

Climate Change in Hawaii and the United States-Affiliated Pacific Islands: A Call to Action for Environmental Public Health

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Abstract Hawaii and the U.S.-Affiliated Pacific Islands (USAPI) are facing a climate change crisis that threatens the health, safety, and well-being of Pacific Islander communities. This article provides an overview of the unique impacts of climate change on this often-overlooked region from an environmental public health perspective, as well as its vulnerabilities and resilience efforts. The article highlights the urgent need for action and the crucial role that environmental health professionals can play in partnering with Pacific Islander communities to build climate resilience.

We conducted research and key informant interviews between September 2023 and June 2024, which provided valuable insights into the lived experiences and perspectives of local leaders, environmental health practitioners, and community members who are grappling with the effects of climate change. By bringing together scientific data, case studies, and perspectives from local leaders and storytellers, this article paints a holistic picture of the complex realities of climate change in Hawaii and the USAPI. This nuanced understanding is essential for informing effective, equitable, and culturally appropriate interventions to protect the health and well-being of Pacific Islander communities in the face of the climate crisis.

Keywords: climate change, Pacific Islands, environmental health, community resilience, Indigenous perspectives, public health

Pacific Islander Traditional Story of Courage and Collaboration

The Micronesian legend, “How the Women Saved Guam,” is based on a retelling found in three collections coauthored by Dr. Nancy Bo Flood and published by Bess Press in Hawaii: *Marianas Island Legends*, *Micronesian Island Legends*, and *Pacific Island Legends*.

Nothing was left to eat.

Children cried from hunger. Their empty stomachs hurt, hurt, hurt as they chewed on coconut scraps and fish bones.

The taro had stopped growing. Even the banana tree gave no fruit. The island was thirsty. Dry winds teased, rattling



Coastal Erosion: This haunting scene is a stark reminder of the ongoing battle between land and sea, where rising sea levels and intensifying storms due to climate change are accelerating coastal erosion and threatening fragile ecosystems and communities on Pacific Island nations.

the palm trees' withering branches, laughing, leaving swirls of dust but not even a spatter of rain.

“We have angered the spirits,” the old women warned. “For too long we have taken from the earth, taken from the sea and have given nothing in return.

Our greed has angered the spirits. Now our island's soil grows nothing; our lagoon is empty of fish.”

Slowly a distant thunder filled the air. The sun seemed to grow in size and heat. As the rumbling sounds grew louder, the island began shaking, the

people began crying, “Help! A monster fish is eating our island, boiling the waters, tearing apart our reef.”

Men grabbed clubs and nets. “We must capture the beast and destroy it.”

But every net was quickly ripped apart.

The women gathered, watched, wondered, what could save their island?

The oldest woman, the maga’hāga, stepped forward. “A stronger net is needed. We women must work together and weave a net of great strength.”

The younger women bowed their agreement to the old one’s words.

“Our net must be a sign of our respect and gratitude for all that the ocean and land have provided.”

The women gathered in a circle. As they exchanged glances, they realized what their sacrifice must be. “Our hair is our beauty but it is also our strength.”

The old one asked, “Those who are willing to offer your hair, bow your head.” One by one, she held each woman’s long thick hair and cut it. “Now we will begin.”

All through the night the woman worked, weaving together the long black strands. Their voices chanted prayers of hope as they sang to their island, sang their apologies.

With the first dim light of dawn, the weaving was finished. The women gathered up the enormous net and followed the old one to the water’s edge.

“When the slippery one comes close, we will throw our net over its head and then everyone must pull, pull, pull with all your strength.”

The women answered, “Yes, we can do this. The strength of many has become one.”

A loud roar shook the island. The monster fish leaped toward the women.

“Now! Throw now!”

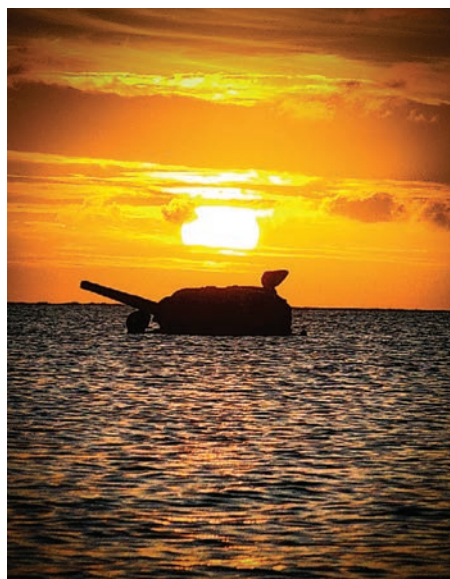
The monster’s teeth tore at the net. Its deadly tail thrashed the water. The women began chanting, “Pull, pull. Be brave. Be strong. Pull!”

