concerns and have far-reaching implications for the humanitarian situation worldwide. It is imperative to prioritize climate change mitigation and adaptation strategies to ensure the well-being and security of the populations in these countries and the broader global community.

Evading High Tides: Analyzing the Challenges of Climate-Induced Migration in Oceania

By Robyn L. Battles, Foreign Affairs Specialist, Palace Acquire Program, Air Force Security Assistance Training Squadron



Using Fiji, Papua New Guinea (PNG), and Kiribati's relocation programs as case studies, this report explains the physical and cultural challenges that arise from forced climate migration. This paper aims to illuminate the challenges associated with climate-induced migration in Oceania by observing trends and analyzing recent examples. Lastly, this paper will provide lessons learned and propose areas of future research to better assist decision-makers in addressing climate-induced migration in Oceania.

Background and Context

The Indo-Pacific region is home to some of the most frequent and violent natural disasters. Displacement and migration caused by catastrophic events are normal for this area, however, climate change has accelerated and intensified these events. Climate change is rarely the sole push factor leading to migration, but as conditions worsen it is increasingly becoming a larger driver for many Pacific Islanders.

Migrants who are displaced and forced to relocate due to the effects of climate change are generally referred to as "climate refugees," "climate migrants," or "environmental migrants." There is an important distinction between people who *voluntarily* move because of worsening climate conditions versus those who *involuntarily* relocate because

Homes on Queens Road in Fiji face the encroaching ocean.

Courtesy Photo/ Maksym Kozlenko

continued settlement in their homeland is no longer feasible. For this report, involuntary migration is primarily considered and will be referred to as "climate-induced migration" or "forced climate migration."

Defining the Problem

The vast majority of islands in the Oceanic region are extremely vulnerable to climate change, particularly coastal flooding from rising sea levels and salinization of freshwater sources. Various scientific models have presented sundry results on the rising sea level's impact on the different types of islands. Most agree that low-lying atolls are most in danger of becoming submerged. Unfortunately, Oceania is comprised of numerous low-lying atolls. Some of the most notable examples include the Marshall Islands, portions of the Kiribati territory, the Cook Islands, territories in the French Polynesian region, disputed Chinese territory (Spratly Islands), and the Northwestern Hawaiian Islands.

Some studies suggest that a few Pacific Islands may have a natural means to resist rising sea levels.[1] Based on the Funafuti Island in Tuvalu, researchers found that coral reef islands (also known as coral islands) composed largely of gravel or sand have some capacity to adapt to rising sea levels.[2] As the sea level increases, more sediment is poured onto the land thus raising the elevation of the island.[3] This does not ensure complete immunity because this natural barrier is only effective if the reef surrounding the island survives. Additionally, scientists found this model to only be true for coral islands, not other rocky islands.

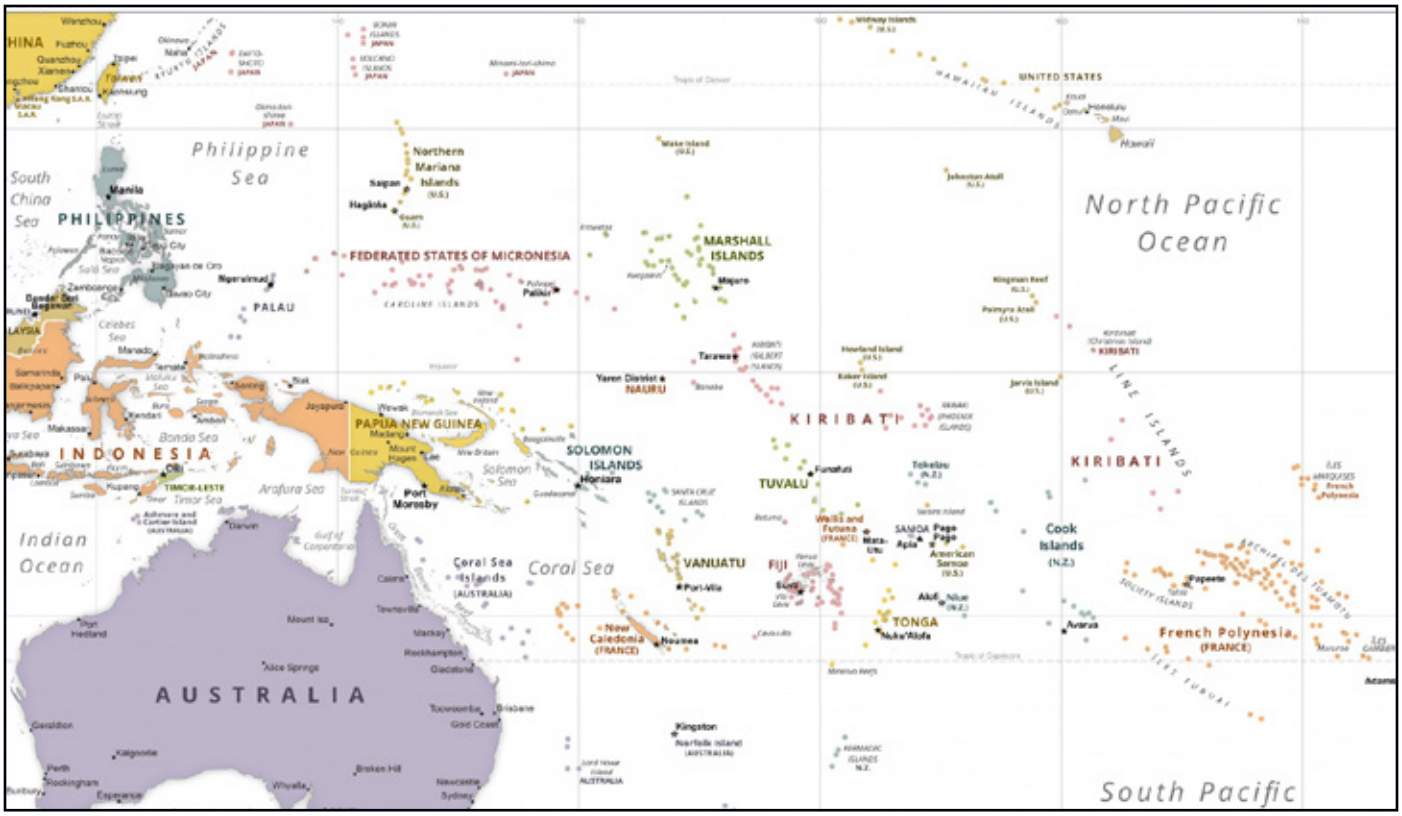
The scope of this paper focuses purely on the challenges that climate-induced migration will cause, but it is important to also recognize the other implications of migration. Violence and mental distress often increase following natural disasters and mass migration.[4] Other ramifications included low fertility rates, sub-replacement rates, and high illiteracy rates. It is also imperative to recognize that climate change is not solely responsible for all estimated displacements. Lack of resources, poor infrastructure, famine, and violent conflicts also play a significant role in those statistics. Climate change is, however, a threat multiplier and exacerbates issues.

Migration Trends

Oceania is extremely diverse culturally, geographically, and environmentally. These differences will impact migration patterns and factor into overall trends. Some territories have a mixture of islands and low-lying atolls thus migration will vary depending on each island's makeup. The Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM) and the University of Texas (UT) report on, "Forced Climate Migration in Oceania" details three types of migration: internal, intra-regional, and extra-regional.[5] These three types will provide the framework to better conceptualize forced climate migration. Internal refers to migration within an island, i.e. moving from a rural coastal area to an inland urban area. Intra-regional refers to movement from one island to another within the region but outside the original territory. Extra-regional refers to migration from one's home island to an area out of the region. For example, moving to the Global North (Australia, Canada, Europe, Israel, Japan, Russia, Singapore, New Zealand, and the United States).

Assuming that parts of the island of origin are still habitable, some studies suggest that internal migration will be the most common.[6] Countries that previously dealt with forced climate migration have primarily encountered internal migration. The strong cultural and historical ties to their homeland play a large role in this decision. This proclivity is also reflected in some Oceanic governments' decisions to focus on adaptation policies as opposed to creating relocation strategies. There are a few exceptions to this trend, most notably in Fiji and Kiribati. Both have a policy or program focused on climate-induced relocation. As climate conditions worsen, however, internal migration may become less plausible.

High poverty rates may be another explanation for



Map of Oceania.

the higher likelihood of internal migration. The UN reports that "a quarter of Pacific islanders live below 'basic needs poverty lines.'"[7] The vastness of Oceania and the lack of resources could physically prevent many individuals from migrating too far from home, despite the necessity to do so. Intra-regional or extra-regional migration may not only be against their preferences, but it may also be unattainable. Internal migration may therefore be their only option. If an island becomes nearly uninhabitable but the population does not possess the means to move, a new problem known as 'trapped populations' arises. A trapped population as explained by the International Organization for Migration is "when people feel the need and the desire to migrate but do not have the possibility to do so."[8] The 2011 Foresight Migration and Global Environmental Change report coined the phrase and became the launching point for further study.

If the population is both willing and able to migrate, intra-regional migration becomes the next best option. Since many Pacific Islanders have close ties to their land of origin it is understandable why they would prefer to move to a place that is culturally and environmentally similar. Thus, islands better equipped to withstand the consequences of rising sea levels will likely take on a greater percentage of migrants. Kiribati has developed treaties with other nearby countries in preparation for this type of migration.[9] Unfortunately, most of these islands are already short on space and have extremely limited resources. This will greatly constrain the number of migrants they can reasonably host.

