State of Hawai‘i’s Ocean Acidification Action Plan

Region: Hawaiian Islands, Pacific Islands
Kilometers of Coastline: 1,210 km
Regionally Significant Marine Resources: Coral Reefs, Aquaculture, Reef Fisheries, Tuna, Intertidal Limpets and Shellfish, *Halimeda* Beds
Status of Action Plan: In-Progress (Aug 2021), Authorizing Draft Plan
Key statistics on ocean economy: Within the nearshore environment, our commercial and non-commercial fisheries are valued between $10 million and $16 million on an annual basis. Subsistence and “recreational” fishers, share much of the fish they catch among families and communities, providing over 7 million local meals each year.[1] Our coral reefs are a local and international treasure, providing cultural, economic, and recreational opportunities to residents and 10 million visitors annually.[2] They drive both our local and tourism economies, generating more than $360 million each year,[3] and providing $835 million in coastal flood protection annually.[4]

1. Grafeld, S., Oleson, K., Teneva, L., & Kittinger, J. N. (2017). Follow that fish: Uncovering the hidden blue economy in coral reef fisheries. PloS one, 12(8), e0182104. https://doi.org/10.1371/journal.pone.0182104.
2. Hawai‘i Tourism Authority, “2017 Annual Visitor Research Report,” 2017 Annual Visitor Research Report, 2017, http://files.hawaii.gov/dbedt/visitor/visitor-research/2017-annual-visitor.pdf.
3. Cesar, H.S.J.S.J., & Beukering, P. (2004). Economic Valuation of the Coral Reefs of Hawai’i. Pacific Science 58(2), 231-242. doi:10.1353/psc.2004.0014.
4. Storlazzi, C.D., Reguero, B.G., Cole, A.D., Lowe, E., Shope, J.B., Gibbs, A.E., Nickel, B.A., McCall, R.T., van Dongeren, A.R., and Beck, M.W., 2019, Rigorously valuing the role of U.S. coral reefs in coastal hazard risk reduction: U.S. Geological Survey Open-File Report 2019–1027, 42 p., https://doi.org/10.3133/ofr20191027.

What Is at Stake in Your Region?

Ka pae ‘aina o Hawai‘i nei (the Hawaiian archipelago) comprises of 137 islands in the north central Pacific Ocean approximately 3,000 miles from any major land mass. The Northwestern Hawaiian Islands are a collection of atolls, reefs, and small islands, designated as Papahānaumokuākea Marine National Monument, covering 582,578 square miles of both land and ocean. In the southeast are the Main Hawaiian Islands, which comprise of the majority of the land area: Ni‘ihau, Kaua‘i, O‘ahu, Moloka‘i, Lana‘i, Kaho‘olawe, Maui and Hawai‘i Island.

Hawai‘i’s culture, wellness, local tradition, food supply, and economies are strongly tied to the ocean. From the Hawaiian worldview, as evident in the Kumolipo creation chant, “*the ocean is the source of all life*.” This ancestral relationship is represented in many other oli (chants), mele (songs), mo‘olelo and ka‘ao (stories and legends), and ‘ōlelo no‘eau (proverbs). Hawai‘i’s residents depend on the ocean and coastal environment for connection across communities, to put locally sourced food on the table, and to support livelihoods from tourism and commercial fisheries.

Specific concerns for Hawai‘i include our coral reef environments and shoreline protection, intertidal shelled organisms, such as ‘opihi or limpets that have cultural significance. Hawai‘i’s Halimeda and other calciferous algae, such as crustose coralline algae (CCA) are an important settlement environment for larval coral. Additionally, Hawai‘i provides significant amounts of seed for shellfish production along the West Coast. It will be important to better understand and predict changing conditions potentially occurring within incoming water flow to hatcheries. As Hawai‘i considers mangrove species invasive, it will be important to further assess opportunities, merits and challenges associated with “blue carbon” ecosystems—relying on native ecosystems and species that can provide carbon sequestration or resilience providing ecosystem benefits.