The net held.

Rain began to fall. The people lifted their faces to the skies. They sang out thanks and then began a new song—how the women of Guam wove their beauty into a net of courage.

What was learned that day is told again and again to the children and the children’s children: Take care of each other, the land, the sea, and they will take care of you.

The legend of how the women of Guam saved their island from a monstrous threat serves as a powerful metaphor for the challenges facing Hawaii and the U.S.-Affiliated Pacific Islands (USAPI) today. Just as the women in the story had to come together, making personal sacrifices for the collective strength of the community, the people of Hawaii and the USAPI are now working to confront the existential threat of climate change. The islands are already experiencing the devastating impacts of rising sea levels, more intense storms, coral bleaching, and drought—which together make up a slow-moving but no less destructive monster than the one in the legend. Solving the climate crisis will require courage, collaboration, and a willingness to put aside short-term interests for the long-term well-being of the land, the ocean, and the people.



Submerged Tank in Saipan: The submerged Sherman tank at sunset off Saipan’s coast serves as a reminder that this island has faced formidable challenges—from the ravages of war to the current threat of climate change—yet its people have always found the strength to persevere and adapt.

Hawaii and the USAPI

The USAPI include the U.S. territories of American Samoa, Guam, and the Commonwealth of

the Northern Mariana Islands (CNMI), as well as the Freely Associated States: the Federated States of Micronesia (FSM), the Republic of the Marshall Islands (RMI), and the Republic of Palau. Hawaii and the USAPI are facing significant environmental public health challenges due to climate change (Centers for Disease Control and Prevention [CDC], 2020). These islands are home to diverse Pacific Islander communities that include Indigenous Peoples with deep cultural and spiritual connections to the land and ocean. Keener et al. (2012) report that more than 77% of the 1.9 million inhabitants of the USAPI region are Pacific Islanders, a major portion of whom belong to Indigenous communities such as Chamoru, Chuukese, Kosraean, Marshallese, Native Hawaiian, Palauan, Pohnpeian, Samoan, and Yapese. These diverse Indigenous groups collectively speak more than 20 native languages. The remaining population consists of individuals from various Asian backgrounds. Apart from Hawaii, all islands in the region are experiencing population declines and a growing trend toward urbanization (U.S. Census Bureau, 2021a, 2021b, 2021c, 2024a, 2024b, 2024c; World Bank Group, 2025).

The Hawaiian and USAPI regions span a vast geography of more than 2,000 islands, ranging from small low-lying atolls to large volcanic islands (Frazier et al., 2023). The total land area is only 14,060 mi², but these islands define nearly one half of the entire U.S. exclusive economic zone. The region is also strategically important, with more than 24 U.S. defense installations, including the headquarters for the U.S. Indo-Pacific Command (Figure 1).

Background

Many Pacific Islander communities are already experiencing disproportionate risks to their health, food and water security, livelihoods, and traditional ways of life (Frazier et al., 2023). These vulnerabilities are exacerbated by histories of colonialism, geographic isolation, dependence on natural resources such as fish, and limited resources for climate adaptation and resilience (Wasley et al., 2023). A lack of data in the region, stemming from exclusion in data collection efforts and rooted in historical injustices perpetuated by colonial and postcolonial governance, hinders effective climate change response (Frazier et al., 2023). This data gap manifests as sparse and discontinuous climate records, a



Guam Fisherman: A lone fisherman on a beach in Guam underscores the vital role of fishing in Pacific Island economies and cultures, while the dramatic sky hints at the increasing climate-related challenges threatening this traditional way of life.