Extra-regional migration to the U.S., Australia, New Zealand, or any other country is the most drastic and difficult. However, given the circumstances, it could become the safest and most sustainable option. Larger extra-regional states also can provide better economic and educational opportunities for migrating populations. These states may also have more resources to provide assistance and relief. Many of the neighboring regional islands that could provide a suitable alternative to a migrant's homeland have a very finite amount of space in

their urban centers. Their own access to land may be heavily limited due to coastal erosion and insufficient resources. This is especially true if multiple islands experience waves of a mass exodus within the same time frame. Regional host islands may be unable to accommodate high levels of immigration from a variety of other island nations. Larger nations outside the region are environmentally better suited to accommodate larger numbers of migrants.

The geographic location of extra-regional states is both a pro and a con. It provides a certain level of protection but also creates new challenges. As mentioned before, most islanders have a strong historical and cultural tie to their homeland and the water. Moving extra-regionally could hurt those ties. Most extra-regional nations have a drastically different culture that Pacific Islanders would need to adjust to. Their ability to fully participate and pass down their cultural practices may be severely limited. Additionally, migrants who move internally can occasionally return to their home island for special occasions. Islanders who migrate extra-regionally may not be able to share this luxury. Most extra-regional migration will likely happen because other regional islands may not have the economic and physical capacity to support large waves of migrants.

The three different types of migration patterns provide a helpful framework for understanding trends. Based on the geological makeup of each island, researchers can hypothesize where migrants are most likely to originate and what areas they will potentially travel to. Territories that possess low-lying atolls are likely to become the greatest source of migrants. The Micronesian and Polynesian islands are mostly low-lying atolls. As the sea levels rise, causing floods and freshwater salinization, these islands will quickly become uninhabitable. As such, internal migration is highly unlikely. Larger islands like Papua New Guinea, Fiji, and Guam have larger elevations and can withstand higher sea levels, thus migrating out of the country is not immediately necessary. Intra-regional or extra-regional migration from these areas will be due to over-burdened urban centers, strained natural resources, and low economic opportunities in the region. Though extra-regional migration is not currently the most common, this trend will likely change as conditions worsen.

Table 1 classifies the most prominent Pacific Island Countries (PICs) and hypothesizes which type of migration it is likely to experience. Classification is based on its vulnerability to rising sea levels, its proximity to other low-risk islands, and its proximity to larger land mass countries. PICs are classified into three levels of thresholds. The lower the number, the higher the percentage of the population that lives within 1 kilometer of the coast and is therefore susceptible to rising sea levels. A threshold of one means 100%-79% of the population lives within that 1km mark. Two means 69%-57% and three means only 30%-25%. The referenced report notes that this evaluation underestimates the percentage of the affected population because it does not include other aspects such as freshwater salinization.[10]

For the table, the author classified a country as likely to experience extra-regional if it met a threshold 1 and if their surrounding country neighbors are also classified as a 1. If the country was classified as a 1 but its neighbors included a mix of 2 or 3 threshold classifications, then intra-regional migration is listed as well. Countries with a threshold of 2 are classified as likely to have internal and intra-regional migration. Finally, a country with a 3 threshold is listed as likely to experience internal migration only. Three of the countries: Australia, New Zealand, and PNG are not accounted for in the original threshold reference table. However, given the large land masses of these areas, they likely would meet a level 3 threshold. Additionally, countries with asterisks represent states that could serve as potential hosts for climate-induced migrants.

Climate Change-Induced Migration Case Studies

This section provides a general overview of current and past climate-induced relocation programs. Fiji, PNG, and Kiribati all demonstrate the different types

of migration. The case studies serve to illustrate how migration has occurred and the challenges they faced. Studying these events creates useful lessons and helps future decision-makers understand the unique challenges this region presents.

Case Study 1: Fiji

In 2014, Vunidogoloa, a rural coastal village on Fiji's Vanua Levu Island became one of the best recent examples of climate-induced migration and relocation. The slow onset climate effects forced the 150-person village to relocate.[11] Vunidogoloa demonstrates internal migration as the population first tried to move further inland before eventually moving to another island within the Fijian territory. Community members requested government assistance after their continuous efforts to retreat further inland failed to protect them. The Fijian police were primarily responsible for the logistics of relocation and worked in partnership with community lead-

Table 1. Population Size and Hypothesized Type of Migration

Country/ Territory	Threshold	Population	Migration Type
American Samoa*	2	55,312	Internal and Intra-regional
Australia*	Not listed	25.4 million	Internal
French Polynesian	1	279,287	Extra-regional
Fiji*	3	889,953	Internal
Guam*	3	167,294	Internal
Kiribati	1	117,606	Intra-regional and Extra-regional
Marshall Islands	1	58,791	Intra-regional and Extra-regional
Nauru	1	12,581	Intra-regional and Extra-regional
New Zealand*	Not Listed	4.9 million	Internal
Niue	3	1,620	Internal
Northern Mariana Islands	2	57,216	Internal and Intra-regional
Palau	1	18,008	Intra-regional and Extra-regional
Papua New Guinea*	Not Listed	8.7 million	Internal
Samoa*	2	197,097	Internal and Intra-regional
Solomon Islands	2	669, 823	Internal and Intra-regional
Tonga	1	104,494	Intra-regional and Extra-regional
Tuvalu	1	11,646	Intra-regional and Extra-regional
Vanuatu	1	299,882	Intra-regional and Extra-regional

ers.[12] The entire process cost the Fiji government approximately FJD $740,000 (USD $356,454) and the community subsidized around FJD $240,000 (USD $115,607) in timber for construction.[13]

Island submergence was not the only or even primary cause of relocation in Vunidogoloa. The tidal inundation and coastal erosion significantly damaged the island's infrastructure. This prevented normal movement around the island and endangered their livelihood. Additionally, the saltwater intrusion damaged their agriculture. Residents struggled to produce their traditional crops. Crop failure severely endangered their ability to provide food for their community. These conditions prompted the Fijian government to relocate its citizens. This effort provides a great example of how PICs are not only in danger of submergence due to rising sea levels. Other climate change effects can severely damage resources thereby initiating relocation. As this case demonstrated some islands may resist sinking, but nevertheless become uninhabitable.

Like many other PICs, land in Fiji is customarily owned. This means that property in the country cannot be traditionally bought and sold; instead, it is passed down through families. Only 4% of the land belongs to the government and 6% is free to be bought and sold.[14] The remaining 89.75% of the land belongs to the iTaukei communal groups. Developments are allowed on this land, but a lease must be issued by the iTaukei Land Trust Board.[15] Fortunately, the Vunidogoloa villagers belonged to the same *mataqali* (a Fijian clan or landowning unit) that had available land.[16] Since the migrating population belonged to the same familial group that owned the land, no cultural conflict existed. If, however, the migrating population belonged to a different mataqali then they would have had a more difficult time finding suitable land. This cultural consideration will play a large role in future relocation efforts.

Case Study 2: Papua New Guinea

The Carteret Islands (CI), an atoll in the autonomous region of Bougainville, Papua New Guinea has also become a classic tale of the horrors of climate change, global warming, and rising sea levels. This small group of islands is largely uninhabitable due to coastal flooding, erosion, salinity intrusion, and destroyed ecosystems.[17] In 2006, the Carteret Council of Elders led an effort to migrate internally to different locations in Bougainville by creating an organization called Tulele Peisa.[18] Their new homeland was donated by the Catholic Church. Unlike the Fiji case, the residents were not only in favor of moving but were also the main drivers.

Community leaders have long recognized the problems that rising sea levels cause and felt the PNG government did not have a strong enough response. This prompted them to take action and devise a plan to protect their people. Their plan included three components. The first was to create exchange programs between the Carteret and the host site population. The second step included securing land and building housing and infrastructure for the relocated families. The final step, which has yet to be completed, is to create "agricultural and income generation projects."[19] Many of the members including Tulele Peisa leader, Ursula Rakova, view their program as an opportunity to create a blueprint for other climate-induced migrants. The initial concern started in 2006 and the Tulele Peisa received a grant for relocation in 2007.[20]

Due to the limited space in Bougainville, CI residents are still searching for other places to migrate. This has proven challenging since 97% of the land in PNG is customarily owned.[21] As sea levels continue to rise the pressure to find a more sustainable place increases.[22] This is a challenge that will broadly apply to islands experiencing internal and intra-regional migration.

Case Study 3: Kiribati

Kiribati developed the National Framework for Climate Change Adaptation in 2013. This document lays out the Kiribati government's plan to respond to climate change through a five-part strategy. Part of their strategy includes intra-regional and extra-

regional migration. Population resettlement is one component of their planning document. It aims to "reduce the vulnerability of Kiribati to increasing physical risks caused by climate change by establishing host country agreements to government-sponsored and self-sponsored emigration to resettle I-Kiribati overseas and assist the inevitable migration of the population, due to climate change as and when this eventually arrives."[23] The government hopes to begin the process of creating I-Kiribati communities overseas so that when the "inevitable migration of the whole population" arrives they have resources and assistance. The Ministry of Health, Ministry of Internal and Social Affairs, Lands, Management Division, Water Management Division, Environment and Conservation Division, National Economic Planning Office, and others are currently overseeing this process.

Kiribati's isolated low-lying atolls with highly concentrated population centers, make it one of the most vulnerable countries in the world.[24] Its susceptibility is further compounded by the population's low socioeconomic composition. Over the past few years, Kiribati has already experienced waves of internal migration to one of its largest urban centers, South Tarawa. Almost half of the population resides in this area, and it continues to attract more migrants as sea levels steadily rise. Unfortunately, this city faces many strains, poverty being the most prominent. The most up-to-date statistics from 2006 show that the poverty rate was 21.8% in Kiribati and 24.2% in South Tarawa.[25] The added population places a greater strain on the nation's economy and natural resources. While South Tarawa has provided a haven in the past, this option is not sustainable economically. Additionally, South Tarawa is a narrow island and most of the infrastructure is along the coast which exposes the population to the negative effects of climate change. Given dramatic increases in sea level, South Tarawa could become completely uninhabitable. Due to poor economic circumstances compounded with environmental vulnerability, most I-Kiribati will likely need to migrate externally. Fortunately, the Kiribati government understands this reality and has begun establishing relations with neighboring countries. For example, in 2014, the Kiribati government purchased land from Fiji to house climate-induced migrants.[26] However, in February 2021, the Kiribati government began converting this land into a farm to provide food for its citizens in Kiribati.[27]

Challenges

Based on the relocation programs outlined in the previous section, each country encountered various challenges. The issues that arose can be understood in two separate, but related categories: physical

Tanaea-Buota Bridge, an Engineering Civic Action Project (ENCAP), was constructed by U.S. and allied partner nations in Kiribati in 2009. Members of the community tour the bridge for the first time. Photos by Mass Communication Specialist 2nd Class Joshua Valcarcel/ U.S. Navy

challenges and cultural challenges. Understanding not only the physical issues that mass migration can cause but also considering the cultural nuances will create a holistic view and better help decision-makers formulate a course of action.

