

A stylized landscape illustration. At the top, a large, textured orange circle represents the sun or moon against a dark blue sky. Below the sky, two yellow, faceted mountain peaks are visible. The foreground is a dark, textured area with a pattern of green and yellow diamond shapes, suggesting a field or a forest floor. The overall style is modern and graphic.

LANDSCAPE CONSERVATION IN A CHANGING CLIMATE

LESSONS FROM THE PACIFIC ISLANDS
CLIMATE CHANGE COOPERATIVE

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Landscape Conservation in a Changing Climate

Lessons from the Pacific Islands
Climate Change Cooperative

Wendy B. Miles
Susanne C. Moser

The Haleakalā Silversword (pictured below) is endemic to Maui's high elevation ecosystems, which are increasingly threatened by climate change. (Photo: Miles 2018)



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Waimanu Valley in the moku (district) of Hāmākua on Hawai'i Island.
(Photo: Miles & Harrington 2016)

Abstract

“Landscape conservation,” a now common term in conservation biology, emphasizes the importance of planning at scales that encompass ecological processes and species migrations, and addresses large-scale environmental threats. Formal frameworks for evaluating the effectiveness of these efforts are rare, however, and made difficult because these multi-scalar efforts involve many actors over multiple jurisdictions and long timescales. Recognizing the need for collaborative responses to large-scale environmental stressors such as climate change, the Department of the Interior supported a network of Landscape Conservation Cooperatives (LCCs) from 2009 until 2018. As one of these 22 LCCs, the Pacific Islands Climate Change Cooperative (PICCC) was established with the charter purpose of assisting those who manage native species, island ecosystems, and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands. Guided by a diverse steering committee of land/resource managers, the PICCC serviced a vast area across Hawai‘i and the US-Affiliated Pacific Islands. This report presents key findings from evaluative research investigating PICCC’s achievements in the Hawaiian Islands between 2009 and 2018. Based on interviews and a survey, the report describes the foundational conditions from which the PICCC set out to establish a landscape conservation framework, the challenges it faced, its goals and achievements, and transferable lessons from the experience for any conservation community working with limited resources across large expanses of land and ocean. The research underlying this report serves as a record of the unique landscape conservation and climate adaptation approach developed by the PICCC’s steering committee and partners over the course of their collaboration, and points to the benefits that have been and could be achieved in sustained landscape-scale conservation efforts.

Moloka'i's Hīnālenale Point and Hālawā Bay, the islet of Mokuho'oni, and the island of Maui in the distance.
(Photo: Miles & Harrington 2016)



Executive Summary

The Pacific Islands Climate Change Cooperative (PICCC) was one of 22 Landscape Conservation Cooperatives (LCCs) established during the Obama Administration as self-directed conservation alliances. This network of cooperatives extended across the continental US and into parts of Canada, Mexico, the Caribbean, and the Pacific Islands. The PICCC was made up of local, state, federal, indigenous, and NGO members with the charter purpose of “assisting those who manage native species, island ecosystems, and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands.”

The National Academy of Sciences published an evaluation of the LCC Network in 2016, seven years after the first LCCs were established (NASEM 2016). They found that the LCCs were unique among federal programs and that the landscape approach to conservation was needed to address the far-reaching environmental challenges of the 21st Century.

Formal evaluations of landscape conservation initiatives remain rare and this is one of these rare evaluations of an individual LCC made public. This retrospective analysis of the PICCC provides an opportunity to learn from the unique landscape conservation approach that was developed in Hawai‘i and the US-Affiliated Pacific Islands, which emphasized climate adaptation. It points to the benefits that have been and could be achieved through sustained landscape-scale conservation efforts.

Research Highlights

During the decade in which the PICCC operated, the natural resource management community increasingly embraced the need for examples and knowledge of what it takes to successfully adapt. The PICCC created an approach to facilitating adaptation and fostering partnerships that was largely viewed as effective by those surveyed and interviewed. However, PICCC’s funding and staff capacity were too low to adequately serve the Cooperative’s huge service area. In addition, uncertainty about the organization’s long-term survival inhibited its ability to make long-term commitments and engage in forward thinking with its partners at a deeper level.

Despite PICCC’s closure in 2018, some of its impacts persist. In particular, the increased communication on adaptation responses to climate change led to enhanced collaboration among former PICCC member organizations. However, whether such communication and collaboration can be sustained without a centralized forum for exchange over the longterm is uncertain. In PICCC’s absence, natural resource managers are actively seeking where to go for climate information and adaptation support. As the number of organizations and agencies working to address climate change grows, increased coordination across the natural and biocultural resource management community is needed.

The PICCC’s major contributions included **providing technical assistance** and **fostering partnerships** in support of climate adaptation, activities that reinforced each other and helped propel the work of the Cooperative forward. The PICCC model was widely viewed as effective and is believed to have helped accelerate the natural resource management community’s collective understanding of climate change.

However, the authors found that current pressing issues feel all-consuming for many of the islands' natural resource managers. This pressure is compounded by the overwhelming challenge of climate change and insufficient funds to implement adaptation plans. Additional critical gaps include lack of funding sources to implement grassroots and community-based resilience initiatives, and the need for continued work to incorporate climate science into natural resource management actions.

In summary, while it took time for PICCC to build a functional coalition and self-organize around a mutually agreed, two-pronged strategy, that strategy proved remarkably empowering and successful. Time and diminishing resources were the key constraining factors. In other words, with sustained and increased support—to invest more evenly and substantially across the region and offer the personalized technical adaptation support that PICCC coalition members so appreciated—PICCC could have had a profound and lasting impact. Where that impact did not fully materialize or is waning now, it is not because of an inadequacy in its continually learning-oriented approach, but because PICCC did not have the capacity and, ultimately, because it was defunded.

Recommendations

Hawai'i's natural and biocultural resource management community offered a range of recommendations based on their experiences with the landscape-scale conservation approach, which provide some guiding stars to help us along on the next leg of the adaptation journey. These **lessons in laulima** (many hands, working together) should inform any future efforts in rebuilding a coordinating mechanism to support landscape conservation efforts.

RECOMMENDATIONS FOR INSTITUTION-BUILDING AND ORGANIZATIONAL MANAGEMENT

- Establish and adequately support a stable institution that has staying power but design it such that it can accommodate an iterative, evolutionary adaptation process.
- Design the institution, initiatives, and projects with longevity in mind.
- Anticipate and invest in building a strong steering committee.
- Identify upfront the right representatives; this pays dividends many times over.
- Coalesce around a shared agenda to decrease competition and conflict, and support collaborations and the optimization of individual and collective talents and resources. Trusted leadership that helps identify shared goals and values is essential.
- Consider carefully geographic representation and increase inclusivity.

RECOMMENDATIONS FOR SCIENCE AND TECHNICAL SUPPORT

- Co-design projects—and requisite science—involving technical experts, practitioners, and decision-makers to ensure results meet decision needs at influential decision points.
- Consider more personalized support for mainstreaming adaptation, such as designing an “adaptation support” mechanism for critical periods in a partner organization's management planning process.

- Develop tools and strategies that support people in the transitions to thinking about managing natural resources in the context of climate change.
- Make deliberate efforts to transition former PICCC partners and stakeholders to the new repository of PICCC outputs and tools.

RECOMMENDATIONS FOR BUILDING A COMMUNITY OF PRACTICE

- Invest in effective communications. For initiatives aiming to influence behavior, consider focusing more resources on community-based social marketing.
- Engage messengers who are trusted by the audience you aim to address and have the ability to effectively translate the climate science, and how it is applicable in people’s work.
- Train climate scientists, communicators, and practitioners in “bedside manners” needed for sharing the gravity of the information they are conveying to the public.
- Support the personal resilience of those working at the front lines of climate change, which includes the natural and biocultural resource management community.
- Foster peer-to-peer exchanges and “learning trees” so that one set of partners can be a resource for another set of partners that are earlier in the process of taking an adaptation action.

RECOMMENDATIONS FOR FOSTERING ADAPTATION ACTION

- Think globally and systemically, act locally. Developing shared strategies that link global (climate) challenges to local ones, and carefully assess the impacts of adaptation actions on others, is a critical iterative task.
- Look towards the future in management decisions, because environmental baselines will continue to shift. In a continually changing climate and environment, adaptation is a continual task. This is counter to traditional management approaches and means projects need to be designed with an evolving future in mind; monitoring, evaluation, and learning must be built into projects, and resource commitments should be made wisely to minimize future needs when adjustments are necessary.
- Strive towards climate change resiliency in ways that are pono (righteous) and rooted in culture, community, and place.
- Build on the strong interest in and enthusiasm for grassroots and community-based initiatives. To date, there are limited opportunities to fund or support community-based work in Hawai‘i; however, this is the level to which adaptation efforts must be attuned.



Between the corals of Kāneʻohe Bay and the forests of the Kōʻolau Mountains, is the Kahaluʻu community and loko iʻa (fishpond), in the moku of Koʻolaupoko on Oʻahu.
(Photo: Miles & Harrington 2016)

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“You want to have some documentation left behind that persists, that captures the issues, captures the energy that went into it... When the country and the Department of the Interior are receptive to talking about climate change and really investing in it again, you’ll have these documents that are like the preserved memory of years of investment and thinking about climate adaptation... keeping the life alive.”

—Former Steering Committee Member of the
Pacific Islands Climate Change Cooperative,
Hawai‘i, August 2018



A bird's-eye view of Kalaupapa National Historical Park (foreground) and Moloka'i's north coast. Just offshore are 'Ōkala and Huelo islands, where rare plants like the loulu palm can still be found. (Photo: Miles & Harrington 2015)

1. Introduction

This report presents key findings from an evaluative research study of the Pacific Islands Climate Change Cooperative (PICCC). It is a retrospective study, detailing opinions and personal accounts of people's experiences with PICCC (pronounced “pixie”) as they endeavored to mainstream climate adaptation into natural resource management in Hawai‘i and the US-Affiliated Pacific Islands (USAPI). Based on interviews and a survey, the report lays out the foundational conditions from which PICCC set out to establish a landscape-scale conservation framework, the challenges it faced, its goals and achievements, and then tries to distill transferable lessons for others in the conservation community working with limited resources across large expanses of land and ocean. This report is intended to serve as a record of the unique landscape conservation and climate adaptation approach that was developed by PICCC’s steering committee and partners over the course of the 10-year collaboration, beginning in 2009.

In 2009, the Department of the Interior (DOI) enacted Secretarial Order 3289, calling for the development of a network of collaborative “Landscape Conservation Cooperatives.” Underpinning Order 3289 was a recognized need for coordinating natural resource management responses at a landscape scale in order to adapt to the evolving impacts of climate change (Salazar 2009). Rather than conforming to state boundaries and the borders of the United States, LCC service areas would be determined by the geography of ecosystems and biomes. That year, PICCC was formed and, in 2010, its Steering Committee developed an organizational charter, laying out a framework for supporting climate change adaptation in Hawai‘i and the USAPI (PICCC 2011).

Charter Purpose: The Pacific Islands Climate Change Cooperative is a self-directed, non-regulatory conservation alliance whose purpose is to assist those who manage native species, island ecosystems, and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands.

PICCC was an autonomous conservation alliance sponsored by the DOI and composed of local, state, federal, indigenous, and non-governmental member organizations¹ that actively worked together through the Cooperative to prepare for the impacts of climate change on the natural and biocultural resources of Hawai‘i

¹ **PICCC Member Organizations:** American Bird Conservancy; Bernice Pauahi Bishop Museum; Hawai‘i Conservation Alliance; Hawaiian Islands Land Trust; Pacific Birds Habitat Joint Venture; Kamehameha Schools, Land Assets Division – Endowment Group; Micronesia Conservation Trust; DOI, National Park Service (NPS), Pacific Western Region; DOI, NPS, Pacific Islands Inventory and Monitoring Program; The Nature Conservancy, Hawai‘i Office; NOAA National Marine Fisheries Service, Pacific Islands Regional Office; NOAA National Centers for Environmental Information (NCEI) and the National Environmental, Satellite, Data, and Information Service (NESDIS); NOAA Office for Coastal Management, Pacific Islands Region; NOAA National Marine Sanctuaries, Papahānaumokuākea Marine National Monument; Office of Hawaiian Affairs; Pacific Science Association; State of Hawai‘i, Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW); State of Hawai‘i, DLNR, Division of Aquatic Resources (DAR); Trust for Public Land; University of Hawai‘i at Hilo, Office of Research; University of Hawai‘i at Mānoa, Social Science Research Institute; University of Hawai‘i at Mānoa, Center for Conservation Research and Training; US Army Corps of Engineers; US Army Garrison Hawai‘i; US Department of Agriculture, Institute for Pacific Islands Forestry, Pacific Southwest Research Station; US Department of Agriculture Natural Resources Conservation Service; DOI, USFWS, Ecological Services Pacific Islands Fish and Wildlife Office; DOI, USFWS, Division of Migratory Birds and Habitat Programs, Region 1; DOI, USFWS, National Wildlife Refuge System, Hawaiian and Pacific Islands National Wildlife Refuges; DOI, USFWS, Wildlife and Sport Fish Restoration Program, Region 1; DOI, Office of Insular Affairs; DOI, US Geological Survey (USGS), Pacific Island Ecosystems Research Center and Pacific Coastal and Marine Science Center (non-member); DOI, USGS, Pacific Islands Water Science Center.

and the USAPI. Member representatives on the PICCC Steering Committee collectively designed the organizational structure, goals, and breadth of work, and provided the PICCC staff with guidance. An Executive Council composed of member representatives rotated annually, distributing the leadership duties. PICCC's staff were employed by the United States Fish and Wildlife Service (USFWS), National Park Service (NPS), United States Geological Survey (USGS), and University of Hawai'i (UH) to serve as members of the PICCC team. Staff roles consisted of a Coordinator (USFWS), Science Coordinator (USFWS), Cultural Adaptation Coordinator (NPS), Research Ecologist (USGS), Data and GIS Manager (UH), Communications Manager (UH), Adaptation Initiatives Manager (UH), Administrative Assistant (USFWS), and research support staff. These roles were never all filled at once, and the PICCC's staff averaged 5–7 people at any given time, with additional short-term student interns and research assistants.

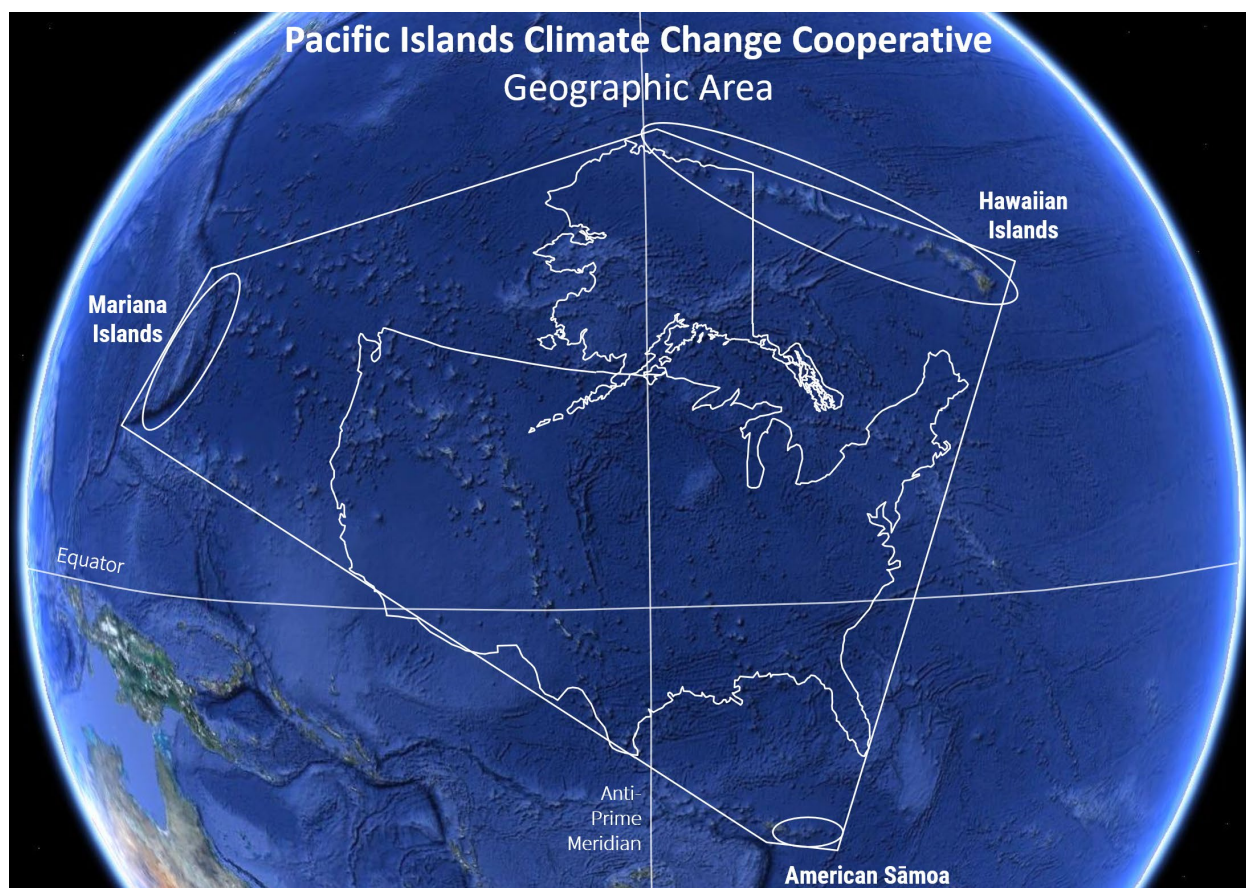


Figure 1: Map of PICCC's service region, overlain by an outline of the continental United States and Alaska to provide scale. PICCC served the Hawaiian Islands, American Sāmoa, Guam, the Commonwealth of the Northern Mariana Islands, and the nations of the Republic of the Marshall Islands, Federated States of Micronesia, and Republic of Palau. Source: USFWS (2009).

PICCC's service region spanned from the Hawaiian Islands in the northwest, to American Sāmoa in the south, to Guam and the Commonwealth of the Northern Mariana Islands in the northeast, as well as three independent nations affiliated with the United States through Compacts of Free Association: Federated States of Micronesia, Republic of Palau, and the Republic of the Marshall Islands (Figure 1). Together these nations and jurisdictions encompass approximately 2,000 islands with just under 2 million people representing numerous cultures and languages calling them their home. From the snow-capped peak of Mauna Kea to the ocean depths of the Mariana Trench, the region hosts an array of diverse and endemic

species. Sea level rise, warming air and ocean temperatures, changing ocean chemistry, increasing intensity of typhoons and hurricanes, and changing rainfall patterns all threaten the land- and seascapes of this unique region and way of life in the Pacific Islands.

When reflecting on the challenges faced and progress made by the collective efforts of PICCC, it is worth keeping in mind that its service area covered a significant portion of the Earth and it was tasked with helping the region’s natural resource management community prepare for one of the most pressing issues of our time. PICCC started this journey with a budget of about \$1.6 million USD, which increased until 2012, and then declined until 2018, when the only remaining funds were to close-out projects (Figure 2). This report does not analyze the factors leading to the closure of the PICCC, which were the consequence of shifts in federal policies, politics, and priorities. Instead, this report focuses on what the PICCC was able to do with the resources and time it had, and what can be learned from its achievements and struggles.

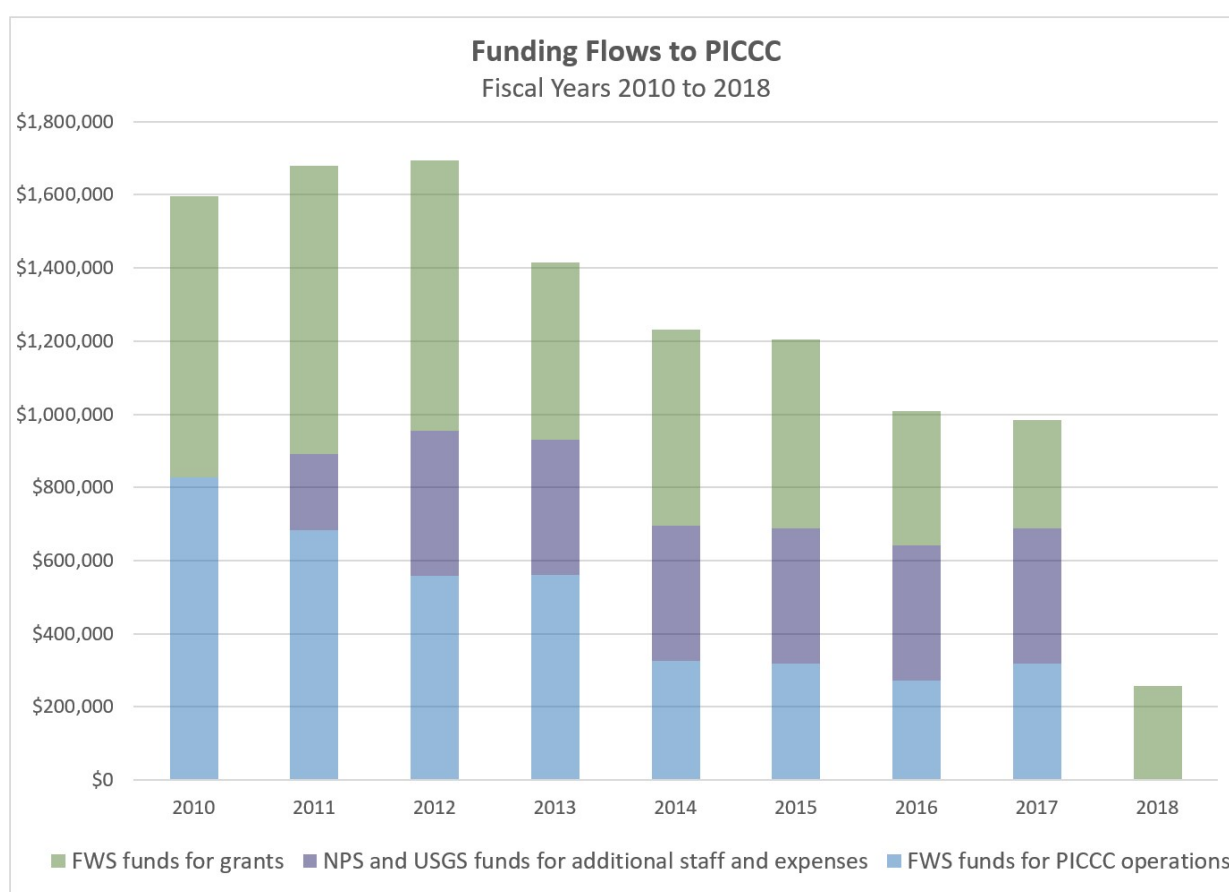


Figure 2: Funding flows from the US Fish and Wildlife Service, National Park Service, and USGS towards PICCC during fiscal years 2010 to 2018. Note that NPS and USGS funding contributions are approximations for fiscal calendar years 2013, 2015, 2016, and 2017. Source: USFWS Science Applications (2021).

The report is organized as follows. This section (Introduction) provides readers with an initial background of what the PICCC was. Section 2 (Research Design) describes the research methodology used to examine the efforts and impacts of the PICCC, while Section 3 (Key Findings) offers the major themes uncovered through the research. The Key Findings section is organized into six sub-sections. The first examines the incorporation of climate science into natural resource management in Hawai‘i and the factors that may have

shaped that process from 2009 to 2018 (Section 3.1). The second section recounts the development of PICCC's organizational design and strategy, and how it evolved over the course of the decade in order to adapt to changing circumstances and community needs (Section 3.2). The third section considers, in retrospect, what lasting impacts PICCC is likely to have (Section 3.3). This is followed by sections on the aspects of PICCC's work that, with their closure, appear to be having diminishing impacts (Section 3.4), as well as the gaps PICCC left and gaps thus far not filled by any organization (Section 3.5). The final Key Findings section focuses on the value added by the PICCC and what made the whole more than the sum of its parts (Section 3.6). We conclude this report with closing remarks on lessons learned and suggestions for taking landscape-scale conservation efforts forward (Recommendations). The survey questions and anonymized responses are shared in Appendix A for anyone interested in delving more deeply into the quantitative data. Appendix B provides the interview protocol used for this study. Appendix C depicts PICCC's action logic model as a representation of its collaboratively developed theory of change.

2. Research Design

This research study examines the unique trajectory of the Pacific Islands Climate Change Cooperative, one of 22 LCCs established during the Obama Administration. Each of the LCCs were designed as public-private partnerships with representatives of states, tribes, federal agencies, non-profits, academic institutions, international organizations and governments, and others working together towards a vision of “landscapes capable of sustaining natural and cultural resources for current and future generations” (LCCN 2014). In this report, a landscape is defined as “a large area encompassing an interacting mosaic of ecosystems and human systems that is characterized by a set of intersecting management concerns” (NASEM 2016).

Formal frameworks for evaluating the effectiveness of landscape conservation efforts are rare, made difficult because these multi-scalar initiatives involve many actors over multiple jurisdictions and long timescales (Bixler et al. 2016). To help account for the unique configuration of agencies, organizations, and actors; local-to-global dynamics; and cultural and historical contexts shaping PICCC’s evolution, the authors of this report conducted a ‘thick’ analysis (Adger et al. 2003) utilizing semi-structured interviews and a survey of Hawai‘i’s natural and biocultural resource management community.

This study is an “inside-outside” evaluation in that it was conducted by Dr. Wendy Miles (with “inside” experience as the former Adaptation Initiatives Manager for PICCC from April 2016–March 2018) and Dr. Susanne Moser (an “outside” evaluator contracted by the USFWS).² Semi-structured interviews and an online survey together explored four themes and five operative research questions:

Theme 1: Facilitating Climate Adaptation

1. In what ways did PICCC help natural resource managers and decision-makers integrate relevant climate change research and information into natural and biocultural resource management plans?
2. What have been the achievements and outcomes of PICCC’s investment in climate change adaptation?

Theme 2: Fostering Partnerships

3. Did PICCC foster partnerships and conditions important for climate change adaptation to occur at landscape scales?

Theme 3: Interplay of Strategies

4. What was the interplay between facilitating climate change adaptation and fostering partnerships in the context of PICCC?

² Dr. Moser served in this role for the duration of PICCC’s existence and facilitated some of the Steering Committee’s work in developing its theory of change, but she was not involved in the day-to-day work of PICCC or any of its partner organizations.

Theme 4: Baseline and Progress

5. What was the foundational context in which PICCC was established, what challenges did it face in its development, and what conditions helped and hindered PICCC's ability to achieve its strategic goals and mission?³

The human subjects research protocol for this study was approved on July 2, 2018 by the IntegReview Institutional Review Board (protocol number: ELSC2018).

Interview Methodology

Twenty semi-structured interviews were conducted from July 25, 2018 to October 17, 2019, with the majority taking place in 2018. These individuals' names were provided by the former PICCC Coordinator and purposefully selected to represent the diversity of organizations and agencies involved in PICCC as Steering Committee members, partners, or staff, and to include organizations that had experience with PICCC over the course of its evolution. Representatives were selected from the following.

- **Federal government:** USFWS Pacific Islands National Wildlife Refuge Complex; USFWS Wildlife and Sport Fish Restoration Program; USFWS Pacific Islands Fish and Wildlife Office; USFWS Science Applications; National Park Service; United States Geological Survey; Pacific Island Ecosystems Research Center; Pacific Islands Climate Adaptation Science Center (PI-CASC); National Ocean and Atmospheric Administration (NOAA)
- **State government:** State of Hawai'i Division of Forestry and Wildlife
- **Semi-autonomous state agencies:** Office of Hawaiian Affairs
- **Academic institutions:** University of Hawai'i; East-West Center
- **Non-governmental organizations:** Micronesia Conservation Trust; The Nature Conservancy; Pacific Islands Managed and Protected Area Community

Interviews were conducted in person at locations convenient for the interviewee when possible, and otherwise conducted by phone. Interviews averaged 63 minutes in length (shortest: 36 min; longest: 175 min; median: 56 min), and were all transcribed. Through qualitative analysis by both lead authors, key themes, events, and timelines were discerned and synthesized. The quotes shared in this report are representative of larger patterns that surfaced during the process of consolidating and analyzing responses across the 20 interviews. The protocol used for interviews is described in further detail in Appendix B.

Survey Methodology

The survey conducted in Fall 2018 was designed to thematically complement the interviews conducted for this research. A confidential, online survey was distributed to 96 targeted respondents to gather information on the experiences and perceptions of Hawai'i's natural resource management community on the approach

³ PICCC's mission statement: "The PICCC will improve the ability of native island species and ecosystems to accommodate future climate change and related perturbations, and support the long-term protection of key cultural resources by providing useful projections of climate and natural resource change in the Pacific Islands, innovative management options, and a membership that supports coordinated action among institutional and community stakeholders."

taken by PICCC to support landscape-scale conservation in the face of climate change. The survey population was developed by former PICCC staff to represent the diversity of organizations and agencies working in the conservation field in Hawai‘i, with an emphasis on natural and biocultural resource management practitioners. Individuals included representatives from the following organizations.

- **Federal government:** National Park Service; O‘ahu Army Natural Resource Program; Sea Grant; USFWS National Wildlife Refuges; USFWS Pacific Islands Fish and Wildlife Office
- **State government:** State of Hawai‘i Division of Forestry and Wildlife in Honolulu, Kaua‘i, Maui, and Hawai‘i counties; Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands; DLNR Division of Aquatic Resources
- **County government:** Office of Economic Development; Office of Planning; Office of Climate Change, Sustainability, and Resilience
- **Hawai‘i NGOs:** Watershed Partnerships on Hawai‘i, Maui, O‘ahu, and Kaua‘i; the Invasive Species Councils for Hawai‘i, Maui Nui, O‘ahu, and Kaua‘i; Hawaiian Islands Land Trust; Hawai‘i Conservation Alliance; National Tropical Botanical Garden; and representatives from local-level conservation organizations such as Lyon Arboretum, Maui Forest Bird Recovery Project, Pu‘u Kukui Watershed Preserve, Moloka‘i Climate Change Network, and Ka Honua Momona
- **International NGOs working in Hawai‘i:** The Nature Conservancy; American Bird Conservancy
- **Large-scale land managers in Hawai‘i:** Kamehameha Schools Land Division; Kaho‘olawe Island Reserve Commission; and the Pūlama Lāna‘i and Four Seasons Resort Lāna‘i

Survey responses were collected anonymously. To the extent respondents volunteered any self-identifying data, it was limited to multiple-choice questions on the ways in which they had engaged with PICCC, jurisdictional level under which they worked (i.e., county, state, federal, Native Hawaiian, non-governmental, private), and scale at which their work is focused (i.e., species-level, ecosystem or habitat-level, single watershed, across multiple watersheds, island-scale, across islands).