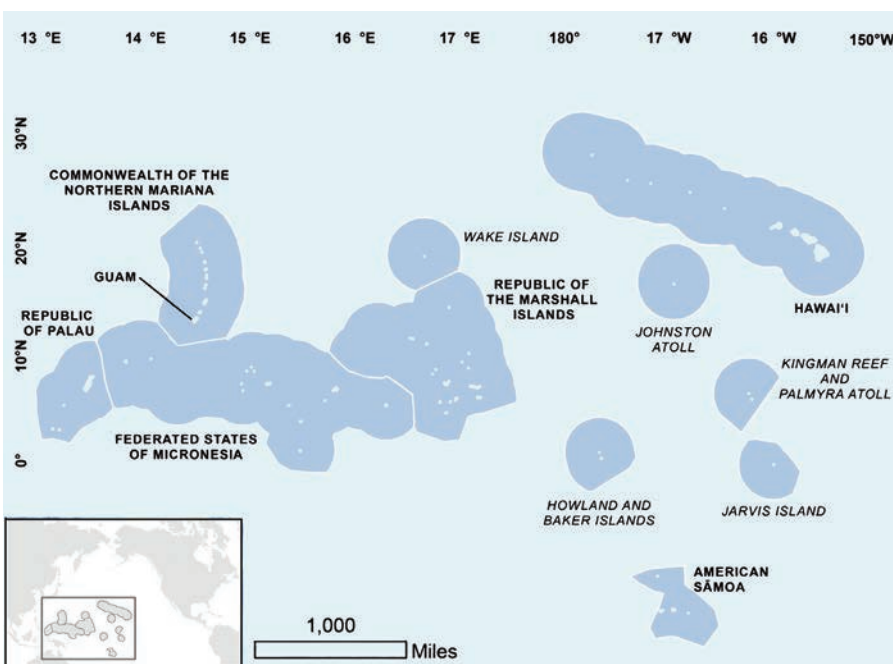
lack of coastal flood hazard modeling and sea level rise exposure mapping, limited downscaled climate projections, insufficient information on water resources, and scarce data on ecosystem responses (Grecni et al., 2020, 2021; Keener et al., 2012, 2021; Polhemus, 2017). Similar gaps exist in socioeconomic and health data related to migration, health outcomes from extreme weather events, food supply chain vulnerabilities, and resource-dependent livelihoods (Barnett, 2020; Dyer, 2017; Johnson et al., 2020; McIver et al., 2015).

Indigenous knowledge systems and stewardship, despite being foundational to climate change response, have long been undervalued, suppressed, and ignored by Western science, only recently gaining recognition as valid knowledge sources at the federal level (Keener et al., 2022; Office of Science and Technology Policy [OSTP], 2022; Winter et al., 2023). Addressing these data gaps is crucial for enabling data-driven decision-making and improving climate services in the region (Frazier et al., 2023).

Pacific Islander communities—and in particular Indigenous Peoples—are facing the loss of their ancestral lands, cultural sites, and traditional practices (CDC, 2020). Despite these immense challenges, Pacific Islander communities have demonstrated

FIGURE 1

Map of Hawaii and the Pacific Islands



remarkable resilience and are leading efforts to adapt to climate change impacts (McLeod et al., 2019). They cannot, however, do it alone. An urgent need exists for increased awareness, resources, and support to address the environmental public health crisis in the USAPI (McLeod et al., 2019).

This article explores the key climate change impacts on Hawaiian and USAPI communities, their environmental public health risks and vulnerabilities, and the opportunities for action to support climate resilience and health equity in the Pacific Islands.

Climate Change Indicators in Hawaii and the USAPI

The unique geographical, ecological, and socioeconomic characteristics of the USAPI make these islands particularly vulnerable to the impacts of climate change (Frazier et al., 2023; Spencer et al., 2020; Techera, 2013). Climate change is amplifying existing environmental public health threats in the USAPI and introducing new challenges (Frazier et al., 2023). The Centers for Disease Control and Prevention (CDC, 2020, 2024a) reports that rising sea levels, coastal ero-

sion, saltwater intrusion, drought, flooding, and extreme weather events are endangering critical infrastructure, contaminating freshwater resources, and disrupting food systems. These factors are also increasing vectorborne diseases, water-related illnesses, food safety issues, and mental health issues.

The Pacific Islands Climate Change Monitor 2021 provides an overview of the observed climatic changes across the USAPI as the result of ongoing human-forced climate change and underlying natural variability (Marra et al., 2022). Since 1959, the record concentration of atmospheric carbon dioxide (CO₂) at the National Oceanic and Atmospheric Administration's (NOAA) Mauna Loa Observatory in Hawaii has increased by >100 ppm, to an annual average value >414 ppm in 2020. Furthermore, as of December 2020, the combined impact of the greenhouse gases CO₂, methane (CH₄), nitrous oxide (N₂O), and halogenated compounds (e.g., chlorofluorocarbons, hydrochlorofluorocarbons) equate to a CO₂ concentration of 504 ppm.

Subsequently, since 1951 the annual average air temperatures across the Pacific Islands region increased by 2 °F (1.1 °C), with seven



Typhoon Mawar Cleanup: In October 2023, typhoon debris in Guam (e.g., appliances, green waste, and construction materials) awaited removal by the U.S. Army Corps of Engineers as part of the extensive cleanup operation after Typhoon Mawar hit.

of the eight warmest years on record having occurred since 2007. The Pacific Ocean in this region has also seen a temperature increase of approximately 1.6 °F (0.9 °C) since 1982. Furthermore, in the western tropical Pacific Sea, the sea level has risen approximately 10–15 cm (4–6 in.), nearly twice the rate measured in 1993. Similarly in the central tropical Pacific Sea, sea level has increased to 5–10 cm (2–4 in.), which has already resulted in an increased frequency of minor flooding. Oceanic pH measurements recorded at Station ALOHA, Hawaii, show a >12% increase in acidity between 1988 and 2020 with a significant decline in phytoplankton size (Marra et al., 2022).