Hawai‘i has documented increasing concentration of carbon dioxide in the atmosphere at Mauna Loa. Hawai‘i has also documented increasing concentration of caron dioxide in seawater at Station ALOHA—an internationally recognized ocean acidification monitoring station that has contributed immensely to global understanding of climate related ocean change. Additionally, there exists high levels of bioerosion occurring in the Main Hawaiian Islands, which can exacerbate coastal conditions.

Policy Vehicle, Enabling or Authorizing Conditions for Creating an OA Action Plan

The State of Hawai’i joined the OA Alliance in 2018 at the Global Climate Action Summit, committing to develop a state Ocean Acidification Action Plan (OA Action Plan). While there was no formal state legislation or task force developed to draft the OA Action Plan, the Division of Aquatic Resources within the Department of Land and Natural Resources was designated as the lead division within the State of Hawai‘i to develop the plan. Division of Aquatic Resources, has partnered with other State departments, programs, and commission:

Department of Land and Natural Resources	Responsible for Hawaii’s unique and limited natural, cultural and historic resources
Department of Health	Responsible for conducting water quality monitoring under the Clean Water Branch
Department of Agriculture, Aquaculture and Livestock Support Services Branch	Responsible for permits and regulatory requirements for aquaculture in Hawai‘i
Office of Planning, Coastal Zone Management Program	Responsible for implementing the Ocean Resource Management Plan and organizes 33 state, county, university and federal partners that manage ocean related resource management within the Hawaiian Islands
Hawai‘i Climate Change Mitigation and Adaptation Commission	a multi-jurisdictional effort across 20 different departments, committees, and counties and is responsible for ambitious, climate-neutral, culturally responsive strategies for climate change adaptation and mitigation in a manner that is clean, equitable and resilient

Non-state partners include the University of Hawai'i at Manoa, School of Ocean and Earth Science and Technology, which hosts both the Hawai'i Ocean Time Series (HOT) at Station ALOHA and the Coastal $MAPCO_2$ moorings with the NOAA PMEL and PacIOOS system. University of Hawai'i Sea Grant College Program Aquaculture Focus provides a great expertise and network to the Aquaculture industry in Hawai'i. Kua'āina Ulu 'Auamo (KUA), a grass-roots non-profit, works with communities to improve their quality of life through caring for their bicultural (natural and cultural) heritage. Within KUA, the Hui Mālama Loko I'a (Hui) is a growing network of fishpond (loko i'a) practitioners and organizations from across ka pae'āina o Hawai'i (the Hawaiian archipelago).

At the federal level, the National Oceanic and Atmospheric Administration, Pacific Island Fisheries Science Centre, and the National Coral Reef Monitoring Program, have been monitoring for ocean acidification impacts on coral reefs, including the accretion and erosion rates and multiple water quality parameters in both the main Hawaiian Islands as well as the Northwestern Hawaiian Islands.

At the policy level, the following partners have been, and will continue to be, helpful in developing future legislation: other U.S. state members of the International Alliance to Combat Ocean Acidification, US Climate Alliance, The Ocean Foundation.

The State of Hawai'i OA Action Plan will be an independent plan that is referenced within larger management frameworks. Ocean acidification is mentioned in the Hawai'i Office of Planning Coastal Zone Management 2020 Ocean Resource Management Plan. Components of the OA Action Plan will be detailed within Climate Ready Hawai'i Initiative's Nature-based Resilience and Adaptation to Climate Change in Hawai'i Working Paper from the Hawai'i Climate Change Mitigation and Adaptation Commission. As part of the strategy to assess potential "Blue Carbon" ecosystems, the State of Hawai'i's Wetland Program Plan contains multiple activities that incorporate wetland habitats into climate planning efforts.

The Hawai'i Climate Change Mitigation and Adaptation Commission has initially approved of the five goals of the State of Hawai'i OA Action Plan and will be charged with approving the final plan due to the Commission's scope related to climate change.