The survey was open from September 30 to November 5, 2018. Fifty-one of the 96 conservation professionals targeted for this survey participated, yielding a 53% response rate. The survey completion rate was 79% (i.e., respondents completed an average of 79% of the questions). We conducted simple, first-order statistical analyses of the survey responses. The baseline (2009) and progress (2018) findings depend on respondents’ *recollections* of 2009 compared to their *current perceptions* in fall 2018 when the survey was conducted. The exact wording of the survey questions and a summary of responses are provided in Appendix A.

3. Key Findings

3.1. A Decade in Review: Incorporating Climate Science into Natural and Biocultural Resource Management in Hawai‘i

This report offers insights on a slice of time, reconstructed from respondents’ memories of the decade of 2009–2018, when PICCC was in operation. Any organization is shaped by the place and community within which it evolves. We therefore begin by examining the natural resource management community’s own perceptions of the shifts in the past decade. It is important to stress that complex societal change cannot be explained by simple linear causality of single factors. In other words, there are many complex contributing factors to the changes observed by respondents. Below, we integrate survey and interview findings, beginning here with a brief oral history, not to assign attribution but to reflect on the progress made by Hawai‘i’s natural resource management community as a whole.

Adaptation Waypoints for Climate Science in Hawai‘i

A significant shift occurred in Hawai‘i between 2009 and 2018, as climate change was increasingly discussed, understood, and incorporated into the management of the islands’ natural and biocultural resources. A rising tide in awareness and action is reflected in Figure 3. The conversations have changed (for instance, everyone surveyed is now discussing climate change in the context of their work) and over 75% of agencies/organizations reported that climate change considerations directly informed their management plans and actions (compared to a combined 26% in 2009) (Appendix A-22 and A-23). Half of survey participants reported that their organization or agency conducted a climate change vulnerability assessment in the decade of 2009–2018 and for 40% of respondents climate change had become an integral part of how their organization manages resources (Figure 4; Appendix A-7).

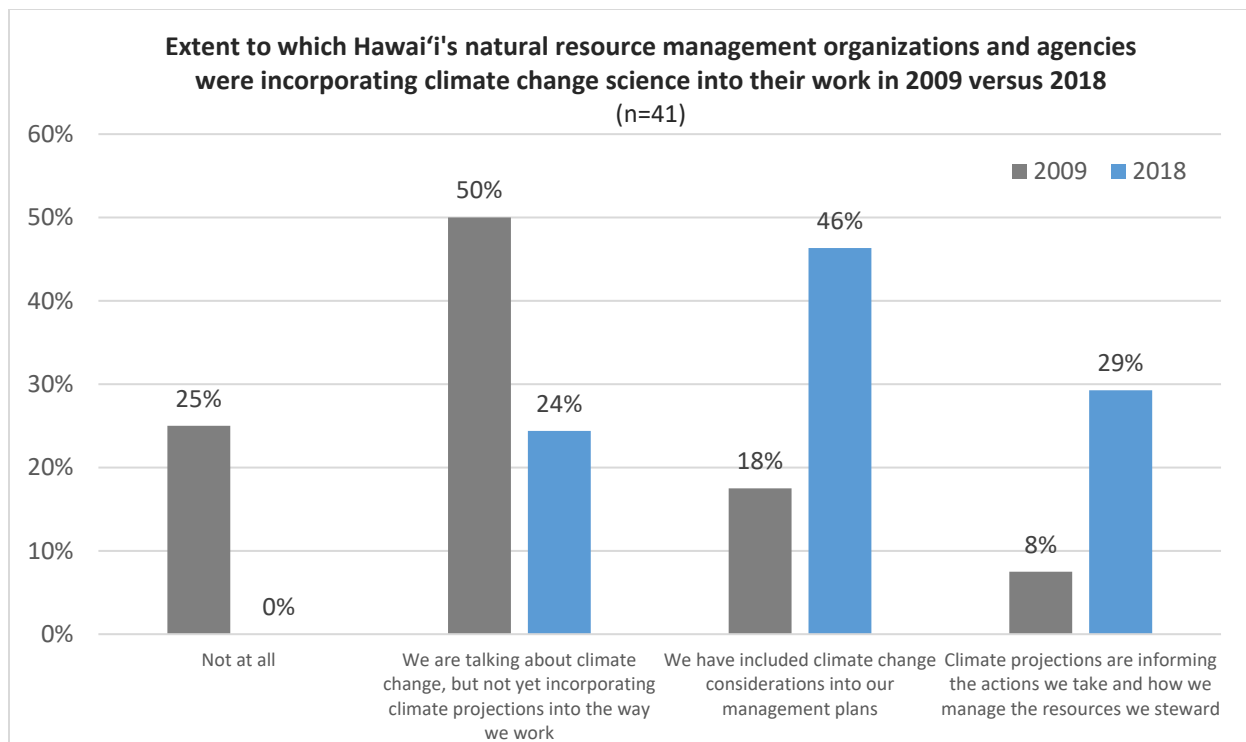


Figure 3: Changes in the integration of climate science into natural resource management in Hawai'i.

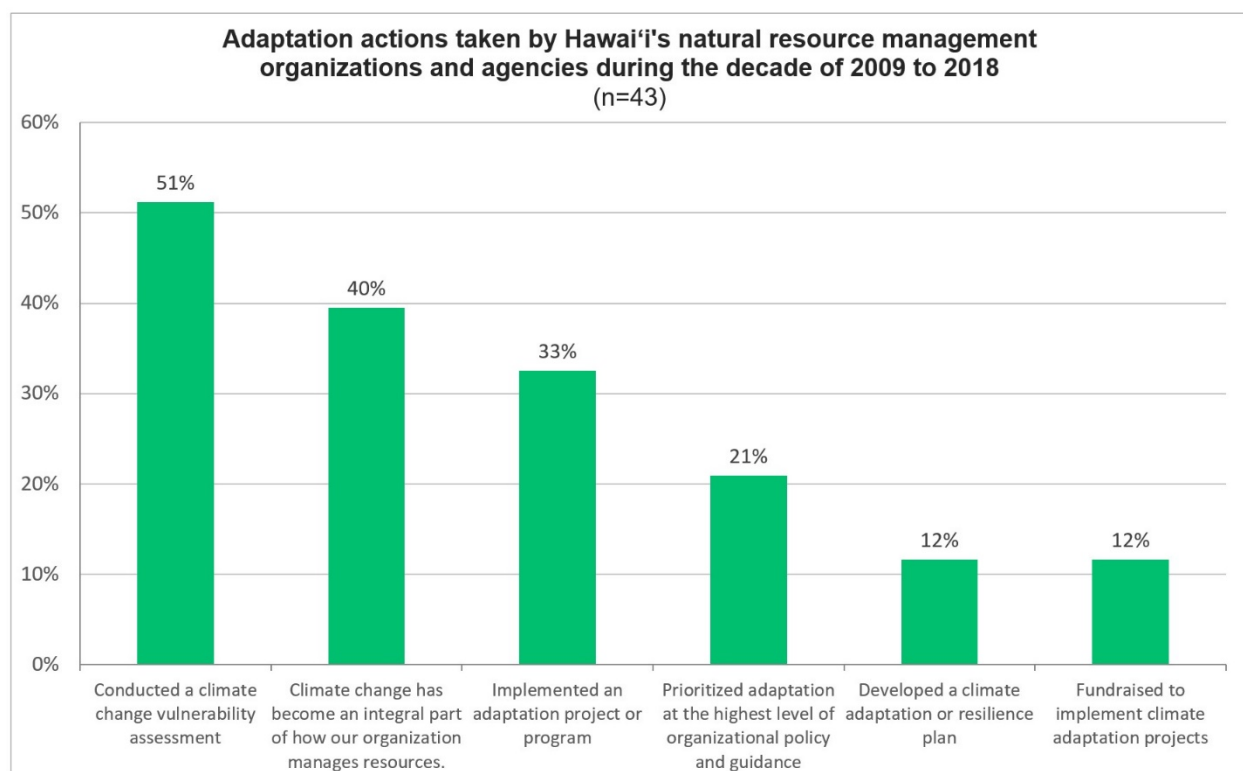


Figure 4: Commitments made and actions taken on climate adaptation by Hawai'i's natural resource management organizations.

Natural resource managers describe a process of the United States attempting to catch-up with the international community and Hawai'i "coming [up] from behind" compared to more well-resourced states like California and New York. The national lag was attributed to the suppression of open discussions on climate change by the United States government until the last years of the Bush Administration.

"[In the late 2000s] there were a number of agencies beginning to have conversations [about climate change] and there was just beginning to be a ground swell of acknowledgement."

"There were no downscaled projections for Hawai'i [in the 2000s], but we knew that the global projections were not adequate, so we were trying to figure out what this meant. We had nothing to go on. We were doing back-of-the-envelope science."

Hawai'i's conservation community had to depend on large-scale, long-term climate projections like those found in the Intergovernmental Panel on Climate Change (IPCC) assessment reports to *imagine* what impacts climate change might have on the Hawaiian Islands. One of the early attempts at 'localizing' global climate change projections for Hawai'i was the creation of the "bathtub" models of sea level rise, developed by researchers at the University of Hawai'i beginning early in the first decade of the 2000s (University of Hawai'i Coastal Geology Group 2008).⁴

"We had some sense of the global sea level forecast and some managers were thinking about how to incorporate that. But it really was just sea level, and then there was a lot of speculation about how rainfall might change. And really what we were left with was historic records that said, 'well, if the past is a harbinger of the future, then this is what is going to happen.' That was obviously seen as pretty inadequate...."

In the early 2010s, climate models were downscaled for the Hawaiian Islands—a costly endeavor that involved the pooling of resources among multiple partners. NOAA funded these first modeling efforts through the Pacific RISA program; PICCC and the Pacific Islands Climate Science Center (renamed the Pacific Islands Climate Adaptation Science Center) joined Pacific RISA's efforts and contributed additional funding support. As more localized information became available, a second challenge emerged. Early projections for Hawai'i did not align with the planning time frames of organizations and government agencies, slowing the uptake of climate science in natural resource management.

"Managers looked at that [climate vulnerability assessment] and said, 'well, I can't plan for 2120, I can't even plan for 2020.' So that was, in my mind, a necessary but naïve step to think that we could project out that far, and then I think it took us to where we are these days, which is, okay, let's think about things in the next decade or two... because that is about as far of planning horizon as you can effectively ask people to work with."

In the early 2010s, climate projection timescales were adjusted and there was a concerted effort to communicate findings that aligned with planning horizons. For instance, the first Pacific Islands Regional Climate Assessment (PIRCA) published in 2012—a first-of-its-kind synthesis of climate research created for Hawai'i and the USAPI—incorporated projections as early as 2030 for coral bleaching and 2050 for sea level rise (Keener et al. 2012). As the decade progressed, the timeframes used to discuss climate change continued to evolve. By the end of the decade there was increased attention on how the climate was impacting people's work in the present tense—not just in the future—and how best to adapt to climatic variability both in the near- and long-term.

⁴ C. Fletcher, University of Hawai'i School of Ocean and Earth Science and Technology, pers. comm., Feb 20 2021.

“In 2018 we had models for how the optimum ranges for every single vascular plant in the native flora were going to be affected by the best model we could come up with for climate change, and it was night and day!”

In the past decade, Hawai‘i’s climate science community passed through two **adaptation waypoints**, a term used here to describe a destination that, after you arrive at it, you can see with greater clarity where to go next. These two adaptation waypoints were as follows.

- » **Local climate projections:** Achieving climate projections at geographic scales more appropriate for planning (including Hawai‘i’s first down-scaled climate projections).
- » **Near-term climate projections:** Adjusting the time frames used to communicate climate projections so that they also included the near-term, which better aligned with the planning cycles of organizations, businesses, and government.

Building Collective Momentum for Climate Action in Hawai‘i

The changes happening in the natural resource management community, with and without PICCC’s help, did not happen in a vacuum. Interviewees described some of the societal currents that built momentum for climate action in Hawai‘i from 2009 to 2018, which are summarized below.

- » **Top-down and bottom-up pressures coalesced:** Forces from the top-down (e.g., mandates) and bottom-up (e.g., public opinion) pushed the climate agenda forward. During the Obama Administration this included federal support for climate action, signing of the Paris Agreement, and local climate work set into action with energy from this wave. Within the state government, Act 23 (2017) created the Hawai‘i Climate Change Mitigation and Adaptation Commission to promote “ambitious, climate-neutral, culturally responsive strategies for climate change adaptation.” From the bottom-up, there was growing awareness and concern about climate change in the public. Voters on O‘ahu created Honolulu’s Office of Climate Change, Sustainability, and Resiliency through a chartered amendment in 2016. And just one week after President Trump announced the country’s planned departure from the Paris Agreement, Hawai‘i’s Governor and Mayors gathered to pass legislation committing to the goals of the Agreement, and in doing so become the first US state to independently join the Paris Agreement (Bromwich 2017).
- » **International engagement:** Pacific Island nations are well recognized for their strong advocacy for climate action on the international stage. As a US state, Hawai‘i has different circumstances and positioning. In 2013, the [Polynesian Voyaging Society](#) set sail from Hawai‘i on the Hōkūle‘a to spread the message of “Mālama Honua” (to care for our Earth) through the worldwide voyage. At home, the Hōkūle‘a crew shared the concept of mālama ‘āina (to care for the land) through social media and news coverage, and by directly engaging with Hawai‘i’s schools and the public. Further local-to-global environmental connections were made in 2016 when Hawai‘i became the first place in the US to host the International Union for the Conservation of Nature (IUCN)’s World Conservation Conference (WCC). Representatives from across Hawai‘i’s natural resource management community and state government had roles in preparing for and hosting the 25th IUCN WCC. At the WCC, Governor Ige launched the Sustainable Hawai‘i Initiative as part of a statewide effort to achieve the [Aloha+ Challenge](#), a locally-driven framework to implement the United Nations Sustainable Development Goals. Coinciding with the WCC, President Barack Obama traveled to Hawai‘i and the Northwest Hawaiian Islands where he discussed the threat of climate change, and announced the

quadrupling of Papahānaumokuākea Marine National Monument (to a size comparable to Texas). Since committing to the Paris Agreement in 2017, the State of Hawai‘i has sent representatives to the United Nations Framework Convention on Climate Change annual Conference of the Parties. In 2018, the United Nations invited Hawai‘i Green Growth to become one of the world’s first Local2030 sustainability hubs.

- » **Increased investment in climate science and action:** Philanthropic and federal funding helped create an increased number of jobs and research projects dedicated to working on climate change than in the previous decade. For example, the 2016 selection of Honolulu by the Rockefeller Foundation as one of the world’s 100 Resilient Cities included the following forms of support: financial and logistical guidance for establishing a Chief Resilience Officer; support in the development of a city/county resilience strategy; and membership to the 100 Resilient Cities, which facilitates learning across the network. From the federal funding side, both PICCC and the Pacific Islands Climate Science Center were established during this period (2009 and 2010, respectively), increasing the number of grant and cooperative agreement opportunities available for climate change related work locally (although Hawai‘i was only one of the seven jurisdictions served by these organizations). Pacific RISA, composed of researchers from the East-West Center and University of Hawai‘i, was established with partial funding in 2003 and full funding in 2010 through the NOAA Regional Integrated Sciences and Assessments (RISA) program, which provides competitive grants to regional climate research teams.
- » **Commitment to working together:** Interviewees elucidated how the culture and geography of being island communities shapes Hawai‘i’s approach to addressing climate change. A high value is placed on solving problems collaboratively, working out disagreements, building trust, and doing what is best for the collective. This also translates to working towards climate resiliency in ways that are pono (righteous), and rooted in community and place.

“Being of the place, being driven from the place. It is working with folks to understand what they need and what you can bring to bear.... It is co-production but it is also the pono way.”

One interviewee described the incorporation and inclusion of Hawaiian cultural practices and concerns as “more threaded” than usually observed on the continental United States. In their observations of the interactions of diverse stakeholder groups on the mainland, “it just doesn’t seem to weave together as smoothly as what I see out in Hawai‘i.”

- » **Indigenous, grassroots, and community leadership:** Initiatives to incorporate traditional ecological knowledge (TEK) into climate change science and adaptation actions were also a source of both inspiration and guidance. Examples include the non-profit organization [Ka Honua Momona](#) on Moloka‘i charting a path forward on how to incorporate both TEK and climate science in the management of loko i‘a (fishponds), or the community of Ka‘ūpūlehu on Hawai‘i utilizing TEK to understand climate change impacts and preserve key cultural and natural resources.
- » **New climate messengers:** While in the first decade of the 21st century, the messengers most associated with climate change in the general public were likely Al Gore, Leonardo DiCaprio, and older white male scientists, that was being overturned in the second decade. Trusted indigenous leaders, people with close relationships to the land and sea, and community advocates were speaking out on and informing climate research and action. In Hawai‘i, the change in messengers gave increased weight and credibility to the climate crises. Inspirational individuals mentioned by

name included Dr. Pualani Kanahale, a respected Native Hawaiian scholar, and Kathy Jetñil-Kijiner, a Marshallese poet.

“I think that what has helped [raise awareness of climate change] in Hawai‘i is the rise of the indigenous knowledge and observations and Native science if you would, combining with people who have been trained in scientific realms and fields. I think that has really helped the credibility side, because one, there is an ability to talk to the practitioner who actually observes the everyday thing, the fisherman, the taro farmer, ‘you know I have seen a lot heavier storms, and more water volume, and we’ve had longer periods of drought, and I’ve seen higher tides than ever, I’ve seen algae blooms of this and that, and the fish change and now you have to go to a different spot.’ So, there is this on-the-ground true grit hands-in-the-dirt verifications of the scientists’ observations and hypotheses, right? So, it is about who is saying it and how it’s being said, and where is the justification. The indigenous side I think is really important because it’s tangible observation. ‘I do this every day. This is the change I have seen.’ Not, ‘it’s in a computer and in some model and this is what the projections and algorithms say it’s going to be.’ Putting them both together, is the way that I think made a big difference. And I talk about the uptick of the Hawaiian understanding, and it’s really accredited to the Papakū Makawalu Auntie Pua folks, and Kekuhi folks, and that ‘ohana, they’ve really been able to—through the research and the chants—look at these observations that were documented in the chants, and then bring it forward in applicability to this day-and-age.”

“[When Kathy Jetñil-Kijiner’s] poem was shown at the Hawai‘i Conservation Conference, I think that really shook a lot of people because there was one of us, a Pacific Islander who was talking about climate change in a very intimate way—it wasn’t a PhD in a lab somewhere sending out messages of doom and gloom—it was very personal. This is the first time I remember seeing that sort of cultural expression of climate change in that medium, and it made it very real.”

- » **Increased public visibility of climate change:** During 2009–2018, climate change has become more ‘visible’ in terms of the availability and scale of scientific information, the amount of media coverage, and in the personal observations people are making about changes in their local natural environment. In turn, people started thinking less abstractly about how climate change will impact the islands. Interviewees described the public anxiety experienced when three Category 4 hurricanes (Kilo, Ignacio, and Jimena) lined up to strike Hawai‘i in 2015, and the collective sense of loss felt during the massive coral bleaching event that devastated Hawai‘i’s coral reefs in 2014–2015. Conversations about environmental change have become more prevalent in Hawai‘i and have been enriched by programs like the “Hawai‘i and Pacific Islands King Tides Project,” led by Hawai‘i Sea Grant, which engages the public in tracking, photographing, and geo-tagging the annual king tides, giving people glimpses into what future sea level rise might look like.

“So, I think because of the greater depth and availability of science and it being shared in media more frequently and intensely, and us seeing the impacts of it, too... the 2014 to 2015 bleaching event, I mean, that really blew people’s minds! To lose 50% of the live hard coral cover from the northwest point of the Big Island to the southwest point, and in some places it was up to 90% loss. That, I think, really has gotten a lot more people involved and concerned....”

“All of the general predictions that were made about warming trends, about increases in severity and frequency of storms, about sea level rise—all of those elements that we think about—we are all actually seeing them happen now, so it becomes not a theoretical aspect of our work, but a direct day-to-day aspect of it.”

- » **Personal observations of environmental change by professionals:** In communities of practice that observe terrestrial and marine environments closely over time, including the natural and biocultural resource management communities, the nuances of environmental change are becoming day-to-day realities. Interviewees described how this is also motivating actions.

“There are efforts to start establishing sea bird colonies on high islands because we see that all their nesting sites on the low-lying islands will be gone, and they’re already experiencing major winter storms that are flooding out those nesting birds. That is one folks are already realizing: it’s definitely going to happen and they’re finding new strategies and places for the birds to nest.”

“If you talk with any of the folks that are dealing with rare plants, let’s say, rare plant management, they’re all recognizing that the places that they work are changing.”

Reflecting on a Decade of Progress

Juxtaposing the urgency of the climate crisis and the actions being taken to address it, interviewees understandably felt that society is moving at a snail’s pace. But it is worth appreciating just how far that “snail” has traveled, particularly given the limited resources and challenges it faces.

“Now everybody is talking climate change. They’re all running around doing stuff. The states are engaged, you have the Paris Climate Accord, you have state commissions on climate now formed. So, there’s been this huge surge!”

“[Hawai’i] came from behind. For example, New York or California, they have been doing this for a while. But then again, they have a lot more information. So, we’ve spent the last 5–6 years building up the information that we needed and then people were just ready to learn how to use it and put it into planning and policy... As a state, we are ready to start using this information and if we have good enough information to offer to people, they are going to go with it. In 2013, that was unthinkable.”

“It has been a slow and steady progression, but now I think [climate projections] are being used in actual policy and planning.”

In summary, these observations—here grouped into common themes emerging from the interviews—illustrate the change in context in which PICCC worked to bring the natural resource management community together to address biocultural climate adaptation in Hawai’i from 2009 to 2018. Some of this progress was aided by PICCC’s work, some of the observed changes were contextual, but together they demonstrate that, as a community, substantial progress has been made.

3.2. The Evolution of PICCC

Secretarial Order 3289 of the Department of the Interior, signed on September 14, 2009 by then-DOI Secretary Ken Salazar, recognized the unprecedented scope of threats to landscapes and seascapes in the 21st century, and called for the establishment of Landscape Conservation Cooperatives as a means to pursue coordinated, landscape-level conservation strategies in response. The Pacific Islands Climate Change Cooperative became the first LCC established in USFWS Region 1 (serving the US Pacific Northwest, Hawai‘i, and the US-Affiliated Pacific Islands). The first steering committee meeting was held in Honolulu on October 14, 2009, focusing on the purpose, form, and function of the new LCC. Many steering committee meetings would follow as the organizational design was fleshed out, and a founding charter was developed. The USFWS placed an interim coordinator at the helm in October 2009, and dedicated two staff to the positions of Coordinator and Science Coordinator in July 2010. The PICCC Charter was signed by the steering committee members in August 2010.

PICCC’s governance structure was designed with the intention of incorporating management guidance from across the natural resource management community. Their “cooperative” model required a substantial investment of time upfront to find a common purpose and establish goals. This early visioning stage was crucial in shaping what would follow and would have been difficult to speed-up. Substantial investments of time are needed to build trust and foster community cohesion, and this was a crucial aspect of achieving PICCC’s broader vision.

“A lot of time in the early years was just spent working out the governance piece for PICCC—who would play, how they would play, what the expectations were, how you mesh all of the agencies with their missions and regs, rules, laws, whatever. There was a long, big block of time spent just sorting out how everybody would work together, play nice, and share... And it was truly a testament to that original group of Steering Committee members.”

“We started out with such naïve thinking, ‘oh yeah, we’ll have a big kind of research center, a bunch of scientific staff, produce all this science that the managers need, and then we’re going to make headway.’ But you know, it’s not about the information. The science itself is really complex and it’s really challenging to talk to managers that have a very limited bandwidth to make sure that they’re including all of the caveats.... Even the general idea, ‘Oh, we’ll interact with our managers, and our managers tell us what they need.’ Well, even that idea in itself is challenging because sometimes managers don’t know what they really need... and so, it’s like the whole process was a really huge learning process for both scientists and the whole institution itself in terms of what really is needed to make adaptation work... learning this along the way....”

In its early years, PICCC worked to identify and help fill in knowledge gaps about the potential impacts of climate change in Hawai‘i. This included collaborations to support downscaled climate modeling, the first PIRCA report, large-scale climate vulnerability assessments of Hawai‘i’s native plants and birds, and research-funding competitions for innovative climate research projects. An “Integrated Science Framework” guided PICCC’s early work (PICCC 2012). PICCC’s strategy was also informed by the USFWS’s Framework for Landscape Conservation (known as “Strategic Habitat Conservation”) (USFWS 2008, 2010) and the role of LCCs as “boundary organizations” (Jacobson and Roberson 2012). The Cooperative’s approach evolved with a growing awareness of the complex human dimensions of climate adaptation.

“One of the main lessons from PICCC is that, we started with such a simple model of what is climate change adaptation, what is needed, what is the process of incorporating science into decision making and all of those things. We didn’t solve them but all of us—whether it is people within the PICCC that were part of the core staff or all of the partners—we all came out with such a much more complex understanding of what all that is.”

Aiming for a more strategic approach, PICCC unveiled a five-year strategic plan in 2014, which was used as guidance until 2018, when federal funding for the operational staff was discontinued. This new strategy had two interlinked goals aimed at achieving the organization’s mission.

Mission Statement: The PICCC will improve the ability of native island species and ecosystems to accommodate future climate change and related perturbations, and support the long-term protection of key cultural resources by providing useful projections of climate and natural resource change in the Pacific Islands, innovative management options, and a membership that supports coordinated action among institutional and community stakeholders.

The first goal focused on **facilitating climate adaptation** by helping managers and decision-makers use the information, tools, and techniques needed to plan for and manage systems in a changing environment. The second goal aimed at **fostering partnerships** to create the optimal political, policy, organizational, and community conditions for climate adaptation to advance. The assumption made by those designing this approach was that these two goals would both be needed and work synergistically to move toward fulfilling PICCC’s purpose as an organization (Figure 5).

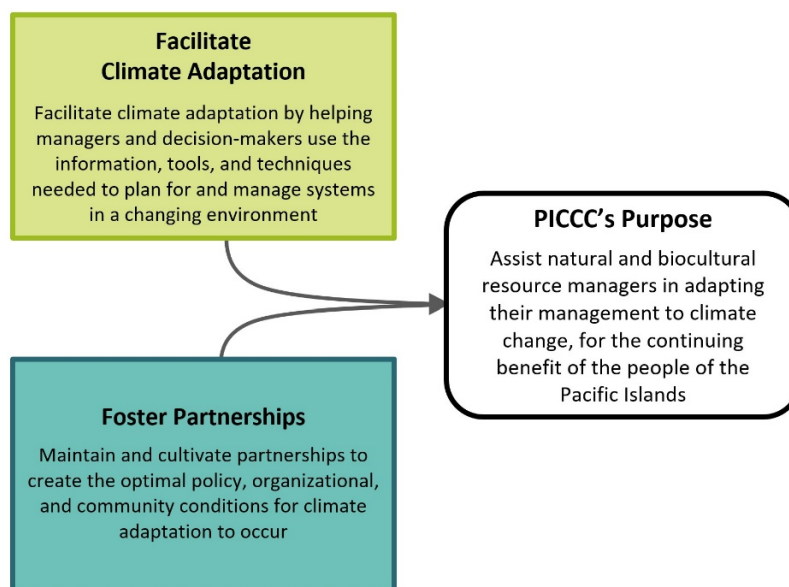


Figure 5: PICCC’s two strategic planning goals, facilitating climate adaptation and fostering partnerships, were pursued with the aim of achieving its charter purpose.

PICCC’s Logic Model and Theory of Change is provided in Appendix C. Published in its 2014–2019 Strategic Plan (PICCC 2014), this model depicts the high-level outputs and activities that member organizations saw as necessary to attaining PICCC’s goals and advancing its strategic direction. Major outputs for each goal were proposed within the model, and grouped into phases within a 5-year timeline. Key activities were nested into each major output, to support the implementation of the strategic plan through the

development of adaptation initiatives. A *simplified* version of PICCC’s Logic Model and Theory of Change summarizes the strategy from 2014 onward (Figure 6).

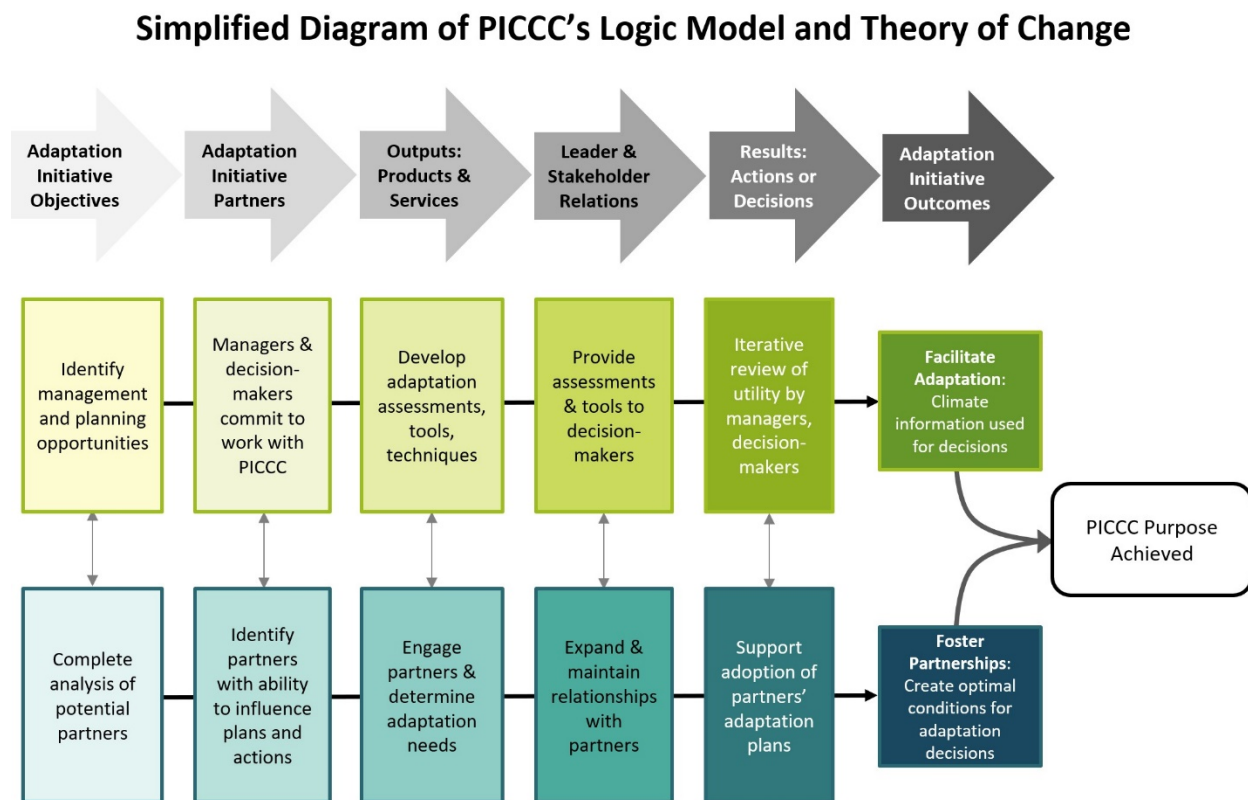


Figure 6: Simplified diagram of PICCC’s Logic Model and Theory of Change (see Appendix C for full model).