According to G. Bare (personal communication, June 10, 2024), when asked about climate-related changes resulting from climate change, Leilani L. Navarro, the environmental public health officer supervisor for the Department of Public Health and Social Services at the Guam Division of Environmental Health, said:

I have noticed that typhoons are more intense, and they come in unusual times of the year, such as Typhoon Mawar that hit Guam in May 2023, which is typically the start of the summer season. In addition, air temperatures seem to be higher in the last 5 years, and wildfires are occurring more frequently than when I first came to Guam in 2010.

Climate Change Impacts on Hawaii and the USAPI

Hawaii and the USAPI are facing numerous environmental health threats and risks due to climate change. Rising sea levels, extreme weather events, and changes in precipitation patterns are affecting the very foundations of

life in the Pacific Islands. In recent years, the region has experienced an increasing intensity of tropical storms and typhoons, causing widespread damage to infrastructure, homes, and livelihoods (Frazier et al., 2023).

According to G. Bare (personal communication, June 10, 2024), when asked about how these effects of climate change are impacting environmental health programmatic areas, Navarro said:

Heavy rainfall and flooding may increase the levels of pathogens in water and food and can increase foodborne and waterborne diseases. Increasing air temperatures may result in increased wildfires, which can affect food safety. Typhoons damage homes and buildings and result in unsanitary conditions that allow pests to breed and transmit diseases to people.

For example, in 2018 Typhoon Yutu, also called Super Typhoon Rosita—the strongest typhoon ever recorded to impact the Mariana Islands—caused catastrophic damage to Saipan and Tinian in the Commonwealth of the Northern Mariana Islands (Frazier et al., 2023). The Federal Emergency Management Agency (FEMA, 2019) reported that the torrential rain and wind speeds of 130–180 mph killed 2 people, injured at least 133 others, and damaged or destroyed much of the buildings and critical infrastructure on the islands. As a result, local, state, and federal partners mobilized to address widespread power outages, severed water lines, large-scale debris removal, and the large number of people experiencing homelessness (FEMA, 2019).

In 2019, Typhoon Wutip (also called Tropical Depression Betty) brought heavy rainfall and flooding to Guam, the Federated States of Micronesia, and the Commonwealth of the Northern Mariana Islands. The Department

of Environment, Climate Change, and Emergency Management (DECCEM, 2019) reported that in the Federated States of Micronesia alone, approximately 10,000 individuals were affected by Typhoon Wutip, with more than 100 families displaced. Furthermore, more than 90% of crops were destroyed in the worst-affected areas, with approximately \$1 million in damages. The extensive damage caused by the inundation of salt water exacerbated the food security of the drought-affected islands and contaminated the limited freshwater resources (DECCEM, 2019).

UNICEF (2020) reported that Severe Tropical Cyclone Harold caused major damage to the Solomon Islands, Vanuatu, Fiji, and Tonga. The greatest destruction occurred in Vanuatu, where winds >200 km/hr affected approximately 92,300 people, including 24,300 children, which equates to 30% of the country's population. Public infrastructures (e.g., roads, hospitals, schools, homes, churches) sustained major damage across Vanuatu's northern and central islands of Maewo, Pentecost, Ambae, and Santo. Gardens were destroyed, food crops seriously affected, and water infrastructure damaged (UNICEF, 2020).

In addition to these devastating storms, the USAPI region is also grappling with the emerging threat of wildfires (Pacific Fire Exchange, 2017). According to G. Bare (personal communication, June 12, 2024), when asked about climate-related changes resulting from climate change, John Kolman, the Hawaii district health officer for the Hawaii State Department of Health, said:

I have seen highways and roads become more frequently impacted by storms with debris and needed repairs. I have seen wildland fire risks increase, including burning structures.



Wildfire Aftermath: Charred coastal land in Saipan after a small wildfire. Scattered remnants of grasses, a coconut shell, and shrubs dot the scorched earth.