Physical Challenges

1. Geographical Isolation

The territories in this region are extremely isolated from larger land masses and one another. This isolation makes it harder for assisting governments to respond quickly and makes moving extremely dangerous. Millions of people are at risk of becoming displaced, thus providing aid and transporting residents becomes an extremely daunting and slow task. This challenge is further complicated by the sheer vastness of the ocean. There will likely not be a central location to coordinate efforts or gather migrants together in every region. Assisting governments and relief organizations must be aware of how geographically spread out their assistance may be required. Traveling long distances over the ocean will significantly limit the amount and type of supplies that organizations may be able to transport.

Additionally, as more people attempt to migrate, the possibility of other issues arising increases. Without a proper vessel, traveling across large bodies of water has proven to be extremely dangerous and even deadly. The Rohingya sea migration provides a gruesome cautionary tale. Since 2017, hundreds of refugees fleeing Myanmar have died, thousands have become stranded at sea and thousands more arrive at refugee camps with serious medical conditions.[28] Refugees were also subjected to human trafficking, abuse, and exploitation. Mass migration across the world's largest ocean will likely be even more dangerous and deadly. As such, search and rescue capabilities from assisting entities should be prepared to respond to this challenge.

2. Limited Natural Resources

As islands slowly become uninhabitable, population density on habitable lands will increase. Consequently, the natural resources become strained. Land, agriculture, and water are the three most basic resources that are most vulnerable. First, the land is extremely limited on many of these islands. Even the larger islands such as Fiji, PNG, Guam, and New Zealand have limited habitable land due to the mountainous regions, geography, and customary practices. Secondly, to make room for a larger population, agricultural land will likely become compromised. The demand for natural resources will increase in some locations, yet climate change may significantly degrade those resources.

Rising sea levels can cause salinization of fresh water sources that affects both potable water and harms agricultural production even on larger islands that are not at risk of submergence. Decreasing agriculture capabilities also create food insecurities. The little agricultural land available will be further limited by salinization from floodwaters. In many PICs, food must often be imported from other regions. While addressing mass migration, host PICs will likely need even greater food importation. This is a challenge that will be immediately necessary for the short term and needed to sustain the increase in population over the long term.

Other effects of climate change include higher temperatures, droughts, and flooding that threaten the natural resources in PICs. These severely threatened resources are expected to come under even more pressure as the population density in host countries, specifically other PICs increases. Responders and decision-makers should be aware of these challenges. These issues are also likely to drive higher rates of extra-regional migration.

3. Weakened Infrastructure

Climate change intensifies natural disasters which can destroy infrastructure. Once structures like roads, electrical grids, water supplies, and telecommunications are damaged, it can take years and millions of dollars to reconstruct. Kiribati, the Solomon Islands, and Tuvalu are among the most vulnerable and have been classified as a Least Devel-

The village of Vunidogoloa on Vanua Levu was the first community in Fiji to relocate because of coastal erosion and flooding attributed in part to climate change.

Nansen Initiative/ UNOCHA

oped Country (LDC) by the United Nations.[29] These territories tend to have less funding for their infrastructure due to their low economic standing. The infrastructure that does exist is heavily threatened by climate change and natural disasters. The Fiji case study showed how weakened infrastructure could lead to relocation. In addition to causing displacement, damaged infrastructure can stifle migration potentially trapping people in an unsafe environment. Damaged pathways filled with debris and other hazardous material pose a health and physical risk for migrating populations. Extreme flooding contaminates water sources with power lines, waste, harmful chemicals, and wild animals.[30] Additionally, water can become breeding grounds for water-borne illnesses or attract pests that spread diseases.[31] Internal migration becomes more dangerous and intra-regional and extra-regional migration becomes more necessary.

Weakened infrastructure not only becomes a public health concern, but it also can significantly limit disaster relief efforts. Agencies may be unable to distribute humanitarian aid in certain areas due to the damage caused by extreme flooding. Responding agencies may not be able to reach the population in need or may not be able to properly distribute humanitarian aid. Relief capabilities will likely become less efficient and more challenging. Rebuilding infrastructure is extremely costly and challenging, yet without it greater challenges are created.

4. Increased Urbanization

Forced mass migration risks creating increased urbanization both in PICs and in extra-regional host countries. The rural coastal areas are not conducive to hosting large migrant populations. This is primarily because coastal areas significantly expose the population to the harsh effects of climate change. Additionally, the lack of access to social support services in rural areas provides a huge barrier. Since climate-induced migrants are fleeing from one exposed area it is in their best interest to move to another area and urban centers generally provide the best option. Urbanization will increase due to

A girl wears traditional dress in Milne Bay, Papua New Guinea.

climate-induced migration and climate change-related migration. According to the International Labour Organization, higher urbanization rates lead to other problems such as "[limited] access to land by migrants, a lack of employment and limited opportunities for subsistence livelihoods, and the growth of squatter settlements, which have limited access to infrastructure and are often located on exposed sites, such as low-lying or steep land."[32] With land already extremely limited due to the smaller sizes of many islands, heavily concentrating a migrant population in one area can exacerbate problems and strain public services. Increased urbanization also worsens public health problems due to a lack of sanitation and crowded areas, and water sanitation systems.[33] Additionally, host countries will need to address social issues like higher unemployment rates. Mass migrations can place a substantial strain on their social services.[34]

Despite the numerous challenges mentioned above, increased urbanization may be necessary and helpful. It centrally locates migrant populations in one area instead of dispersing them. In a geographically isolated region like Oceania, urbanization can overcome the aid distribution challenges mentioned above. This is especially important since responding organizations will need an area to coordinate efforts and distribute supplies. Responding entities should be aware that in exchange for ease of access, there is the potential for the difficulties discussed above.

Cultural Challenges

1. Conflicting Customs and Social Structures

The social and cultural challenges are perhaps the most nuanced and will vary depending on which population is migrating away from their home. In many Pacific Islander cultures, the land is symbolic and deeply embedded into their social norms. Oftentimes, it is only passed down through familial lines. For example, the residents of the Carteret islands live in a matriarchal society in which land is passed down from the mothers to their daughters. Territories with deep historical and ancestral ties often cannot be bought or sold. This presents a major challenge to acquiring land in an already limited space. In some cases, the government is completely unable to acquire new land for potential migrants. Even local clans that wish to assist in relocating other refugees can be prevented from selling land. The Vunidogoloa case of resettlement was a fortunate exception. As a larger number and more diverse populations are forced from their homes, this will become a significant challenge. Land on PICs is

extremely finite by nature, they have smaller landmasses and sometimes mountainous regions that make them inhospitable for humans to reside. These cultural differences are not just socially understood, oftentimes the local legislature reflects these norms as well. Relocation may entail reforming local laws in addition to moving entire populations. Host countries may need to acquire legal title to land to provide for increases in their population.

Each ethnic group will also have differing complex social structures. The I-Kiribati interaction with the PNG government is the best example. They are primarily a matriarchal chiefdom with a governing body called the Carterets Council of Elders. Even though the Council of Elders was the main driver of their relocation programs they needed the PNG government to authorize their plan. PNG has authority over the island territories, but the Council of Elders and Chiefs has local authority granted by the House of Representatives of the Autonomous Bougainville Parliament to represent the islanders. Other PICs have dual authority structures as well. Host countries and responding agencies will need to be sensitive to these differences.

2. Population Reluctance

Pacific Islanders' deep cultural and historical ties to their homeland account for the significant reluctance to relocate. Though the urgency of climate change is felt across the Oceania region, the response varies greatly. The Vunidogoloa case illuminated how reluctance became a challenge. The elderly in particular, tend to be the most resistant to migrating. Many hold firm religious beliefs that their land will be protected. One study observed that the younger generation felt more comfortable leaving their home island compared to the older generation. This general sentiment is reflected in the climate change adaptation plans that PICs have formed. Some adaptation plans do not include sections on potential resettlement or migration. Despite the worsening climate change effects, decision-makers show a clear proclivity towards mitigation plans as opposed to migration. The exception to this trend is Kiribati, which has framed population relocation as inevitable.

In the Vunidogoloa case, the villagers moved from one island within the Fiji territory to another. Many saw this as a huge loss. A similar sentiment can be expected from other populations across Oceania. Migrants moving extra-regionally will likely have an even greater struggle. Migration as a last resort option has the potential to endanger populations as they risk waiting too long to move. The more a population resists, the direr the circumstances they encounter that eventually force them to take refuge elsewhere. This means that the responding agencies will need to prepare to provide emergency responses. As previously mentioned, most climate-induced migration will not happen in one catastrophic event and is likely to create waves of migrants over time. Even with this trend, an extremely reluctant popula-

Village on South Tarawa atoll, Kiribati.

Maloff / Shutterstock

tion increases the likelihood of becoming stranded or trapped. In the "migration trend" section of this paper, the potential for trapped populations existed for socioeconomic reasons. This possibility also exists for reluctant populations. Responding agencies should be extremely sensitive and aware of this challenge. Ignoring the perspective of locals losing their land will be detrimental to relations and could lead to creating a more dangerous situation. In addition, reluctant populations will likely struggle more with integrating into their host country.