"As the state works to mitigate and adapt to the impacts of climate change, incorporation of ocean actions into our climate actions is imperative for our island state surrounded by ocean. There is a synergy between actions to combat, adapt, and build resilience against ocean acidification, and our general actions to address climate change"

—the State of Hawai'i Climate Change Mitigation and Adaptation Commission

INTERNATIONAL ALLIANCE TO COMBAT OCEAN ACIDIFICATION

Priority Areas or Actions in Your Plan

Hawai'i's oceans are being impacted by climate change. The damage from greenhouse gas emissions have led to rising global temperatures, subsequent ice melt and changing water chemistry. These change impact the oceans, impeding their ability to sequester carbon and to provide a resilience coral reef ecosystem in Hawai'i's waters. To encourage the coordination and integration of general actions to address climate change with ocean climate actions, the Hawai'i Climate Change Mitigation and Adaptation Commission approved the general work being undertaken in response to Hawaii's membership within the International Alliance to Combat Ocean Acidification:

1. The Commission approves of the five goals of the State of Hawai'i's OA Action Plan, as listed below:
    1. Increase scientific understanding of ocean acidification in the region (SDG 14.3);
    2. Reduce carbon dioxide emissions and land-based sources of pollution (SGD 13);
    3. Build adaptation and resilience of coastal communities to impacts of ocean acidification (SDG 14);
    4. Increase public understanding of ocean acidification (across local communities and at the state legislature) (SDG 14.3); and
    5. Build and continue international collaboration, leadership, and action.

2. The Commission encourages any and all coordination and collaboration within State of Hawai'i with counties, other states, and federal, private, and academic partners to enhance action on ocean and climate issues.

Measures of Success, Challenges, and Lessons Learned

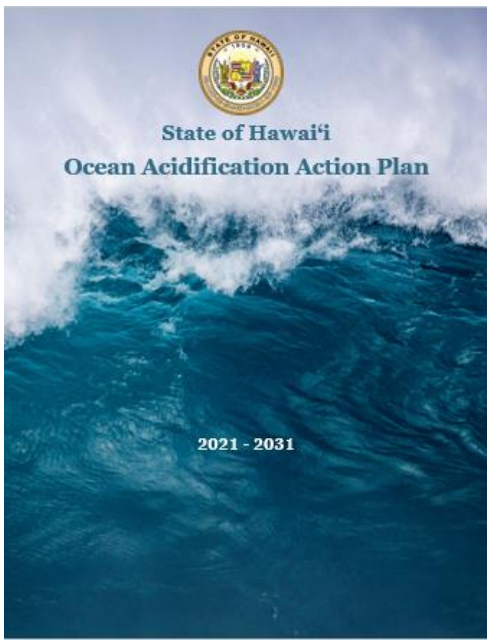
The State of Hawai'i OA Action Plan was not developed by a formal or mandated working group or task force. In order to ensure sustained implementation of the recommendations outlined, a formal working group or task force should be formed to carry out the approved OA Action Plan, including updating priorities and incorporating new data and information. While there was meaningful voluntary involvement from departments in the drafting of the OA Action Plan, continued coordination will be needed to ensure integration and synergy of efforts.

A statewide vulnerability assessment is currently being conducted. The assessment will use productive forecast models to pair with socio-economic ecosystem services models, which will help determine species, ecosystem and human community impacts of OA in Hawai'I and inform further actions. There is an informal team working on redistributing current $MAPCO_2$ within the main Hawaiian Islands in order to increase monitoring coverage across the archipelago. There are several funded projects on Restorative Aquaculture exploring syngenesis between aquaculture products and mitigation through carbon sequestration. Success in 5 years would include a designated OA working group coordinated at the state level to support recommendations of the vulnerability assessment and carry forward priorities of the OA Action Plan on a rolling basis.

INTERNATIONAL ALLIANCE TO COMBAT OCEAN ACIDIFICATION

How Does OA Action Support Your Existing International and Domestic Climate Commitments?

The final State of Hawai'i OA Action Plan will be submitted as a voluntary commitment to support implementation of the U.N's Sustainable Development Goals, in particular SDG 14, with a focus on ocean acidification under SDG 14.3. In 2019, Hawai'i signed a Joint Statement for U.S. States Taking Ocean-Climate Action, which included collaborative work with Maryland, Washington, Virginia, California, and Rhode Island, to take action through forums such as the U.S. Climate Alliance and the International Alliance to Combat Ocean Acidification. The OA Action Plan will build upon collective efforts to account for ocean strategies across Hawai'i's goal to be Carbon neutral by 2045.



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