While wildfires are not typically associated with tropical islands, climate change is creating conditions that are more conducive to their occurrence (Dendy et al., 2022; Minton, 2006; Pacific Fire Exchange, 2017). Native Hawaiian and Pacific Islander communities already experience high rates of asthma, and rates are expected to increase as climate change worsens air quality (Rudolph et al., 2017). In August 2023, as reported by the U.S. Fire Administration (2024), a series of wildfires broke out in Hawaii, predominantly on the island of Maui. Wind-driven fires prompted evacuations and caused widespread damage, killing at least 101 people. The fires destroyed more than 2,200 structures and caused an estimated \$5.5 billion in damages (U.S. Fire Administration, 2024).

The increasing frequency and severity of droughts—coupled with the spread of non-native, fire-prone grasses—are contributing to the growing wildfire risk in the region (Mass & Ovens, 2024). According to G. Bare (personal communication, June 3, 2024), when asked about the last climate-related impact on the community, John M. Tagabuel, the program administrator for Environmental Health Disease Prevention within the Commonwealth Healthcare Corporation, said:

CNMI or the entire North Pacific islands region are facing the El Niño cycle. And this climate phenomenon, it exasperated already challenged island infrastructure, with wildfire—with limited fire equipment to address bush and structural fires.

One of the most pressing concerns presented by CDC (2024a) is the impact of sea

level rise. The Pacific Islands are already experiencing accelerated sea level rise, leading to coastal erosion, episodic flooding, permanent inundation, and increased exposure to marine hazards. In American Samoa and Guam, coastal flooding and erosion are projected to disproportionately affect minority and low-income populations and individuals outside of the age range of 16–65 years (Reguero et al., 2021). The sea level rise threatens critical infrastructure such as housing, energy, and transportation systems and compromises access to essential services and resources, including food, fresh water, and healthcare.

The Hawaii Climate Change Mitigation and Adaptation Commission (Hawaii Climate Commission, 2017) reports that over the next 30–70 years, sea level rise will increase chronic flooding and, in doing so, will affect approximately 6,500 structures, 38 mi of coastal roads, 550 cultural sites, 13 mi of beaches, and 19,800 people across Hawaii. This damage would equate to an estimated \$19 billion of economic loss (Hawaii Climate Commission, 2017). Saltwater intrusion into surface and groundwater systems further jeopardizes the sustainability and quality of freshwater supplies, posing significant risks to public health (CDC, 2024a).

Climate change is also amplifying the spread of vectorborne diseases in Hawaii and the USAPI (CDC, 2024a). Warming temperatures and changes in rainfall patterns are creating more favorable conditions for mosquito populations, leading to a surge in diseases such as dengue and malaria (Kulkarni et al., 2022). Data from 2014–2020 identified 104 dengue, chikungunya, and Zika outbreaks across the USAPI (Matthews et al., 2022). The World Health Organization (2015) has identified the USAPI as one of the most vulnerable regions to climate-sensitive diseases, warning that without adequate adaptation measures, these health risks will continue to intensify.

Food safety and security are increasingly under threat (CDC, 2024a). In Hawaii, rising ocean temperatures, acidification, and damage to watersheds and reef systems—in combination with drought conditions—are disrupting traditional food sources. The locations of fisheries are shifting further out to sea, and traditional crops such as taro are being inundated with saltwater, increasing the difficulty for traditional fishers and farmers.



Subsistence Fishing: This traditional practice is vital for communities in this region and is increasingly under threat by climate change effects on marine ecosystems and fish populations.

These changes are forcing greater dependence on imported foods, which are often low in nutritional value and have hidden environmental, financial, social, and cultural costs. This dietary shift, combined with high rates of obesity and chronic diseases such as diabetes, is exacerbating the region's health challenges (Novotny et al., 2015). Due to the islands' small sizes and relative isolation, food and water security are the most important aspects related to drought for the USAPI (Heim et al., 2020). Maintaining adequate freshwater supplies in the face of climate change places stress of an uncertain magnitude on already fragile water resources.

The low-lying island populations of the Federated States of Micronesia and the Republic of the Marshall Islands are the most vulnerable to freshwater supply shortages and agricultural crop losses during droughts. Higher islands such as Guam, Yap, and Palau have reservoirs, yet Guam suffers from an insufficient water distribution system. Therefore, as most agriculture is rainfed, the combination of reduced rainfall and saltwater intrusion is a hazard for crops.

Furthermore, in response to drought, crops have reduced yield, increased mortality, and increased susceptibility to pests and diseases (Heim et al., 2020). In the Federated States of Micronesia, the 1997–1998 El Niño drought caused coconut production to decline by 20%, from which it did not recover for 4 years. From 1996–2018, federal crop insurance programs paid \$11.2 million to Hawaiian farmers for drought losses, followed by a loss of approximately \$53.5 million in cattle production due to the most severe drought on record from 2008–2016 (Frazier et al., 2022).