PICCC’s Logic Model and Theory of Change is designed to *intentionally* engage stakeholders in meaningful “co-production” of projects, to ensure these projects address real-world decision points and adaptation needs. The PICCC Steering Committee, which served as the representatives of the broader natural and biocultural resource management community, selected overarching Adaptation Initiative themes and goals that were incorporated into Requests for Funding Proposals (RFPs).

“One of the key strengths of PICCC was that they really made an effort on co-production with stakeholders—to have that drive the needs, drive the product development, drive the requirements.”

The Logic Model and Theory of Change was still new to those responding to the RFPs. Interviewees recounted that the language of collaboration and stakeholder engagement occurred in proposals, but perspectives on what that meant varied between project funding applicants and PICCC. In addition, there were limited options for PICCC to influence a project’s design after awards were made. In other words, the RFP process front-loaded PICCC’s influence, and they had few mechanisms to ensure that projects that received funding achieved the desired level of community engagement. Researchers are often rewarded for their productivity publishing, particularly in peer-reviewed journals and on ideas that are novel to the academic community. There is a well acknowledged mismatch between these motivations and the on-the-ground needs of natural resource managers and policymakers (Gibbons et al. 2008). Like so many other organizations investing in applied research, there was observed tension between the existing reward system in academia and the goals

of PICCC as a funding organization. Compounding this was the relatively small numbers of proposals that were submitted in each funding cycle, leaving the selection committees with limited choices. Some of the strongest projects PICCC funded, which followed the PICCC Logic Model and Theory of Change most closely, were led by non-governmental organizations that had close, trusted relationships within the communities they represented.

PICCC's Logic Model and Theory of Change assumes that facilitating climate adaptation and fostering partnerships are synergistic, with one propelling the other. We explored this assumption, and found some evidence to support it. For instance, 49% of survey respondents viewed the process of gathering, producing, and sharing climate change relevant science, tools, and techniques as changing relationships within the natural resource management community in Hawai'i, based on their own personal experiences and observations (Appendix A-17). Similarly, when asked if the relationships developed and/or strengthened through PICCC helped natural resource managers to integrate relevant climate change information into terrestrial, freshwater, and/or marine management plans in the main Hawaiian Islands, 56% of those surveyed responded yes (Appendix A-18). Survey respondents elaborating with written feedback reported that PICCC's efforts to foster adaptation partnerships had simultaneously helped with the uptake of climate change considerations into management decisions, informed policy makers, and helped promote policy changes (Appendix A-18, written feedback). Finally, just the act of working on climate adaptation appears to have had some influence on relationships within Hawai'i's natural resource management community, as shown in Figure 7 below.

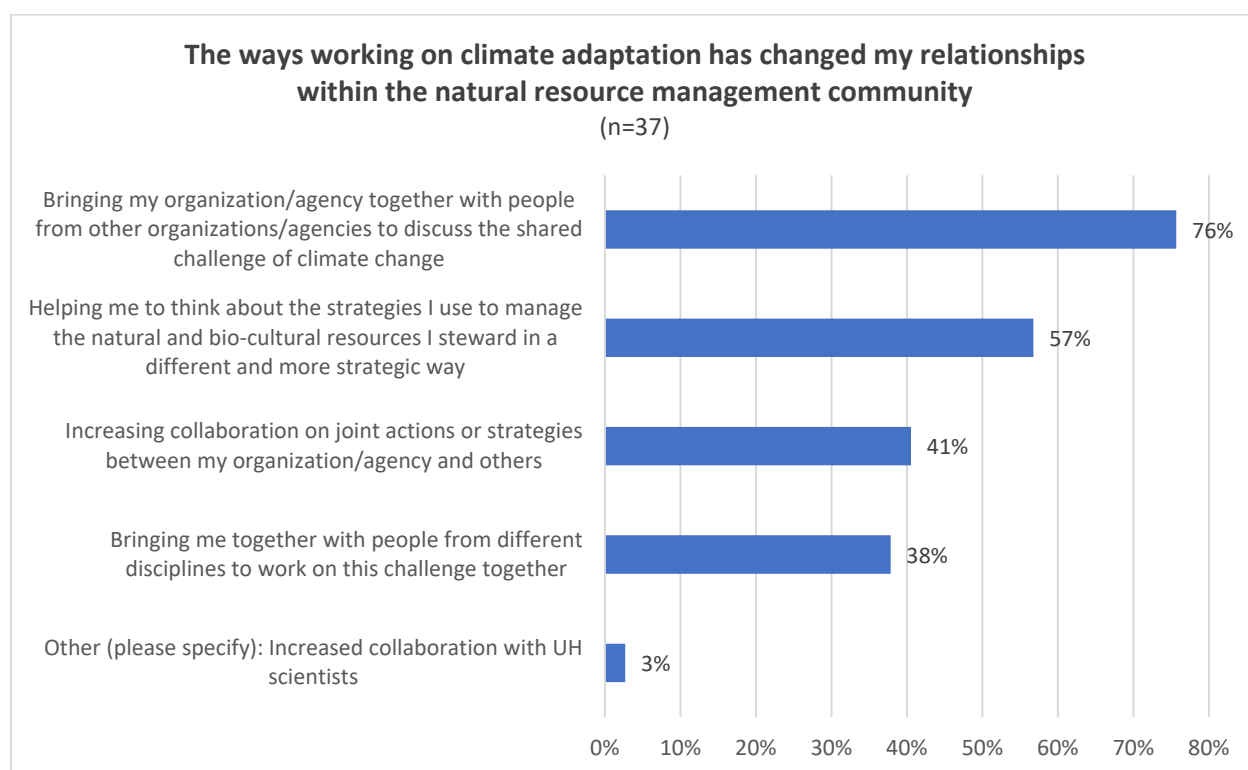


Figure 7: The ways working on climate adaptation has changed relationships in Hawai'i's natural resource management community.

One core element of PICCC's Logic Model and Theory of Change was working closely with resource managers. With only 5–7 staff plus interns at any time and a large service region, it was not possible to achieve the level of engagement desired. However, in some initiatives, such as the Hawaiian Islands Terrestrial Adaptation Initiative, which included the Hawaiian Islands Climate Synthesis Project facilitated by EcoAdapt and PICCC, stakeholder/end-user engagement was particularly emphasized. Thus, in Fiscal Year 2017, PICCC directly engaged with over 320 individuals through workshops, steering committees, working groups, and adaptation initiatives (PICCC 2017a). In that same year, PICCC engaged with 87 different organizations and agencies (and an additional 48 sub-programs, offices, and departments) (PICCC 2017b).

Through time, PICCC continued to hone its approach. One of the lessons learned was the importance of **designing climate science with adaptation decision points in mind**, as described by this interviewee.

"You have the managers [in the conversation] as you're working, as you're developing your products or your analyses and questions, and it's just like, 'So how are you going to use this?' 'When do you need this information?' 'What are the decisions that you're going to be using this for?' It is understanding exactly what are some of the kinds of decisions being made so that you can more realistically assess how your information can be actually used. It's really that super fine scaled understanding of who is using the data and what's their timeline and what's the kind of information that they are familiar with, that they'd likely to use, that they have time to consider, and so forth."

PICCC's overall strategy appears to have been viewed positively with over 97% of natural resource managers surveyed reporting that PICCC's approach was effective (51%) or somewhat effective (46%) (Appendix A-21).

"It is one matter to put it onto the web and send an email to out to folks, and it is another matter to go one-by-one to each of those member agencies, sit down with their staff that do GIS and do planning, and explain what the relevance of this thing is. And that is what PICCC staff did. That is a good example of how far they went to try and foster cooperation and partnership."

As a cooperative, PICCC was designed to be a "hub" of sorts to bring the network of natural and biocultural resource managers together and facilitate discussions to support climate adaptation. This role is reflected in the following quote.

"It was really important to have this one place where any community could come up to speed on things.... We are able to network much more readily than in the past, and PICCC was cognizant of that and took advantage of all of those avenues. I can't overstress how important that kind of thing is in facilitating current and future cooperation. Just knowing that you're able to do that easily—because for most people if you can't do it easily you just stop trying. So, the fact that PICCC helped establish and was part of that active network was really important."

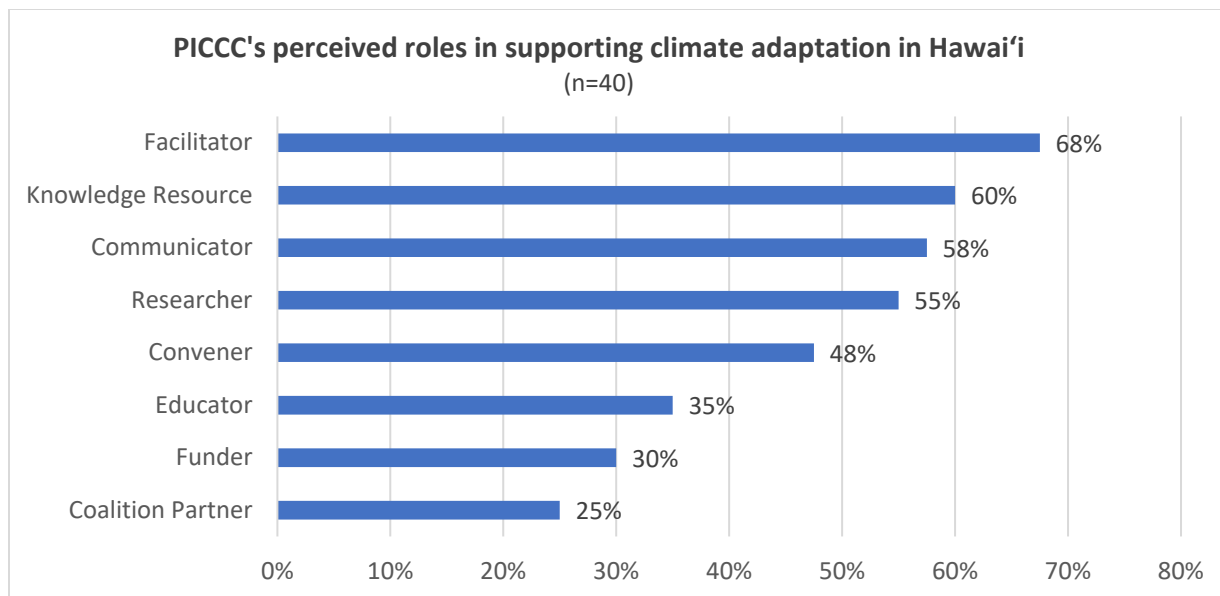


Figure 8: PICCC's perceived roles in supporting climate adaptation in Hawai'i.

Examining PICCC's perceived role in climate adaptation in Hawai'i (Figure 8; Appendix A-11) illuminates the niche that PICCC filled within the larger natural resource management community. Given the Cooperative's design and cooperative mission, and its facilitation of various workshops and convenings across the archipelago, it is unsurprising that respondents viewed PICCC as a "Facilitator" (68%) and "Convener" (48%). PICCC had a full-time research ecologist on staff, and PICCC contributed both funding and time towards developing new climate research and information products. This aligns with PICCC's reputation as a "Knowledge Resource" (60%) and association with the "Researcher" role (55%). Like other cooperatives in the national LCC Network, PICCC had a full-time communications manager. Survey participants recognized PICCC for its roles as "Communicator" (58%) and "Educator" (35%). PICCC dedicated significant resources and staff time towards creating and managing funding opportunities, but this role was less recognized by survey participants (30%). This might be because many respondents had attended PICCC events or utilized PICCC-led/supported research, but few had been recipients of PICCC funding opportunities. The perceived roles of PICCC aligned with its dual aims in the 2014–2019 Strategic Plan, to "facilitate climate adaptation" and "foster partnerships." PICCC was an active member of the Hawai'i Conservation Alliance, where it worked alongside other agencies and organizations to support Hawai'i's conservation agenda. The PICCC staff served on several advisory and working group committees, which may help explain the (limited) recognition as a "Coalition Partner" (25%).

The Adaptation Initiatives (AI) model, which was a turning point in PICCC's strategy at Year 5, was a more strategic approach to achieving the Cooperative's goals. Each AI was a multi-year initiative with a specific theme and overarching goals developed by the Steering Committee, under which multiple project teams could work on aspects of the larger initiative. The focus of the new AIs changed each year but the duration of prior-year AIs could be extended. In early 2018, PICCC was wrapping up its four active AIs in preparation for the next 5-year cycle but also because of increasing funding uncertainty due to the change in administration. The four foci of the AIs were:

- **Hawaiian Islands Terrestrial Adaptation Initiative (HITAI)** focused on the incorporation of climate change research into natural and biocultural resource management in Hawai'i;
- **Micronesian Mangroves Adaptation Initiative** focused on coastal and community resilience to the impacts of climate change in the Federated States of Micronesia through improved management of mangrove ecosystems;
- **Pacific Islands Agroforestry Adaptation Initiative** focused on the adaptation of agricultural practices to changing climatic conditions, supported through climate forums for Cooperative Extension Service personnel in the USAPI;
- **Marine Communities Adaptation Initiative** focused on the impacts of extreme climate events (e.g., El Niño, drought, coral bleaching, and tropical cyclones) on marine-dependent communities in Hawai'i.

As the number AIs grew from 2014 to 2018, so did the demands on staff. Furthermore, while this report focuses on PICCC's work in the Hawaiian Islands, Hawai'i was just one of seven jurisdictions the Cooperative served. It was impossible to make similar investments across the USAPI given the limited resources of the organization.

"The theory was much more grandiose than we could actually accomplish. We didn't have the people to do it right. We were stretched thin. It was a lot more labor intensive than we had capacity for. People didn't understand what it actually meant, so each one was completely different because the people we were cooperating with conceived of them differently. We couldn't control that. People are used to applying for a project, getting funding, and doing the project. 'Period.' They were not necessarily interested in what we were interested in."

While effective during PICCC's active years, the size of the Cooperative's staff/resources was mismatched with its service area and staff were hard-pressed to keep up with the growth of the Cooperative. This raises the question: How can an organization of this size best represent the immense diversity, knowledge, and needs of a region with land- and seascapes spread out across the world's largest ocean? Interviewees generally understood this mismatch. As one interviewee put it:

"PICCC grappled with the same challenge again that all of our big regional programs have, and that is that the USAPI covers five times zones, 20 languages, a set of different governance structures and so on.... I would say that the PICCC did about as good as any program could do to try and find a niche and attempt to produce something useful."

PICCC's closure was due to a loss of funds for operational staff resulting from shifting policy directions in Washington. This sensitivity to political shifts imposes constraints on programs that—by their nature—must think long-term: How can an organization be truly forward thinking when it is facing insecurity about its short-term survival? How could such an organization be designed so that it is more resilient in the face of political, economic, and societal stressors and shocks?

"The whole uncertainty on the future of PICCC and other LCCs and the whole Science Application program is a big hindrance on thinking about the future."

"I think that funding uncertainty is part of our world today in this area of research and applications but, it is a huge challenge that the folks that create that uncertainty either don't know or they're trying to create the chaos in the hopes that things will fail."

Interviews believed that had PICCC persisted, it would have continued to evolve, further honed its approach in response to the needs of the region, and would have had more significant impact.

“PICCC was positioning itself really well from my perspective to really roll out a new five years that would really amp up the transformation and not just information pushing but the collaborative development of knowledge in our resource management partners.”

We close this section with a quote that reflects an important organizational impact PICCC had, which took time to bring about but is a precondition for landscape-scale cooperative conservation. And that is the achievement of a collective identity and organizational alignment in which individual members leave their organizational silos, learn and develop trust with each other, coalesce around unifying goals, acknowledge their shared challenges, and then collectively work on solutions.

“As a whole the Steering Committee became more robust, more informed, and more demanding if you will.... They reached some clarity about what was important to them as a group, as a collective, and really put aside their individual agency needs and looked at landscape level needs.... We worked through the strategic planning process and actually started looking at particular projects and geographic areas, collectively making those decisions about where we were going to put resources and what we hoped to achieve. And I think that is a tribute to and a positive outcome of the way that the PICCC partners learned and evolved into working together. And I think that is reflective of that much bigger, larger piece that we carry here in the Pacific where we have these long-term partnerships that have levels of trust, that have the ability to behave like siblings and, you know, we clean it up and figure it out and keep moving forward, and I think that the idea ‘how do we share and solve problems together’ in these partnerships is our working norm. This is the norm for us. And PICCC has been an incredible example of how we work best here in the Pacific.”

3.3. Lasting Impacts

Climate adaptation achievements that Hawai‘i’s natural resource management community (represented by survey participants) gave PICCC credit for are shared in Figure 9 below. Survey participants were specifically asked about those achievements and outcomes that they had “observed and to which they felt” PICCC’s investment in climate adaptation contributed (Appendix A-10). Increased communication about climate change in the practitioner community (76%), considerations of climate change in decision-making (66%), increased collaboration within the natural resources management community (44%), and implementation of adaptation responses to climate change on the ground (34%) are considered lasting outcomes from 2009 to 2018.

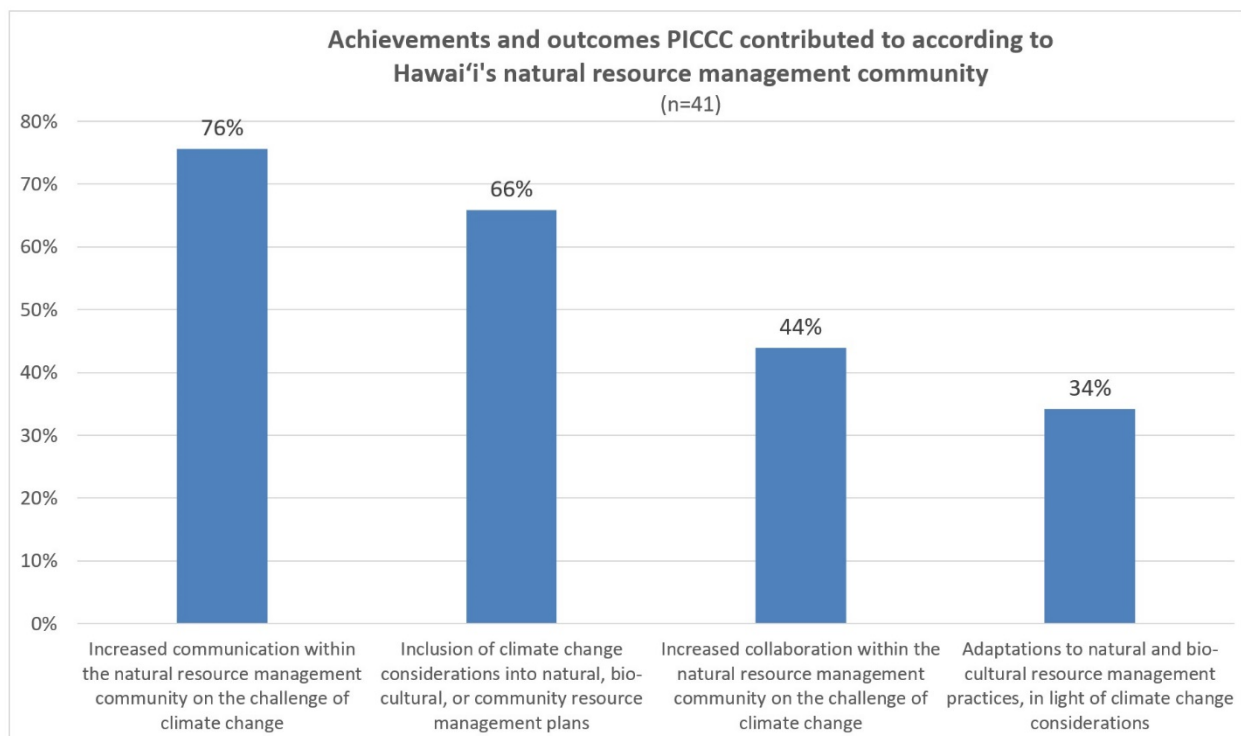


Figure 9: Achievements and outcomes observed by survey participants that they believed PICCC’s investment in climate adaptation contributed to.

Interviewees were at times challenged to assign responsibility for achievements, which is not surprising given the multiple contributors to any outcome and changing context over that decade (see Section 3.1). PICCC, PI-CASC, and Pacific RISA specifically were credited with bringing greater focus to the issue of climate change within Hawai‘i’s natural resource management community. Below we discuss PICCC’s perceived contributions to these four lasting impacts in turn.

Increased Communication about Climate Change

The process of bringing people together and facilitating access to the most recent climate information was described as accelerating learning within the natural resource management community. Those surveyed

emphasized the importance of PICCC's role in bringing people together to identify shared goals and concerns, and facilitating important discussions on climate adaptation. PICCC-organized events were viewed as supporting networking, collective learning, and peer-to-peer accountability (Appendix A-9, Contribution 2). Interviewees described PICCC as elevating the quality of the conversations about climate change—gaining more breadth, depth, and nuance.

“...while PICCC was active we had access to all of the folks that were on the cutting edge of those kinds of (climate) data. So, it was great. I think that PICCC's existence greatly facilitated and accelerated our understanding.”

“[PICCC] served as a catalyst... for other organizations to be connected... But it was so much more than that, because the engagement of the groups, it wasn't just connectivity, but it was taking that information and sharing it back in ways that people on the ground could use it. And agencies and organizations could connect to people on the ground. And packaging that information in ways that it could be used, or shared, or duplicated.”

Inclusion of Climate Change in Management Plans and Policy

Resource managers reported that PICCC's work helped focus discussions, supported priority setting for species and habitats, and informed natural resource management decision-making and policy (Appendix A-9). PICCC-supported climate science informed debates and management plans and was utilized in reports, public presentations, and community outreach. PICCC-organized workshops provided time to absorb the new information and enabled peer-to-peer dialogues on new climate research and how it pertained to resource managers' concerns, vision, and goals. New information gained from workshops and products were then shared by resource managers with their own stakeholder communities (Appendix A-9, Contribution 1).

“Midway and some of the other islands [comprise] the world's largest albatross colony, and it's not going to be there in one hundred years [due to sea level rise]. So [Pacific Rim Conservation and partners are] taking eggs from two species of albatross as well as smaller sea bird species from the Northwestern Hawaiian Islands and moving them into a predator free area at James Campbell National Wildlife Refuge on the North Shore. That is probably the longest term, most strategic conservation project we have going on. And it is all stimulated by this new understanding of what is likely to happen in the Northwestern Hawaiian Islands a few generations down the road. Now is the time to be doing that; it takes a while for a colony to establish. That is an example of a very specific project that was started because of our better understanding of climate change and how to adapt to it, or get around it.”

“Based on that [study of the future of coral reefs that PICCC funded], and based on all of the other science around coral reefs and bleaching, [the Department of Aquatic Resources is now] looking at how you can deal with management to help this problem. And, they're not looking at when the coral reefs are all gone. They are looking at ‘we can't do anything that prevents bleaching, and given that, what can we do that aids in the recovery of bleaching?’ They're totally applying the information correctly, and they are incorporating public viewpoints into that... By snapping people awake early on to the issue I think [PICCC] contributed to that. But it takes that amount of time—5, 6, 7 years—before people kind of “[big swallow], okay given that, what can we do?” You can't ask for more than that. They're not throwing up their hands—they're managing for the people of Hawai'i and the resources.”

“[PICCC] has been very strategic working with the Office of Insular Affairs, and changed their outlook on, ‘Hmm, we spend a lot of money funding infrastructure projects, maybe we should think about doing something—before we spend 10 million dollars on a road—maybe we should make sure it’s not going to get flooded out in 20 years.’ Or working with the Office of State Planning, the Office of Conservation and Coastal Lands, to help them think a little bit longer term.”

Respondents noted that the local focus of PICCC’s climate research was critical to its utility and uptake in adaptation planning (Appendix A-9, Contribution 3).

“The main thing is the resolution of the climate models for Hawai‘i. That was a real important milestone. PICCC was a major part of making that not only directly relevant but Hawai‘i-specific. It’s one thing to have climate change models global or sub-areas or general predictions, but to have them catered to your place precisely, and the species that you’re working with precisely, made all the difference.”

Survey participants and interviewees credited PICCC with helping the adaptation conversation in the conservation community evolve. One specific example was Dr. Lucas Fortini’s modeling of forest birds with an emphasis on avian malaria and disease transmission. This research received large traction, including in the general public, and is a prominent example used to describe the impacts of climate change on Hawai‘i’s local ecosystems and culturally important species. Fortini’s Vulnerability Assessment for Native Hawaiian Plants was seen as another influential study that, with time, might support more serious discussions about the relocation of plant and animal species in preparation for their previous ranges no longer being suitable. PICCC also tried to bring attention to innovations in climate adaptation with a six-part video series featuring some of the most forward-looking projects at the time, including on species relocations already being done in Hawai‘i.

“The whole tenor of discussion about climate change has changed, and [maybe] that is just a sign of the times, but I think that PICCC was instrumental in leading a lot of those conversations that changed people’s consciousness and thinking about climate change.”

Increased Collaboration on Climate Change Challenges

PICCC’s commitment to partnership-building appears to have borne fruit with survey respondents reporting that PICCC contributed to fostering—to varying degrees—the kinds of relationships needed for climate adaptation to advance (Figure 10; Appendix A-15). Particularly significant was PICCC’s contribution to building partnerships across agencies and organizations (within the conservation arena) (believed by 67% of respondents), which were also seen by 82% of respondents as being most important for advancing adaptation. Nearly as important were PICCC’s contributions to building partnerships across disciplines. PICCC was less successful in helping build partnerships across sectors, scales, and worldviews.

Asked whether the relationships they had personally developed/strengthened through PICCC activities supported the incorporation of climate information into natural resource management, 56% felt that it did, 32% were not sure, and 12% did not see evidence of this (Appendix A-18).

Together these results emphasize that information does not stand alone and that, instead, the personal connection and emphasis on building networks of trust and learning, i.e., a community of practice, ultimately changes attitudes and decision-making processes.

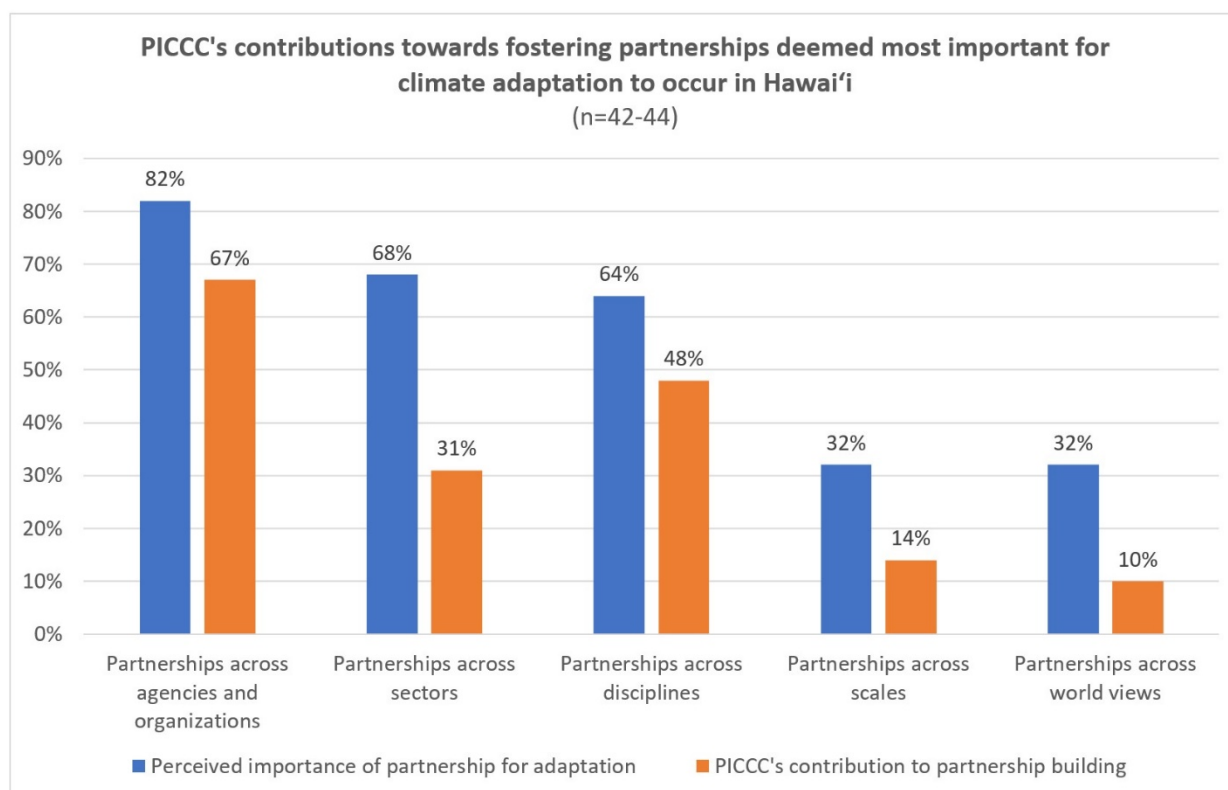


Figure 10: The perceived importance of partnerships for climate adaptation in Hawai'i and PICCC's perceived contributions towards fostering these kinds of partnerships.

"PICCC invested in fostering relationships among the community... it was basically building a community of practice."

In fact, endeavoring to build a community of practice is a useful way of understanding the deeper motivation behind PICCC's work fostering partnerships. It also explains why some of PICCC's contributions will continue to "ripple" out, having a lasting impact through the network that continues this work. The "learning trees" concept, described below, is an ideal goal.