3. Population Integration

Relocating populations internally, intra-regionally, and extra-regionally is a massive task with a unique set of challenges. Everything from selecting land to transporting mass amounts of people to meeting migrants' basic needs all require a great amount of effort and consideration. The other facet of migration is the population's integration into their host country's society. Migrating into a new society, especially extra-regionally, can fracture migrants' social structure. The above paragraphs explained how certain cultural norms conflict with migration, but it also hinders a population's ability to integrate into their new home. Aside from the culture shock that many will encounter, other tangible challenges arise. Many Pacific Islanders are highly skilled in subsistence farming. With some extra-regional societies, this skill may not provide enough income to sustain migrant families. Additionally, the intra-regional territories may have less agricultural land in general for them to work and live. Their skills are suited for life on their home island, but may not help them become productive in their new home. Other factors like language barriers or traditional gender roles may hinder their ability to smoothly integrate. These issues by themselves may not seem significant, however, if mass amounts of people are experiencing difficulty, then that creates issues for host governments. Problems like high unemployment rates, poor physical and mental health, and strains on social services could negatively affect a government's ability to aid migrants. This issue also exists within climate change-related migration as well, but it does not become detrimental to the host government when there's a small population struggling to integrate.

The Kiribati government recognized this challenge and has incorporated a solution into their relocation strategy. They plan to utilize the I-Kiribati communities abroad to help settle future forced climate migrants. The government encourages its residents to continue moving abroad for this reason. The voluntary climate change-related migrants could prove to be beneficial in helping others successfully migrate and cope. Areas with high immigrant populations often adopt resources to better serve their residents. This could include language classes, bilingual schools, and job training programs. These existing resources could be modeled and utilized in other places to help integrate future migrants.

Lessons Learned

Each example highlights various challenges from which important lessons can be inferred. These cases possess numerous factors that make them unique, thus all of the lessons garnered cannot be applied to all situations. For example, the Kiribati government's decision to buy land from Fiji is an effective means of protecting their population. Other territories may consider similar strategies, but Fiji cannot be used as an option for every nation. The concepts provided in this section are meant to bring awareness, but it is by no means a comprehensive list of all the steps necessary to ensure a smooth migration. There are many other complex and unforeseeable issues that may arise. However, this report will provide decision-makers with an advantage by outlining the lessons already acquired from previous relocation programs.

One of the biggest physical challenges is the lack of available and suitable land to host migrants. Many will need areas for subsistence farming in addition to housing. As sea levels continue to rise and threaten culturally diverse regions, finding land that aligns with regional practices will become increasingly challenging. Government agencies will need to iden-

tify relocation areas well in advance. Waiting until thousands are displaced will exacerbate an already catastrophic event and introduce avoidable complications. Failure to create a plan for potential relocation could endanger many Pacific Islanders' lives. Additionally, negotiations with local ethnic groups may be necessary. This is a lengthy process and is best conducted ahead of drastically changed sea levels.

Vunidogoloa, Kiribati, and the Carteret Islands highlighted the importance of involving the local communities. The migrating population and host government will need to consider the cultural differences and move beyond those challenges. Both parties should be involved in the relocation process from the beginning. Local community leaders understand the needs of their people better than government agencies could. Relocating populations is more than just getting them to safety, it is also about ensuring they can continue to have a quality life afterward. Therefore, cultural considerations and challenges are equally as important as physical ones. Community members can also educate responding agencies on local customs and practices that may hinder efforts. This report mentioned how chiefdoms with dual authority and family-based land ownership can stifle migration and create larger issues. These are just a few potential challenges based on published studies. There are many more nuances within each culture that could present points of contention. The lack of consideration for the local community's opinions and preferences has caused huge issues in past relocation efforts. To forgo the challenges in the future, government officials must consider the opinion of the population they are affecting. The earlier responding agencies understand and include cultural considerations in their planning, the more efficient the process can become.

Human resource development prior to migration is another important lesson the I-Kiribati government learned. As previously mentioned, the migration process is about more than just moving populations from one location to the next. Creating a space where their basic necessities are met is crucial as well. It does the migrating population and the host countries little good to move a population from one dangerous location to the next. Employment, education, and healthcare are just a few of the areas that will need attention. Many cultures in this region primarily focus on subsistence farming, but in cases like extra-regional migration, these skills may not be adequate to provide for their well-being. In these cases, human resource development programs like job training and language instruction become crucial. Without proper resources, larger problems such as unemployment, homelessness, and illiteracy put people in a vulnerable state. This problem has the potential to snowball, creating larger issues for the migrating population and the host government. Unfortunately, these programs will create additional costs and burdens on the host country's economy. While it is ideal that these social programs are in place, not every host country will be able to afford them. If this is the case, it is important to note the additional challenges that can arise as a result.

Conditions to Consider

Each of the sections above highlight the lessons learned from existing climate-induced migration literature. These warnings are based purely on what has already happened. As such, it is worth understanding other factors that could influence the situation in the future. First, the political landscape will largely be responsible for shaping the logistics of how migration will take place. Depending on local politics some countries may be more or less willing to accept waves of migrants. Places like the US, Australia, and Europe continuously have debates over immigration. In March 2021, the Washington Post released a study gauging Americans' perceptions of different types of migrants. They found that "Our respondents saw climate migrants about four percentage points more favorably than economic migrants, those who migrate for better economic opportunities. But they preferred refugees to climate migrants by about three percentage points."[35] Navigating this tricky scenario will likely come into play as vulnerable PICs begin to

find land to host their populations. As their governments begin negotiating with various states, they will need to consider the political environment. As proven in the Rohingya case, if a host country is unwilling to take on migrants it severely endangers them and makes them even more vulnerable.

Second, one of the issues now with current climate-induced migrants is their legal status. The United Nations and governments have a specific definition for refugees and currently, those fleeing their homes due to climate change, do not meet that definition. As such, all of the legal protections that accompany someone possessing a "refugee" status do not apply. There are various efforts across international bodies that are working to address this gap and perhaps as the problem becomes more apparent a resolution will be reached. However, as it currently stands, climate-induced migrants are not classified as refugees and thus do not have protections under international law.

Third, the broader implications of mass migration should be considered. As mentioned earlier in the report, violence and mental distress are common among those who face a natural disaster. Migrants and refugees often face similar trends. Failing to properly address these issues could unnecessarily burden host countries and endanger the migrant populations' well-being. Host countries will need to address interpersonal and community violence. They should also be aware of the sub-replacement rates and high illiteracy that may accompany mass migration.

Finally, Islanders' access to social services is a potential problem. Even now in the United States, despite the immigration benefits that Islanders of Compact of Free Association nations receive, they are still barred from accessing social services. On one hand, this exacerbates issues such as unemployment, homelessness, and illiteracy which ultimately can burden a host country's economy. On the other, funding these resources for a new subset of the population could also severely weigh on the host country. Most governments would be cognizant of this dilemma which lead to them becoming less willing to accept migrants. Humanitarian organizations will become crucial to balancing these extremes. As a result, responding agencies will need to work closely not only with the local communities, and the local government but also outside humanitarian organizations. Once again, this highlights the importance of being proactive as opposed to reactive when addressing climate-induced mass migration.

Rabaul Volcano, is a large volcano on the tip of the Gazelle Peninsula in East New Britain, Papua New Guinea.

Areas for Future Research

Understanding the additional 'conditions to consider' uncovers various gaps in the present research. Studies on climate change-induced migration have exponentially improved over the last decade but researchers should delve deeper into certain topics to foster a more comprehensive understanding of the subject. First, it is important to understand the substantial ethnic, cultural, and linguistic diversity in the Oceanic region. Terms such as "Pacific Islanders" are

used to group hundreds of different ethnic groups. To truly understand the challenges and fully track migrants, the subcategories of "Pacific Islanders" will need dissection.

Additionally, the effects of voluntary climate change-related migration deserve more attention. Analyzing voluntary migration could shed light on issues such as integration, host population attitudes toward environmental migrants, and economic impacts. These issues in combination with climate-induced migration have larger implications than what is discussed in this report. Researcher, Sarah Munoz's paper "Understanding the Human Side of Climate Change Relocation" provides insight to the personal and political challenges of climate migration.[36]

Further research on trapped populations is necessary. To properly respond to this potential disaster, studies concerning the implications, challenges, and lessons learned must be conducted. This issue will require planning and preparation to successfully assist in providing relief efforts. Trapped populations and forced climate migration are created from the same environmental problems, thus they are closely linked. However, addressing stranded populations creates a unique challenge and requires individual response plans that differ from climate change-induced migration. Thinking through these challenges is crucial to managing this disaster.

Finally, a deeper dive into the cultural differences, political landscape, and effects on economies are all necessary. Political and economic realities will inevitably influence mass migration caused by climate change. Progressively rising sea levels increase the pressure on potential host states to reexamine their practices. Immigration policies should account for influxes of migrants. States, in partnership with the migrating country's government, may need to locate potential land. Doing so not only mitigates cultural conflicts but also reduces the burden placed on urban centers. The economic effect will be tremendous. Understanding the potential impacts on all parties involved (migrants, origin governments, and host governments) is key to preventing extreme economic conditions. If governments, international organizations, and other responding groups can clearly comprehend the financial implications, then they can better plan and coordinate efforts to address the problem. Waiting to discuss immigration policies, locate land, and address economic concerns until migrants are at their shorelines could prove catastrophic for host countries. This report fervently recommends a proactive approach to address this issue which includes initiating dialogue.