The mental health and well-being of Pacific Islanders are also being affected profoundly by

climate change. As ancestral lands are lost to rising seas and erosion, and traditional practices are disrupted, many communities are experiencing a sense of displacement and disconnection from their cultural identities (CDC, 2024a). Mental health effects include stress, anxiety, depression, grief, sense of loss, strains on social relationships, substance abuse, and post-traumatic stress disorder (PTSD) (Dodgen et al., 2016). These mental health conditions can also manifest into physical health concerns such as changes in fitness and activity level, heat-related illness, allergies, and increased exposure to waterborne and vector-borne illnesses (Dodgen et al., 2016). The psychological toll of watching one's home and way of life being threatened cannot be overstated.

Following the Hawaii wildfires in 2023, the Maui Wildfire Exposure Cohort Study (MauiWES) found that 55% of participants were exhibiting depressive symptoms (Juarez et al., 2024). The number of individuals likely to need counseling following the Maui wildfires, coupled with contextual factors such as the loss of transportation, is anticipated to burden an already overtaxed behavioral healthcare system (Holliday et al., 2024). Moreover, 49% of MauiWES participants reported that their health is now worse since the wildfires, and 24% reported that they do not have reliable access to medical care (Juarez et al., 2024). Furthermore, relocation or separation from family or communities following the event reduces individuals' ability to receive social support (Holliday et al., 2024). Only 24% of MauiWES participants remained in their pre-wildfire homes, with 65% in temporary homes and 11% in new permanent homes (Juarez et al., 2024).



Communicating Danger: This wildfire danger sign in Saipan informs community members of the current risk level.

Certain populations within the USAPI are particularly vulnerable to these climate change impacts. Indigenous communities,

which often rely heavily on natural resources for their livelihoods and cultural practices, are facing disproportionate risks (Frazier et al., 2023). As a result, there are exacerbated mental health consequences, particularly for rural populations, socioeconomically disadvantaged populations, and people with disabilities (CDC, 2024a). Women, who bear the brunt of caregiving responsibilities and are often on the front lines of climate adaptation efforts, also face heightened challenges due to the significant roles they play in economic activities, safety, health, and livelihoods (CDC, 2024a).

The cumulative effects of these environmental health threats are putting immense pressure on the already limited resources and capacity of the USAPI region (Frazier et al., 2023). Addressing these challenges will require a concerted effort to build resilience, support adaptation, and prioritize the needs and voices of the individuals who are most at risk (McIver et al., 2016). Urgent action is needed to protect the health, safety, and well-being of Pacific Islander communities in the face of the climate crisis (Pacific Islands Forum Secretariat, 2019).

Resilience and Adaptation

Pacific Islander communities, particularly Indigenous Peoples, have a long history of resilience and adaptability in the face of environmental challenges (Nunn et al., 2016). Today, as the impacts of climate change intensify, these communities are drawing on traditional knowledge, cultural values, and their deep connections to the land and sea to build climate resilience and protect their health and way of life (Frazier et al., 2023).

Sproat (2016) discussed that the key factor in the resilience of Indigenous communities is their right to self-determination; by exercising this right, Indigenous Peoples can respond to climate change in ways that meet their unique needs and aspirations. As stated by the Office of Science and Technology Policy (OSTP, 2022), their ability to do so, however, is often undermined by institutions and policies shaped by the legacy of settler colonialism, which is reflected in the current Hawaiian water law that is a distinct departure from the ancient Hawaiian water-management system of *ahupua'a* (Harvard Law Review, 2024).

Ahupua'a was a system ruled over by the *Ali'i* (chiefs), with water viewed as a "true public trust resource." Management of the system was overseen by the *Konohiki* (resource stewards), and water was apportioned according to the need and amount of labor provided. It was customary that during times of scarcity, those with sufficient access would share any excess with those in need. This system sustained approximately 200,000 Indigenous Peoples for nearly a millennium.

The arrival of Western settlers in 1778, however, resulted in the segmentation and privatization of the land, with sugar plantations weaponizing the water law. This change allowed for the diversion of a significant amount of water out of the watershed permanently, meaning the plantations were appropriating water beyond the amount tied to the land under the *ahupua'a* system. The same colonial agriculture and ranching operations also destroyed native vegetation and introduced highly flammable non-native plants. These issues were further exacerbated when plantations ceased operations and left large grasslands unmanaged.

The role of these contributing factors to the devastating Hawaii wildfires in 2023 has received great criticism and could provide the political momentum needed to reform Hawaii's water law, with a greater infusion of Native Hawaiian history, culture, and tradition (Harvard Law Review, 2024). This example of Hawaii's water law demonstrates how colonial institutions and policies can undermine the ability of Indigenous communities to exercise self-determination in managing their resources and responding to climate change.