"I definitely felt they were sort of at the cusp of really building those partnerships, and not just partnerships here and then there, but "learning trees" if you will. One set of partners being resources for other sets of partners that are maybe just starting out on the process. And so, role models from an organizational standpoint. It was really challenging, and I'm impressed with how much PICCC did do because it was such a small staff and it was not budgetarily well supported. So, they really depended on their partners to help out and that played some of that role in that partners saw that they had to help out, and that makes a more living, productive, and engaged partnership. And so, I believe that that works; and I think that PICCC was doing that."

Advanced Climate Change Adaptation Actions

Hawai‘i’s natural resource management community is taking more actions on climate change now than a decade ago, as demonstrated by Figures 3 and 4 in Section 3.1. Interviewees cited the importance of PICCC-funded projects that directly informed management plans, such as the collaborative marine spatial planning analysis done for the State of Hawai‘i’s 30x30 Initiative, which utilized decision-support tools such as Marxan and SeaSketch (Hawai‘i Coral Reef Initiative 2017).

“The Hawaiian Islands Plant Vulnerability Assessment is the accepted standard for including climate change into species status reports and management planning.”

Both survey respondents (Appendix A-6) and interviewees praised the Vulnerability Assessment (VA) for Native Hawaiian Plants led by PICCC research ecologist Lucas Fortini. Respondents reported Fortini’s research being used by the Plant Extinction Prevention Program to prioritize species for action; the USFWS for strategic habitat plans; and for seed banking decisions in Hawai‘i. With time, this research could support serious discussions about the moving of plant species between locations. Plant translocation pilot projects are already happening in Hawai‘i and were featured in PICCC’s 2018 [climate adaptation videos](#).

“[The] plant vulnerability assessment totally changed the way I look at long term planning for rare plant conservation”

Lucas Fortini’s Vulnerability Assessments of Native Hawai‘i Birds proved important in informing the work of a small portion of survey respondents (5%), but with a significant impact (Appendix A-6). The utility of this resource was echoed in interviews where it was reported that the Hawaiian Birds VA influenced the listing of the I‘iwi (Native Hawaiian Honeycreeper, *Drepanis coccinea*) to the IUCN Red List, as well as the USFWS Threatened and Endangered Species List.

“I’ll use the example of Dr. Fortini’s work with the I‘iwi (Native Hawaiian Honeycreeper), [and] the fact that we had the climate change information and modeling done for the main Hawaiian Islands and how it applied to the forest bird species on the Big Island. One of the struggles we always have is projecting what is going to happen out into the future, and that is part of what we’re required to look at—we’re required to look at the current context and make some sort of best judgment about what is happening in the future. We depended on extremely heavily the climate change information that was provided that covered the entire landscape of the Big Island... and it made a huge difference... that is a key piece of information that we would not have had otherwise.”

One lasting impact of PICCC is the process of learning-by-doing within the Cooperative. No one had a map on how to go about achieving climate resilience and PICCC helped them explore this challenge as a collective.

“PICCC stands as one of the best examples of what to do when you have a global issue of great complexity coming down on your place, and you have no idea at first what to do about it, and so you get together the best minds and concerned partners that you can, and start to hammer out how they would approach things, how they already are approaching things in their own shops, and then use that partnership to gain higher resolution on the issues specific to your place. And then... to go straight to the ‘so what?’... So, the combination of taking global consequences and focusing them to the specifics of a place, and then the added step of matching those specific consequences to specific actions we can take to mitigate those consequences or adapt to those consequences, those are the things that PICCC did amazingly well in the time that it was a recognized and existing body. That approach should be emulated for just about any environmental or global issue that has local expression.”

3.4. Diminishing Impacts

PICCC was a voluntary collaboration of conservation leaders representing more than two dozen natural and cultural resource conservation organizations, who provided vision and guidance. This community carries forward the relationships built and lessons learned during PICCC's existence, as they continue to steward the region's natural and biocultural resources. But the convening hub and facilitation PICCC provided have not been replaced, potentially decreasing the flow of this information across the conservation community, which in turn hampers dialogue, coordination, and collaboration across the landscape. After PICCC's closure and one year into the COVID-19 pandemic, Hawai'i's natural resource management community is likely *less* in-the-know about what their colleagues are doing on climate adaptation, what new funding opportunities are available, what novel approaches may exist, and what newly published climate science is saying about emerging risks.

After PICCC's Closure

"It would be helpful to have kind of a "Life after PICCC" [guide]; how do we link to some of the things that are still happening?"

At the time of this research, conservation practitioners were scanning the organizational horizon to see how the gaps left in PICCC's absence might be filled. One interviewee explained that with PICCC's closure, their organization recognized that the climate adaptation goals they had previously collaborated on with PICCC would need to be filled in-house.

"When PICCC was still around, we approached it as 'we as an organization will work with PICCC to address this issue.' In 2018 [when PICCC closed], we realized that things are going to change really significantly. So, at that point we acknowledged climate change as an overarching threat [in our strategic plan]. Climate change and invasive species are called out in our goals as these long-term, touching-every-ecosystem, types of threats that need to be addressed for our conservation vision."

With Hawai'i's natural resource management community already being spread so thin, PICCC's closure was a hit to the conservation community's collective adaptive capacity, at least in the short-term (circa 2018–2022).

"One of the objectives we developed is for conservation management plans to all address climate change threats and projected changes using the best of the available data.... You know some of that came out of HITAI [PICCC's Hawaiian Islands Terrestrial Adaptation Initiative].... And I think what we can expect to accomplish is 5% of what could have been accomplished with the PICCC around; because it's just a capacity issue."

What made PICCC stand out was not its role as a funding agency (see Appendix A-26), but in a resource-constrained conservation context, even PICCC's modest contributions to the adaptation funding pie are now being missed. (This will be even more evident going forward as the State of Hawai'i faces difficult funding decisions due to COVID-19 and its impact on the State's economy.)

"The reality is that if there is X amount of funding dollars brought in on one side and Y on the other, now we are just down to X. When there is not as much research being done it doesn't mean the bus

shuts down tomorrow and everyone stops, but in the long-run we might start to feel the effects of having less information available for resource management and stewardship.”

PICCC was described by some interviewees as a “concierge service” of sorts, striving to fill the role of an adaptation “extension service” or of a climate adaptation “help desk” for the conservation community. PICCC’s most useful contribution according to survey respondents was that of facilitating dialogues on climate adaptation (64%), as well as providing coordination between agencies and organizations on climate change (51%) (Appendix A-26). It was also noted that PICCC’s internship opportunities and research assistantships provided important hands-on experience for the next generation of adaptation professionals in the region.⁵ The Cooperative’s staff had built a reputation of being approachable, which can go a long way in bringing people together and keeping them connected.

In PICCC’s absence, natural resource managers are actively seeking where to go for climate information. Among respondents and interviewees, PI-CASC⁶ had strong name recognition as did the Pacific RISA.⁷ The [PIRCA report](#) published in 2012 was praised by survey respondents and interviewees. The PIRCA⁸ [website](#)—a clearing house for climate information on Hawai‘i and the USAPI—appeared to be less well known, with some interviewees not yet aware that PICCC’s publications were stored there, along with other useful resources. The Manager Climate Corps⁹ was also mentioned as an important community resource on Hawai‘i Island where they work to build “adaptive capacity locally by identifying existing professional networks and expanding them through manager-driven research projects and collaborative forums.” These entities are specifically focused on climate adaptation and are recognized sources of adaptation expertise.

⁵ For those looking for early-career opportunities in climate adaptation and/or landscape conservation, the [Pacific Internship Programs for Exploring Science](#) (PIPES), [Kupu](#), and the [Manager Climate Corps](#) all specialize in providing hands-on, transformative learning for the next generation of environmental professionals. Agencies with up-and-coming adaptation leaders on their team include the Office of Climate Change, Sustainability and Resiliency, through the [City and County of Honolulu AmeriCorps VISTA program](#), and the [State of Hawai‘i Climate Ready Cohort](#), whose AmeriCorps Vista members work with state offices to address climate readiness and equity. These and other opportunities can be explored using [Conservation Connections](#) and the [Conservation Career Compass](#), managed by the Hawai‘i Conservation Alliance.

⁶ [Pacific Islands Climate Adaptation Science Center](#) (PI-CASC) is a collaborative partnership between the US Geological Society and a university consortium composed of the University of Hawai‘i at Mānoa, University of Hawai‘i at Hilo, and the University of Guam. PI-CASC’s goal is to: “Provide natural resource managers and cultural stewards in federal, state, and local arenas access to the best science available on climate change and other stressors impacting the region’s natural and cultural resources. Emphasizing cooperative efforts between researchers and managers, [PI-CASC] aim[s] to create actionable science and accessible products to use on real problems.” There were a total of 8 USGS-funded [regional CASCs](#) (formerly known as Climate Science Centers) in the US in 2020.

⁷ [Pacific Regional Integrated Sciences and Assessments](#) (Pacific RISA) is one of 11 regional RISA teams grant-funded through the [NOAA Climate Program Office](#). Pacific RISA’s objectives are to: “Meet critical climate information needs in the Pacific Region through multidisciplinary research, assessment, education and training; provide integrated, locally relevant climate information to decision makers and communities in the Pacific Region; enhance regional and local capabilities to manage climate risks, build resilience in key sectors, and support sustainable development; and promote collaboration among Pacific regional, US national, and international institutions and programs providing climate information products and services.” Pacific RISA principal investigators are currently based at the East-West Center and the University of Hawai‘i at Mānoa.

⁸ The [Pacific Islands Regional Climate Assessment](#) (PIRCA) is a collaborative effort to assesses the state of knowledge about climate change indicators, impacts and adaptive capacity in Hawai‘i and the USAPI. Primary responsibility for management of the PIRCA is shared by Pacific RISA, NOAA’s NESDIS and NCEI, PI-CASC, and the US Global Change Research Program.

⁹ The [Manager Climate Corps](#) was created by the University of Hawai‘i at Hilo to lead UH Hilo’s participation in PI-CASC. The Manager Climate Corps’ foundational elements are: “supporting and developing long-term trust, building upon existing in-person professional networks (knowledge networks), utilizing knowledge co-production (manager-driven collaborative research), and recognizing and engaging multiple knowledge forms.”

The role of “convener” of adaptation discussions across Hawai‘i’s natural resource management community has not been filled to the extent it had been by PICCC, prior to its closure.¹⁰ The primary convener for Hawai‘i’s conservation community has been and continues to be the Hawai‘i Conservation Alliance (HCA),¹¹ which hosts the annual Hawai‘i Conservation Conference (Hawai‘i’s largest environmental conference) and facilitates improved coordination across the various organizations and agencies working to conserve Hawai‘i’s environment. They do this with only 4–5 staff and the support of the HCA Foundation and member organizations. After PICCC’s closure, the HCA founded a climate crisis sub-committee composed of volunteers from HCA member organizations and HCA staff.

There are a number of entities working to increase coordination between organizations and agencies to achieve greater community resilience (e.g., PRIMO¹² and LAMA¹³). The service area of these entities varies from the island scale (e.g., Honolulu’s [Office of Climate Change, Sustainability and Resiliency](#)) to the Pacific Islands region (e.g., SPREP¹⁴).

The entities mentioned above each have unique missions. There are variations in their organizational structures, funding streams, service regions, and beneficiaries. At this time, there is no organization focused specifically on improving communication/coordination on climate adaptation within Hawai‘i’s natural and biocultural resource management community. PICCC had helped to fill this niche but there was also room for improved coordination and collaboration on adaptation efforts when PICCC was active. Findings from a policy analysis commissioned by PICCC in 2017 found a “lack of alignment and strategic cohesion” across Hawai‘i’s natural resource management community was hindering collective progress on climate adaptation, and that “organizations would ideally be finding synergy and pursuing a ‘sum greater than the parts’ outcome” (Brough 2017). That analysis recommended pursuing something akin to a “collective impact model” (Bockstette et al. 2014) in order to: (i) assess the collective resources and talents of different stakeholders; (ii) map these against adaptation needs and priorities; (iii) develop a common agenda and strategy; and (iv) pursue complementary and mutually reinforcing activities (Ibid.).

Having a widely trusted and dependable entity filling the role of facilitator for Hawai‘i’s growing “adaptation network” promotes better connections and more efficient, effective work as a collective. (With renewed federal attention on the climate crisis and the potential for adaptation funding and activities to quickly expand, it is arguably even more important that Hawai‘i’s conservation community—particularly those

¹⁰ In some cases, in other regions across the US with LCCs that also got defunded, a partner took over the role of convener and coordinator (e.g., Alaska, <http://www.northernlatitudes.org/>).

¹¹ The [Hawai‘i Conservation Alliance](#) is a collaboration of conservation leaders representing government, cultural, educational, and non-profit organizations from across Hawai‘i. It was established in 1988 with the purpose of: “Facilitating strategic coordination and knowledge exchange among conservation stakeholders; increasing dialog, participation and collaborative efforts in Hawai‘i’s critical conservation issues; and building capacity for effective conservation of Hawai‘i’s lands and sea.”

¹² The [Pacific Risk Management ‘Ohana](#) (PRIMO) brings people and organizations together to channel their efforts towards the common goal of making the Pacific Islands more resilient to the impacts of natural hazards, including those brought on by climate change. Supported by NOAA, the PRIMO effort includes individual hui (working groups) and an annual conference focused on increasing the safety and sustainability of Pacific Island communities.

¹³ [Loli Aniau, Maka‘ala Aniau](#) (Climate Change, Climate Alert) (LAMA) is housed within the Hawai‘i inuiākea School of Hawaiian Knowledge at the University of Hawai‘i at Mānoa. LAMA’s mission is “to catalyze climate adaptation and resiliency by engaging communities in Hawai‘i and beyond through innovative training and policy tools that link decision-makers with the university, island communities, and the public as well as private sectors” and their goal is “to engage and empower climate justice communities in Hawai‘i and globally.”

¹⁴ The [Secretariat of the Pacific Regional Environment Program](#) (SPREP) serves 21 Pacific Island countries and territories. Established by the Governments and Administrations of the Pacific Islands, SPREP is charged with “protecting and managing the environment and natural resources of the Pacific.”

agencies and organizations whose primary mandate is climate change mitigation and adaptation—synchronize their efforts.) Importantly, any large-scale coordination effort will require dedicated staff, regular communication, the building of trusted relationships, and sufficient resources to convene and collaborate. In the interim, entities specializing in climate adaptation in Hawai‘i might consider organizing a facilitated “retreat” aimed at developing complementary near-term agendas that optimize their collective resources and strengths.

Finally, the individuals involved in PICCC continue to do conservation- and/or climate science-focused work in the community, but the *influence* PICCC had as an independent entity representing the natural and biocultural resource management community on climate adaptation is lost.

“A good example is Senator Schatz’s office. That staffer really looking at the information coming out of PICCC. He knew all about PICCC.... At least at that level—the decision makers level—they were relying on that [climate] information [from PICCC].”

Awareness by politicians and their staffers of PICCC points to the necessity of future organized efforts to support and coalesce the conservation community: it is critical to foster relationships with political offices at the state and federal levels to illustrate the value of an entity such as PICCC to those at the policy and funding levers.

Preserving the Collective Memory

Members of the natural resource management community expressed the importance of documenting what had been both created and learned through the PICCC experience. This was not about saving the “brand” of the organization but about honoring the community’s labor (and love), which they had invested in preparing for climate change.

“It was very important to invest in the preservation and stewardship of the products rather than the PICCC brand. You want to have some documentation left behind that persists, that captures the issues, captures the energy that went into it.... When the country and the Department of the Interior are receptive to talking about climate change and really investing in it again, you’ll have these documents there that are like the preserved memory of years of investment and thinking about climate adaptation... keeping the life alive.”

Prior to its closure, PICCC had made arrangements with Pacific RISA to store all of the organization’s publications on the PIRCA website (www.pirca.org). Final products and data are also stored in folders arranged by year in the USGS online ScienceBase Catalog (www.sciencebase.gov/catalog/).

3.5. Adaptation Barriers and Gaps to Be Filled

The previous section, *Diminishing Impacts*, articulated some of the ways the conservation community is compensating for the closure of PICCC. But the roles of climate adaptation convener, facilitator, and “concierge service” that PICCC had previously played for the natural resource management community have not, or at best only partially, been filled by other entities. PICCC’s in-house climate adaptation research is largely able to continue thanks to Lucas Fortini’s employment as a research ecologist with USGS in Hawai‘i and PICCC’s former Science Coordinator, Jeff Burgett, continues to provide targeted support on climate adaptation through his position with the USFWS Science Applications Pacific Islands Office. This section focuses on the “adaptation barriers” natural resource managers have (at the time of our survey) experienced, many of which are unlikely to have been overcome and may be greater hindrances in the near future. We will also address gaps that, if filled, might help to overcome some of these barriers.

Persistent Adaptation Barriers

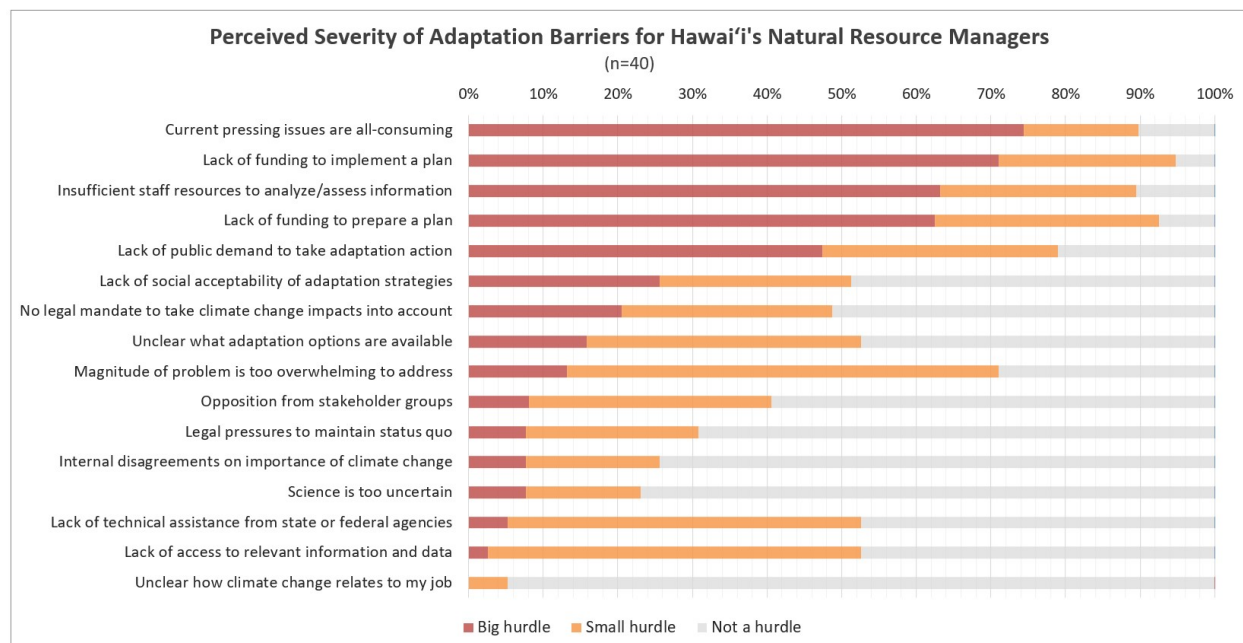


Figure 11: Perceived severity of adaptation barriers for Hawai‘i’s natural and biocultural resource managers.

To gauge the perceived severity of adaptation barriers among natural resource managers in Hawai‘i, we utilized a research question asked by Hart et al. (2012) and Moser et al. (2018) of coastal professionals in California (and slightly adapted in other surveys across the nation). The results (Figure 11) show a pattern that echoes many of the themes mentioned in previous sections. The most significant hurdle stems from current pressing issues being all-consuming. This is followed by three closely related adaptation barriers, namely the “lack of funding to implement a plan,” “lack of funding to prepare a plan,” and “insufficient staff resources to analyze/assess information.” Also notable are barriers related to public acceptability and demand for adaptation—issues that are critical for implementing adaptation and making adaptation politically salient. Generally, the ranking order of adaptation barriers for Hawai‘i and California respondents

followed a similar pattern for the more severe and less severe groupings of adaptation barriers. However, respondents in Hawai‘i were more pessimistic about the severity of adaptation barriers in 2018 than survey participants polled in California in 2011 and 2016.

While a number of factors could account for these differences, the results from Hawai‘i make clear why it is nearly impossible for already tightly resourced and staffed organizations to fill the gap left by the loss of a coordinating entity such as PICCC. Interestingly, with PICCC no longer being the provider of credible information to the conservation community, the barriers perceived around information access may now be even more severe than before. We will return to this issue in the Recommendations section.

In the interviews, the regional variation in resources was also mentioned.

“Thinking of the Californian and Southeast LCCs, they’ve had incredibly rich resources to draw on: data, models, university partners, and so many resources we could only dream of having out here. Having conversations with them has been very different than talking with folks from Alaska and other parts of the country struggling with our shallow benches, our limited climate models, and so on. But at the same time, we’ve all been doing stuff despite the limitations: You still have to move forward with adaptation; you just have to adjust your expectations of how informed you can be.”

The survey findings do imply that people have adjusted their expectations on how informed they need to be to take action and that the downscaled models and climate information available for Hawai‘i, while not perfect, are enough to act upon. The lowest ranked responses for adaptation barriers were: “the science is too uncertain” and “[it is] unclear how climate change relates to my job” (Figure 11). The large majority of natural and biocultural resource managers in Hawai‘i see climate change as clearly relevant to their work. While we do not have comparable data from 2009, and multiple factors have changed people’s awareness of climate change (see Section 3.1), other data synthesized above about PICCC’s contributions allow us to hypothesize that PICCC at least helped conservation professionals see that relevance of climate change to their work.

The following sub-sections each focus on the major barriers identified by survey respondents and interviewees, adding insights on what gaps need to be filled to help support the natural and biocultural resource management community in implementing climate adaptation in their work.

Investing in Capacity

“Here in Hawai‘i, everybody is running around with their hair on fire. Everybody is in a freaking emergency. We’re all losing battles everywhere.”

“Current pressing issues are all-consuming” is the biggest hurdle for conservation practitioners in Hawai‘i (Figure 11). For those familiar with Hawai‘i, this is not surprising. Hawai‘i’s conservation community is tasked with trying to protect *nearly half* of all endangered species in the United States (502 species were listed as endangered in Hawai‘i as of 2020). The archipelago has ten of the thirteen world climate zones and 9,975 known endemic species (Case 2021). The island geography constrains species from moving poleward with warming temperatures. The peaks of Hawai‘i’s mountains limit the extent to which species can escape upward to cooler temperatures. The patchwork of land ownership and land use types also constrains the mobility of species and limits the options available to conservation practitioners. The pressure has continued to mount on land since the discovery of Rapid ‘Ōhi’a Death (ROD) on Hawai‘i in 2014 and its

subsequent spread, and at sea, with the worst bleaching and coral death ever documented occurring during the global bleaching event of 2014–2015 (State of Hawai‘i 2017, Eakin et al. 2016). Looking forward, these competing pressures and severe resource constraints will not likely improve any time soon. The COVID-19 pandemic hit Hawai‘i’s tourism-dependent economy especially hard, with deep State budget cuts and labor-saving measures being considered for 2021.

The two prevailing asks from natural resource managers are: Capacity + Funding. “Capacity” in this case does not refer to further trainings and bringing in expertise from outside of Hawai‘i (although there is a time and place for both). Instead, it is about giving natural resource managers the staff and bandwidth to complete the work they are trying to get done; providing time for experimentation, creativity, and visioning; and enabling more opportunities for cross-scale learning and collaborations. This is where increased funding—*greatly increased funding*—comes in, for all aspects of adaptation, which is unlikely to manifest when there is a “lack of public demand for adaptation action,” the 5th biggest adaptation barrier noted in our survey (Appendix A-24). Until society invests greater resources and funds into Hawai‘i’s conservation efforts, there is only so big of a “cake” on which to draw, using this interviewee’s analogy.

“No matter how you mix the ingredients in, if you only have half a pound of flour to bake a cake, you’re not going to make a freaking cake. You can come up with very creative ways to still make a delicious small cake, but you’re not going to make a cake for the forty people in the room that are hungry.... A lot of times we have these conversations and we’re like ‘Oh man this would be great! And we could do this and this and this....’ And it all makes sense, but when it gets to the point of ‘so who actually leads this, who actually carries this forward, and who can actually do this?’ Nobody has the time. Nobody has the resources.”

Increasing Resources for Implementation

A “lack of funding to implement a plan” is among the dominant hurdles (#1 when big and small hurdles are combined) (Figure 11). Given that acquiring funding for adaptation project *implementation* is a major challenge, it is not surprising that survey participants most hoped PICCC would acquire and make available more funding for the implementation of adaptation projects (57% of respondents) (Appendix A-25). PICCC provided some important funding for science and planning but the need far outpaced the availability of funds (Figure 2). This finding suggests that conservation practitioners are reaching a wall after accomplishing the more affordable climate adaptation tasks of research and planning, resulting in frustration that they cannot take some of the actions they have identified as critical to climate adaptation, due to shortages of resources. As of 2020, there are few successfully *implemented* adaptation projects in Hawai‘i, and there continues to be a huge need for pilot adaptation initiatives to be implemented and evaluated, with lessons shared up the “learning trees” among peers in Hawai‘i and beyond.

Supporting Personal Resilience

“...It’s hard because people take the bad news and just go, ‘Oh god. Where are the razor blades?’ And that is when people first get exposed that it ain’t going to be like you thought it was going to be. You have to give people time to deal with that, and you have to give them a way out mentally to do that.... It’s like going to the doctor and hearing you have some huge disease, and you may not live as long as you thought you would. ‘What?’ You don’t just laugh that off. The deeper you care the harder it is. And the expectation in the natural resource field is that this information is value neutral, and it is

like, ‘Oh, you know, we have to figure out a way to put this in a planning document, blah-blah-blah-blah-blah.’ It’s not giving people anywhere near the scope they need to deal with this.”

Natural resource managers ranked “the magnitude of the problem is too overwhelming to address” as the sixth most important barrier overall. The fact that so many respondents selected it gives us insights into what the conservation community is coping with, especially against the backdrop of having insufficient capacity and resources to deal with what is coming. New research shows that just the *threat* of long-term climate change can cause significant psychological distress, including feelings of anxiety and depression (Palinkas and Wong 2020). This is compounded by Hawai‘i’s ongoing extinction crisis. The emotional burden of these two intertwined emergencies is under-appreciated.

“Most people in this business love something really strongly; telling them that it is going to die—that is not a trivial thing, and we are treating it like it is a trivial thing.... I think this is one thing that has been completely neglected—you need to work the grief process into this, into this set of ‘should do’s,’ into this developing a new paradigm of action. There is loss involved. There is grief involved. And we will run into a wall of denial, among people that should know better and who need to be thinking about this, if we don’t honor that.”

New research is being pursued on how to build the personal resilience of those on the “front lines” of climate change, an effort from which Hawai‘i’s conservation community could greatly benefit (Moser et al. 2019). Other programs trying to address this growing need include the [Good Grief Network](#), which facilitates a peer-to-peer support program to help build “personal resilience while strengthening community ties to help combat despair, inaction, eco-anxiety, and other heavy emotions in the face of daunting systemic predicaments.” Similarly, the [American Society of Adaptation Professionals’](#) Personal Resilience Affinity Group offers adaptation professionals in any sector a regular place to express and address the psychological challenges associated with working on climate change. Likewise, the [Council on the Uncertain Human Future](#) has grown into more than twenty “council groups” across several continents, each examining the root causes of the climate crisis and its consequences through collective reflection. As of 2020, the authors are unaware of any initiatives of this sort being offered to the conservation community in Hawai‘i.

Fostering Grassroots and Community-based Initiatives

“What I’m seeing is that some of these very grassroots level, community-based or communities of practice[-led] projects are transferable and are now carrying on and empowering other places.”

When asked what areas of the PICCC approach natural resource managers would have most wanted to see further adjustment to in order to increase effectiveness, the top choice was “increased focus on community-based initiatives” (Appendix A-20). This was chosen over increased focus on supporting collaborative climate adaptation efforts within the natural resource management agencies (Figure 12). Hawai‘i is the only US state that has no incorporated municipalities, instead having four counties (five if Kalawao County is considered separate from Maui County). This means that resources, staff, and governance are centralized in each island’s County seat—Honolulu, Līhu‘e, Wailuku, and Hilo—and that individual communities do *not* have access to many of the funding opportunities that their counterparts in much of the continental United States do. Note that this also means county governments have an especially important role in local and island-scale adaptation efforts.

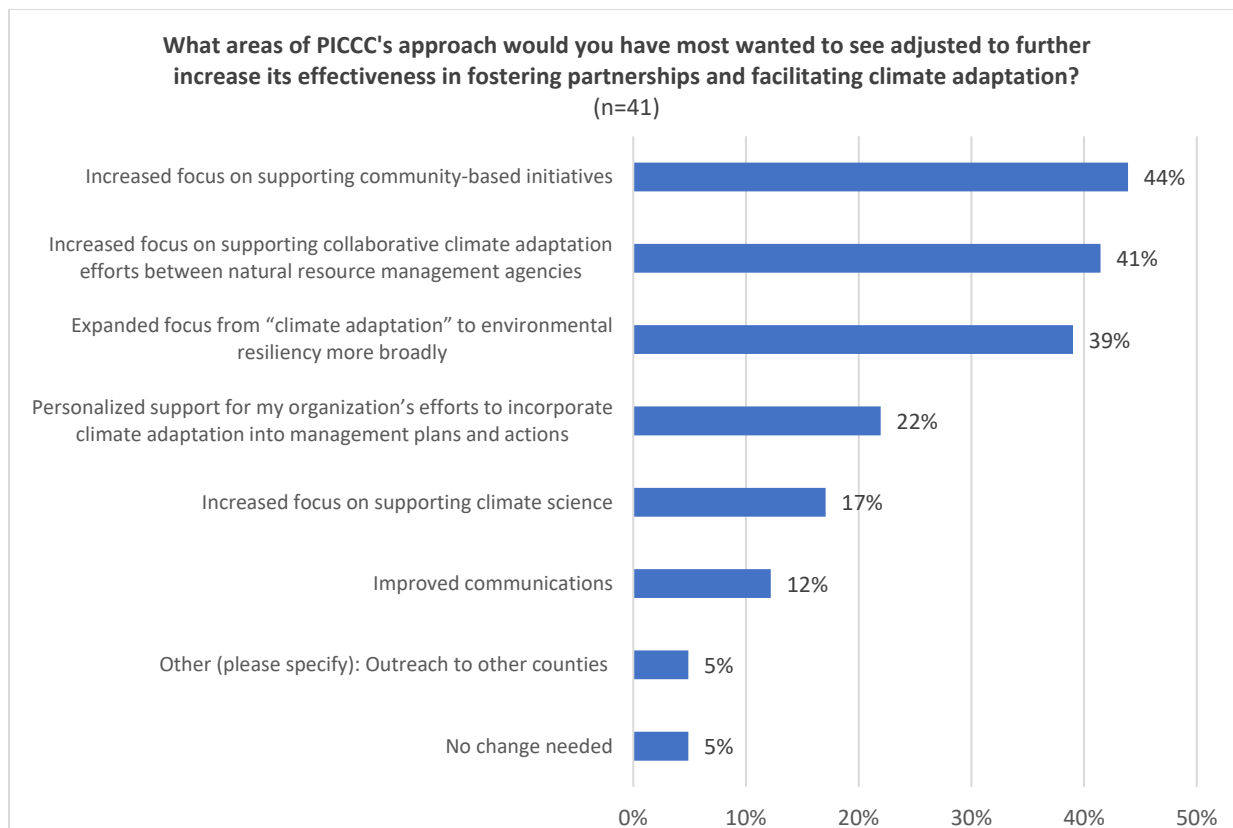


Figure 12: Survey participants' prioritized areas for adjustment/improvement to increase effectiveness of PICCC's approach to adaptation in the conservation context.