Conclusion

Migration is not a new or uncommon practice for the Oceanic region. Even migrating specifically due to natural disasters or worsening climate conditions is not a new phenomenon. Unfortunately, as sea levels continue to rise causing coastal erosion, intensified natural disasters, and water salinization, more people will be forced to leave their homes. Numerous uninhabited islands in the Pacific have already become completely submerged. On habitable islands, residents have been forced to move further inland or relocate to an entirely different island. The three case studies presented in this paper outline three different scenarios which provide meaningful lessons learned. Responding organizations, decision-makers, and government entities should begin the planning process to address forced relocation. Migrants, countries of origin, nor host countries can afford to ignore the potential mass climate-induced migration that severe climate change will cause.

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Climate Change Priorities in the Republic of the Marshall Islands

The Fight against Climate Disruption

By Monica Bennett, Luis Lopez, Nicholas Sakamoto, Shelly Ueda, & Staci Sakoda Yoshihara, Master Of Public Administration Graduates, the University of Hawai'i Public Administration Program

A Coast Guard HC-130 Hercules aircrew flies over a commercial fish carrier on Taka Atoll in the Marshall Islands in 2019. The ship was stranded during a storm.

Courtesy Photo/ U.S. Coast Guard

The Republic of the Marshall Islands (RMI) is one of the lowest lying nations in the world and is vulnerable to climate change-influenced hazards and to associated impacts from the U.S. nuclear testing program that ran from 1946-1958 in the islands. This report focuses on RMI executive policies and parliamentary resolutions as well as strategic plans published by both the RMI and the U.S. We analyze these policies, resolutions, and plans in order to find shared ground between RMI's priorities and U.S. interests. Among the key areas of common concern are the impacts of rising seas and storm surges on nuclear waste containment areas.

Country Background

RMI is a chain of over 1,200 islands and islets spread over 180,000 square miles (466,198 square kilometers) of the Pacific. None of the inhabited 29 low-lying atolls and five coral islands are more than 20 feet (6 meters) above high tide.[1] The total population as of 2022 is 42,782 people.[2] Spain claimed the islands as a colony in the 1500s and then sold the islands to Germany in 1885. The Japanese military seized the islands in 1914. A combination of massive Japanese immigration and forced labor led to a significant drop in the native population. The U.S. took control of the islands in 1945 during World War II and eventually signed a Compact of Free Association (COFA) with RMI in 1983. The Compact was finalized in 1986, and RMI has been an independent nation thereafter.[3]

Climate Conditions

RMI has an average temperature of 81°F (27°C) year-round with hot and humid conditions. Wet and dry seasons alternate with the wet season starting in May and ending in December (The Republic of Marshall Islands Embassy, 2022). The northern atolls receive approximately 20 inches (500 millimeters) of rain per year compared to the wetter southern atolls that receive, on average, 160 inches (4,000 millimeters) of rainfall.[4] Several northern atolls are uninhabitable because of insufficient rain.[5] Although RMI's islands border the Pacific typhoon belt, they rarely experience severe typhoon conditions. The northern islands are more exposed to typhoons than the southern islands.

Two key global oceanic and weather phenomena impact RMI – convergence zones and El Niño. The overall climate depends on the trade winds and movements of the South Pacific Convergence Zone (SPCZ), a spur of the Inter-Tropical Convergence Zone (ITCZ). An area of wind convergence and higher temperatures that drive regular rain and thunderstorms, the ITCZ broadly controls the wet and dry seasons in the tropics. The SPCZ is an area of low-pressure rainfall that breaks away

from the equatorial ITCZ and moves southward in the Pacific.[6]

The El Niño Southern Oscillation has an impact on both flooding and droughts. RMI tends to experience heavy rain during the first half of an El Niño year as the phenomenon redirects the development of tropical storms away from Micronesia and toward RMI.[7] The year following El Niño tends to bring rainfall significantly below average during the first few months of the new year, leading to severe drought. Sea levels drop significantly during strong El Niño years and rise in the summer months the subsequent year. El Niño conditions affect RMI's freshwater, infrastructure, public health, and agriculture.[8] Because of its low-lying character, RMI is highly susceptible to coastal flooding driven by storms,[9] as illustrated in Figure 2,[10] but both storms and drought influenced by a strengthening El Niño trend portend future humanitarian catastrophe for the people of RMI.

Rising temperatures have been noted in RMI over the past four decades. Majuro (southern Marshall Islands) and Kwajalein (northern Marshall Islands) have reported an increase in the number of warm days every year and a decrease in the number of days marked by cooler temperatures. Figure 3[11] shows how RMI's coral will react to rising ocean temperatures. Moreover, annual rainfall recorded in Majuro has decreased by 5% since 1954. Studies suggest the change in rainfall patterns is due to the ITCZ moving away from Majuro. The combination of surging temperatures and rising sea levels will intensify tropical storms, typhoons, droughts, and flooding.[12]

Compact of Free Association (COFA)

In 1986, the U.S. and RMI entered into a bilateral treaty, the Compact of Free Association (COFA), which has government, economic, and defense provisions. While the agreement recognizes RMI's sovereignty over many policy areas,[13] the defense provisions in particular gave the U.S. perpetual strategic rights to deny third-party nations' military access, and this element is considered a critical component to U.S. national security.[14] In exchange, the U.S. assumed all responsibility to defend the RMI from attacks or threats. Furthermore, the Compact provided the right for the people of the RMI to seek employment, education, and medical services, and to establish non-immigrant residency in the United States. Compact provisions also include compensation to Marshallese citizens who experienced loss or damage to property or life as a result of the U.S. nuclear testing program that occurred between 1946 and 1958.[15]

Figure 2: Ebeye Island in Kwajalein Atoll (l) and Inundation from Waves in Kwajalein's Lagoon (r)

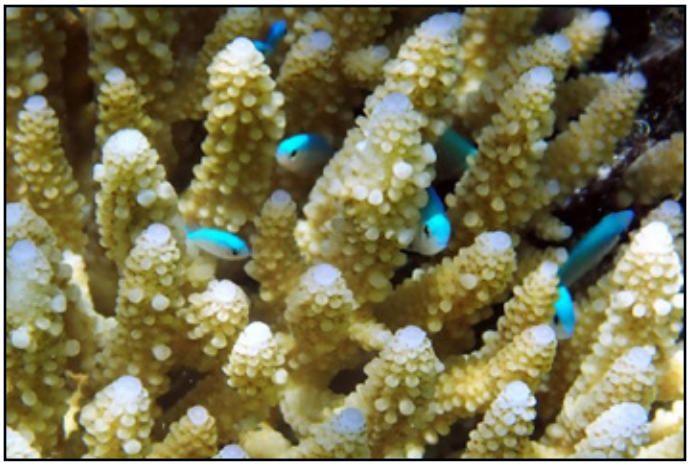


Figure 3: Coral Showing Signs of Heat Stress, Marked by Purple Tips by Lorena Iniguez Elebee and Sean Greene.

Pursuant to the economic relations provision (Title II) of the Compact, the U.S. has provided financial assistance to the people of the RMI since 1986. Grants distributed to the RMI are overseen by the U.S. Department of the Interior to aid in the country's economic advancement and self-sufficiency. The U.S. also contributes to the RMI's Compact Trust Fund, which exists to provide revenue to the RMI after the Compact's grant assistance program ends. Additionally, RMI receives funding under the Compact's Federal Programs and Services Agreement for postal, weather, aviation, and disaster assistance and is eligible for U.S. grants to support agriculture, environmental monitoring for nuclear-affected areas, and public health programs.[16] The Compact was renewed in amended form in 2003 (Compact II), and this renewal extended the economic provisions for an additional 20 years. However, revisions of the agreement require funds to be administered to six sectors under the new Fiscal Procedures Agreement and the Trust Fund Agreement. Distributed funds under the revised Compact are administered by the Joint Economic Management Committee (JEMCO), which consists of three members from the U.S. Government and two from the RMI.[17]

According to a 2022 study by the U.S. Government Accountability Office, the aggregate of U.S. grants provided to the RMI on an annual basis totals US$56 million. The impact is illustrated by the fact that such grant funding supported over one-third of the RMI government's FY2019 expenditure budget (per the RMI's most recently audited financial report). Therefore, it is apparent that the RMI government is reliant on provisions outlined in the Compact. With Compact grants and the Supplemental Education Grant (SEG) set to expire at the end of 2023, there is expected to be a large, potentially destabilizing financial gap as the Compact Trust Fund is not projected to produce disbursements until after 2033.

Methodology

Based on the U.S. Indo-Pacific Command's request to illuminate linkages between U.S. policy and RMI priorities and plans. The team first performed an independent search to identify the RMI government's current plans and priorities to address climate change. The criteria for the search of documents required identified RMI goals addressing disaster risk and/or climate change objectives for the current and future well-being of the Marshallese people. Common goals and priorities found in the numerous governmental strategic and environmental plans were considered by our team as defining the RMI's priorities.

To be considered for this paper, one or more aspects of an executive policy document required the ability or intent to impact climate change concerns relative to adaptation, disaster management, mitigation, or loss and damage. We considered policies that address: energy demand by promoting low carbon energy supply and sustainable land use; climate-related research and development; mitigation efforts; natural disaster risk management; restrictions on the growth of fossil fuel-based infrastructure; low-carbon transport; and the nuclear legacy. To enable a distinct understanding of how RMI prioritizes climate change, we assessed policy documents to identify the most relevant areas of government activity relative to achieving their objectives. The criteria for the search of parliamentary resolutions also required that one or more aspects of the resolution address climate change resiliency.

A comparative analysis was performed to align

researched policies, resolutions, and strategies to the RMI's climate change priorities. The analysis was then extended to examine how RMI priorities align with U.S. priorities, as outlined in the September 2022 U.S. Pacific Partnership Strategy (PPS). Findings from the comparative analysis were used as an aid to form our recommendations.

Executive Policies, Plans, and Strategies

This section is not a comprehensive list of policy documents that fit the criteria for consideration. Rather, herein we discuss the major documents that illustrate RMI's conclusion that disaster risk management, disaster response planning, and climate change adaptation dovetail and may, in fact, have knock-on climate change mitigation effects.