Expanding support from federal and state governments to uphold the right of Indigenous Peoples to self-determination is crucial for guiding effective and equitable climate resilience efforts (OSTP, 2022). As a result of location-specific climate exposures and unique societal and demographic characteristics, each region of the U.S. experiences different health impacts due to climate change. A report by CDC (2024a), *Preparing for the Regional Health Impacts of Climate Change in the United States*, provides a summary of health effects, resources, and adaptation examples from health departments funded by the CDC Climate and Health Program. The report supports states, counties, cities, tribes, and territories in assessing how climate change will affect their community by

identifying populations that are more vulnerable to climate change and implementing adaptation and preparedness strategies to reduce the health effects of climate change.

The Building Resilience Against Climate Effects (BRACE) Framework developed by CDC (2024b) has five sequential steps that can help health officials in developing strategies and programs that better prepare communities for the health effects of climate change:

1. Forecasting climate impacts and assessing vulnerabilities.
2. Projecting disease burden.
3. Assessing public health interventions.
4. Developing and implementing a climate and health adaptation plan.
5. Evaluating impact and improving the quality of activities.

To supplement BRACE and support public health departments and adaptation planners, the National Environmental Health Association (NEHA, 2023) produced *Integrating Environmental Justice and Climate and Health* to provide examples of how environmental justice, climate, and health can be integrated into core environmental public health programs and services to improve health outcomes. Using the Climate and Health Adaptation and Mitigation Partnership (CHAMP) Program and strategic framework, jurisdictions can identify their climate-related health risks, develop responsive climate adaptation plans, and implement targeted adaptation actions to protect their communities from environmental health risks related to climate change (Figure 2; NEHA, 2023).

One promising approach is the development of Indigenous-led management and co-management strategies for lands, waters, and other resources (Frazier et al., 2023). Many Pacific Islander communities are calling for a greater role in decision-making and the integration of traditional resource management practices into climate adaptation efforts (Winter et al., 2023). According to G. Bare (personal communication, June 10, 2024), when asked about the strengths that the previously-mentioned disaster highlighted within the department, Navarro said:

The local community exhibited resilience and solidarity in the aftermath of the typhoon. Community organizations, such as religious groups, local clubs, and civic associations, came together to organize and help distribute supplies

FIGURE 2

Diagram of the Climate and Health Adaptation and Mitigation Partnership (CHAMP) Program From the National Environmental Health Association (NEHA)



Note. BRACE Framework = Building Resilience Against Climate Effects Framework from the Centers for Disease Control and Prevention.



and assist in rebuilding efforts. In general, Guam people maintained a positive outlook and continued to work toward rebuilding their homes, infrastructure, and livelihoods.

Co-management arrangements, when done right, can create opportunities for asserting Indigenous knowledge and practices while building climate resilience (Winter et al., 2020). It is essential, however, that these arrangements prioritize the strengthening of Indigenous capacities, clear and consistent communication, and the uplifting of Indigenous cultures (Winter et al., 2023). For example, from 2017–2018, the Commonwealth Healthcare Corporation delivered a climate change training in the Commonwealth of the Northern Mariana Islands, from which staff throughout the agency could build knowledge

and expertise locally. Throughout the project, the team fostered relationships with key partners outside of public health (e.g., governmental agencies) who can provide expertise and input on climate and health work across the Commonwealth (CDC, 2020).

Similarly, in 2017, the Department of Health and Social Affairs for the Federated States of Micronesia hosted educational workshops and hands-on exercises to combine local agricultural and diet-related knowledge and practices with outside technical assistance. The goal was to empower the people of the low-lying islands, such as Chuuk and Pohnpei, with the knowledge, skills, and abilities necessary to maintain a healthy island diet in a changing environment (CDC, 2020).

Local environmental public health departments, programs, and partner organizations

also play a crucial role in supporting community-led resilience and adaptation efforts (NEHA, 2023). For example, strategies are being developed and implemented across the region to revitalize healthier traditional food systems, resulting in more just access to food (NEHA, 2023). Subsistence-based practices such as agroforestry and fishing, which have sustained Pacific Island peoples for millennia and aided in recoveries from natural disasters, are being promoted as a means of supporting conservation, food security, and broader sociocultural objectives in the face of climate change (Frazier et al., 2023).

According to G. Bare (personal communication, June 3, 2024), when asked how their environmental public health program is changing and adapting to climate change impacts, Tagabuel said:

[. . . by] discussing climate impacts on drinking water, mosquito-borne illness outbreaks in the Pacific, and communicating food safety components during food safety training and environmental health staff training.