Below are examples of community-designed and -led initiatives for which PICCC provided support over the years. The first two received grants from PICCC, and the third was supported with funding acquired by PICCC and partner agencies through a DOI Service First Award, as well as technical support through the USFWS and University of Hawai'i Ka Huli Ao Center for Excellence in Native Hawaiian Law.

- "Incorporating science and traditional knowledge in Moloka'i to prepare fishponds for climate change" led by the non-profit organization, Ka Honua Momona, on Moloka'i.
- "Learning from traditional ecological knowledge to understand climate change impacts and preserve key cultural and natural resources in Ka'ūpūlehu, Hawai'i" led by principal investigator, Tamara Ticktin, of UH-Mānoa.
- The Resilient Hawaiian Communities Initiative co-led by the USFWS (first represented by PICCC, then by USFWS Science Applications), National Park Service Pacific Islands Office, DOI Office of Native Hawaiian Relations, and University of Hawai'i Ka Huli Ao Center for Excellence in Native Hawaiian Law, and funded under the DOI Service First Authority. Through a competitive process, Waiehu Kou III, Maui, and Kailapa, Hawai'i were awarded funds to each design and lead a community resilience planning process.

The Resilient Hawaiian Communities (RHC) initiative was delayed in 2018 due in part to PICCC's closure, which also hampered communication about this effort with the RHC Working Group. However, the project was continued in 2019 with USFWS Science Applications continuing in PICCC's stead, but without PICCC's

non-federal staff support. The quote below, which captures the excitement felt by PICCC Steering Committee members about the RHC Initiative, is from 2018 when communications had been stalled and PICCC had been closed.

“It was the planning for the RHC Initiative—and the level of the conversation and the things that were being discussed with representatives from Kamehameha Schools, The Nature Conservancy, Office of Hawaiian Affairs, Office of Native Hawaiian Relations, and others—that was the point [when] I really felt excited because it was the point when it was really meaningful to people who I know and to places that I know; so that for me the applicability of it all was becoming more real. And I didn’t get to experience it going anywhere from there. But I felt like, that discussion, that fire that was lit that day, was the one that we should continue to pass out torches from.”

Other interviewees similarly felt that the community-level and biocultural work that PICCC engaged in was a big strength.

“I think the home run was working with communities, and the one that immediately comes to mind is the engagement with the Moloka‘i community. First off, that was a group that came forward and said, ‘We want your help to bring in expertise,’ so PICCC was a co-developer—I hate that word—but, you know, worked with the community to get expertise to come to Moloka‘i and talk about climate change and then listen to people on Moloka‘i. There was a lot of back-and-forth in those workshops on how does the Moloka‘i community—given the information, the best forecasts that were available from mauka to makai—how does the Moloka‘i community respond?”

“Seeing how that very small investment [in the community of Ka‘ūpūlehu]—small financial investment but a huge investment of time and conversation and people and community—but seeing how PICCC was able to foster that investment and watch it grow, and watch that community expand their engagement for their own future across their own community landscape. I keep coming back to that example because to me it is a very powerful reflection of what you can do when you leverage and partner and PICCC was able to provide a little seed money that went a long way.”

PICCC was one of the few organizations providing funds for these organic, experimental, grassroots-driven initiatives. In PICCC’s absence, the work of local communities and communities-of-practice continues, but on a shoestring budget (if any budget at all). Small pots of funding could meaningfully boost these efforts. It is important that grant processes are designed to increase accessibility and ease for the communities participating, appreciating that many of those involved are volunteering their time. There is also a needed respect and trust in a *community*-led project, which funding agencies do not always exhibit, and this is a fundamental element of successful, locally-led adaptation.

Supporting Translation and Transdisciplinary Research

In interviews, there was an expressed need for “translation” of climate science into direct management actions, not just in the sense of making jargon and science understandable, but in the sense of helping managers understand the implications of the science and find effective responses. This need was well articulated by one interviewee as follows.

“One of the gaps is translating—for both managers and the public—the best available research into: what do we do about it? There is a reasonable comprehension—with all the uncertainty involved—about some of the changes that are coming. But there are a lot of places where we all are like, ‘I don’t know what we’re going to do about this.’ We have more than enough science to act upon, but because

this is a new thing we've never had to face before, we don't always know what the best available actions are.... I think that translation of science into management actions is not something that managers are necessarily trained and equipped to do."

Filling this gap will require dedicated attention, and more management-relevant research, developed through a process involving straightforward consultations between managers and those with relevant expertise, and more iterative interactions of knowledge co-production (transdisciplinarity) to determine viable next steps.

For management decisions that do require further investigation, such transdisciplinary research can help determine: (a) if information currently available is sufficient to address their need; (b) if the given management question can be realistically addressed through research; (c) how best to co-design a research initiative that does address management needs; and (d) how to create/deliver informational products that will directly inform management action.

"There is a whole refining of goals and targets [between managers and researchers]. Those conversations—it sounds simple in this context—but those conversations actually take a long time to ripen."

Multidisciplinary and interdisciplinary research still places the main emphasis on academic knowledge, while transdisciplinary research incorporates knowledge systems from both inside and outside of academia, and involves scientific and non-scientific stakeholders in the formulation of research. Co-development of a research project with community leaders, such as developing future flood modeling scenarios at the ahupua'a¹⁵ scale with community visioning/input, or consulting with managers on the interpretation of research results, and non-academic partners co-leading outreach on newly available information/products are all examples of research reflecting a transdisciplinary approach.

Personalizing Support for Mainstreaming Climate Adaptation

"It's almost like you need people that do this work embedded in each organization to actually lead the change internally. And to have something like a PICCC or something that will help them and link them and encourage them."

Our interviews surfaced requests for more personalized support in mainstreaming climate adaptation into natural resource management. Twenty-two percent of those surveyed also expressed that they would appreciate more personalized support for their organization's efforts to incorporate climate adaptation into management plans and actions (Appendix A-20). Understanding that all agencies and organizations have limits when it comes to human resources, interviewees wished for a mechanism through which "adaptation support" could be provided to an organization during a critical period of its management planning process. They envisioned support staff that could be permanent federal staff with expertise in climate science and adaptation, or perhaps an early-career climate practitioner supported through an "applied adaptation fellowship."¹⁶

¹⁵ Ahupua'a are Native Hawaiian land divisions that span from mauka (the mountains) to makai (the sea), reminiscent of a watershed.

¹⁶ Note, such mechanisms already exist in places. For example, NOAA Sea Grant (sometimes in a collaborative, co-funding arrangement with NOAA RISA) employs coastal resilience extension specialists. The "Extension" model, of course, also exists within USDA's Land Grant institutions. The USDA Climate Hubs are currently insufficiently resourced to provide this type of support.

“If somebody like Jeff Burgett [PICCC’s former Science Coordinator] could for a month, two months, embed himself into the organization and kind of get a feel for—not just read the management plans but actually participate in some operational stuff and then say, ‘hey look, this is what you’re doing, and this is the information we have available, and here are the places where those connect.’ I think that would get over the workload issue, and it wouldn’t be something on the outside: some training I have to attend, or that I have to read this document I don’t really have time to read. It would be someone in there kind of bringing it to you rather than us going to it.”

“[In] the next phase—in an alternate reality where PICCC was persisting—I think it would be much more valuable to focus that partnership-strengthening at very specific place-based situations that address very specific goals in climate change adaptation.”

Confronting Sticky Issues in Adaptation

Conservation practitioners can get “stuck” not taking an action because it is financially or logistically unfeasible. However, they can also get slowed down taking an action because it is “sticky,” i.e., controversial, and there is not yet the social buy-in to pursue it (see Figure 11 for relevant barriers). With climate change, natural and biocultural resource managers will increasingly be faced with these sticky issues as they enter into a reality where they can no longer return to the status quo. The conservation field is inherently concerned with the “re” (returning nature to a former state) because of the field’s mandate to steward and preserve. But *re*-creating the past (e.g., *restoration*, *rehabilitation*) is no longer possible because climatic conditions are permanently and continually changing. This creates situations where conservation practitioners are forced to consider options that go against what they would have recommended *prior to* the climate crisis and what the public may expect.

One example of a sticky issue in adaptation is whether to relocate endangered species to places outside of their historical ranges because their home habitats are no longer climatically suitable for them. Similarly, as sea level rises, cultural sites in low-lying areas may need to be dismantled and moved to new locations inland, or else be allowed to submerge under the ocean. These are challenging realities to face, and the decisions they force managers to make are value laden.

“There are some situations that are relatively easy, right? Better protecting our forests is going to build resilience; but we want to protect them anyway. Better protected riparian zones will help us mitigate for flooding events; but we wanted to repair our riparian zones anyway. So, there are some very—not that they’re low-hanging fruit in terms of the funding and resources needed to get them done, or the social and political will needed—but from a conservation perspective are like, ‘yeah, yeah, that’s easy.’ But there are all of these other things that are much more complicated. So, we briefly touched on the idea of translocation of species to places where they didn’t exist before. Do we take birds that are native to Kaua’i and put them on Hawai’i island? What are the impacts then to that ecosystem that we’ve introduced a new species to? What are the consequences if we don’t? Even having a forum to even start to tackle some of these issues... We have to deal with it and we haven’t because we don’t even have the resources to deal with the things we know are good [to do], and are easier.... When you think of the ethical implications, ecological implications, financial: how much do we invest in species that are near extinction when we are also looking at entire ecosystems that are threatened? There is a huge gap there that we don’t have the resources to deal with as quickly as we’re going to have to because those changes are coming.”

Improving Geographic Representation

“The kinds of information PICCC was providing was helping to list species on the endangered species list—specifically in Hawai‘i. And that gap remains in other places like the Commonwealth of the Northern Mariana Islands.”

Many issues discussed in this report specifically focus on Hawai‘i because that is where most of PICCC’s work and investment focused and where most of the interviewees and survey respondents were located. But some of the issues raised here are reflective of those experienced across the USAPI.¹⁷ Limited resources all too often justify a Hawai‘i focus by federal agencies, even if they nominally serve the broader USAPI region. The PICCC Steering Committee went through a deliberate process of improving representation of the USAPI, reflected in the Micronesian Mangroves Adaptation Initiative and Pacific Islands Agroforestry Adaptation Initiative, however, the USAPI was still under-represented in the Cooperative’s composition and efforts. Addressing this gap in representation will require commitment, adequate investment, and creativity. For example, the scientific focus needs to be more evenly distributed across the region. High-quality sea level rise mapping remains unavailable for much of the USAPI.

“Ideally, we’d have projections for every island in the world, you know? Well, we should be able to do it for many of the main islands where a lot of the populations are. Like in Palau and Kosrae and Chuuk... and the Marianas. We should be able to do this work. I know that our partners are already looking at other sources of funding to expand this work to other places.”

Moreover, interviewees bemoaned that engagement with stakeholders and decision-makers needs to be expanded. Relationships take time to build in any natural resource management community and PICCC, with a team of 5–7 based in Honolulu, was tasked with fostering these relationships in Hawai‘i, American Sāmoa, Guam, and the Commonwealth of the Northern Mariana Islands as well as the nations of Palau, Federated States of Micronesia, and the Republic of the Marshall Islands. It was not feasible to have comparable operations in all of these jurisdictions with the available resources. However, the pandemic forced things to quickly evolve on the technology front, illustrating it is possible to have real-time, face-to-face, virtual meetings between groups in multiple jurisdictions. It thus would be feasible and cost-effective to “decentralize” initiatives such as PICCC so that local project leads, local staff, and local partners representing the full spread of the service area could be engaged with staff at a central hub.

“One of the easy parts about PICCC is it was Hawai‘i Conservation Alliance ‘plus,’ and that made it very easy.... Should we not have gone that easy route? Should some of us [have] sat down and thought, ‘so who all is likely to be affected by climate change and who needs to be at the table?’ ...When you think about roles: always push outside of the silo and look for those opportunities to bring new people in. [Bring] new organizations in, not just new people. Because, again, if it is just the same people preaching to the choir then we are not going to be as successful, or successful at all. As opposed to if it is every voice singing from the same sheet of music, from their own perspective.”

Bringing an office/agency to implement an adaptation step, such as sea level rise mapping, together with their equivalent peers on an island that has already completed that step, has multiple benefits. It gives them the opportunity to exchange their experiences on what has and has not worked, brainstorm, and problem-solve aloud with one another. These kinds of “peer-to-peer” exchanges are something that PICCC, if it had remained active,

¹⁷ The decision to have this research examine PICCC’s work in Hawai‘i was done largely for logistical reasons (small research budget, limited time, geographic ease of focusing on Hawai‘i when Hawai‘i-based), and is a significant shortcoming of the study design. Representatives from the USAPI were interviewed and their quotes are included in this report. However, most interviewees and all survey participants were Hawai‘i-based.

would have been well-situated to kick-start because of the organization's existing knowledge of the network and activities happening within it. The hope is that an exchange sparks a close enough initial connection that these peers feel comfortable re-connecting in the future when challenges or opportunities arise.

“I think the communities are ready, countries in Micronesia can do this, and we know that our local partners are already asking us why this is only done [for some islands]. So, the local partners are ready to expand this work, and it's just a matter of getting the partnerships around this moving and the resources to do it.”

3.6. In Summary: Value Added

Most of the people comprising PICCC's staff still work in the natural resource management community. The same is true for the organizations that constituted the collaborative. Given this, what was the added value of having PICCC, focused specifically on climate adaptation? Using the metaphor of the outrigger canoe, this section considers how PICCC's two strategic goals—fostering partnerships and facilitating climate adaptation—added value, propelling the natural resource management community forward on their journey to climate action.

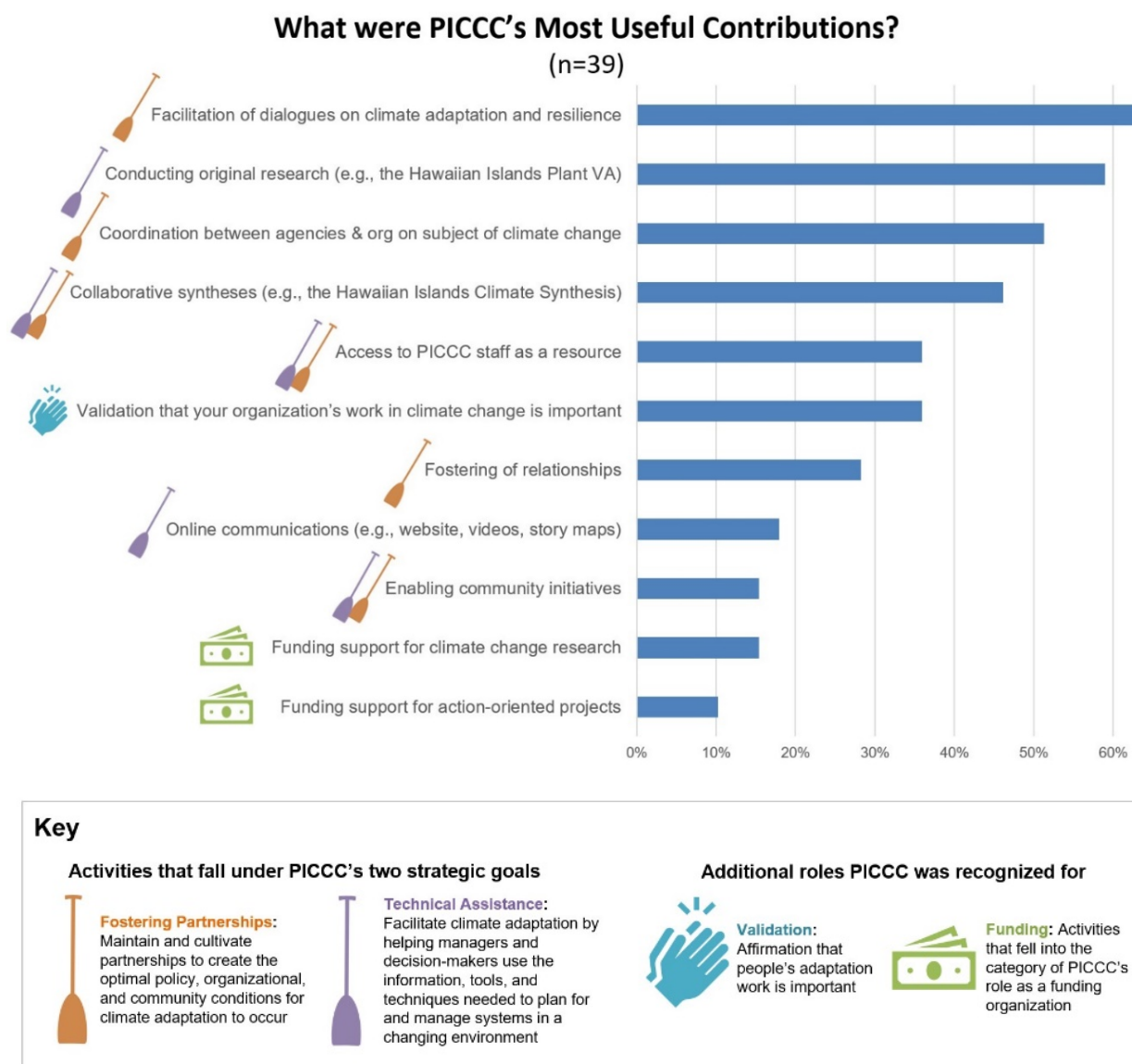


Figure 13: Perspectives on PICCC's most useful contributions. The orange paddle symbolizes activities that foster partnerships, the purple paddle represents the provision of technical assistance in facilitating climate adaptation, the hands clapping represent the validation of people's work, and the dollars symbolize PICCC's role as a funder.

PICCC's Most Useful Contributions

Survey respondents viewed both veins of PICCC's work—fostering partnerships and providing technical assistance in climate adaptation—as valuable contributions (Figure 13). A consistent story emerges from Figure 13 against the findings detailed to date. Among the most important contributions PICCC made was its roles as convener and facilitator of dialogues among disparate conservation managers, conducting critically important research, and providing coordination and collaborative syntheses for everyone's use.

While demands for adaptation funding were high among those surveyed, PICCC's role as a funder of climate change research and projects was at the bottom of the list of what people viewed as PICCC's most important contributions. We hypothesize this is because the amount of funds provided was so small compared to the need and most survey respondents never received funding from PICCC. Despite the amount being modest, PICCC's project funds gave member organizations a collective resource, which they directed toward prioritized uses and adaptation initiatives. This shared resource gave steering committee members a reason to gather, brainstorm, debate, and design requests for proposals in support of their resource management needs. In this way the funds helped to support an evolving adaptation conversation that was occurring.

By contrast, “validation” ranked high and is worth mentioning (Figure 13). People are often met with resistance when pursuing climate action, and it usually requires work above and beyond what their job requires. **Having an organization and forum that affirms peers' adaptation work is important and a meaningful part of building a community of practice and supporting each other.**

“We had already begun to understand the need to incorporate climate change adaptation into our work. So, it was an affirmation, our involvement in PICCC, that yes, this is important, and we need to look at conservation work with a climate change lens.... Everybody [here] was recognizing the need to ensure that our conservation work started to have climate adaptation added to the work we were doing. So, nothing new, but it was a good affirmation.”

Providing Technical Assistance in Climate Adaptation

In PICCC's logic model, the organization strived for strategic alignment of technical assistance and partnership building for successful adaptation. One form of technical assistance was through climate information and research. Of the informational products that were produced by PICCC, respondents reported that the three most useful products were (Appendix A-6):

- Hawaiian Islands Climate Synthesis (95% heard of | 66% used | 5% important for informing work);
- Hawaiian Plants Vulnerability Assessment (75% heard of | 45% used | 11% important for informing work);
- Hawaiian Birds Vulnerability Assessment (73% heard of | 30% used | 5% important for informing work).

The PICCC product with the strongest name recognition was the Hawaiian Islands Climate Synthesis, with over 95% of survey respondents familiar with this work. However, the vulnerability assessments for Native Hawaiian birds and plants, led by Dr. Lucas Fortini, produced research findings that—when used by survey participants—were considered the most important resource in informing their work (see Appendix A-6 and Section 3.3: Lasting Impacts). Further climate change research supported by PICCC and recognized for its usefulness by respondents included research on projected rainfall changes across the main Hawaiian Islands, research focused on the future impacts of climate change on Hawai'i's terrestrial ecosystems (e.g.,

Silversword high elevation ecosystems research), and the 2012 PIRCA report, which provided a novel, comprehensive summary of the available climate change research for Hawai'i and the USAPI.

According to survey respondents, there were several things that made the climate science produced by PICCC particularly useful. The first was that PICCC's climate information **supported the natural resource management community in priority setting and management decisions**. PICCC's research, informational products, and workshops supported learning within the natural resource management community, which was then extended by resource managers' engagement with their own stakeholder communities. PICCC-supported climate science informed debates and management plans and was utilized in reports, public presentations, and community outreach. PICCC-organized workshops provided time to absorb the new information and enabled peer-to-peer dialogues on new climate research and how it pertained to resource managers' concerns, vision, and goals (Appendix A-9).

Another benefit of PICCC's climate research was that it was **place-specific and, at times, species-specific, at scales and resolutions that resource managers could utilize** more easily. The tailoring of climate information to local geographies *and* species was particularly useful for some interviewees.

PICCC was also appreciated as a team player: (i) encouraging and providing initial funding support for the first series of downscaled climate projections for the Hawaiian Islands; (ii) bringing climate science and adaptation expertise to the table as a member of the Hawai'i Conservation Alliance; and (iii) contributing to the first PIRCA report, published in 2012.

Fostering Partnerships in Support of Climate Adaptation

The “partnerships” that survey respondents deemed most important for climate adaptation to occur (i.e., “who” should be involved) are shown in Figure 10 in Section 3.3. To get a better understanding of the “how” of partnership building, interviewees were asked about what elements they perceived as most important for supporting climate adaptation. Their responses included the following characteristics of cultivating sustained, trusted partnerships.

- » Build partnerships from “both ends of the spectrum” (ground-up and top-down)
- » Involve local communities (i.e., community-centered and community-led adaptation)
- » Work with, support, and enhance existing local networks
- » Build and maintain trust
- » Be rooted in place and culture
- » Have a sense of (funding) security to be clear whether long-term commitments can be made
- » Show up year-after-year-after-year
- » Ensure diversity of partners
- » Foster partnerships between scientists and science users
- » Work together from early on (*co-creating* projects)
- » Maintain a close-knit environmental management network
- » Be clear about expectations and roles
- » Communicate frequently and effectively

- » Uphold high levels of integrity, respect, and mutual acknowledgement
- » Take responsibility (everyone pulling their own weight)

Interviewees emphasized the important role PICCC played in **bringing people together in this fashion to identify shared goals and concerns**. PICCC’s facilitation of important discussions and the opportunity that PICCC events provided for networking, collective learning, and peer-to-peer accountability were all singled out (Appendix A-9, Contribution 2).

“I think the ability of PICCC to facilitate [the interpretation of science and translating it into management] and build collaborative approaches to implement recommendations and build resiliency is what is needed now.”

The activities PICCC coordinated were seen as both fostering positive relationships in the natural resource management community and **enhancing trust** in the available climate science.

“I feel like the relationships and the coordination was one of the biggest strengths that the PICCC brought... it was really about the relationships that were fostered and the trust within the natural resource management community around their information.”

PICCC was seen as a **hub for climate adaptation** information exchange and a place to catch-up on the latest climate science.

“Even though that information can change over time, we also knew that at least while PICCC was active, we had access to all the folks that were on the cutting edge of those kinds of data. So, it was great. I think that PICCC’s existence greatly facilitated and accelerated our understanding.”

Resource managers work at various scales and their responsibilities can range from hands-on species/habitat conservation in the field, to shaping agency priorities and budget allocations. Interviewees felt that it is important that both the diversity of actors within agencies and across agencies hear from each other, and PICCC was recognized for **being inclusive** both of the diversity of actors *within* agencies and organizations, and *across* the natural and biocultural resource management community.

“[PICCC enabled an] increase in community engagement—I think that the fact that there were program managers, resource managers, planners, data reporting field exercises and projects—it became very inclusive.”

PICCC’s fostering of partnerships extended beyond convening events and workshops. PICCC staff also developed personal relationships between natural resource managers over time. Fundamental to all of this was PICCC Coordinator Deanna Spooner’s **commitment to the cooperative model**, in which the Steering Committee sets priorities and guidance on major initiatives. The bi-annual PICCC Steering Committee meetings enabled transparency on how PICCC’s funds and resources were being used, and the meetings helped the Cooperative to adapt and evolve through time with the natural resource management community. Deanna Spooner was recognized for the investment she personally put into relationship building in the region, which was seen as critical to the success of PICCC’s adaptation efforts.

“You know how important relationships are to getting information across in the islands and I think that the time Deanna personally spent building those relationships was responsible for creating the trust that allowed for the research that PICCC did to get taken up, trusted, utilized, and seen as a reliable and trusted source of information.”

“I think that a real passion of Deanna’s was trying to find out who were the people, who are the stakeholders, and she made a really solid effort, and I think a very successful effort, in getting those people to the table.... Deanna was working at a higher level, thinking ‘how do we get people to change the policies that are going to affect climate change adaptation.’ I often looked at what she was doing, not really understanding the sort of the brilliance of her madness, but in hindsight she was spot on—use a longer lever to move a bigger rock.”

The Secret in the Sauce

The “secret in the sauce” of PICCC’s approach may be the reinforcing nature of its two major strategies: empowering with science and coordinating partners to get to action. Together, this empowering approach **helped propel the conservation community forward** on its climate adaptation journey.

“PICCC stands out as a place in which all the consequences of climate change came into sharp focus for us, but you also felt this amazing ability to deal with it. You felt like—it wasn’t just a matter of standing by and wringing your hands over what was coming down the pike—we were in the position to change our policies and activities to maximize our ability to deal with it. So, that is what PICCC was to me.”

In a community that feels “current pressing issues are all-consuming” and also finds the “magnitude of the problem too overwhelming to address” (Figure 11; Appendix A-24), the PICCC model **made dealing with climate change less daunting**.

“It is a combination of long-term personal and working relationships combined with the messaging about reaching in together and not always having to reach outside to ask for help, but realizing that there are a variety of resources available. I think that PICCC’s engagement in climate change adaptation has been strengthened by their capacity to do education and outreach to create awareness.”

Connecting natural resource managers to new/relevant climate information through meetings and facilitated workshops helped to keep the natural resource management community informed and **accelerated collective understanding**.

The PICCC model for mainstreaming climate adaptation was perceived positively with over 97.5% of survey respondents judging PICCC’s approach to be either effective (51%) or somewhat effective (46%) for supporting the resiliency of Hawai‘i’s natural and biocultural resources to climate change (Figure 14). A final “value added” of PICCC is the organizational model they developed, the best parts of which can be incorporated into future efforts.

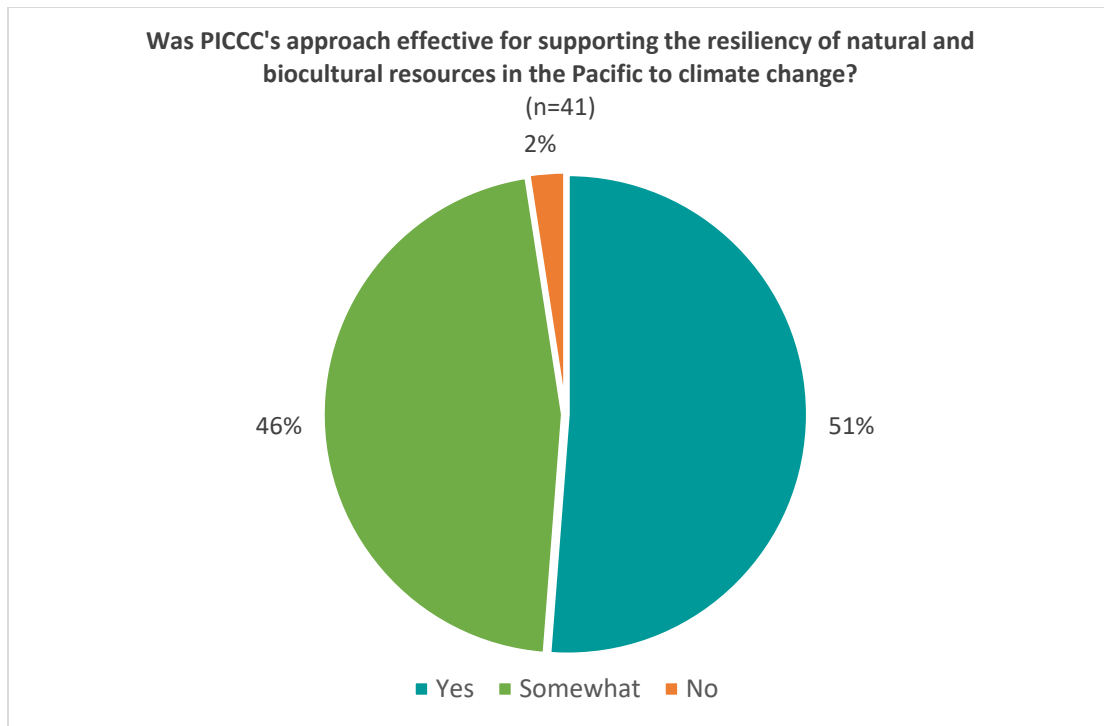


Figure 14: The perceived effectiveness of PICCC's approach for supporting the resiliency of natural and biocultural resources in Hawai'i to climate change.