RMI - Executive Policies & Acts

The National Climate Change Policy Framework (NCCPF), implemented in 2011, guides the "All Islands Approach" to adapt and develop measures to address RMI's needs. It establishes a blueprint for building partnerships with regional and global partners to foster a sustainable environment where RMI is prepared to manage the current and future impacts of climate change.[18] In 2014, the Joint National Action Plan for Climate Change Adaptation and Disaster Risk Management (JNAP) was introduced to define adaptations against the effects of climate change and to align effective and appropriate responses to natural disasters with actions identified under the RMI National Action Plan for Disaster Risk Management 2008-2018 and the NCCPF.[19] Further, RMI recognized the need to promote sustainable development and governance of development efforts to address shortfalls in environmental conservation, and the Office of Environment Protection and Policy Coordination (OEPPC) developed the National Environment Management Strategy 2017-2022.[20] This document deepens discussion of the environmental risks addressed in the NCCPF and illustrates RMI's commitment to the Sustainable Development Goals (SDG) set forth in the United Nations-led 2030 Agenda for Sustainable Development.

Though RMI's total greenhouse gas emissions are negligible on a global scale, the country takes its national motto, "Jepilpilin ke ejukaan" ("Accomplishment through joint effort"),[21] very much to heart.[22] RMI recognizes that it has a role to play in the global effort to combat climate change; even with limited means, it will undertake ambitious action. In its Nationally Determined Contributions, the RMI made plain its commitment "to the full, effective, and transparent implementation of the Paris Agreement" per its provisions and relevant decisions of the Conference of the Parties to the United Nations Framework Convention on Climate Change. [23][24]

In the JNAP, RMI commits to further developing and enhancing the existing adaptation framework to build upon integrated disaster risk management strategies through the development and implementation of a national adaptation plan and further integration of strategic development planning such as protecting traditional culture and ecosystem resources, ensuring climate-resilient public infrastructure, and pursuing facilitative, stakeholder-driven methods to increase the resiliency of privately-owned structures and resources. The plan committed RMI to seeking the legal and regulatory means to best support these approaches.[25]

RMI has identified that water security is a priority development area urgently in need of adaptation strategies and resources due to experiences of drought and post-disaster rehabilitation.[26] The government developed the National Water and Sanitation Policy to provide guidelines and support central and local governments to formulate water and sanitation laws, strategies, investment programs, projects, and plans.

RMI Parliamentary Resolutions[27]

Resolution 52 (2015)

This Resolution approves RMI's ratification of the 2012 "Doha Amendment" of the Kyoto Protocol (1997) that operationalized the United Nations

Framework Convention on Climate Change (UNFCCC). It encourages RMI to commit to the reduction of greenhouse gas emissions during the period 2013-2020.

Resolution 19 (2016)

This Resolution approves RMI's ratification of the Paris Agreement. It also addresses actions and developments to eradicate poverty and promote human rights. The Resolution emphasizes ensuring the integrity of all ecosystems, including oceans and their biodiversity. It places importance on government engagement with the community in education, training, and active participation in recognizing sustainable lifestyles.

Resolution 83 (2019)

The RMI petitions the entirety of the international community and Paris Agreement signatories to recommit to the goal of limiting the global temperature rise to 1.5°C (2.7°F). This resolution declares a national climate crisis as the RMI is a low-lying coral atoll nation, and it calls on all parties to reach net zero emissions by 2050.

Resolution 36ND1 (2021)

This resolution appeals to the U.S. government to consider using Mili Atoll as an additional defense site.

Resolution 37 (2021)

This resolution appeals to the U.S. government to integrate climate change concerns into negotiations surrounding the COFA because the impacts of climate change pose a national security threat to RMI. The resolution welcomes the Biden administration's declarations on climate change and rejoining the Paris Agreement. The climate change-influenced hazards mentioned in this resolution are sea level rise, heatwaves, wildfire, disease, drought, crop failure, ocean acidification, mass extinction, collapse of food chains, saline intrusion, pluvial flooding, coastal flooding, and mass population migration.

Resolution 45 (2021)

This resolution underscores the importance of the Laura groundwater lens and highlights the threat of contamination of this resource by a lack of sewerage and a rising population that, over time, will lead to higher mortality rates in the area and, subsequently, to water contamination from mortuary practices. The main priority for residents of the Laura area of Majuro Atoll is to install a proper sewerage system in their community.

U.S. - Pacific Partnership Strategy

According to the Center for Strategic and International Studies (CSIS), "For years, the Pacific Island region suffered from strategic neglect from Washington and others, and Beijing has stepped into that strategic vacuum, moving to increase its influence and project its power across the region" (Edel, 2022).[28] Assessments such as this one sparked action from the Biden administration to send representatives to the region and to promise more engagement and resources. The three main objectives of the U.S. Pacific Partnership Strategy (PPS) are to partner with the Pacific Islands to drive global action to combat climate change, to maintain free, open, and peaceful sea lanes, and to ensure that growing geopolitical competition does not undermine the sovereignty and security of the Pacific Island States.

The PPS is broken down into four complementary and overlapping objectives: a strong U.S.- Pacific Islands partnership, a united Pacific Island region connected with the world, a resilient Pacific prepared for the climate crisis and other 21st-century challenges, and empowered and prosperous Pacific Islanders. The administration will approach these objectives by taking the Pacific Islands Forum (PIF) as its guide; that forum has stated it seeks "effective, open and honest relationships and inclusive and enduring partnerships—based on mutual accountability and respect." In pursuit of these partnerships, the Biden administration indicated that its approach will align with the U.S. Indo-Pacific Strategy, which envisions a free, open, interconnected, secure, resilient,

and prosperous region, and specifically commits in its action plan to "Partner to Build Resilience in the Pacific Islands".[29]

Case Study - Runit Dome

On Runit Island, one of 40 islands in Enewetak Atoll, sits the Runit Dome, also known as the Cactus Crater containment structure or "the tomb" to locals. It was constructed in the late 1970s and holds over 104,000 cubic yards (79,500 cubic meters) of contaminated soil and debris left by the United States' nuclear testing program. Shown in Figure 4,[30] the dome's diameter is 374 feet (114 meters), and its apex is 24.3 feet (7.4 meters) high. The base of the dome is an unlined nuclear test crater left by the 1958 "Cactus" nuclear test, and because the groundwater beneath the dome is in direct contact with the surrounding ocean and lagoon, it rises and falls with the tides.[31] The base of the crater is filled with a mixture of contaminated soil, debris, and cement that sits below high-tide level. These contaminants are covered by additional oversize soil and large chunks of cement. Within the top center of the mound (also referred to as the donut hole) sits another section filled with a mixture of contaminated soil, debris, and cement.[32] The dome itself is made up of 358 18-inch (45-centimeter) thick concrete panels.[33] See Figure 5[34] below for a cross-sectional view of the dome structure and contents.

The Insular Areas Act of 2011 requires the U.S. Secretary of Energy to monitor and report to Congress on 1) significant changes to the dome, and 2) health risks due to the structure's contaminants. Levels of groundwater contamination within the dome far exceed levels observed in open waters across the Marshall Islands.[35] During a 2014 study to trace the migration of radioactive materials released from Japan's Fukushima nuclear plant in 2011, scientists found plutonium sediments in the South China Sea and its neighboring Pearl River Estuary; instead of tracing to Fukushima, they traced back to the Pacific Proving Grounds (where the U.S. conducted its nuclear testing) in the Marshall Islands.[36]

Sea levels are rising twice as fast in the western Pacific as anywhere else, creating high concern that climate change poses a catastrophic risk for the

Figure 4: Runit Dome

structure.[37] Although climate change-related hazards are bringing the containment structure to global attention, the Runit Dome has always been of great concern to the Marshallese people who feared – or even suspected – potential leakage of radioactive waste into the sea. In structural terms, while dome-shaped structures are known to withstand concentrated loads of pressure, such as from heavy rain,[38] sea level rise was not considered when the Runit Dome was built and, at the current rate, the structure is expected to be partially submerged by the end of the 21st century.[39] Moreover, rising sea levels combined with an increase in frequency of severe storm surges and wave-driven flooding will spell more frequent and forceful interaction of sea water with water below the dome and will likely deliver radioactive materials from within the site directly into the local marine environment.[40] Figure 6[41] illustrates the way in which changing maritime characteristics could impact the dome. High storm waves could also breach the dome's structure.[42] Should this occur, not only will it impact food security reserves and create health risks locally, but it also spells unprecedented global ecological catastrophe. Thus, the U.S. Department of Energy (2020)[43] suggests that a measurement of storm events will aid in providing a better understanding of the long-term effects surrounding sea level rise and its correlation to dome-derived radionuclides dispersed into the environment.