Pacific Reef Heron: Changes in ocean temperature and acidity negatively impact fish populations, affecting the heron's primary food source. Fish abundance is also reduced by coral bleaching, which disrupts the reef ecosystem.

In Pohnpei, Federated States of Micronesia, a partnership between the Island Food Community of Pohnpei, the Pohnpei State Government, and the Micronesia Conservation Trust is working to promote local food production and preserve traditional agroforestry practices (Convention on Biologi-

cal Diversity, 2023). By supporting home gardens and providing training on sustainable farming techniques, this initiative is enhancing food security and resilience (Convention on Biological Diversity, 2023). Other promising adaptations include establishing networks of marine protected areas to preserve coastal resources, safeguarding fish habitats from pollution runoff, and restoring traditional fishpond mariculture (Mills et al., 2023). Community food-sharing networks, such as those that emerged during the start of the COVID-19 pandemic, also offer a model for building resilient food systems in the face of climate change (Fardkhales & Lincoln, 2021; Farrell et al., 2020; Ferguson et al., 2022).

A pressing need exists, however, for additional resources and support to scale up these efforts. Environmental public health departments and partner organizations require funding, technical assistance, and capacity building to effectively implement climate adaptation strategies. Greater coordination and collaboration among the various organizations and agencies working on climate change and health in the Pacific Islands are also necessary, as is a commitment to centering the voices and needs of Indigenous communities in all resilience and adaptation efforts. Ultimately, building climate resilience in Hawaii and the USAPI region will require a sustained and concerted effort guided by the knowledge, values, and self-determination of Pacific Islander communities. By working together and prioritizing Indigenous rights and leadership, we as a profession can support the development of healthy, sustainable, and resilient island societies in the face of the climate crisis.

Conclusion

Hawaii and the USAPI region are facing an existential threat from climate change, with profound negative impacts on the health, safety, and well-being of Pacific Islander communities. To effectively address this threat and build resilience in the region, urgent action is needed from governments, civil society organizations, development partners, and the environmental public health workforce. Priority needs for Hawaii and the USAPI region include:

- Increased funding and resources for climate adaptation and mitigation initia-

tives that are community-driven and culturally appropriate.

- Capacity building and technical assistance to strengthen the ability of environmental public health departments and local organizations to assess climate-related health risks, develop adaptation plans, and implement resilience measures.
- Support for the integration of Indigenous knowledge and practices into climate change planning and decision-making, and the removal of institutional barriers that hinder Indigenous-led management of natural resources.
- Improved data collection and monitoring systems to address critical gaps in climate, health, and socioeconomic information and to enable better decision-making and resource allocation.
- Enhanced regional cooperation and knowledge sharing to facilitate developing and scaling up best practices and innovative solutions across Hawaii and the USAPI.

Environmental public health professionals have a vital role to play in building climate resilience in Hawaii and the USAPI, such as:

- Advocating for increased resources and support for Hawaiian and USAPI climate change initiatives, and work to elevate the voices and needs of Pacific Islander communities in decision-making processes.
- Partnering with local communities and organizations to assess climate-related environmental health risks, develop culturally appropriate adaptation strategies, and strengthen local capacity for response and resilience.
- Providing technical assistance and expertise to support the implementation of key resilience measures (e.g., strengthening food and water safety, improving sanitation and waste management, enhancing disease surveillance and vector control, ensuring the safety and integrity of buildings and shelters).
- Facilitating the integration of Indigenous knowledge and practices into planning and programming and dismantling institutional barriers and biases that perpetuate inequities.

By working hand in hand with Hawaiian and USAPI communities and honoring their unique strengths, knowledge, and lived experiences, the environmental public health workforce can make a meaning-

ful difference in the fight against climate change in the Pacific Islands. The time to act is now. The very survival of Pacific Islander communities and cultures is at stake. We must come together in a spirit of partnership, justice, and care for our common future. We must center the voices and self-determination of the individuals most affected by the climate crisis. And we must dedicate ourselves wholly to the work of building safe, healthy, and thriving communities in Hawaii and the USAPI for generations to come. We have a shared responsibility and moral imperative in the face of the defining challenge of our time.

By drawing on their deep cultural wisdom, resilience, and connection to land and sea, Pacific Island communities have the power to be leaders in the global effort to protect and sustain precious ecosystems for generations to come. Like the women in the legend who

wove their hair into a net of strength, it will require everyone working together, sharing knowledge, and taking courageous action to overcome the urgent challenges posed by climate change in the region today. ✨

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