Combining these two strategies of fostering partnerships while facilitating adaptation through technical assistance led interviewees to point to key insights about how to do so in a nuanced way:

- » Building a foundation of trust between partners;
- » Ensuring climate adaptation is culturally informed and place-based;
- » Prioritizing efforts that are community-centered, thereby building public support;
- » Working toward legal mandates and policy changes to incentivize adaptation efforts;
- » Illustrating cost-effectiveness and providing other economic incentives, including support for staff and projects;
- » Building leadership capacity at all levels.

The experiences and knowledge that the natural and biocultural resource management community gained during the past decade, and specific lessons learned through PICCC, build an important foundation for future climate adaptation in the conservation community.

"I've felt very honored and humbled to have worked with such an amazing group of people for as long as I was with them all, and I think that the climate change adaptation conversation is really just getting started, and with the engagement of multiple generations and communities, and the acknowledgement of science and culture, we've got a great future ahead of us, despite the politics. It was an amazing group; it remains an amazing group of people. They're all still connected and as the state and national agendas begin to move, we'll continue to remain engaged.... It is something that is not going to go away just because you take the name of it and its money away; you've still got people, and people's commitment to place, and community [regardless of] where we all end up in the future. I feel really honored."

4. Recommendations

This evaluative study aimed to understand the impact the Pacific Islands Climate Change Cooperative had over the decade of its existence. The key findings detailed in the previous section make clear that while it took time for PICCC to build a functional coalition and self-organize around a mutually agreed, two-pronged strategy, that strategy proved remarkably empowering and successful. Time and diminishing resources were the key constraining factors. In other words, with sustained and increased support—to invest more evenly and substantially across the region and to offer the personalized technical support that PICCC coalition members so appreciated—PICCC could have had a profound and lasting impact. Where that impact did not fully materialize or is waning now is not because of an inadequacy in its continually learning-oriented approach, but because PICCC did not have the capacity and, ultimately, because it was defunded.

The organization's small but approachable staff was much appreciated and some of its scientific products were highly influential. PICCC held a key role in fostering climate adaptation dialogue and collaboration across the region's conservation and natural and biocultural resource management communities.

We conclude here with a number of “lessons learned” that should inform any future efforts in reviving and/or rebuilding a coordinating mechanism to support landscape conservation efforts.

Recommendations for Institution-Building and Organizational Management

- **Establish and adequately support a stable institution that has staying power but design it such that it can accommodate an iterative, evolutionary adaptation process.** Climate change and societal needs and preferences are moving targets, demanding that adaptation itself evolves over time. Any long-term adaptation effort will need to evolve with the community it serves. PICCC utilized “Adaptation Initiatives” with the aspirational goal of continuous learning from each AI. This allowed PICCC to hone the AI process. PICCC also continually sought feedback from its large Steering Committee and the numerous organizations they represented to stay in tune with the natural resource management community's evolving adaptation needs.
- **Design the institution, initiatives, and projects with longevity in mind.** PICCC's untimely closure is a reminder that efforts are dependent on political support and vulnerable to political shifts. Several implications follow from this. At the project level, design each initiative or product with longevity in mind, e.g., ask partners involved to think deliberately about ensuring lasting impacts. At the internal organizational level, build redundancy in skill sets and focus into staff hires. Share and rotate leadership on the Steering Committee. At the external organizational level, put effort into informing political offices of your efforts, successes, and needs to enlist their support in appropriations negotiations and policy developments.
- **Anticipate and invest in building a strong Steering Committee.** PICCC's strategic conversations at the Steering Committee level needed time to ripen to coalesce into shared goals and approaches. Truly

collaborative work requires back-and-forth to determine what is both feasible and needed. But it also benefits from the deep knowledge different partners hold about how to create change on the ground.

- **Identify upfront the right representatives; this pays dividends many times over.** When given the opportunity to start (or relaunch) a new program or initiative, it pays to spend the needed time to identify the exact niche that needs to be filled and who is most suited to fill it. Giving new people an opportunity to participate brings in new energy, expertise, and enthusiasm. Highly respected and well-networked individuals bring influence and credibility that can pull in others. Balancing the involvement of major players with careful attention to inclusion of under-represented groups gives the effort legitimacy. How to handle “representation” is not always obvious. The right “movers and shakers” within their organizations or communities are not always the bosses or elected leaders.
- **Expect politics, egos, and personal agendas to be an issue until a group coalesces around a shared agenda.** Unsurprisingly, personal agendas can slow down collective progress, and people/organizations can pay lip service to “cross-agency collaborations,” “co-production,” “community engagement,” and so forth. While this can happen at any level, a greater weight of responsibility should fall on federal agencies, international NGOs, and foundations, whose size and influence can undermine a group’s collective efforts. Strong leadership that helps identify shared goals and values is essential. Early and repeated invitations to connect those with steering/directing power with the needs and aspirations of the places and people they are trying to serve will ground efforts in reality and legitimize foci and approaches geared toward those most in need.
- **Consider carefully geographic representation and increase inclusivity.** PICCC’s limited resources resulted in the commonly observed problem of underserving the USAPI. Feedback on the need for greater presence outside of O’ahu and the main Hawaiian islands reflects the geographic reality of the Pacific. However, COVID-19 illustrated the opportunities involved in more effectively using modern communications technologies as well as the opportunities opening up from shifts in workplace culture during the pandemic. Virtual meetings and teleworking are now a regular part of life. With strategic allocation of staff resources and early investment in building personal partnerships, much greater geographic inclusivity in the leadership and staff of organizations that serve Hawai’i and the US-Affiliated Pacific Islands is now within reach.

Recommendations on Science and Technical Support

- **Co-design projects—and requisite science—involving technical experts, practitioners, and decision-makers to ensure results meet decision needs at influential decision points.** Setting expectations for and actively fostering partnerships between scientists and science users is critical. This requires robust, sustained, back-and-forth communication between those partners to ensure that the information produced meets the needs of the information-user. It also needs to be incentivized and made a selection criterion in evaluating proposals. Seed funding to help develop those partnerships has been shown to be highly effective in assisting in the co-design phase of projects.
- **Consider more personalized support for mainstreaming adaptation.** PICCC provided “concierge services” to its partners and this was very much appreciated. Consider designing an “adaptation support” mechanism for critical periods in a partner organization’s management planning process. This support staff could be federal staff with expertise in climate science and adaptation or an early-career climate

practitioner supported through an “applied adaptation fellowship.” Learn from extension and other co-production and technical support models and allocate dedicated resources to this essential function.

- **Develop tools and strategies that support people in the transitions of thinking about managing natural resources in the context of climate change.** While this is rapidly changing, many practitioners did not get trained in climate science or thinking outside their home discipline. In siloed governance institutions, they often do not have time to think systemically or dynamically about management problems. They are often overworked and under-resourced with little time to invest in self-education. Helping practitioners see those interconnections and working with them to identify opportunities to integrate more systemic approaches is time well spent before developing more tools.
- **Make deliberate efforts to transition former PICCC partners and stakeholders to the new repository of PICCC outputs and tools.** While there is an immediate need to ensure the conservation community is aware of where to find PICCC products, this recommendation also holds for any future revival of a coordinating institution or any transition of materials from one hub to another. It is critical not to abandon partners and stakeholders, even if coordinating functions are transferred.

Recommendations for Building a Community of Practice

- **Invest in effective communications.** The field of climate change communication has advanced over the past two decades. Invest in communication expertise in your organization. Initiatives that aim at influencing behavior should focus more resources on community-based social marketing to share limited but motivating information about climate change that supports people with ideas for personal actions they can take. Engage messengers who are trusted by the community you aim to involve and have the ability to effectively translate climate science and its relevance to people’s work.
- **Train climate scientists, communicators, and practitioners in “bedside manners”** needed for sharing the gravity of the information they are conveying to the public. Those directly engaged with the public should work hard to relate to their audiences on a personal level. This, too, is a learnable skill and communication training should be a supportive strategy in an entity aiming to foster adaptation.
- **Support the personal resilience of those working at the front lines of climate change**, which includes the natural and biocultural resource management community. Consider current initiatives, like the Good Grief Network, and other support networks tailored to the unique needs of Hawai‘i’s conservation community to help professionals process the implications of climate change.
- **Foster peer-to-peer exchanges and learning trees.** Island-to-island, peer-to-peer adaptation learning around a common challenge (such as sea level rise) can accelerate learning and move things forward more equitably. The hope is that initial exchanges spark interest and connections that encourage these peers to re-connect again in the future when challenges or opportunities arise. The long-term goal is for “learning trees,” defined by an interviewee as when one set of partners is a resource for another set of partners that are earlier on in the process. As partners continue to “pay forward” what they have gained, the learning tree branches out. In this way an adaptation community of practice gets built. It is important to expand the adaptation network to ensure inclusivity, which means intentionally bringing in representatives from underrepresented communities, and recruiting a diverse cohort of early-career resource managers eager to address the environmental challenges of the 21st century.

Recommendations for Fostering Adaptation Action

- **Think globally and systemically, act locally.** While climate change is global, and many human activities are regionally, sectorally, and even globally interconnected, adaptation actions need to meet and address local needs. It is no longer adequate, however, to only think about local impacts and contexts (as COVID-19 has illustrated). We need to trace climate and interrelated risks through the tangled networks of influences, and build redundancy and resiliency in ways that do not transfer risk and vulnerabilities onto other communities and systems. Developing shared strategies that link global (climate) challenges to local ones and carefully assessing the impacts of adaptation actions on others are critical and iterative tasks.
- **Look towards the future in management decisions,** because environmental baselines will continue to shift. In a continually changing climate and environment, adaptation is not a one time action but rather a continual task. This is counter to traditional management approaches. This means projects need to be designed with an evolving future in mind. Monitoring, evaluation, and learning need to be built into projects, and resource commitments must be made wisely to minimize future needs when adjustments are necessary. Projects need to support the “shovel-ready” initial work and also maintenance and adaptive management over time.
- **Strive towards climate resiliency in ways that are pono (righteous), and rooted in culture, community, and place.** To make adaptation actions socially acceptable, they must be rooted in local culture, place, and community. Thus, the engagement of technical experts with professionals is only one element of effective adaptation. Meaningful engagement of local communities must also be deliberately and carefully integrated and designed into projects.
- **Build on the strong interest in grassroots and community-based initiatives.** To date, there are limited opportunities to fund or support community-based adaptation work in Hawai‘i, in part because the state does not have incorporated municipalities. However, this is the level to which adaptation efforts must be attuned. Limited local capacity and resources make it imperative that NGO, foundation, or state/federally funded adaptation initiatives pay more attention to, and engage, local communities in realizing adaptation. There is great enthusiasm to tap into.

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Appendix A: Detailed Survey Results

Survey Population

A-1. In what ways have you engaged with the Pacific Islands Climate Change Cooperative (PICCC)? (please select all that apply)

Ninety-four percent¹⁸ of survey respondents reported having engaged with PICCC in some way, be it through PICCC-sponsored events and workshops, the utilization of PICCC research and publications, contributions to PICCC-sponsored work, receiving PICCC funding for their work, or direct collaborations.

Table A-1: Respondents engagement with PICCC

Answer Choices	Responses
Participated in PICCC-sponsored events and workshops	78%
Utilized PICCC-sponsored research, publications, and/or staff support in my work	51%
Contributed to PICCC-sponsored work	35%
Collaborated with PICCC staff and steering committee members in a professional context	33%
Received PICCC funding for my work	10%
Other (please specify)*	8%
<i>*Other: "Colleague has worked with them in the past" "Not sure" "Haven't yet – but interested in collaborating" "Involved with field activities"</i>	
(n=51)	

A-2. What jurisdiction do the natural resources you manage fall under? (check all that apply)

Table A-2: Jurisdictional representation of survey respondents

Answer Choices	Responses
State	61%
Federal	37%
County	22%
Non-governmental	22%
Native Hawaiian	20%
Private	20%
Not applicable	0%
<i>Note: Not limited to one answer.</i>	
(n=51)	

¹⁸ Percentages throughout this report are rounded to the nearest full number.

A-3. At what scale is your work focused?

Table A-3: Scale of work of respondents' organizations and agencies

Answer Choices	Responses
Across multiple watersheds	27%
Ecosystem- or habitat-level	22%
Across islands	18%
Species-level	16%
Island-scale	14%
This question is not applicable to my work	4%
A single watershed	0%
	(n=51)

Theme 1: Facilitating Climate Adaptation

A-4. Through your engagement with PICCC and its partners, did your organization/agency experience any of the following? (select all that apply)

Table A-4: Experiences through engagement with PICCC and its partners

Answer Choices	Responses
A climate adaptation need we already recognized was further refined	80%
PICCC-sponsored activities helped to address a climate adaptation need we had	33%
PICCC-sponsored research helped to address a climate adaptation need we had	24%
A climate adaptation need was identified for the first time	11%
None of the above	6%
Other (please specify)*	4%
	(n=46)
<i>*Other: "I think PICCC helped to provide justification or reference material for many organizations." "The workshop offered the space for partners to discuss solutions and next steps and was facilitated well. Many of these partners do not make the time to meet and have these discussions until an event like this occurs. It was definitely needed and extremely helpful."</i>	

Over half of survey respondents reported that PICCC-sponsored activities (33%) and research (24%) helped to address a climate adaptation need they had. Most natural resource managers surveyed (80%) reported that a climate adaptation need they already recognized was further refined with support from PICCC, while 11% reported identifying a climate adaptation need for the first time through their engagement with PICCC. Under the "other" category one interviewee shared that PICCC helped to provide justification or reference material for the work of many organizations, while another shared that a PICCC workshop had "offered the space for partners to discuss solutions and next steps and was facilitated well. Many of these partners do not make the time to meet and have these discussions until an event like this occurs. It was definitely needed and extremely helpful."

A-5. Through your work with PICCC and its partners, did any of the following occur?

Table A-5: Progress through engagement with PICCC and PICCC partners

Answer Choices	Responses
We identified new sources of climate change information useful to our work	74%
We identified a new opportunity to collaborate on climate adaptation with other organizations and/or agencies	35%
We identified a new opportunity to prepare for climate change within my organization	22%
None of the provided options	15%
We identified a new opportunity to raise funds for climate adaptation	9%
Other (please specify)*	2%
*Other: "We learned that the management we are already doing is even more urgent, but it didn't really change the work we did or the amount of funding we got to do the work." (n=46)	

Seventy-four percent of those surveyed reported identifying new and useful sources of climate change information through working with PICCC and its partners. In addition to being a conduit of climate science information, PICCC was also recognized as playing a role in supporting new climate adaptation opportunities between and within natural resource management organizations and agencies (35% and 22% of respondents, respectively).

A-6. Please indicate your level of familiarity with the following PICCC tools and products...

Table A-6: Familiarity with and use of PICCC tools and products

	I have <u>not</u> heard of this resource (0)	I have heard of this resource but not used it (1)	I have used this resource once (2)	I have used this resource in a variety of ways (3)	This has been an important resource in informing my work (4)	Weighted Average Familiarity & Use Ranking
Hawaiian Islands Climate Vulnerability & Adaptation Synthesis	5%	30%	32%	30%	5%	2.0
Vulnerability Assessment for Native Hawaiian Plants	25%	30%	11%	23%	11%	1.66
Vulnerability Assessment for Native Hawaiian Birds	27%	43%	11%	14%	5%	1.25
PICCC resources not listed above*	57%	19%	0%	14%	10%	1.0
Hawaiian Islands Terrestrial Adaptation Initiative "Story Map"	39%	43%	9%	9%	0%	.89
Climate Adaptation Policy Analysis for Hawai'i's Natural Resources	42%	42%	4%	11%	0%	.84
Hawai'i Climate Adaptation Videos	51%	37%	5%	7%	0%	.67
Resilient Lands and Waters Initiative	66%	17%	5%	10%	2%	.66
*Write-in responses: Silversword high elevation ecosystems research, rainfall-related research, PIRCA						(n=45)

Under the umbrella of the Hawaiian Islands Terrestrial Adaptation Initiative spearheaded by PICCC, there were a variety of individual projects. Respondents were most familiar with the Hawaiian Islands Climate Vulnerability and Adaptation Synthesis, a 2-year project that involved two series of county-level workshops with natural and biocultural resource practitioners. This project had a high recognition score but comparatively lower utility score, possibly due to this survey being conducted the same year the products were published. Since the climate synthesis products were still new when this survey was conducted, it is possible there will be greater uptake with time.

Although more respondents had heard of the Hawaiian Islands Climate Synthesis (95%) than the next product of greatest familiarity, the Vulnerability Assessment for Native Hawaiian Plants (75%), the Hawaiian Plants VA was reported to be the most important for informing the work of survey respondents. Interviewees reported that the Hawaiian Islands VA was used by the Plant Extinction Prevention Program for prioritizing species for action, by the USFWS for strategic habitat plans, and for seed banking decisions in Hawai'i.

The Vulnerability Assessments of Native Hawaiian Birds is another PICCC product that proved important in informing the work of a portion of survey respondents (5%). The utility of this resource was echoed in interviews, where it was reported that the Hawaiian Birds VA influenced the listing of the I'iwi as an Endangered Species.

Respondents also reported using the following PICCC-supported products in the survey and write-in responses: Silversword high elevation ecosystems research, rainfall-related research, the first Pacific Islands Regional Climate Assessment, HITAI Story Map, Adaptation Policy Analysis, Adaptation Video Series, and the Resilient Lands and Waters Initiative report.

A-7. Which of the following commitments and actions important to making progress on climate adaptation has your organization/agency achieved in the past decade? (select all that apply)

Table A-7: Commitments and actions being taken to make progress on climate adaptation

Answer Choices	Responses
We have conducted a climate change vulnerability assessment	51%
Climate change has become an integral part of how our organization manages resources	40%
We have implemented an adaptation project or program	33%
Other (please specify)*	28%
We have prioritized adaptation at the highest level of policy/guidance in my organization	21%
We have developed a climate adaptation or resilience plan	12%
We have fundraised to implement climate adaptation projects	12%
<p><i>*Other: "Climate change has become another factor to consider in the management of our natural resources but we do not have any official decision making rubric that enforces this" "We have only gone as far as PICCC has taken us" "Used the vulnerability assessment for Hawaiian plants to complete IUCN Red List assessments" "Formed an affiliation of organizations working to deal with climate-related changes" "Integrated climate information into County General Plan and Community Plans" "Although climate change affects many aspects of what DOFAW does, I'm not sure it has actually changed the way anything is done" "Have no funding for any of these things, so haven't been able to implement" "I am not sure what DLNR/DOFAW has achieved in the past decade, but I can speak more towards my program" "I provide technical assistance to a wide range of groups. Unfortunately, I am much more limited in my ability to assist others in climate change related items (since 2017), unless it is termed differently, or is a reaction to a disaster. It is unfortunate and frustrating." "Continued monitoring and population sampling in selected streams with restored stream flow." "None" "None of these"</i></p>	

(n=43)

Half of survey participants (51%) reported that their organization/agency had conducted a climate change vulnerability assessment during the decade of 2009–2018. Forty percent agreed that climate change had become an integral part of how their organization manages resources. Reflecting this, 33% reported that their organization/agency had implemented an adaptation project/program during the past decade, 21% reported prioritizing adaptation at the highest level of policy/guidance in their organization, and more 12% belonged to organizations/agencies that were fundraising to implement climate adaptation initiatives. One respondent wrote-in about the integration of climate information into their County General Plan and community plans.

Challenges to making progress on climate adaptation were also shared. Respondents expressed that although climate change was being considered in natural resource management, “we do not have any official decision-making rubric to enforce this” and “we have only gone as far as PICCC has taken us.” There was frustration expressed by federal workers over their limited ability to assist others in climate adaptation work since 2017, unless it was termed differently or in reaction to a disaster. Insufficient funding for implementing climate adaptation actions was cited as another obstacle to progress.

A-8. Of PICCC’s activities that you have observed or been part of, which do you perceive as the most useful? (please rank from most (5) to least (1) useful)

Table A-8: PICCC activities perceived as most useful by those who have observed or been part of them

	Most useful				Least useful	<i>Weighted Average</i>
Assigned values:	5	4	3	2	1	
Climate science information produced through PICCC	36%	19%	5%	19%	21%	3.29
Strengthening my professional climate adaptation network through PICCC activities	8%	24%	55%	13%	0%	3.26
Sharing my own work more broadly through PICCC	10%	18%	15%	49%	8%	2.87
Facilitated discussions and workshops with peers on climate change adaptation	11%	29%	21%	16%	24%	2.74
Other (see Question 9 below for elaboration)	45%	0%	0%	0%	55%	2.8

(n=42)

It is evident from this question and others that PICCC’s perceived benefit was from *both* the science and products it produced and sponsored, *and* from the collaborative networking opportunities it facilitated towards the goal of climate adaptation. This is further elaborated upon by survey participants in their responses to Question 9 below.

A-9. Please briefly explain what made your top ranked choice for question 8 so useful.

Most survey participants elaborated on why the PICCC activities they ranked as most useful for question 8 were beneficial. Although there was overlap, responses emphasized the following three major areas of contribution:

CONTRIBUTION 1: CLIMATE INFORMATION THAT SUPPORTS NATURAL RESOURCE MANAGEMENT

Resource managers reported that PICCC's work helped focus discussions and support priority setting for species and habitats, and informed natural resource management decision-making and policy. PICCC's products and workshops played a role in collective learning in the natural resource management community, which was then extended by resource managers' engagement with their own stakeholder communities. PICCC-supported climate science informed debates and management plans and was utilized in reports, public presentations, and community outreach. PICCC-organized workshops provided time to absorb the new information and enabled peer-to-peer dialogues on new climate research and how it pertained to resource managers' concerns, vision, and goals.

Why this contribution was useful:

Helps with priority setting and focus

"PICCC-funded research products on vulnerability of plants, birds and coral reefs were extremely useful in focusing discussion regarding impacts and adaptation needs."

"The science produced has been very eye opening and continues to guide my current and future target species and highlight the most vulnerable habitats to focus on."

Helps with management decisions

"Climate science information can help us plan how to better manage our natural resources for coming environmental change."

"As land managers we rely on outside expertise to develop climate science and analysis to inform management decisions."

"The research helps aid in management decisions."

"Science/data/models critical to informing where and how we choose to do management."

Promotes policy change

"Reliable, peer-reviewed information that can be used to promote policy change as well as serve outreach/education needs in the community at large."

Meets collective climate science needs

"As a program manager administering a watershed restoration program, the cost and time associated with conducting long-term or focused research related to climate change are often prohibitive. Working with partners who have the capacity and funding to conduct directed research is an asset."

"My job is to connect stakeholders with the latest and greatest science. PICCC is a great resource for that."

Science utilized in reports, public presentations, and community outreach

"Referring specifically to the PIRCA report which I have referenced repeatedly in other technical reports and presentations."

"I cite Fortini et al.'s work."

"important research findings"

Climate science products shared through workshops and events (increasing accessibility)

“The actual models and subsequent analysis as it relates to rare or threatened species and ecosystems seems like it was the most useful product generated by PICCC. The workshops and events seemed like the way in which those products were presented and explained.”

CONTRIBUTION 2: COMING TOGETHER AS A RESOURCE MANAGEMENT COMMUNITY

Resource managers emphasized the importance of PICCC’s role in bringing people together to identify shared goals and concerns, their facilitation of important discussions, and the opportunity that PICCC events provided for networking, collective learning, and peer-to-peer accountability.

Why this contribution was useful:

Convening to address shared goals and concerns

“The heart of change lies in unified human intention and vision. When people come together around common goals and/or to address shared concerns this unlocks our collective power to create change. Our engagement with PICCC helped to bring our community together to talk more about current and future vulnerabilities, assets, and how we can support one another.”

“Knowing how to take the science and adapt is our biggest challenge. I think the ability of PICCC to facilitate that and build collaborative approaches to implement recommendations and build resiliency is what is needed now. We need to take what we have learned and apply it more effectively.”

Facilitation of important, peer-to-peer discussions

“Having a well facilitated meeting with partners that we normally do not make the time to meet with for these discussions, was a great opportunity to come together and work on solutions.”

“The workshop made a lot of people sit down and talk about what’s going on. The products that came were a bonus to refer to.”

“The manager workshops statewide were helpful from a planning perspective.”

“The workshops have been great and an excellent way to learn about the work of PICCC, meet and network with other professionals, and learn about products produced by PICCC.”

Collective learning

“Being able to talk to other land managers about vegetation management and building resiliency is very helpful. Learning about specific ranges of species and where ranges may extend to (or shrink to) in the future helps to guide us.”

“Facilitate discussions and workshops with small organizations/public. I believe that educating and bringing the public into the decision-making arena be [sic] important.”

“Workshops allowed discussion and networking with peers and helped synthesize outcomes.”

Accountability for climate action

"PICCC workshops were helpful to digest the science and make connections to people that can help push climate change work further. Also useful to make one feel guilty if they haven't made any progress."

"At this point my work is to make climate change adaptation and resilience a part of our work. In order to do this I need to persuade our board of directors that climate change is something we need to plan for, and resilience planning could prove meaningful in preserving the conservation values on our protected lands."

CONTRIBUTION 3: SCALE AND RESOLUTION OF STUDIES

Respondents also expressed that PICCC's climate research being locally focused was critical to its utility and uptake in adaptation planning.

Why this contribution was useful:

Place-specific PICCC climate science products

"It is Hawai'i specific."

"I need a citation for what is predicted to happen with climate change in Hawai'i for various products I write."

"Understanding high resolution climate change impacts to natural resources is integral for adaption planning."

A-10. Have you observed any achievements and outcomes that you believe PICCC's investment in climate adaptation contributed to? (select all that apply)

Table A-10: Achievements and outcomes that PICCC's investment in climate adaptation contributed to

Answer Choices	Responses
Increased communication within the natural resource management community on the challenge of climate change	76%
Inclusion of climate change considerations into natural, biocultural, or community resource management plans	66%
Increased collaboration within the natural resource management community on the challenge of climate change	44%
Adaptations to natural and biocultural resource management practices, in light of climate change considerations	34%
Other (please specify)*	12%
<i>*Other: "Increased awareness of climate change issues amongst the public" "Connected with communities on outer islands." "As I mentioned before, our natural resources management actions have not changed significantly. This is not because we haven't gotten or used the data, but because what we were already doing was consistent with what we should be doing for climate change adaptation." "Haven't observed/might not know enough at this time." "Not sure"</i>	
(n=41)	

A-11. What role did PICCC play in contributing to the above achievements (in Question 10)? (select all that apply)

Table A-11: PICCC’s roles according to survey participants

Answer Choices	Responses
Facilitator	68%
Knowledge Resource	60%
Communicator	58%
Researcher	55%
Convener	48%
Educator	35%
Funder	30%
Coalition Partner	25%
Unable to answer	3%
Other	0%
	(n=40)

Examining PICCC’s perceived role in climate adaptation in Hawai‘i (Table A-11) helps us to understand how PICCC (i.e., its core staff, steering committee members, and partners working together) were viewed as “adding value.” Given PICCC’s design as a cooperative composed of partner organizations and agencies, and their facilitation of various workshops and convenings across the archipelago, it is unsurprising that respondents viewed PICCC as a “Facilitator” (68%) and “Convener” (48%). PICCC had a full-time research ecologist on staff, and their team contributed both funding and time towards developing new climate research and information products. This aligns with the perception by survey participants that PICCC was a “Knowledge Resource” (60%) and that one role they filled was that of “Researcher” (55%). Like other cooperatives in the national LCC Network, PICCC had a full-time communications manager and survey participants recognized PICCC for its roles as “Communicator” (58%) and “Educator” (35%). PICCC dedicated significant resources and staff time towards creating/managing funding opportunities, but this role was less recognized by survey participants (30%). This might be because many respondents had attended PICCC workshops/events and/or utilized PICCC developed/supported research, but comparatively fewer had been recipients of PICCC’s funding opportunities. The perceived roles of PICCC aligned with their dual aims in their 2014–2019 strategic plan, to “facilitate climate adaptation” and “foster partnerships.” In addition, PICCC was an active member of the Hawai‘i Conservation Alliance where it worked alongside other agencies and organizations to support Hawai‘i’s conservation agenda.

Theme 2: Fostering Partnerships

A-12. Which of the following conditions do you consider as most important for climate adaptation to occur in Hawai‘i? (Check the 5 most important conditions)

Table A-12: Most important conditions for climate adaptation to occur in Hawai‘i

Answer Choices	Responses
Collaboration	75%
Long-term commitment	61%
Government leadership	61%
Place-based approaches	50%
Economic incentives and support	50%
An interdisciplinary, trans-disciplinary, systems-based approach to problem-solving	48%
Community-based approaches	45%
Trusting relationships	30%
Co-production of shared knowledge	30%
Personal connection to the environment	20%
Inclusivity	11%
Other (please specify)*	5%
<i>*Other: "Money. Lots of it." / "More funding for conservation work."</i> (n=44)	

A-13. In your view, did PICCC’s work make contributions to any of the conditions you selected above (in Question 12)? (select those that apply)

Table A-13: PICCC’s contributions to the conditions needed for climate adaptation to occur in Hawai‘i

Answer Choices	Responses
Collaboration	67%
Co-production of shared knowledge	40%
An interdisciplinary, trans-disciplinary, systems-based approach to problem-solving	29%
Community-based approaches	26%
Place-based approaches	24%
Government leadership	24%
Trusting relationships	19%
Inclusivity	17%
Not able to answer	17%
Personal connection to the environment	12%
Economic incentives and support	10%
Long-term commitment	7%
Other (please specify)*	2%
<i>*Other: "Not really, we haven't seen a lot of new funding for conservation or government leadership."</i> (n=42)	

Comparison between the conditions most important for climate adaptation to occur (A-12) and the conditions that PICCC's work contributed towards (A-13)

The condition deemed by respondents as the most important for climate adaptation to occur in Hawai'i — *collaboration*—was also the condition that the greatest percentage of respondents stated that PICCC was contributing towards (contribution ranking #1; priority ranking #1). While “long-term commitment” was ranked as the #2 most important condition for climate adaptation to occur in Hawai'i, PICCC received a low score on this (7%; last place), likely because the Cooperative was forced to shutter in 2018.

The #10 ranking of PICCC's perceived contribution towards economic incentives is interesting given how few funding sources for climate adaptation research activities existed during this time period in Hawai'i, and that a sizable portion of PICCC's annual budget went towards external funding opportunities (30-48% from fiscal years 2010 to 2017). However, since PICCC's grant funds were limited (peaking at \$790,000 in 2011; Figure 2), respondents may not have registered PICCC as providing significant economic incentives for climate adaptation in the islands.