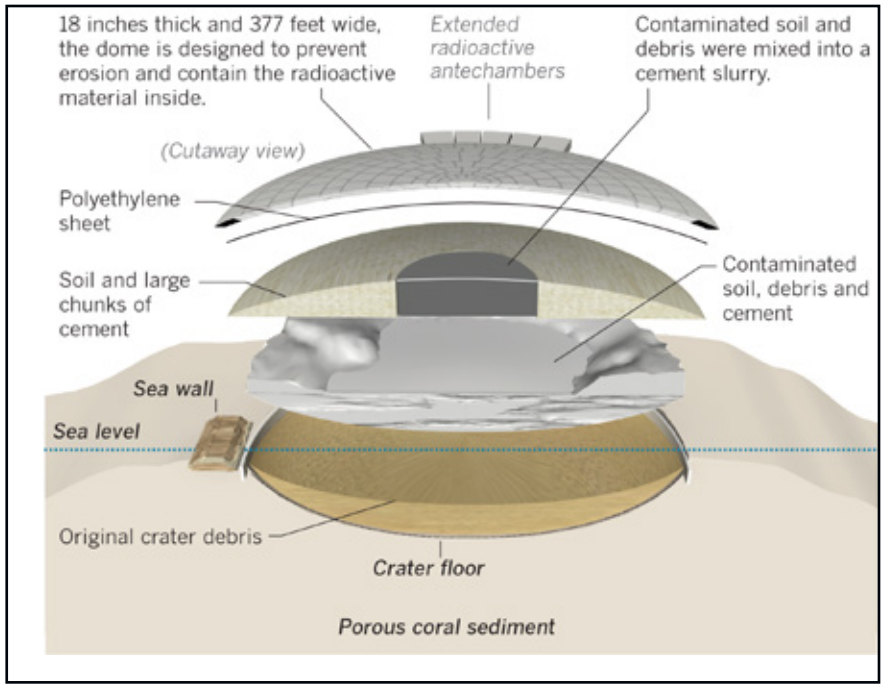
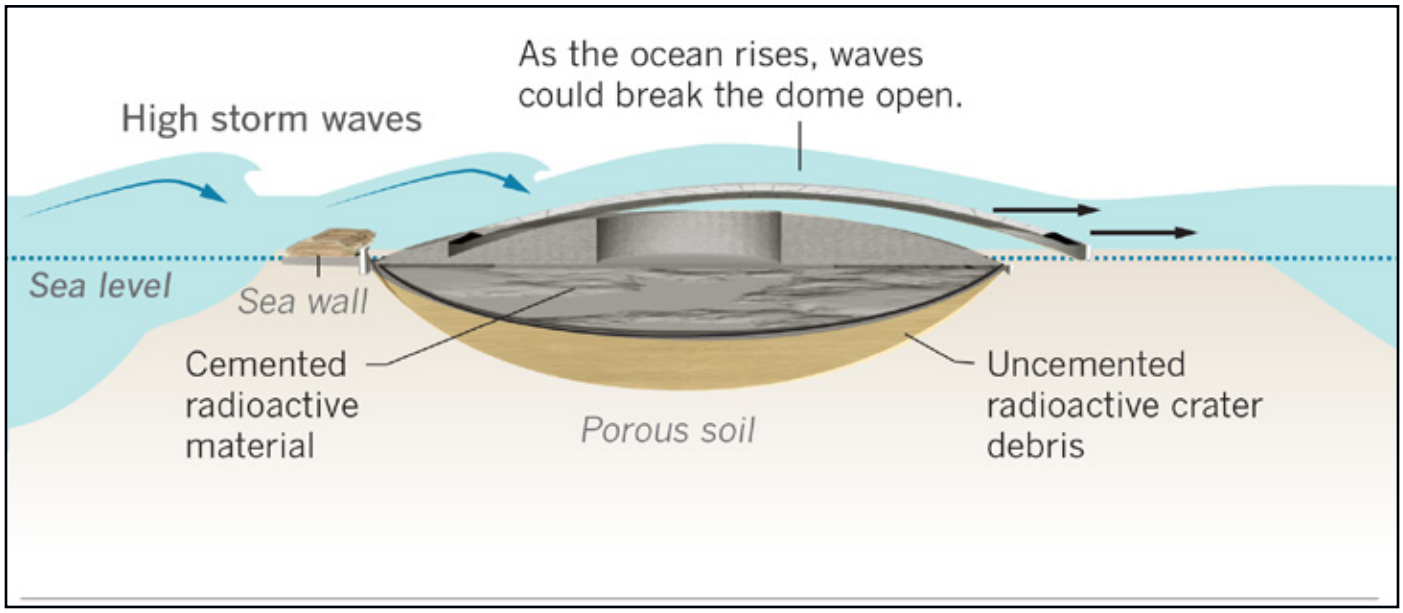


Figure 5. Cross-section of Runit Dome showing structure and contents

Figure 6: Cross-Section of Runit Dome to Display Sea Level Rise and Storm Impacts on the Structure by Lorena Iniguez Elebee and Sean Greene.



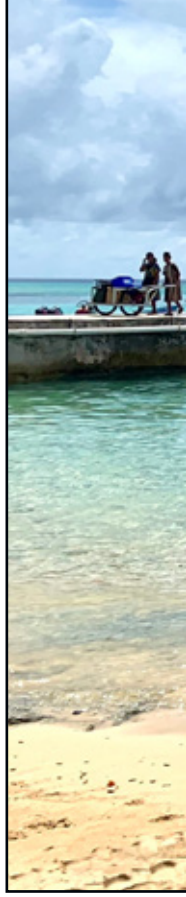
Summary of Findings

Building the climate change resilience of RMI is informed by the principles of sustainable development outlined by the country's Vision 2018. RMI is incorporating climate change in every aspect of its economy, and analysis of RMI executive policy documents indicates the priority that every sustainable development and planning decision must address climate change. Pervasive themes in executive policy are:

- Requirement for external assistance in cleaning up nuclear waste.
- Establishment of and supporting for an enabling environment for improved coordination between disaster risk management and climate change adaptation.
- Education and public awareness campaigns surrounding effective Climate Change Adaptation and Disaster Risk Management from local to national levels.
- Enhanced emergency preparedness and response at all levels.
- Improvement of energy security while working towards a low carbon future.
- Enhancement of local livelihoods and community resilience for all Marshallese.
- An integrated approach to development planning, including consideration of climate change and disaster risks.

Additional themes can be derived from the resolutions approved by the Nitijela (Parliament); these themes are:

- All parties who signed the Paris Agreement should commit to reducing greenhouse gas emissions.
- Eradicating poverty and promoting human rights.
- Ensuring the integrity of all ecosystems by engaging the community through education, training, and active participation to recognize and support sustainable lifestyles.
- Requesting the Cabinet declare that climate change is an issue of national security that should be discussed during the COFA negotiations.
- RMI wants the international community to comply with strategies to reach net zero emissions by 2050.
- RMI requests for the U.S. military to use the Mili Atoll as an additional defense site.
- Residents of Majuro request for the installation of a proper sewage system to stop contamination of their water supply.



Finally, goals highlighted in the September 2022 U.S. PPS are:

- The U.S. wants to strengthen its bond with the Pacific Islands to fulfill and increase the U.S. Commitment to the Pacific.
- Strengthening ties with allies and partners to bolster Pacific regional institutions and elevate the Pacific in regional architecture.
- Helping the Pacific to combat climate change and build climate resiliency by supporting marine conversation, maritime security, sovereign rights, and improving infrastructure.
- Empower Pacific Islanders by creating partnerships to create economic opportunities and forge connectivity.

Recommendations

The Marshall Islands are on the front lines in combating the effects of climate change. RMI requires assistance from the U.S. to enact climate change priorities to fight against climate disruption. We have examined RMI executive policies and Nitijela resolutions alongside the U.S. PPS, introduced by the Biden administration to demonstrate shared regional priorities. Based on our analysis, we recommend the following five strategies and actions to aid RMI in achieving climate resiliency.

1. Involve RMI officials and community leaders in the development of climate change plans, espe-

Construction Electrician 3rd Class Christian Carnate/ U.S. Navy

Naval Mobile Construction Battalion (NMCB) 5's Detail Marshall Islands helps deliver construction materials and tools to Enniburr Island, Kwajalein Atoll, Republic of Marshall Islands. U.S. Navy Seabees constructed a concrete evacuation center that will serve as the local community's disaster preparedness building.

cially during the Compact negotiations

COFA grants are set to expire at the end of 2023. It is pertinent that RMI officials release and allocate funds based on the government's priorities. However, under the 2003 Compact revisions, funds are to be administered by the Joint Economic Management Committee (JEMCO), wherein the U.S. has three representatives compared to RMI's two. Negotiations should include meaningful discussions to advocate for equitable outcomes for all parties. Such inclusion will engage stakeholders to build a shared vision with a strategic assessment to illuminate benefits and shortcomings. Developing transparency on both sides will allow for a more equitable process and outcome.

2. Assist RMI with the nuclear legacy clean up

In an address to the United Nations General Assembly in September 2022, President David Kabua of RMI stressed the need to address the historical effects and contemporary challenges of nuclear testing in the Marshall Islands.[44] Runit Dome is already leaking radioactive contaminants into the ocean. The government is concerned that the structure could collapse due to increased frequency and severity of storm surges, wave-driven flooding, and rising sea levels, and that such a collapse will release plutonium into the ocean and damage the surrounding marine environment.[45] RMI residents are also concerned that nuclear waste from the dome will impact local food supplies underpinned by marine life.[46]

3. Strengthen the relationship between RMI and the U.S. by establishing and supporting a mechanism to improve disaster risk management and climate change adaptation in the Marshall Islands

The Biden administration has committed to leadership in driving global action to combat climate change by partnering with RMI and other regional partners through the PPS. According to Pillar 1 (Strong U.S. - Pacific Islands Partnership) the current U.S. administration is interested in completing negotiations on COFAs to create stronger partnerships and promote a policy space for COFA states to

make the best decisions for their communities while lobbying the U.S. government to maintain transparency and meet its obligations.

4. Assist with upgrading public infrastructure that reflect community desires to protect resources such as water

Resolution 45 passed in 2021 by the Nitijela urges the RMI government to build a proper sewage system to stop contamination of the Laura groundwater lens. According to PPS Pillar 3 (A Resilient Pacific Islands Region Prepared for Climate Crisis and Other 21st-Century Challenges), the U.S. federal government is committed to supporting regional partners, such as the Marshall Islands, in efforts to mitigate climate change by sharing climate information services, integrating adaptation planning across central and line ministries, and financing resilience through infrastructure, water, food security, and health systems. Supporting projects such as a proper sewage system in Majuro's Laura area promotes climate resiliency by helping RMI to protect its water resources.