In interviews, PICCC was recognized for its leadership in supporting biocultural conservation in the context of climate change, and their dedication to local and community-driven initiatives. These views are supported by survey respondents, who reported PICCC making contributions to the “co-production of shared knowledge” (#2); “interdisciplinary, trans-disciplinary, systems-based approaches to problem-solving” (#3); “community-based approaches” (#4), and “place-based approaches” (#5).

Table A-12 & A-13: Ranking of importance by survey participants of the conditions needed for climate adaptation to occur in Hawai'i, and PICCC's contributions towards these conditions.

Answer Choices	Ranking of Importance (n=44)	Ranking of PICCC contribution towards (n=42)
Collaboration	#1	#1
Co-production of shared knowledge	#8 (tied)	#2
An interdisciplinary, trans-disciplinary, systems-based approach to problem-solving	#6	#3
Community-based approaches	#7	#4
Place-based approaches	#4 (tied)	#5 (tied)
Government leadership	#2 (tied)	#5 (tied)
Trusting relationships	#8 (tied)	#7
Inclusivity	#11	#8
Personal connection to the environment	#10	#9
Economic incentives and support	#4 (tied)	#10
Long-term commitment	#2 (tied)	#11

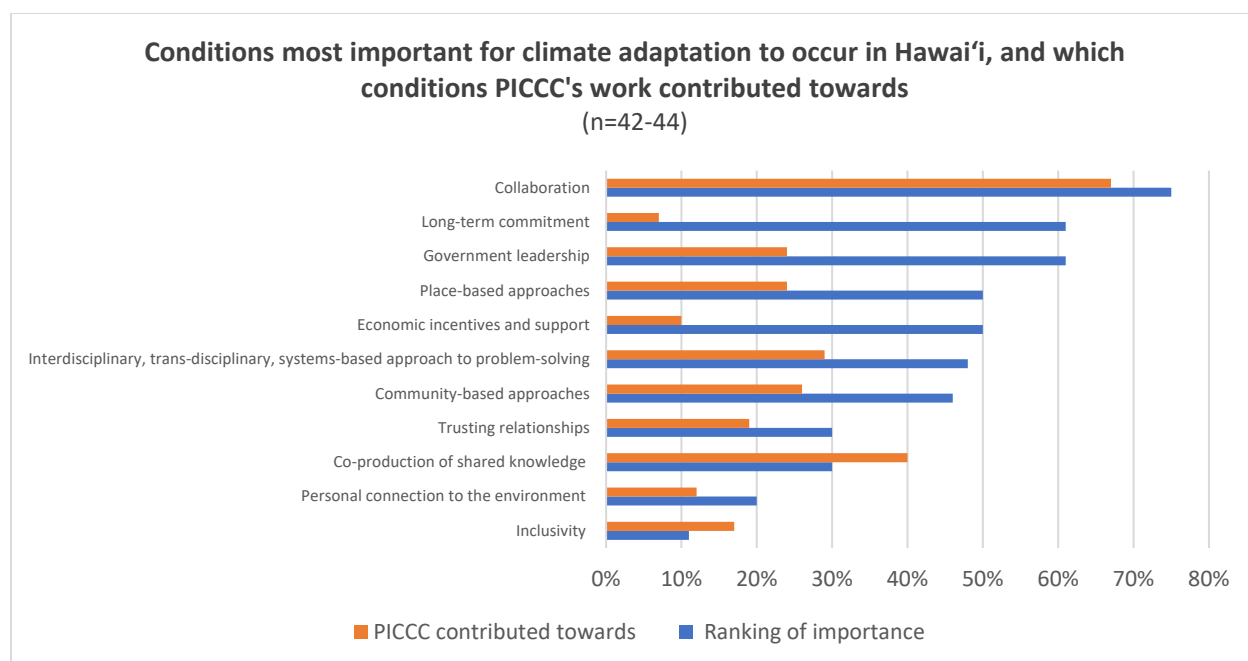


Figure A-12 & A-13: PICCC's contributions to the conditions needed for climate adaptation to occur in Hawai'i.

A-14. Which of the following kinds of partnerships do you consider as most important for climate adaptation to occur in Hawai'i? (select all that apply)

Table Q-14: Partnerships most important for climate adaptation to occur in Hawai'i

Answer Choices	Responses	Importance Ranking
Partnerships across agencies and organizations	82%	#1
Partnerships across sectors (including public-private*)	68%	#2
Partnerships across disciplines	64%	#3
Partnerships across scales	32%	#4 (tied)
Partnerships across worldviews	32%	#4 (tied)
Other: Partnerships across landscapes**	5%	
Other: Personal relationships***	2%	
* "Other" responses addressing public-private partnerships were added to the category of "partnerships across sectors" ** "Partnerships across landowners so we can protect large landscapes rather than being confined by ownership boundaries as climate shifts. For example, the watershed partnerships." "Partnerships across landscapes" *** "Personal relationships"		
(n=44)		

A-15. Did PICCC’s work make contributions to fostering any of the kinds of partnerships you selected above (in Question 14)? (select all that apply)

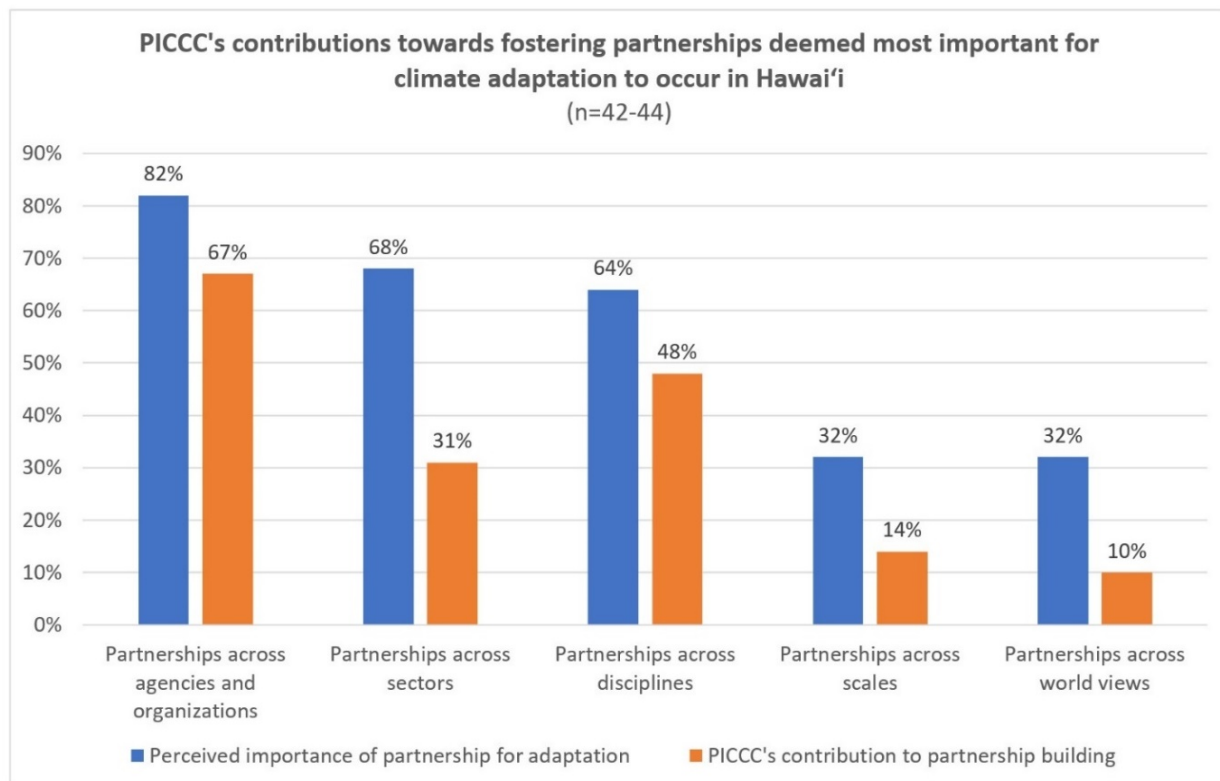


Figure A-15: PICCC’s contributions towards fostering partnerships deemed most important for climate adaptation to occur

While a total of 76% of those surveyed responded positively to question A-15, 19% selected “not able to answer” and 5% filled in “no.” Possible reasons for this include the scale of the challenge (compared to the size/resources of PICCC), ambiguity within the survey (what is meant by “fostering of partnerships,” and how is it gauged?), and this being an area that PICCC could have continued to improve upon.

Theme 3: Interplay of Strategies

A-16. Please reflect on your personal experiences with PICCC to complete the following phrase (please select all options that apply). Through my interactions with PICCC...

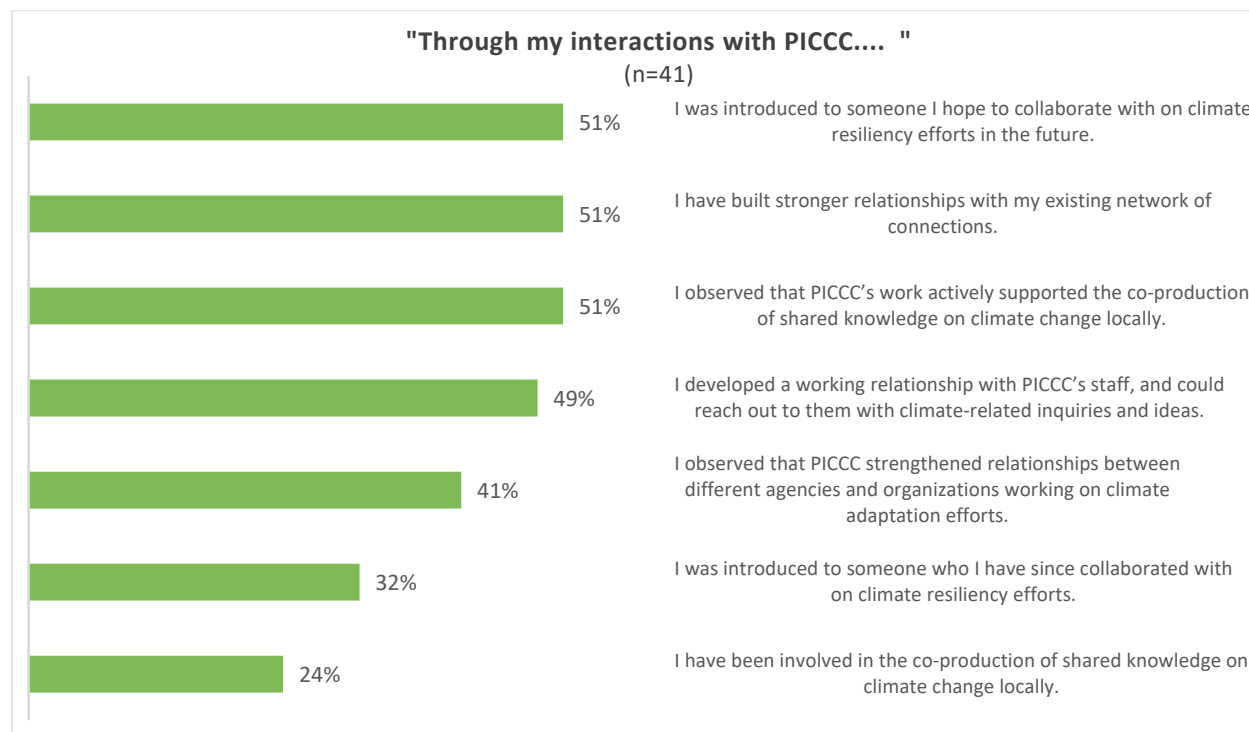


Figure A-16: Survey participants' experiences interacting with PICCC

A-17. From your experience, did the process of gathering, producing, and sharing climate change relevant science, assessments, tools, and techniques change relationships within the natural resource management community in Hawai'i?

PICCC's two-pronged approach focused on facilitating climate adaptation and fostering partnerships, based on the belief that these two activities were synergistic. But does working to address climate change influence how natural resource managers interact with each other? Among respondents, 49% viewed that it did. Reflecting on their personal experiences, these respondents reported that the process of gathering, producing and sharing climate change relevant science, assessments, tools, and techniques had changed relationships within the natural resource management community either somewhat (37%) or very much (12%). Those that elaborated on their responses shared that through working on climate adaptation, they had "met new people," were "able to see what others have accomplished," and had "formed a local group on Kaua'i to continue to share knowledge and action."

"The creation of this shared knowledge and approach brought our community closer together with a focus on climate-change adaptation and resiliency."

The remaining respondents reported not being able to tell (37%) or not seeing such changes personally (15%). One survey participant explained, “It takes more than a few workshops to get people to change their decades-long institutional cultures.”

Table A-17: Did the process of gathering, producing, and sharing climate science, assessments, tools, and techniques changed relationships within the natural resource management community in Hawai‘i?

Answer Choices	Responses
Yes, somewhat	37%
Yes, very much so	12%
I cannot tell	37%
No	15%
	(n=41)

A-18. From your perspective, did the relationships developed and/or strengthened through PICCC help natural resource managers to integrate relevant climate change information into terrestrial, freshwater, and/or marine management plans in the main Hawaiian Islands?

Table A-18: Did the relationships developed/strengthened through PICCC help natural resource managers to integrate relevant climate information into natural resource management plans in the main Hawaiian Islands?

Answer Choices	Responses
Yes, somewhat	44%
Yes, very much so	12%
I cannot tell	32%
No	12%
	(n=41)

Fifty-six percent of respondents felt that relationships developed/strengthened through PICCC activities supported the incorporation climate information into natural resource management and planning, while the remainder were not sure (32%) or did not see evidence of this (12%). Those that perceived a positive relationship between relationships developed/strengthened through PICCC and improved natural resource management shared the following feedback.

Helped to incorporate climate change considerations into management decisions

“Our relationship with PICCC helped our organization mindfully consider the impact climate change will have on our restoration efforts. We were then able to shift the way we manage our ‘āina to better prepare for the changes ahead.”

“Climate change is now a consideration for management goals.”

Informed policy makers and helped promote policy change

“It informed policy makers in government that what we are currently experiencing climate-wise is connected to climate change and Hawai‘i needs to anticipate and adopt appropriate land use policies.”

Influenced inter-agency collaboration and communication

“Better inter-agency collaboration and discussion.”

“Climate change is being discussed publicly.”

However, experiences not uniform

“I’ve not seen too much collaboration between these but I’ve heard people starting to talk about it.”

“In my field, nothing has changed. We are integrating climate info the same way we already were.”

A-19. Please select each that you personally have experienced to be true: Working on climate adaptation has changed my relationships within the natural resource management community by _____. (a) Bringing me together with people from different disciplines to work on this challenge together, (b) Bringing my organization/agency together with people from other organizations/agencies to discuss the shared challenge of climate change, (c) Helping me to think about the strategies I use to manage the natural and biocultural resources I steward in a different and more strategic way, (d) Increasing collaboration on joint actions or strategies between my organization/agency and others, (e) Other (please specify)

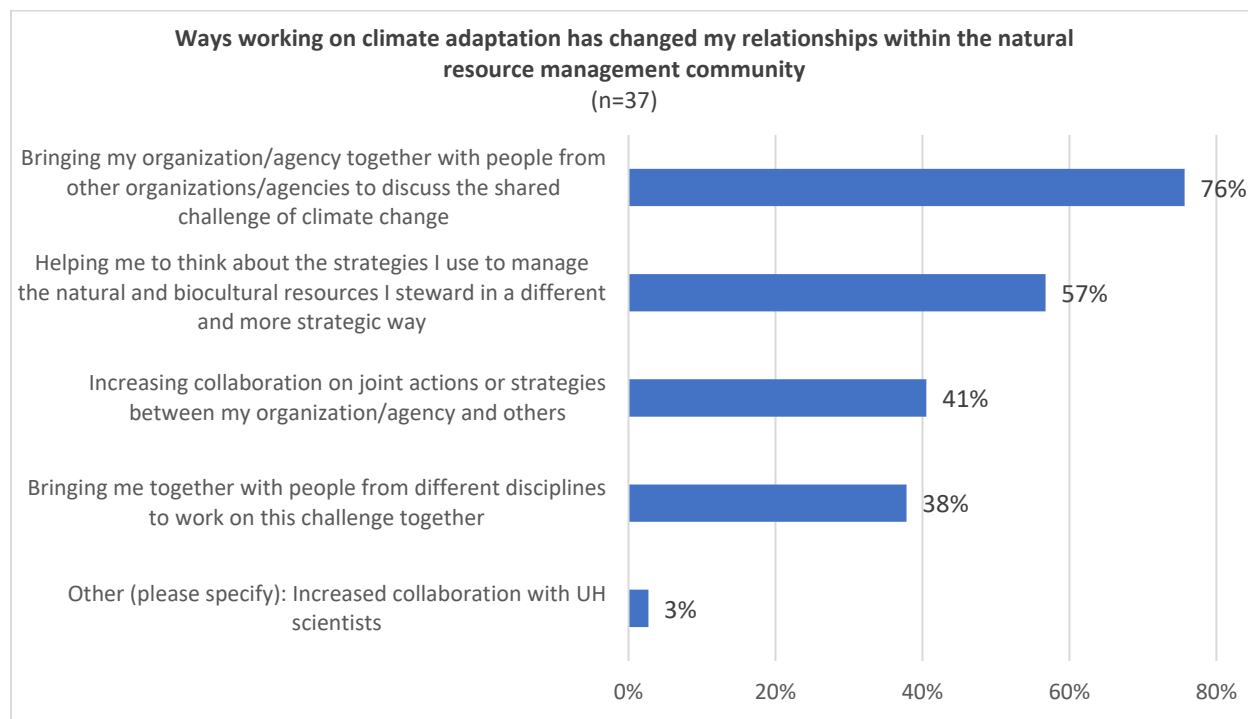


Figure A-19: Survey participants’ experiences with the interplay between climate adaptation and relationships within the natural resource management community.

A-20. What areas of PICCC’s approach would you have most wanted to see adjusted to further increase its effectiveness in fostering partnerships and facilitating climate adaptation? (Please select your three top priorities for improvement): (a) improved communications, (b) increased focus on supporting climate science, (c) increased focus on supporting climate adaptation efforts between natural resource management agencies, (d) Personalized support for my organization’s efforts to incorporate climate adaptation into management plans and actions, (e) Expanded focus from “climate adaptation” to environmental resiliency more broadly, (f) no change needed, (g) unable to answer this question, (h) other (please specify).

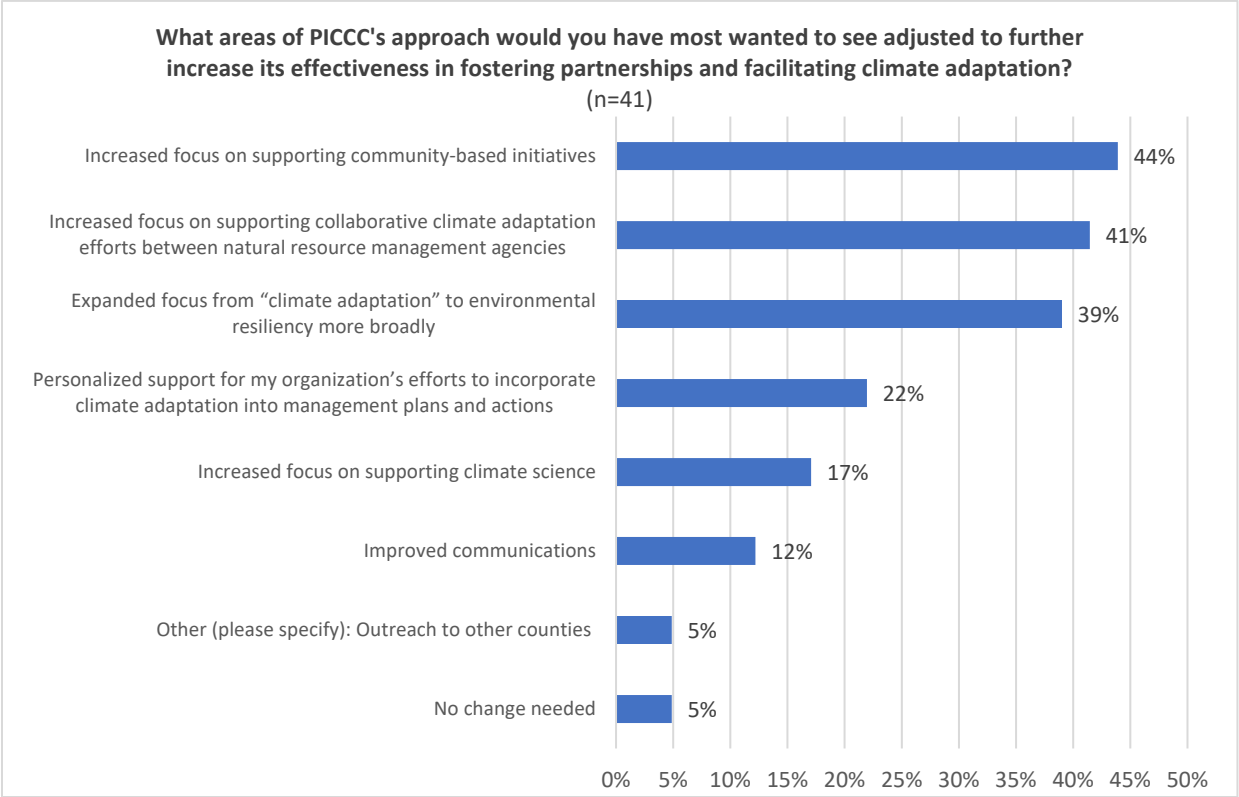


Figure A-20: Survey participants’ recommendations on adjustments to further increase effectiveness.

A-21. Do you perceive the overarching strategy of PICCC as effective for supporting the resiliency of natural and biocultural resources in the Pacific to climate change?

Over 97.5% of respondents viewed PICCC’s overarching strategy as effective or somewhat effective for supporting the resilience of natural and biocultural resources in the Pacific to climate change. Those giving further feedback on this survey question provided the following advice.

Being an effective “convener” and “communicator” remains important

“Need an agency to take the lead in bringing different agencies together as well as synthesize new information and explain it to all of us.”

Develop actionable, concrete next steps

“We need actionable, concrete steps specific to each of our areas of expertise and responsibility. All your models and discussions and buzzwords don’t mean much to me if I can’t figure out, or am not being told, how to modify what I’m currently doing (rare plant species recovery efforts, for example) to address climate change and the latest science coming out of your or anyone else’s organization.”

“A lot of talks and publications and not much action or fundraising to actually make things change.”

Include county governments

“More county government participation desirable.” (Note: In this research, similar sentiments were expressed by government representatives of more than one county.)

Go “big”

“Need large projects that can show a positive impact. For some, it’s gotta be big to be recognized and appreciated.”

Keep in mind the political landscape

“I think there may need to be different focus/terminology used to enable work to be done, especially if federal partners or federal funds are to be involved.”

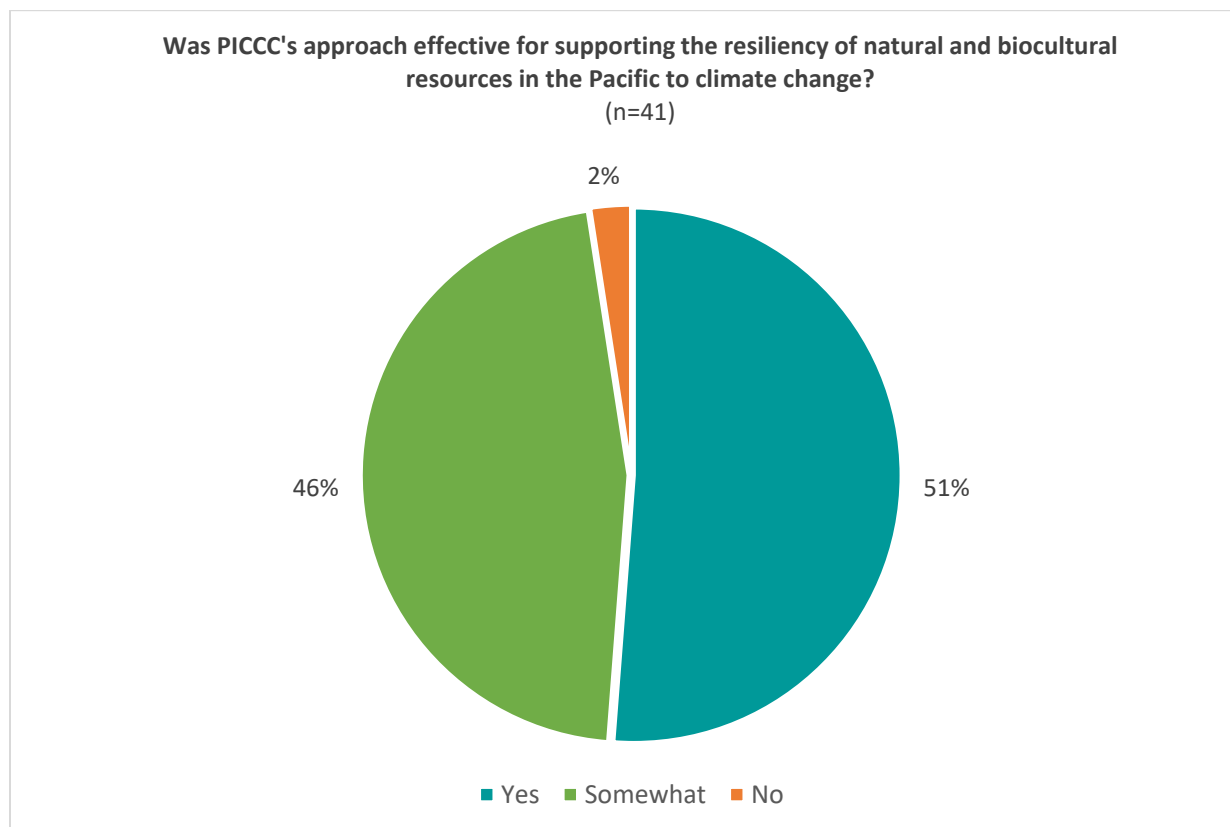


Figure A-21: Was PICCC's approach effective in reaching its goals?

Theme 4: Baseline and Progress

A-22 & A-23. In 2009/2018, to what extent were you and your organization incorporating forward-looking climate change science into your work?

Survey findings reflect a significant shift in the natural resource management community's engagement in climate science and planning from 2009 to 2018. One-quarter of respondents reported that their organization/agency was not talking about climate change at all in 2009. Compare this to 2018, when *all* respondents reported that their organization was discussing climate change. During this decade there was also a considerable shift towards the inclusion of climate considerations into management plans (from 18% to 46%) and management actions being directly informed by climate projections (from 8% to 29%). As of 2018, only 1 in 4 respondents' organizations were not yet incorporating climate change considerations into their management plans and/or actions.

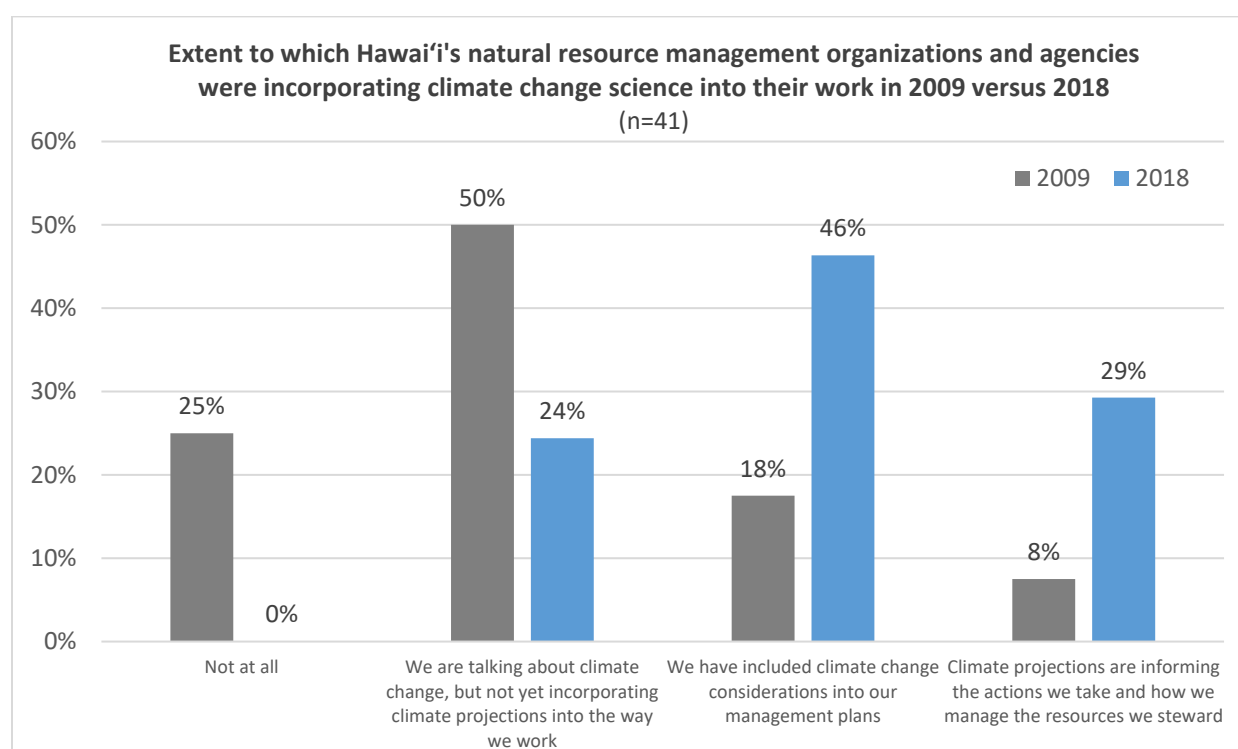


Figure A-22 & A-23: Changes from 2009 to 2018 in the integration of climate science into natural resource management in Hawai'i.

A-24. What are the most significant factors influencing your ability to incorporate forward-looking climate change science into your work?

To gauge the perceived severity of adaptation barriers among natural resource managers in Hawai'i, we utilized a research question asked by Hart et al. (2012) and Moser et al. (2018) of coastal professionals in California (and slightly adapted in other surveys across the nation).

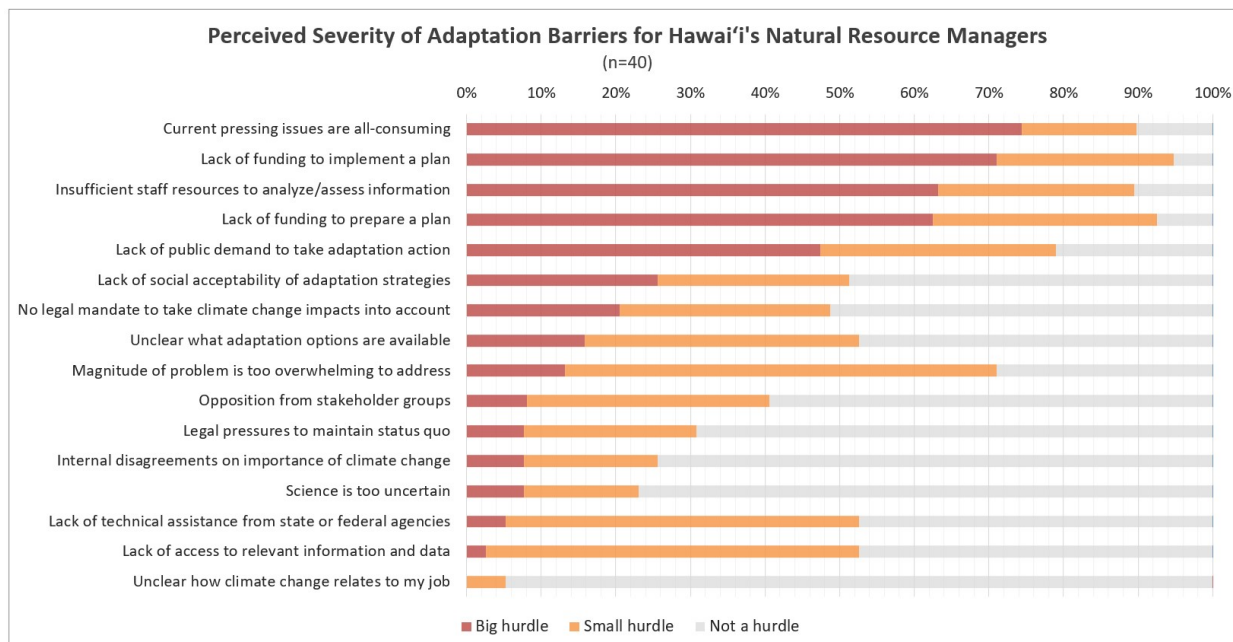


Figure A-24: Perceived severity of adaptation barriers for Hawai'i's natural and biocultural resource managers.

Respondents in both Hawai'i (n=40) and California (n=455-478) reported the "lack of funding to implement a plan" as their top hurdle overall. Generally, the perceived severity of adaptation barriers for Hawai'i and California respondents followed a similar pattern. However, respondents were more pessimistic about the severity of adaptation barriers in 2018 in Hawai'i than survey participants were in California in 2011 and 2016. This variation could be due to geographic reasons (such as differences in funding availability), temporal variations (large-scale events occurring from 2016–2018 that may have decreased overall optimism), and/or the differences in the professions of those surveyed (natural resource managers in Hawai'i versus coastal professionals in California).

The lowest ranked responses were "the science is too uncertain" and "[it is] unclear how climate change relates to my job." This suggests that most natural resource managers in Hawai'i no longer see a lack of climate science as a major barrier to them incorporating climate considerations into their work. These findings also communicate nearly universal recognition by natural and biocultural resource managers in Hawai'i that climate change is relevant to their work.

A-25. From your perspective, what did you really hope PICCC would achieve, but did not? (please select up to three items): (a) achieve greater climate change related policy advances, (b) acquire and make available more funding for research, (c) acquire and make available more funding for adaptation planning, (d) acquire and make available more funding for implementation of adaptation, (e) build stronger relationships, (f) provide more effective climate change communications, (g) offer more effective climate adaptation tools and resources, (h) build greater know-how and capacity among natural resource managers in the region, and (i) other (please specify).

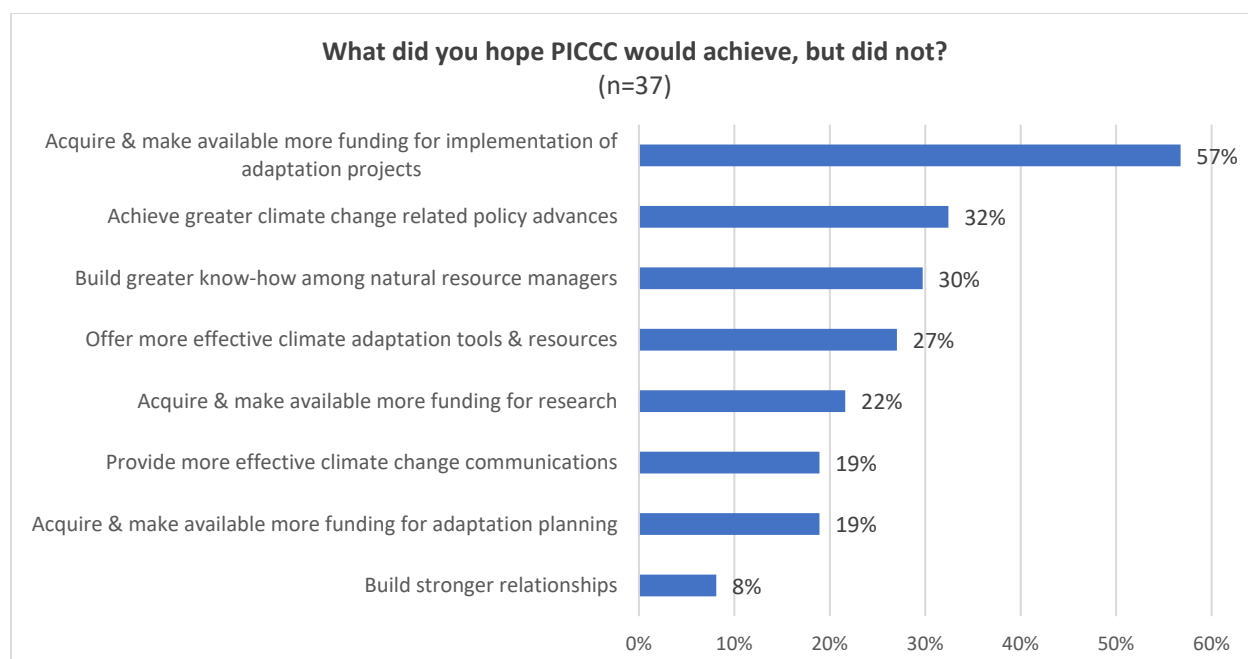


Figure A-25: What Hawai'i natural resource managers hoped PICCC would achieve, but did not.

One way to interpret these answers is through the lens of evolving needs. Unmet hopes for what PICCC would achieve reflect—in part—what natural resource managers wished for in 2018 when the survey was conducted. These hopes would have evolved from 2009 when PICCC was established. In 2018, survey respondents' #1 unmet hope was for project implementation funds (57%); they did not place this same emphasis on funding for research (22%) or planning (19%). In PICCC's early years it prioritized filling climate knowledge gaps in Hawai'i (i.e., funding adaptation research), and then the Cooperative increasingly worked to support vulnerability assessments and adaptation planning. As part of this progression, one would expect funding needs to increase since project implementation is typically more costly than pre-project research and planning. In other words, the feedback on questions 24 and 25 might reflect the higher costs and challenges of implementing climate adaptation versus researching and planning for it.

Although not one of the top-ranking answers, a significant number of respondents (19%) had hoped for more effective climate change communications. In terms of improvements, this seems like a lower hanging fruit than some of the other recommendations.

Of those that answered "other," one wished PICCC would have "achieved greater public education and understanding of climate change," and the other had hoped for "a greater presence and availability on outer islands." Feedback on the need for greater presence on "outer islands" reflects the nature of PICCC's service area (multiple archipelagos across the world's largest ocean), as well as the location of PICCC's office and staff being housed on the island of O'ahu (home to the state's capital and the majority of Hawai'i's population). PICCC's steering committee members were also primarily based on O'ahu followed by Hawai'i Island, with very limited representation of the USAPI.

A-26. From your perspective, what do you view as the most useful contribution(s) that the PICCC made while it existed? (please check up to 3)

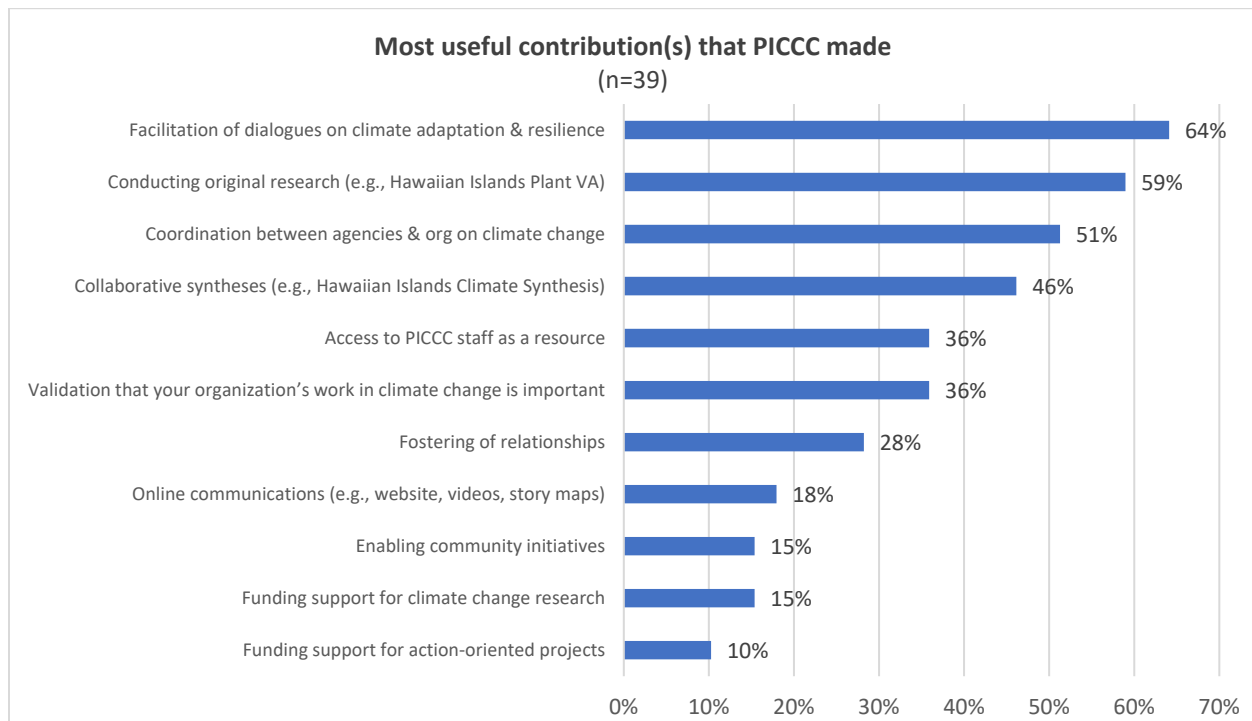


Figure A-26: Perspectives on the most useful contributions PICCC made.

A-27. In one or two sentences, what made your top ranked choice(s) above (Question 26) useful to you and your work?

Respondents' feedback to this question is organized below into six thematic groupings.

1) Provision of climate science and informational resources

Climate science that is trustworthy, addresses local needs, and supports decision-making

"Climate science on the ranges of species habitat helps determine which species are most threatened with extinction."

"Having people and resources I can cite or seek trustworthy information from or seek collaboration with."

"The organization was a useful clearing house for information"

Climate adaptation research that strengthens grant proposals and management plans

"Having resources available for use in grant applications, management plan creation, etc."

“It is useful for grant writing to cite research showing the probable impacts of climate change.”

“It is useful to be able to cite threats to forest health in proposals and reports.”

“My organization is orienting itself towards a more resilience-based management model; research in this area is very useful.”

2) Fostering partnerships needed to cultivate the optimal conditions for climate adaptation

Bringing stakeholders together and facilitating dialogs

“Bringing people together to facilitate dialog was really a key driver in getting the work prioritized and completed. I think the products that we are left with are great, and hopefully will continue to be used. The relationships and building collaboration and how to move forward will keep us moving in the right direction forward.”

“Collaboration and having PICCC call together agencies and colleagues was a good thing.”

“Communication is key in bringing groups and ideas together.”

“Fostering relationships”

“I thought the workshop on the climate synthesis was excellent, forced people to work hard, and dialogue together.”

“The facilitated workshop was extremely important to have the larger discussions among the agencies with knowledgeable facilitators.”

Promoting climate adaptation collaborations

“Assembling a variety of stakeholders to educate and promote collaborations was the most useful contribution that PICCC accomplished for my work.”

“Coordination and leadership on climate change”

“[PICCC was] an important forum in which agencies could meet to develop mutual strategies to a common threat.”

“Our collaboration with PICCC empowered our organization to bring together diverse groups of people—resource managers, community members, elders, scientists, government agencies, etc.—to work together on identifying risks/vulnerabilities and brainstorming collaborative solutions.”

3) Influencing policy

Building momentum for change

“Outreach tools for policy makers and the general public are critical to gathering enough political support for change to occur.”

Informing state policies and actions

“Original and synthesis climate research provided basis for state-based climate initiatives, vulnerability assessment, and policy discussions.”

4) Supporting shifts in thinking about climate change and conservation

“Plant vulnerability assessment totally changed the way I look at long term planning for rare plant conservation”

“My top ranked choices above were useful in that Climate Change gradually became a topic we discussed when looking at recovery of endangered species”

“On the personal front, I enjoy the way the relationships fostered help me address my personal climate impact.”

“Meeting with a number of agencies in a room on one project made the whole process less daunting.”

5) Evolving to help address natural resource managers’ changing adaptation needs

“The early climate research work funded by PICCC was excellent. With the establishment of the USGS Pacific Islands Climate Science Center, however, this role largely moved over to that organization, which seemed logical. This left PICCC in a role of translating research findings into vulnerability assessments and adaptation strategies, which was a good niche that was not otherwise filled. The organization was a useful clearinghouse for information and an important forum in which agencies could meet to develop mutual strategies to a common threat. The ecosystem and regional focus was also useful, since many other organizations were already operating at the community level.”

6) Tailored support to the rare plant conservation community

“The Hawaiian Islands Plant Vulnerability Assessment is the accepted standard for including climate change into species status reports and management planning.”

“...there was some useful approaches that were taken to utilizing some of the HI islands Plant vulnerability assessment regarding prioritization of seed banking for non-listed but climate threatened species”

“the plant vulnerability assessment has been somewhat helpful in aiding management decisions by pulling/gathering current research out there and summarizing it. Managers can’t always keep up with the latest research work...”

A-28. If there is anything else you wish to add, please use the space below.

Some survey respondents expressed here and elsewhere that they were not familiar with many of PICCC's products mentioned in the survey (*"I was completely unaware of many of your products, e.g., story maps... So it seems that some outreach is in order."*). Indeed, PICCC had staff turnover and several periods without a communications manager, leaving the organization with limited capacity in this regard. The last series of HITAI products were published online just as PICCC was losing their non-federal staff in Spring 2018.

Feedback also reflected the need for more stakeholder engagement in the co-design of research agendas.

"I think that in the future PICCC, or whatever iteration or new group that gets formed, should specifically focus on the agencies they wish to influence. Start by learning, in detail, what that agency already does or would like to do (i.e., what is already in their management plans but they have not yet been able to accomplish), and then do your climate research and make suggestions specific to that agency and their work as to how they can best modify their current work or mgmt. plans, if at all."

The above recommendation also expresses the desire for further guidance on *what* local actions should be taken. Given PICCC's limited staff and funding resources, working more closely with practitioners would require casting a smaller net, i.e., re-thinking staffing and organizational design so that human resources could be dedicated to a "deep dive" with individual agencies.

While opinions varied on whether PICCC should place greater emphasis on climate action or adaptation science, there was broad agreement that PICCC played an important and needed role in facilitating adaptation dialogues and collaborations. Remaining comments underscored the desire for a "greater presence on the outer islands," the need to focus on the implementation of adaptation actions, and the hope for increased funding opportunities for this work in the future. Praise and gratitude for the PICCC, and the desire for the Cooperative's work to continue, were expressed.

"I hope PICCC can remain and continue to support our many needs. Mahalo for all the great work that you all have done!"

"PICCC conducted important research and published relevant scientific information regarding the impact of climate change on our natural ecosystems. This information is vital for assisting natural resource agencies management of natural resources such as the DLNR."

"Mahalo nui loa no kou kokua and for all your efforts to raise awareness and collaborative efforts to plan for climate change adaptations in the coming decades. Aloha nui loa!"

Appendix B: Interview Protocol

Twenty semi-structured interviews were conducted from July 25, 2018 to October 17, 2019, with the majority taking place in 2018. These individuals' names were provided by the former PICCC Coordinator, and were purposefully selected to represent the diversity of organizations and agencies involved in PICCC as Steering Committee members, partners, or staff, and to include organizations that had experience with the PICCC over the course of its evolution. Interviews were conducted in person when possible and by phone when not, averaging 63 minutes in length (shortest: 36 min; longest: 175 min; median: 56 min), and then were transcribed. Through qualitative analysis by both lead authors, key themes, events, and timelines were discerned and synthesized. The quotes shared in this report are representative of larger patterns that surfaced during the process of consolidating and analyzing responses across the 20 interviews. Due to the confidentiality of this information, only Miles and Moser (both human subjects certified social scientists) had access to the data. The quotes shared in this report are representative of patterns that surfaced during the process of analysis. Details about interviewees (e.g., affiliation) are not shared in this report to maintain their anonymity.

Interview Script

Introduction: To start, please reflect a bit on your involvement in/engagement with PICCC.

- How long were you involved in the PICCC?
- Did your role or form of engagement change over time? [if so, why?]
- What do you recall as the most enjoyable/challenging part of being involved with PICCC?

Theme 1: Facilitating Climate Adaptation

Question 1: In what ways did PICCC help natural resource managers and decision-makers integrate relevant climate change research and information into natural and biocultural resource management plans?

Potential follow-up questions:

- What needs, gaps, and opportunities for improving climate change resiliency were identified through the PICCC partnerships and experience?
- What scientific findings, assessments, tools, and techniques were gathered, produced, and shared by PICCC?
- What commitments and actions important to making progress on climate change adaptation in Hawai'i and the US-Affiliated Pacific Islands (USAPI) were achieved?
- What do natural resource managers and decision-makers like yourself perceive as the most useful contributions of PICCC?

Question 2: What have been the achievements and outcomes of PICCC's investment in climate change adaptation?

Potential follow-up questions:

- What are some of the achievements you have noticed that have come out of PICCC's investment in climate change adaptation in [area the interviewee has experience/expertise in]?
- What role did PICCC play in contributing to these achievements and/or outcomes?

Theme 2: Fostering Partnerships

Question 3: Did PICCC foster partnerships and conditions important for climate change adaptation to occur at landscape scales?

Potential follow-up questions:

- What “partnerships” and “conditions” do you consider as important for climate change adaptation to occur in Hawai‘i and the USAPI, based on your experiences?
- In what ways did PICCC foster such partnerships? Were first-time introductions between potential climate change adaptation partners facilitated, and were existing social connections strengthened?
- What proportion of the targeted PICCC partner organizations/agencies (i) participated in PICCC, (ii) how did they participate in PICCC, (iii) what was the duration of their participation in the initiative, and (iv) what are their perspectives on the quality and outcomes of their participation?
- To date, what have been some of the outcomes of relationships initiated and/or strengthened by PICCC? (e.g., formal partnerships, specific plans, final products, on-the-ground actions)

Theme 3: Interplay of Strategies

Question 4: What was the interplay between facilitating climate change adaptation and fostering partnerships in the context of PICCC?

Potential follow-up questions:

- Did the process of gathering, producing, and sharing climate change relevant science, assessments, tools, and techniques (Strategic Planning Goal 1: Facilitating Climate Adaptation) change relationships within the natural resource management community in PICCC’s service area, and if so, how?
- Did the partnerships developed or strengthened through PICCC (Strategic Planning Goal 2: Fostering Partnerships) help natural resource managers to integrate relevant climate change information into terrestrial and freshwater management plans in the main Hawaiian Islands and the USAPI?
- If PICCC had continued, how could its approach and framework be adjusted to further increase its effectiveness in fostering partnerships and facilitating climate change adaptation?
- Do PICCC’s partners perceive the overarching design of PICCC as an effective approach for supporting the resiliency of natural and biocultural resources in the Pacific to climate change? Why or why not, and what recommendations do they have for improving climate resiliency in the region?

Theme 4: Baseline and Progress

Question 5: From your vantage point, what was the foundational context in which PICCC was established, what challenges did it face in its development, and what conditions helped and hindered PICCC’s ability to achieve its strategic goals and mission?

Potential follow-up questions:

- In [2009/2013/2018], to what extent were/are climate change projections being incorporated into the work of major land management entities (e.g., government agencies, NGOs, and large-scale land owners) in Hawai‘i and the USAPI?
- In [2009/2013/2018] what were/are the most significant factors—both positive/negative— influencing natural resource managers’ ability to incorporate climate projections in their work?
- Over the course of PICCC’s existence, what conditions helped and hindered its ability to achieve its mission?


**APPROVED BY
INTEGREVIEW IRB
07-02-2018**

**INTERVIEW INFORMED CONSENT DOCUMENT
AGREEMENT TO BE IN A RESEARCH STUDY**

NAME OF SPONSOR COMPANY: Susanne Moser Research & Consulting

PROTOCOL NUMBER AND TITLE OF STUDY: ELSC2018: "Evaluating landscape-scale conservation in the face of climate change: The Pacific Islands Climate Change Cooperative"

NAME OF PERSON IN CHARGE OF THE RESEARCH STUDY (LEAD INVESTIGATOR): Susanne Moser, Ph.D.

TELEPHONE NUMBER(S), DAYTIME & AFTER HOURS: 

INTRODUCTION

We are asking you to take part in an evaluative research study. The goal of this project is (1) to conduct a review of the Pacific Islands Climate Change Cooperative (PICCC)'s work in landscape-scale conservation and climate adaptation within Hawai'i and the United States Affiliated Pacific Islands from 2009-2018, and (2) to interview and survey individuals knowledgeable on these efforts in order to glean lessons learned from the PICCC on how to best design landscape-scale conservation programs in the face of changing climatic conditions.

This research is being conducted under a US Fish and Wildlife Service contract and carried out by Dr. Susanne Moser (Susanne Moser Research & Consulting, SMRC), the PICCC's external evaluator, in collaboration with Dr. Wendy Miles, a former PICCC employee. The research is overseen by Dr. Moser and Dr. Miles is being paid by Dr. Moser to conduct the interviews.

This entire project will last approximately 6 months. One critical part of this project, for which we are requesting consent today, is to conduct interviews with individuals identified as "key informants" on the development, design, work, and/or influence of the PICCC. The interviews are an opportunity for you to share your perspectives on lessons that can be learned from the PICCC experience and that might help to inform future adaptation and landscape-scale conservation efforts in the region and beyond.

We expect the interviews to last ca. 60 minutes.

VOLUNTEERING TO BE IN THE STUDY

Taking part in this study is voluntary. You are not required to participate in any part of this study. You may stop taking part in this study at any time without repercussions.

PAYMENT FOR BEING IN THE STUDY

You will not be paid for participating in this study.

POSSIBLE SIDE EFFECTS AND RISKS

There are no significant risks involved in participating in this study. Talking about past work may bring back positive or negative memories; talking about future landscape-scale conservation and climate adaptation needs may raise concerns. To accommodate participants, the study provides opportunities to express emotional responses, to not answer given questions, and to end the interview at any time. Your privacy will be safeguarded during all stages of the research and during the writing and sharing of the research findings. Voice recordings will only be taken with permission, and they will be securely disposed of before the end of the study.

POSSIBLE BENEFITS OF THE STUDY

The study may benefit those who participate. A direct benefit may arise from reflecting on and learning from PICCC's landscape-scale adaptation and conservation efforts. In addition, with the closing of the PICCC in 2018, this study provides a mechanism through which participants can share their experiences with the PICCC model—unique in time and place—so that their insights can be distilled and the approach can be documented as a reference for future landscape-scale conservation and climate adaptation efforts.

CONFIDENTIALITY

Your records of being in this study will be kept private except when ordered by law. The following people will have access to your study records:

- The principal investigator (Dr. Moser) and her human-subjects certified co-investigator (Dr. Miles)

We will guard your confidentiality. Your identity will be kept confidential in all documents connected to the research. You do not have to answer any questions you do not wish to answer. Research records will be kept in a locked file; only the researchers will have access to the records. If we voice-record the interview, we will destroy the recording after it has been transcribed, which we anticipate will be within three months of its recording. Transcript identifiers will be disconnected from the transcripts and kept in separate, locked files.

CONTACT INFORMATION

If you have any questions about the research, you may contact the research lead, Dr. Susanne Moser [REDACTED] or email her at promundi@susannemoser.com. Alternatively, please contact project co-lead, Dr. Wendy Miles, at [REDACTED] or at wmiles@hawaii.edu. [Note: Personal phone numbers have been blocked out for the purposes of this report.]

You have rights as a research subject. If you do not want to talk to the investigator or study partner, if you have concerns or complaints about the research, or to ask questions about your rights as a study subject you may contact IntegReview. IntegReview's policy indicates that all concerns/complaints are to be submitted in writing for review at a convened IRB meeting to:

Mailing Address:	OR	Email Address:
Chairperson IntegReview IRB 3815 S. Capital of Texas Highway Suite 320 Austin, Texas 78704		integreview@integreview.com

If you are unable to provide your concerns/complaints in writing or if this is an emergency situation regarding subject safety, contact the IntegReview office at 1-512-326-3001 or toll free at 1-877-562-1589, between 8 a.m. and 5 p.m. Central Time.

IntegReview has approved the information in this consent form and has given approval for the investigator to do the study. This does not mean IntegReview has approved your being in the study. You must consider the information in this consent form for yourself and decide if you want to be in this study.

LEGAL RIGHTS

You will not lose any of your legal rights by agreeing to this consent form.

THE REASON FOR INSTITUTIONAL REVIEW BOARDS AND INFORMED CONSENT

What is a consent form?

The informed consent document contains information required by federal regulations. The informed consent document must be approved by an Institutional Review Board (IRB).

What is an Institutional Review Board (IRB)?

An Institutional Review Board (IRB) is a group of people that reviews research studies. The main goal of this review is to protect the rights and well being of the human subjects participating in research studies.

IntegReview, the IRB for this study

IntegReview is an IRB whose board members provide IRB services across the United States, Latin America and Japan.

IntegReview has approved the information in this consent form and has given approval for the investigator to do the study. This does not mean IntegReview has approved your being in the study. You must consider the information in this consent form for yourself and decide if you want to be in this study.

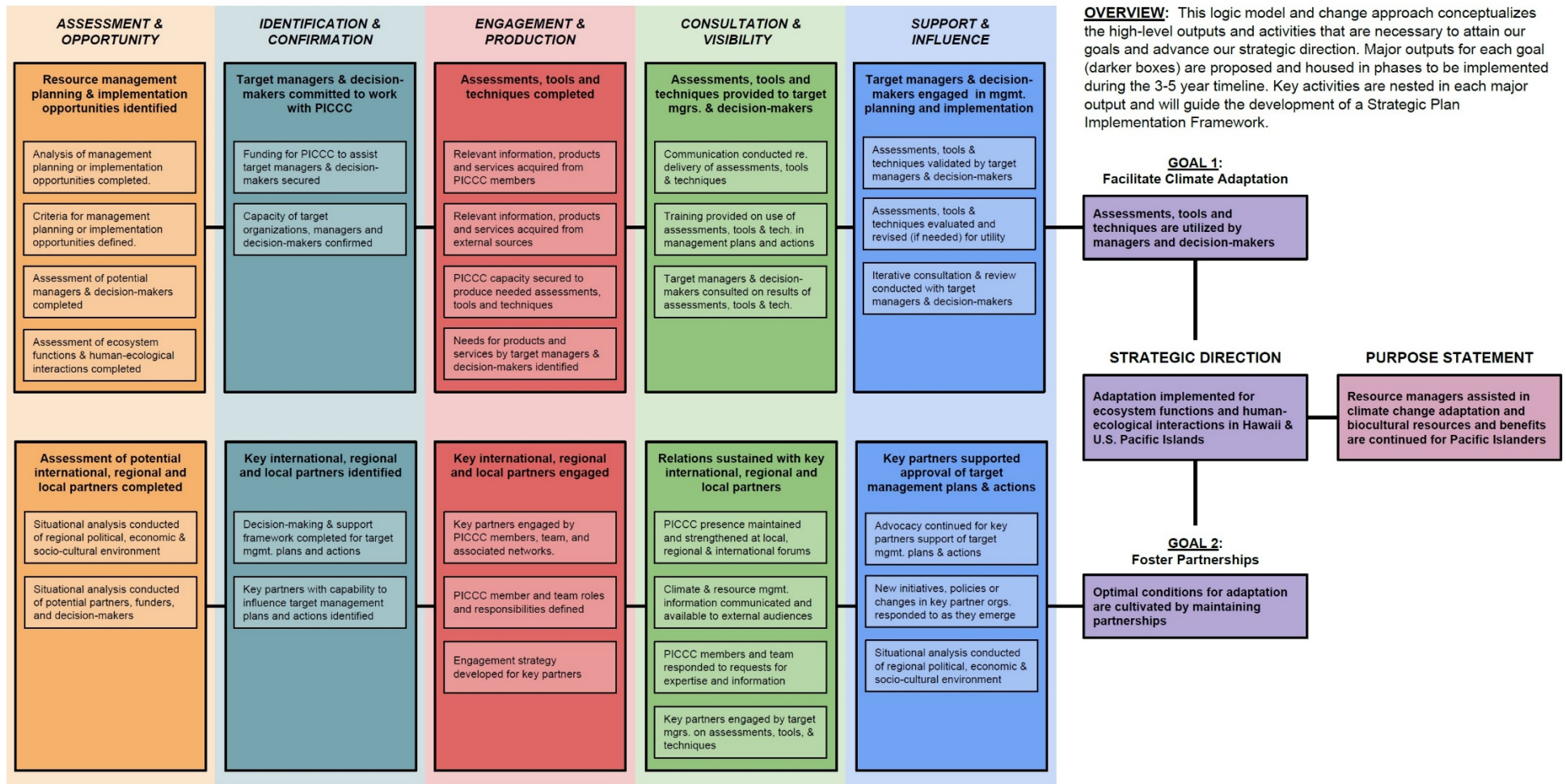
Appendix C: Logic Model and Theory of Change



Pacific Islands Climate Change Cooperative

STRATEGIC PLAN 2014-2019

LOGIC MODEL AND CHANGE APPROACH



EastWestCenter.org

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