5. Push for Paris Agreement stakeholders to comply with reducing their greenhouse gas emissions by 2050

The Nitijela's Resolutions 19 (2016) and 83 (2019) implore all Paris Agreement stakeholders to comply with the treaty's goals of reducing emissions and reducing adverse effects of climate change. The U.S. pledged its commitment to being the global leader in combating the climate crisis in the PPS. RMI believes in its motto "Accomplishment through joint effort" to combat climate change with their limited resources. The U.S. needs to be a role model to display its commitment to the Paris Agreement by showing the world through government measures that it is reducing its carbon footprint.

Conclusion

Since the 1980s, RMI has experienced rising temperatures and sea levels, both of which intensify tropical storms, typhoons, droughts, and flooding. Our research reflects a systematic examination of national policies and resolutions that address reduction of energy demand, climate change resiliency, promotion of low carbon energy supply, sustainable land use, climate-related research and development, mitigation efforts, natural disaster risk management, restricting the growth of fossil fuel-based infrastructure, low-carbon transport, and the nuclear legacy.

RMI requires the cooperation of the U.S. to mitigate climate change risk by establishing and supporting an environment to improve disaster risk management and climate change adaptation measures. We have researched RMI's executive policies and parliamentary resolutions alongside the U.S. PPS, introduced in September 2022. Our examination demonstrates the common themes within these publications that can help address the needs of the Marshall Islands. It is hoped that our recommendations can help the U.S. Indo-Pacific Command find ways to support RMI in achieving climate resiliency.

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The IPCC Report & the Climate Crisis in the Pacific

By Martin Ras, Project Manager, Climate Security Project, UNDP Pacific Office Fiji & Giulio Fabris, Communications & Advocacy Specialist, Climate Security Project, UNDP Pacific Office Fiji

Over 4000 pages, 14,000 scientific papers addressed, thousands of scientists from all over the world, one message: code red for humanity.[1]

The takeaways from the latest IPCC report[2] published in August 2021 are unequivocal: based on our current trajectory, the intensity and frequency of extreme weather events, rising sea levels, global warming, and ocean acidification will increase. The Paris Climate Agreement target to limit global temperature rise at 1.5C is likely to be exceeded in the next 10-15 years.

According to the IPCC, it is unmistakable that human influence has warmed the atmosphere and caused unprecedented climate changes. Some of these changes, such as sea-level rise, are irreversible and already set in motion.

But what does the report say about human security in the Pacific region – the most vulnerable to climate change and yet the one that contributes the least to global warming in terms of emissions?

In the IPCC Regional Factsheet for Small Islands,[3] conclusions leave no space for interpretation: changes in the environment are already and will continue to be the single greatest threat to the security and well-being of Pacific people.

The average temperatures increased already about 1.1°C and will continue to rise, impacting human health and affecting agricultural output and food security.

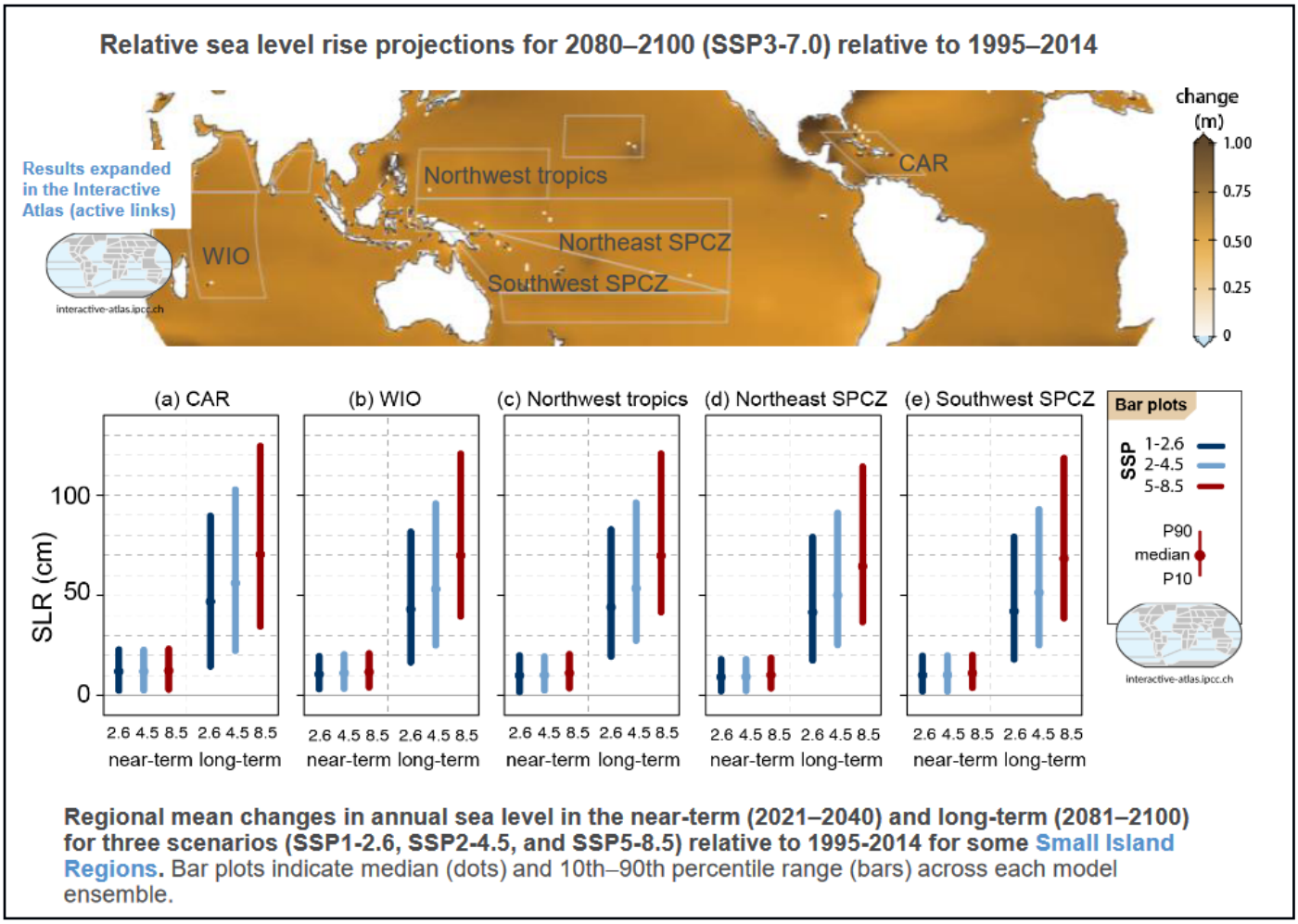

Figure 1: Relative sea level rise predicted by Intergovernmental Panel on Climate Change.

Ocean acidification has increased and will increase further with 1.5°C of global warming, affecting the health of reef ecosystems, where survival is essential for local fishing and the livelihood of communities. Moreover, damages to coral reefs will exacerbate coastal erosion, as they act as the first line of defense against storm surges and strong waves.

The global trend of rising seas will have the most severe consequences in the Pacific: it is posing a threat not only to the habitability of small island nations but to their very existence and survival as a nation. In Tuvalu, for example, the sea level has increased by approximately 13.2cm from 1993 to 2021 with a trend of 4.7mm per year.[4]

Moreover, sea-level rise coupled with storm surges and "king tides" exacerbates coastal inundation and the potential for increased saltwater intrusion, affecting the already fragile water security of Pacific people and communities. In Kiribati, for instance, where the land surface is nowhere any higher than 2-3 meters above the sea level, ocean waves have been as high as 3.5 meters in the last five years.

Rising seas are also eroding coastal areas, causing shorelines to retreat, forcing small island states to invest in reconstruction actions and preventative climate change adaptation. All these are highly costly and put enormous pressure on their national budgets.

In addition, land loss due to coastal erosion or disappearing islands will lead to land disputes and conflicts over marine resources. The reduction of available land will likely also cause a contraction of Pacific Small Island Developing States exclusive economic zone (EEZs), essential for regional stability

and resource management.

The increasing frequency and intensity of extreme weather events will have severe consequences on small island nations, which, due to their geography, are the most vulnerable to the impacts of cyclones, king tides and other natural hazards. Their likely impact includes the destruction of housing villages and infrastructures and damages to agriculture and other livestock livelihoods. All these scenarios create conditions that could increase the violence on women and children.

The report confirmed what is already on our minds: we must act now and stop running towards our own extinction. Our future does not look good, but not all is lost.

Suppose world leaders come together and take proactive and immediate action now to cut global emissions. In that case, it is still possible to keep the temperature within the 1.5C limit and minimize the worst-case scenario.

Climate change financing, bilateral and multilateral funding, and government interventions need to recognize the linkages between climate change and security or they will fail to implement climate actions designed to address climate change.

Sea water intrusion on roads and playfields during king tide.

The UN considers the climate security agenda as a key entry point for risk-informed development in the Pacific region. Its integration needs to be translated into concrete actions at the community level where the climate change impact on security is already a reality. Adaptation initiatives at the local level are happening: in the Republic of the Marshall Islands, for example, a community-based natural resources conservation planning framework (the Reimaanlook[5]) has been developed to address the need of protecting natural resources and biodiversity which are essential to local people's livelihoods. But local adaptation measures are not enough.

Catalytic initiatives such as the Climate Security in the Pacific project[6] need to be expanded to other countries and islands in the region as part of a collective effort to address the multiple effects of climate change, requiring leadership from the highest level at the regional and global level.

The upcoming COP26[7] is the occasion to bring countries together to agree on a comprehensive and ambitious coordination of climate action. The event needs to be a breakthrough for climate action and ensuring the necessary financial and political support by the global north to the most vulnerable countries.

COVID-19 was a painful lesson from which we have learned that global problems require global collaboration before it is too late.

We have just a few opportunities left to ensure our survival and many people will be looking at decisions made by member states to take climate action now before it is too late.

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